Chapter 1. Rules of the Game

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Ideas have consequences. Good ones lead to new knowledge, while poor ones gyrate until mired in their own invalidity. Because faulty ideas and practices never *lead* anywhere, time is not their friend. When it comes to a particularly rigid ideology, in fact, any sense of history proves a fatal intelligence, for it documents the track record of failure no amount of spin can disguise. This is especially true of pseudoscientific endeavors, from occultism to creationism, where each new cycle of novitiates thinks they are the first to ride the merry-go-round, and never learn anything from committing the same mistakes.

Of course, that's not how the ideologue sees things. Sealed inside their often well-padded box, it is always their opponents who suffer from pathological incompetence and error. In the creationist example, since the believer is certain the "true facts of science" firmly contradict evolution, it is a modest logical step to conclude there must be some ulterior motive why otherwise levelheaded secular scientists persist in accepting the "evolution myth." For someone like conservative Florida preacher D. James Kennedy, who accepts literal Flood Geology as a theological absolute, people could only believe in evolution because deep down they hate God. Over on the Intelligent Design side, fellow Presbyterian Phillip Johnson vaults over the methodological naturalism of science (the idea you should seek natural physical explanations for things before invoking supernatural causes) to attribute evolutionary conviction to an intractable animus for religious believers.[1]

The defects of the creationist ideology are cast into relief whenever its analytical practices are laid out against the established ways of science. There happen to be recognizable features to how scientists tackle contentious issues, from the particulars of the Big Bang all the way down to whether *Tyrannosaurus rex* was an active predator or simply the biggest scavenger of all time. Of course science is a human enterprise, so the debate can easily grow as heated and ego-bruising as any in politics or religion—but in the end all that matters is the *evidence*, and that's where the "scientific method" comes in to level out the passion.

Although philosophers of science have been known to tie themselves into knots analyzing what it means to "do science," there are really only three main operating principles governing all sound reasoning, scientific or otherwise. Although they build on the defined rules of logic, they go well beyond them to govern the standards by which faulty conceptions are weeded from the garden of knowledge; failure to abide by them is the hallmark of the rigid ideologue in general, and of pseudosciences like creationism in particular.

First and foremost, there is plain old-fashioned *fairness*. You not only have to lay your own factual cards on the table (unmarked ones, by the way), but those of your opponent, for sometimes you might not be dealing from the same deck. Only when all the evidence is available for inspection can debate be taken seriously. Anyone confident of their case will be scrupulous about presenting the relevant issues for the reader to decide. Conversely, a sure sign somebody is trying to pull a fast one is scholarly neck strain, from constantly having to peek around tactically positioned screens to spot all the information they've swept behind.

The second principle concerns what you *do* with all that information once you have it, for data do not carry little tags telling you what they are supposed to signify. Especially in science, facts take on particular "meaning" when you sit down and carefully describe what you think happened—that's where *theory* enters the picture. People had been watching several unusually bright "stars" glide by in the night sky for a very long time, for example, but until someone stepped forward with a statement of what they thought was going on up there the planets remained either gods or just mysterious lights. It was neither obvious nor easy to work out that the earth was itself a planet orbiting the sun and it took centuries of effort to get the theory straight. But that process depended

on saying precisely what you meant by the facts, and would have been short-circuited if there were no contending theories in the first place.[2]

Which brings us to the third principle, embodied in the old Irving Berlin tune from *Annie Get Your Gun*: "Anything You Can Do (I Can Do Better)." Scientific theories rarely triumph by "explaining everything," at least not in one go. The history of scientific discovery shows that successful conceptions make it through the gauntlet by *outperforming* their opponents. They challenge one another with deductions based on their explanatory model, and vie to work things out with greater scope, clarity, and often simplicity. All of this constitutes the notion of *predictive value*, where subsequent evidence serves either to raise the credibility of the theory by confirmation, or undermine it by failing to turn up as expected.

Skip any of these principles (fairness with the facts, theoretical explanation, and predictive success) and you are bound for trouble. Avoid all three and you have the surefire formula for a persistent pseudoscience, one functionally impervious to empirical refutation. In a world of conflicting evidence, false conceptions can only be sustained by turning off the reasoning faucet at certain critical junctures. The ideologue demands their opponents address "all the evidence" when they fail to do so themselves. They will try to "refute" an entire theory based on some peripherally discordant detail, tossing aside all the mountain of evidence otherwise in its favor, yet will not apply that scalpel to their own theory. Such methodological hypocrisy offends more than just a prissy scientific rule. There is quite a hallowed tradition in both philosophy and religion that frowns on such practices: "Do unto others…."

In science there must be a "sink or swim" attitude, where everyone is to be treated equally, on their legitimate merit. That's not always easy, especially when in the heat of ideological passion the debater's instinct is to put the best spin on their own position, while trying to home in on the opponent's jugular. But every day of our lives we have decisions to make, and reaching a confident resolution depends on the quality of the thought employed. Whether evaluating the real magnitude of a potential pollution threat posed by a nearby factory or deciding how well the geological record supports the validity of the Noachian deluge, sound reasoning can be compartmentalized only at great risk.

That this is no mere academic conceit has been brought home in recent years by the spate of "repressed memory" litigation, where patients who have undergone certain forms of hypnotic regression therapy have taken to suing their former therapists for malpractice. That the brain can occasionally glitch up, resulting in paralyzed waking dreams or sporadic memory loss, is disconcerting enough. But in the hands of an ideologically motivated "therapist" very strange and sometimes dangerous things can happen. While reincarnation believers will elicit more benign "past life" experiences, UFO activists will uncover recurrent alien abductions. But if the therapist is of a certain Protestant fundamentalist persuasion, obsessed with satanic presence in the "end times" before Armageddon, the outcome could be a truly appalling litany of grisly infant sacrifices and horrendous sexual molestation.[3]

Far too many families have been torn apart by these imaginary accusations of parental abuse, mined from the bottomless pit of ideological expectation, to slough it off as a mild aberration. What took place in these cases (and still does, in some instances) was a modern manifestation of a far more ancient mindset, one that Carl Sagan described in his moving penultimate work, *The Demon-Haunted World*.[4] People often as cultured and intelligent as any today administered the ghastly machinery of persecution that combated the "threat" of medieval witchcraft and heresy. While the incubi and succubi have been replaced by gray aliens and televangelism, the history of our own genocidal century should leave us queasy knowing there are citizens living in America today whose thought processes would be quite at home in 1398.

Which brings to mind this clarion passage:

> If evolution is basically impossible from a scientific point of view (as demonstrated by the universality of the two laws of thermodynamics) and untrue from a historical point of view (as demonstrated by God's revelation of a finished creation and subsequent curse on creation), then how can we explain the well-

> nigh universal insistence that all things must have come about by evolution? The real answer, we suggest, is found in II Corinthians 4:3, 4:
>
> "But if our gospel be hid, it is hid to them that are lost: In whom the god of this world hath blinded the minds of them which believe not, lest the light of the glorious gospel of Christ, who is the image of God, should shine unto them."
>
> The answer is *Satan*! He has blinded the minds of men with respect to the gospel. The gospel is the good news of a Saviour, who has borne the sins of men on the cross, that all who believe on him might be saved. But if men have evolved by natural processes out of the elementary "stuff" of the universe, then there is no responsibility to a Creator, there has been no fall and no curse and, therefore, there is no need of a Savior!
>
> The "great dragon … that old serpent, called the Devil, and Satan," who "deceiveth the whole world" (Revelation 12:9)—must without any doubt be the one who has fathered this monstrous lie of evolution, for he is the father of lies. The Lord Jesus called him the "prince of this world" (John 12:31; 16:11); the Apostle Paul called him "the prince of the power of the air, the spirit that now worketh in the children of disobedience" (Ephesians 2:2); the Apostle John stressed that "the whole world lieth in the wicked one" (I John 5:19), and Satan himself was not contradicted by Jesus when he told Him "All this power [i.e., all the kingdoms of the world] is delivered unto me" (Luke 4:6).
>
> When one recognizes the Satanic origin of evolution, then many otherwise confusing issues begin to come into focus. The ultimate issue in the universe, in fact the only real issue, is that of God's sovereignty versus the asserted autonomy of his creatures. Is God really the Creator and King of the universe, or is he limited to greater or less extent by his creatures?
>
> There are not *many* religions and philosophies among men. There is really only one, and that is the rebellious and blasphemous belief that autonomous man is capable of controlling his own destiny independently of the will of his Creator. Every religion (other than Christianity) is an attempt on man's part to earn "salvation" or to improve his standing in the world, either temporally or eternally. Every non-Christian philosophy is an attempt to deduce ultimate truth concerning the universe without submission to the revealed Word of God. All of man's religions and philosophies, apart from the grace of God revealed in his Word, are *man-centered*—or, perhaps more generally, *creature-centered*—rather than *Creator-centered*. They all involve some system of works, of improvement, of development, of human betterment, of *evolution*!—rather than simple submission in helpless faith to the sovereign grace of God manifest in the sacrifice of the Lamb of God for the sins of the world.[5]

Thus spake Henry Morris back in 1963. That was before he started trimming the public sails of Scientific Creationism to better weather the gales of constitutional disapproval billowing from the Supreme Court. Because the overt face of Creation Science is now carefully non-Biblical it is easy to forget people like Morris have *not* changed their minds on such matters in the intervening years. They have just taken a more calculatedly coy approach when it comes to informing potential secular allies about their beliefs. This is further abetted by the authors of the Intelligent Design wing who proceed either as if such views did not exist or were of no consequence.

Suppose we didn't live in our benighted society with its constitutional guarantees about church and state. What if a future electorate established a noble "theocratic republic" of the sort D. James Kennedy envisions in his sermons?[6] What limits might remain to impede an aroused Christian polity when it comes to expunging the satanic evil of evolution from the world? Given Phillip Johnson's argument that the very concept of "methodological naturalism" is a solid ally of evolutionary conviction, where exactly would Christian activists *stop* in rooting it out of science education?

Based on the studied silence of their own writings on this point I don't know the answer to that—and that's one of the things that worries me so about creationism.

The von Däniken Defense

But who granted creationism "special rights" to the brave new world of post-evolutionary education in the first place? Won't *anyone* who juggles information as well be allowed to play? If so, it's going to be a crowded and exciting field. Consider the groundbreaking archaeological insights of former Swiss hotel manager Erich von Däniken, whose *Chariots of the Gods?* launched the "ancient astronaut" craze some thirty years ago. In ascribing everything from the pyramids of Egypt to the heads on Easter Island to the intervention of meddling spacefarers, the theories of von Däniken and others would seem just as relevant to the teaching of human history as creationism is to paleontology or geology.[7]

Three aspects of the von Däniken case stand out in ready parallel to creationism. The most obvious one is its enduring popularity in spite of having absolutely no evidence in its favor. A flock of critics have raked von Däniken over the coals through the years without slowing down either him or the enthusiasm of his readers.[8] In fact, his books have sold so well he's been able to permanently abandon the reservation desk and embark on an extended regimen of travel to document the itinerary of the space gods. This outcome is par for the ideological course whenever the believer depends on *only* the wisdom of the guru, be it von Däniken or Henry Morris in the pseudoscience camp, or Mao or *The Turner Diaries* in the political arena.

The second lesson concerns scholarship and the nature of credulity, and is found by following a curious tangent leading from von Däniken to a minor character in the creationist passion play. One of the chapters of *Chariots of the Gods?* wondered "Was God an Astronaut?" A purely rhetorical question as far as von Däniken was concerned, but not for those who took their religion more seriously. Probably because the scientific community swatted down von Däniken so decisively on their own, unprompted, very few Bible believers bothered to address this theologically offensive point. An exception was an Australian clergyman, Clifford Wilson, who authored two books to combat the awful doctrine that even some of the activities attributed to the God of Abraham might be usurped by the antics of masquerading aliens.[9]

As a Christian, Wilson understandably objected to von Däniken on Biblical grounds, and presented a fairly detailed litany of his misappropriations of archaeological data. If judged only on this, Wilson's books would seem reasonable enough—unless you happened to encounter a little opus written in between, *UFOs and Their Mission Impossible*, which revealed quite another facet to Wilson's metaphysic. For not only did Wilson believe in the reality of UFOs, he was convinced they were of satanic origin, part of Lucifer's longstanding plan to deceive mankind during the critical end times leading up to the Second Coming of Christ. The silly cosmologies and failed landing predictions of many contactees (which skeptics would chalk off as symptomatic of a kooky mindset) are taken literally by Wilson and his brethren as demonic deception, luring the unwary into the web of unchristian thought.[10]

While satanic UFOs are hardly a prominent feature of modern conservative Christian commentary, there is still a quite sizable subculture that believes much as Wilson does, from Hal Lindsey's millennialism to creationists like Kelly Segraves and Norman Geisler. Physicist Donald DeYoung, the current Vice-President of the Creation Research Society (Duane Gish is on its Board of Directors) regards most UFOs as mistaken natural phenomena. But DeYoung still allows some UFOs in from "the demonic world," either as part of Satan's plan "to provide false evidence in support of evolution" or to rationalize the disappearance of believers after the expected Rapture. At the top of the Creation Science pyramid, Henry Morris has played a more equivocal game, expressing UFO convictions very similar to Wilson's, while publicly discouraging such fringe speculation through the official doctrine of the ICR.[11]

As for millennialism, many Scientific Creationists embrace messianic imminence no less dearly than Hal Lindsey does, and so an understanding of that belief contributes to appreciating the mindset of the more overtly "Biblical" creationist. Here again, Henry Morris was far more chatty in

his earlier writing, where he noted the defeat of evolution depended on the destruction of Satan. Fortunately this event was near at hand:

> But we can speak confidently of the imminent death of evolution because we can discern ample signs of the imminent "coming" of the Lord, which the latter-day scoffers so vigorously resist. The very fact that uniformitarian and evolutionary thought seems to have captured the intellectual world is noted by the Apostle Peter (II Peter 3:3, 4) as indicative of the "last days." Similarly, the Apostle Paul, in the last epistle written before his martyrdom, emphasized that "in the last times," men would be "having a form of godliness, but denying the power thereof" (II Timothy 3:1, 5). That is, they would profess some kind of religion or morality, but would deny that there was any "power" to it, and this is nothing else than the denial of the miraculous, of creation, of His coming in judgment, and so again is essentially an allegiance to the concept of uniformity and, therefore, of evolution.[12]

Three "imminent" decades later, creationist astronomer Hugh Ross remarked on whether the earth would last another 10 billion years: "Scientifically it can't because the sun can last only another 6 billion years. I believe it won't because God has promised to replace the entire universe with new heavens as soon as the problem of evil is conquered, and the Bible suggests that time is not far off." He did not elaborate on how far off "not far off" could get before it would expire.[13]

Such vagueness has considerably extended the popular shelf life of modern millennialism. While setting the millennium countdown clock ticking from around 1988 (the fortieth anniversary of the foundation of the modern state of Israel), Hal Lindsey and others have judiciously avoided the fatal specificity that sank the Millerites back in the 1840s. The world failing to end on schedule can be tolerated once, but the second time around really does provoke pangs of doubt. In the process millennialists are unintentionally performing a useful field experiment on the psychology of belief. Just how "imminent" can the Second Coming remain without it actually occurring, and how long can this delay be sustained before the faithful begin to drop away?[14]

Returning to Clifford Wilson and UFOs, his book blazed some revealing citational trails. In marked contrast to his unwavering skepticism when it came to von Däniken, here Wilson was virtually transparent to the emanations of the UFO fringe. Authors like J. Allen Hynek (who at least *started* with a scientific reputation) rubbed shoulders with unabashed screwballs like John Keel, Brinsley le Pour Trench, and Otto Binder.[15] Binder in turn brought Wilson to the antievolutionary speculations of a certain Max Flindt. Early in the 1960s Flindt authored a pamphlet, "On Tiptoe Beyond Darwin," which argued spacemen had engineered Hybrid Man (us) for their earth colony (apparently as rather absentee landlords, judging from the infrequency of their calling).[16] When it came to their version of antievolutionism, Wilson blithely followed Flindt and Binder right off the cliff:

> Until writings such as these began to be prominent in recent times, most of the forthright opposition to the Darwin-based theory of evolution came from Christians who saw it as opposing the Bible. Now many ufologists reject Darwin on biological and other grounds. Many of their arguments were valid, but to insist that man has therefore resulted from a space-earth sexual union is conjectural. There is still no better explanation than that of Divine creation.[17]

Well, that settles that, doesn't it? Now that UFO believers have written off Darwin, no need to bother consulting scientists who might actually have some expertise in the area. In Wilson's world at least, Flindt and Binder were adequately "prominent" for him to switch his brain into neutral and glide gently back to where he started. When we encounter Wilson again, it will be in regard to a belief that makes even Hybrid Man seem levelheaded, the contention that dinosaurs and human beings lived at the same time, back in the tumultuous days of Noah.

Clifford Wilson typifies someone who is often found orbiting among the critics of a controversial position. They arrive at their stance for all the wrong reasons. Wilson was willing to rely on the findings of archaeology in confuting von Däniken only because he already accepted that discipline as validating Biblical truths. In regions where he had no such justification, such as UFOs, he rolled around the deck as a very loose cannon. Especially when an author's conclusions sound entrancingly congenial, it is therefore a wise policy to be familiar with more of their work. Sloppy methods can be concealed for a time, but they usually stick out somewhere in the end.

The third and most vital relation von Däniken bears to creationism occurs on the methodological level. Von Däniken ignored relevant information so routinely it often comes as a shock when he does stumble on it, and nothing even remotely approximating an explanatory theory of *which* aliens were doing exactly *what* to *whom* and *when* has ever emerged from his otherwise loquacious tales.[18] In this respect von Däniken's approach is *identical* to Creation Scientists when it comes to dealing with the age of the earth and universe, or working out the finer details of the Deluge.

Whenever queried about ancient astronauts, Carl Sagan liked to joke von Däniken attributed to their activity anything he didn't understand about the past, and since he comprehended practically *nothing*—well, you get the idea. While I certainly relish well-honed sarcasm, there's something more substantive to glean from William Irwin Thompson's droller take on the von Däniken interpretive style:

> When you know what you are looking for, it is certainly not hard to find it. Von Däniken wants to find holes blasted out by rockets, so he takes the round wells of the Maya, the *cenote* at Chichén Itzá, and says that the limestone well is the result of a rocket blast. Curiously enough, he is willing to take the huge monolithic platforms of the temple of Baalbek in Lebanon, which has no holes scoured out by rockets, and say that this, too, was a launching pad for rockets. Next he goes to the plain at Nazca in Peru to say that the long lines that can be seen only from the air are landing strips for the ships from space. The image of a World War II prop job chug-chugging in from Andromeda and needing a landing strip a few miles long is hilarious, but von Däniken is not sensitive to the perils of what Whitehead called "misplaced concreteness."[19]

What Thompson picked up on here is a common problem for ideologues: they don't like *comparing* things that fall outside the box. After all, if you believe some ancient monument was the product of alien laser tooling, it won't help your case much if you start honestly contrasting that with equally sophisticated stonework clearly *not* done by space visitors. An imposing example of this exists on the island of Samos in the Aegean Sea, where an ancient tunnel nearly a kilometer long was bored neatly through solid granite to make spring water available to the town below. The shafts were cut from opposite ends, like the Channel Tunnel, and missed an exact linkup by only six meters horizontally and but one vertically, requiring a modest kink in the middle. Though this would seem ideal ET fodder (perhaps to pump rocket fuel up to an alien launch pad) it never crops up in ancient astronaut lore, because the Greek historian Herodotus played spoilsport by telling how the engineer Eupalinos of Megara constructed it for the tyrant Polycrates of Samos in the mid-6th century BC.[20]

Now out in the wilds of Intelligent Design, Michael Behe has his own absolute to defend. Certain biochemical systems are "irreducibly complex" according to him, and so must have been designed by some creative intelligence. All well and good, but must *everything* have been designed, or could any of the complicated parts knocking around in living things have developed on their own account? And if so, what might those be? When it came to considering this problem, Behe pressed perilously close to the edge:

> Just because we can infer that some biochemical systems were designed does not mean that all subcellular systems were explicitly designed. Further, some systems may have been designed, but proving their design may be difficult. The face of

> Elvis might be clear and distinct when his (assumed) guitar is an impressionistic blur. Detecting design in the cilium might be a piece of cake, but design in another system might be borderline or undetectable. It turns out that the cell contains systems that span the range from obviously designed to no apparent design. Keeping in mind that anything might have been designed, let's take a brief look at a couple of systems where design is hard to see.[21]

On a technical level, of course, Behe operated way over the head of a scientific illiterate like von Däniken, but not when it came to his analytical method. All the examples Behe went on with were more potential candidates for *designed* systems, not complex processes showing "no apparent design." If he had some example in mind when he began the paragraph, what happened between there and the end? Aspects of the intricate immune system and cellular energy cycles have been implicated as evolutionary in nature, but because Behe never followed through on his own point the reader was left with nothing to *compare*. Just as von Däniken was not interested in showing testaments to human ingenuity, Behe ended up back under his own protective blanket.

The core of von Däniken's argument hinged on his idiosyncratic interpretation of historical evidence, primarily architectural wonders and unusual artwork. But in order to claim things such as that the sarcophagus lid of king Pacal (who ruled the Maya city of Palenque from 615 to 683 AD) actually depicted an ancient astronaut it was necessary to firmly ignore all the findings of contemporary Mayan archaeology.[22] Fortunately, choosing between a carefully established discipline and giving up a pet theory has always been a snap for an ideologue. Von Däniken simply disposed of his critics *en masse* by what amounted to philosophical jujitsu, claiming their views carried no inherent weight because, "contrary to prevailing dogma, I use modern knowledge to explain old texts differently."[23]

But what magic validates the von Däniken interpretation over all others? Don't the details belong in there somewhere? Apparently not for von Däniken—and evidently not for Phillip Johnson, either, for he employs *exactly* this argument to slough off the fossil record suggesting macroevolutionary changes like the common descent of mammals from reptiles. As we'll be seeing in the chapters to follow, it hasn't mattered at all to Johnson what the actual fossils looked like or what their specialized traits might be. If an evolutionist claimed a fossil was transitional, well, that was just their evolutionary bias speaking, wasn't it? If Phillip Johnson is allowed to reject all paleontological analysis by this bold gambit, why can't von Däniken do likewise with the findings of archeology?

The concern here is not about what the overt "facts" are. It's about what those facts *mean*—or rather, what they are *allowed* to mean. Denying *in principle* that reasonable inferences can be drawn from data, as von Däniken and Johnson do, is at best a slippery practice; at worst, it is a potentially dangerous analytical precedent. But from a scholarly standpoint the success of that ingenious tactic depends on the reader knowing less about the subject than what the author was willing to tell. Someone familiar with Mayan archaeology would spot in a second the shell game von Däniken was trying to play, just as anyone aware of the facts of the reptile-mammal transition would gape at how Johnson tried to reach sweeping conclusions as if that information didn't exist.

This is especially so for fields relying on irreversible historical processes, where the vagaries of evidential conservation come with the territory. Provided the critical data were preserved at all, they still had to endure the gauntlet of all subsequent ages without undergoing distortion or destruction. Sometimes that's a tall order. But if the needed facts did not make it, can their existence be inferred from companion evidence that had survived? It is the duty of an informed judgment to detect when there are such empty factual spaces to fill, and if so, deduce what's reasonably missing. Or be able to tell when somebody else is doing that particular trick *wrong*.

In this respect, consider the history of *tarot cards*, something that would seem as far removed from creationism (or even von Däniken) as you could get. But there are parallels to be drawn here because we are dealing with how fragmentary information is interpreted within the context of theory and ideology. Questions of taxonomy arise regarding the tarot and that issue of classification plagues creationism when it comes to analyzing the evolutionary characteristics of living things. No matter what it is you think about, there are still only the three main principles of

sound reasoning to help with the thinking. Sink or swim together, remember? So bear with me for a moment, as we stroll off to the local mall and step into the average chain book outlet.

To find out anything about the tarot you have to make a beeline for the New Age section. On these shelves the origins of the tarot are lost to the mists of time, with exotic hints of ancient Egypt, or even Atlantis. But history takes a back seat anyway to the main event, which is to explain the "meaning" of each card, and how to arrange them into shuffled patterns suitable for their primary purpose of divination and spiritual development. The stars here are the 22 distinctive picture cards they call the "Major Arcana." The remaining 56 consist of numbered and court cards very similar to conventional playing cards, only the suits being odd (swords instead of spades, for example). These dull cousins are dubbed the "Minor Arcana."

Most modern occult tarot authors are aware of an ensemble of historical facts about the cards, in much the same vague way creationists grasp the fossil record. Many know the earliest preserved tarots date from the middle of the 15th century, and don't look much like modern occult packs. Some are even aware there have been games played with these old decks, though usually they don't go into any of the rules. If there are any connections seen between regular playing cards and the tarot, for the occult devotee it could only be through the debasement of the tarot's original profound metaphysical truth.

Many divination practices *are* very ancient, from astrology to the I Ching, but cartomancy turns out not to be one of them. The entire edifice of employing playing cards for fortune-telling has been cobbled together since the 17th century, and most of the details of using specifically *tarot cards* for that were worked out far more recently still. All that Major and Minor "Arcana" stuff, the popular "Celtic Cross" divination spread you'll see psychic hotline readers dealing, and especially the precise card meanings that are supposed to embody the hermetic wisdom, derive from Arthur Edward Waite's *The Pictorial Key to the Tarot*, published in Britain in 1910. Telling fortunes with tarot cards in this way is therefore somewhat less hoary an activity than telephoning long distance or flying an airplane.[24]

The real history of tarot cards is not at all what occultists (or most of the public) imagine it to be. Sometime during the 1300s the Islamic game of *naib* was introduced into Europe, then recovering from the ravages of the Black Death, and much in need of a little divertissement. These decks had fifty-two cards in four suits—not the modern French variety found on American playing cards, but rather those "odd" ones retained in the Italian-suited tarots. About a century later a new card game was invented in northern Italy, obtained by adding a specialized fifth suit and some extra court cards. What occultists insist on referring to as the "Major Arcana" is actually a permanent *trump* suit, a term any Bridge or Pinochle player will instantly recognize (and ought to, since both games lifted the idea from tarot). In the centuries after, tarot games spread throughout Italy, into France and central Europe, developing a rich tradition of card play that has only recently faded, as the juggernaut of Bridge rolls over the world.[25]

And how does the committed occultist deal with all this? Well, they *know* the tarot "works" for them, so the discordant historical pieces are easily piled on their already sizable stack of "Arcana." For fifteen years Cynthia Giles explored the secrets of the tarot as reader, teacher and consultant (specializing in Jungian and archetypal psychology). In 1992 she wrote a history of the field, in which she covered every piece of information needed to demolish her own position. She even remarked about the "curious fact" that the very people who ought to have known of the occult tarot (the otherwise boringly verbose magicians, alchemists, astrologers, and general soothsayers littering the Renaissance) never once mentioned it. For Giles it was a mystery, but there was no "mystery" about it. The Renaissance magicians never spoke of the occult tarot because in those days it *didn't exist*.[26]

When an outcome is ideologically unacceptable, no matter how proximate the facts are to the end of their nose the believer just won't see it. Creationist paleontologist Kurt Wise demonstrated that, leaving poor Cynthia Giles in the dust when it came to spiking data. First, he conceded the entire evolutionary implications of the fossil record. That included the regularity of evolutionary *turnover*, in which groups gradually show less similarity the farther you move away from them in time—in other words, *transitional forms*. Having just shot off his own foot, Wise then declared the wound didn't mean anything. He thought to accomplish this by citing the statistical conclusions

of one of his own *unpublished* papers, the precise details of which he never got around to explaining. If this doesn't set a benchmark for creationist bravado, nothing will.[27]

In trying to make sense of an incomplete record playing card historians face the same frustrating challenge as evolutionists. No one thought enough to write down the rules for the earliest card games until centuries after the trail was cold. Nor have any decks survived from the critical 14th century when Islamic playing cards arrived in Europe, requiring a reliance on literary references alone to piece together what happened. The details of the original tarot game have to be *inferred* from the structure of later games presumably derived from it. Subsequent Italian tarots differ markedly in trump sequence from their presumed northern roots. Since no "transitional forms" exist to document these changes, would the creationist jump in to defend the occult position by declaring the Florentine Minchiate or Bolognese Tarocchino packs independent acts of "special card creation," and so entirely unrelated to the earlier tarots of Milan?

There is even a similarity in *preservation rates* between the tarot and fossilization, and how scholars interpolate the inevitable missing data. The French government kept careful records of card production, since they were a ready source of revenue (a few minor wars were even financed by card taxation). For this reason French card makers tended to locate near the frontier, where they could skip across the border into Belgium should the crown's purse grow too acquisitive. Estimates are upwards of a million tarots were produced in France during the 17th century, but of these, no more than *four* have survived down to modern times, and only *two* as intact decks. Playing card historians rely on all their knowledge and experience to reject the idea that these many *unpreserved* decks included occult ones hiding in the woodwork, but were instead all some form of conventional gaming tarot.[28]

Once you know that the actual distribution of ancient life is just as characteristic of evolution as the observed record of French tarot card production was of the gaming theory, a provocative idea presents itself. When Phillip Johnson wades in to invoke his "theistic realism" to dismiss evolutionary inferences about the fossil record, why shouldn't tarot aficionados like Cynthia Giles adopt their own "occult realism" to disallow this sort of informed naturalism in their own domain? In fact, since Giles actively employs tarot analysis in her psychological studies, what's to stop the "Major and Minor Arcana" from eventually joining the HMO battery along with "therapeutic touch" and crystal stroking? Once you get the ball rolling, there's *plenty* of new "realism" out there to go around.

Ideas have consequences. And this is decisively shown in the tarot field in one more way, by the absence of useful taxonomy. If you were an occultist who obeyed the three principles of reasoning a host of questions would inevitably follow. Who compiled all the "meanings" of the cards, and have any changed with different authors? What are the various schools of tarot interpretation, and in what respect do they conflict? Can any of them be rejected as spurious concoctions based on the available historic evidence? But answering any of those questions would plunge the querent into serious issues of categorization and description, which runs the risk of revealing just how arbitrary *all* those occult doctrines really were. History can be a very harsh teacher, so for the ideologue the safer course is often not to do go down that path at all.

Even though occultists have been writing seriously about the tarot for over a century, and many possess all the required information, there has yet to emerge from the occult camp something so basic as a comprehensive catalog of tarot *types*. A short list of decks in Giles, for example, lumped together ones from entirely incompatible systems, arranging them by their popularity or artistic style rather than the interpretive theories they were intended to embody. Even the three-volume "encyclopedia" of tarot by Stuart Kaplan (done from 1978 to 1990) arranged the occult decks *alphabetically*. It was as if one tried to understand automobile history by classifying models according to their body color or windshield shape instead of their make or year of manufacture. Without a solid taxonomy, that's not going to work.[29]

Now it happens that when Edward Larson surveyed 19th century American science texts for his book on the legal tussle over evolution, he discovered creationism suffered from exactly this malady. Asa Gray was the only American made aware of Darwin's theory before its publication, and was to become an early convert to it. But before then, Gray's pre-evolutionary botany texts were mere catalogues of plant types, reflecting his religious views more than the features of the

flora. Until inspired by evolutionary thinking, Gray hadn't even noticed individual plant variations didn't invariably "revert to the original form of the species." Once Darwinism appeared on the scene, plant characters began to be perceived as *clues* to relationships and functionality. Nothing about the plant was just because the divinity felt like doing it that way, but because its survival necessitated the feature. More significantly, science popularizers who still didn't like evolution, like New York high school teacher J. Dorman Steele, nonetheless adopted the structure of the new evolutionary taxonomy for their books, even though creationism had nothing to do with developing it.[30]

This habit of picking the fruits off the evolutionary tree of knowledge continues to this day. When Duane Gish compiled a book for children called *Dinosaurs by Design*, the reader would never guess just how little of its facts were contributed by his creationist colleagues. He described paleontological excavation and fossil preparation as though creationists did these things. He noted the nesting habits of the herbivorous *Maiasaura* without naming the living evolutionary paleontologist who actually found and interpreted them, John Horner. Regarding the related *Iguanodon*, Gish remarked, "It is now generally agreed that they probably stood upright on their two strong hind legs and feet, but could certainly run on all four legs when they needed to." And who figured all this out? The unmentioned evolutionary paleontologist, David Norman, also very much with us. Yet Gish could specify the name of the German U-boat commander who supposedly slaughtered a sea monster after torpedoing a British ship in 1915 (source unspecified). Such precision forgetfulness served to disguise the awkward fact that, of the reliable modern data Gish did proffer, *none* of it derived from the sweat of creationism's brow.[31]

This process extends to all the "evidence" creationists present to supposedly "refute" evolution. It invariably derives from the evolutionist side itself, often as the flotsam from those quite legitimate controversies that develop in any serious intellectual endeavor. As one scholarly critic of creationism noted:

> If one examines the creationist literature closely, one finds that in no instance have they raised a valid problem that has not already been stated in the evolutionary literature itself. Attention to footnotes, where the creationists use them, clearly demonstrates that to attack evolution, they have had to resort to the evolutionists' own critiques of themselves. Far from denying that evolution has problems, evolutionists have been more critical than creationists of the theory.[32]

The entire creationist case turns on a gigantic act of scholarly parasitism. Once a source is found that can be contrived to support their position, no amount of new information will induce them to give it up, and whenever there is serious scientific debate the competing interpretations are fired at one another in a nervy form of citational Ping-Pong. Punctuated equilibrium is hit with quotes from its rival, phyletic gradualism, then the tables are turned, and the gradualists are flailed by punctuated equilibrium.[33] That both points of view have plenty to say in concert about how "common descent" is a fact of nature inevitably gets lost in the creationist shuffle. The result looks rather like what would happen if someone rammed Oliver Stone and the Warren Commission at one another, and from all their heated disagreements, concluded President Kennedy was really mythological.

Because Creation Science inhabits a cosmos where self-criticism is not on the menu, and where appeals to the ultimate authority of the Bible come as a matter of course, it would seem perfectly fitting to throw the arguments of evolution itself at the satanic enemy. But what they fail to appreciate is the simple methodological reality that in science *opinions* don't matter—only the *facts* do. A thousand scientists denouncing the plausibility of some element of evolutionary theory carries only the weight of the evidence they offer for that position. Which means quoting them without including the full context and range of the data is thoroughly ingenuous.[34]

It is a revealing indication of the mindset of those who play this game most "professionally" that they and their allies do not see themselves as epistemological sinners. Philosopher J. P. Moreland introduced the example in *The Creation Hypothesis* this way:

> In fact, many scientists have said, in various contexts, that evolutionary theory is in a period of crisis. To show this, we have included an appendix by John Ankerberg and John Weldon. They have compiled a list of statements, taken in context, to show that a number of scientists, sometimes in unguarded moments and usually without the intent of abandoning evolutionary theory, have frankly expressed their own intellectual doubts about various aspects of evolutionary theory.[35]

As it turned out, the only scientists insisting evolutionary theory was "in crisis" were antievolutionists like Michael Denton or Fred Hoyle. Anyone familiar with the actual views of major evolutionists, from George Gaylord Simpson to Stephen Jay Gould, would detect no trace of panic or despair. And what sort of "context" would explain anyway how a 1970 quote from Ernst Mayr disparaging a 1940s theory (Richard Goldschmidt's "hopeful monster" idea of reptiles laying bird eggs in one saltational jump) could be cited as specific criticism of punctuated equilibrium, a decidedly non-saltational concept first proposed by Gould and Niles Eldredge in 1972? Del Ratzsch, who otherwise deemed *The Creation Hypothesis* a key work in the effort to establish the scientific credibility of Intelligent Design, found the presence of this tendentious appendix "puzzling."[36]

Henry Morris and Gary Parker also failed to follow their own advice in *What Is Creation Science*? when they offered this confident invitation:

> Our aim has been to make the book easily understood, even by nonscientists, since everyone is vitally affected by the creation/evolution question. At the same time, we believe the book is soundly scientific on all the individual phenomena with which it deals. Extensive use has been made of the writings of evolutionists and, wherever such a source is used, full documentation is given. We would strongly encourage the reader to look up all these references, if possible, and to read the whole context in each case. We have found that one of the most effective ways to win people to creationism is to get them to read what evolutionists actually believe and the basis they give for such beliefs, as stated in their own words! Such a careful reading of sources cited will also disprove the common assertion that creationists quote evolutionists out of context.[37]

Easier said done, for in far too many instances *no* citations were provided, which makes it rather difficult to check up on them. Gary Parker stated twice without documentation that Julian Huxley had calculated the odds of horse evolution at $10^{3,000,000}$ to 1. He may have got this little nugget from Henry Morris, who once quoted Huxley about the probability of random mutations occurring *without any selection* going on. That's a crucial distinction. If someone only gets paid when they flip a hundred coins in a row heads up they're not likely to make much. But if they're allowed to bank any coin landing heads during the hundred tosses they're virtually certain to end up richer. It was precisely Huxley's position that favorable mutations accumulated, knocking the improbability calculation in a cocked hat.[38]

But what difference would it make anyway what numbers game Huxley played in 1953? All that mattered was the quality of the evidence when Morris and Parker wrote in the 1980s, and the evolution of the horse rests on a very long fossil series of increasingly horse-like animals. So what did Morris and Parker have to say about all that in *What Is Creation Science?* Absolutely nothing. The only spot where horses came up again was buried inside another authority quote, this time by paleontologist David Raup, concerning how some fossil sequences have had to be "discarded or modified" on the basis of new evidence. What any of that specifically referred to was left hovering in the stratosphere.[39]

Even when they had more contemporary sources at hand they had trouble straightening things out. Consider this technical point Gary Parker made about one of evolution's star witnesses, the reptilian bird *Archaeopteryx* that lived in Jurassic period Europe:

> What about a lack of a keel? Actually, muscles for the power stroke in flight attach to the wishbone or furcula, and *Archaeopteryx* had "an extremely robust furcula." As a matter of fact, a growing number of evolutionists, perhaps a consensus, now believe that *Archaeopteryx* was a strong flyer. Many now consider *Archaeopteryx* the first bird, and not a missing link between reptiles and birds (See Denton, 1985).[40]

Parker didn't clutter this up with any specific page numbers, but was correct on two points: Denton did discuss *Archaeopteryx,* which did have a large furcula. From there it was downhill. While a bird's pectoralis muscle used for downstrokes and level flight originates on the wishbone, attaching to the keeled sternum, the supracoracoideus used for takeoff and upstrokes involves only the keel and coracoid bone. Because *Archaeopteryx* lacked a massive sternum all its weaker flight muscles employed that enlarged furcula.[41] Denton cited one reference to affirm *Archaeopteryx* was "capable of powered flight as a modern bird," but being *capable* of flight specified nothing about how that ranked with hawks or hummingbirds. The consensus view then (and now) was that *Archaeopteryx* was a fairly anemic flyer, and nothing in Denton suggested anything to the contrary. Nor had Denton quoted *any* contemporary scientists who doubted *Archaeopteryx* was a link between reptiles and birds, let alone that "many" did so. That Denton held that opinion was clear, but that's not what Parker brought him on stage to say.[42]

Beyond all this scholarly evasion lurks a deeper truth. Creationists would have the reader think how "scientific" they are for so diligently vacuuming the relevant literature for ammunition, but this is a virtue only of necessity—there are no creationist findings in paleontology or geology or biology for them to report. There is no Moody Bible Institute "Department of Paleontology" to rely on, nor are smiling evangelical missionaries dispatched to the hinterlands with Bible in one hand, spade in the other, to unearth more fossil vindication for creation whilst "fishing for men." If they did, they would be liable to considerable and persistent disappointment.

This is of relevance to the creationist claim that evolution violates the principles of "Baconian" science, which they would hold superior to the brand of tainted reasoning that leads to nasty Darwinism. According to their proprietary interpretation of Francis Bacon (the English philosopher and polymath whose development of "inductive reasoning" helped fire the 17th century scientific revolution) *true science* consists of "classified knowledge" derived from careful observation, and subsequently kept well clear of contaminating theorization (like evolution).[43] But even here, creationists do honor in the breach, as Eve and Harrold noted:

> Scientific creationists not only fail to do conventional science, they also fail to do Baconian science. Although they conceive of science, and criticize mainstream science, in terms of Baconian principles, they themselves do no research to any significant extent, nor gather "facts" in the field and laboratory, nor work to discern the pattern of these facts. Rather, they simply spray the edifice of evolutionary science with numerous volleys in an effort to hit a vital supporting element and bring it down. The structure they would raise in its place is biblical, not scientific.[44]

It is at the basement level of fundamental terminology and definition that creationism's "scientific" pretensions disappear completely. When creationists talk about "evolution," it is not quite the same thing *evolutionists* are thinking of, and that leads to a mountain of confusion. Ask an evolutionist for a simple definition of what Darwinian theory represents and they can toss back a seven-word nutshell: "descent with modification" and "speciation through natural selection."[45] Put the same question to a creationist and you get a *worldview*:

> Simply stated, the theory of biological evolution asserts that nonliving matter somehow gave rise to simple living organisms that subsequently reproduced and diversified, generating all life-forms. According to this belief, all bacteria, plants, animals, and humans have arisen by mere chance from a single, remote ancestor

> that somehow came into existence. All of this is supposed to have occurred accidentally without the benefit of any intelligence or planning. The basic premise of this "molecule-to-man" theory is that hydrogen gas, given enough time, will eventually turn into people. Diametrically opposed to this viewpoint, biblical creationism postulates an initial special creation by God through which all the laws, processes, and entities of nature were brought into existence as described in the Book of Genesis.[46]

The problem with this cosmic definition is that *nothing* in evolutionary theory actually depends on life having originated naturally. That most evolutionists are thoroughly convinced it *did* come about through purely mechanistic chemical processes is beside the point—evolution grapples with what happened *after* life appeared, independent of *how* that amazing event occurred. By trying to drag every aspect of the evolutionary debate back to the origin of life, if not of matter and the universe itself, creationists endeavor to put as much distance as they can from the business end of things, which is the observed differentiation of *species*.

The notion of "species" is critical to understanding how and why evolutionary descent takes place—and where the failure for creationists to relate that to their created kinds bogs them down. Apart from asexually reproducing forms like bacteria, a natural species is any group of organisms not only *able* to interbreed, but particularly *liable* to if given half a chance. Those are not idle distinctions. For the creationist, variation within a kind is *inclusive*: if A & B are of the same kind, and B & C likewise, then A, B & C are all the same kind. But natural species are *exclusive*: there is no guarantee member A will interbreed with C. Remove B from the picture (through extinction or geographic isolation) and what were originally *subspecies* of a larger population (A & C) would now be separate *species* A & C.[47]

All the sweeping changes that have occurred in the fossil record are believed by evolutionary theory to be the result of these speciation events piling up through time. In other words, that the descendants of A & C might eventually vary from one another so much they would be classified as different *genera* (the next rung up on the taxonomic ladder). All the higher classifications are declarations of such *general similarity*: comparable genera are grouped as *families*, similar families are placed in the same *order*, like orders in *classes*, and classes into *phyla* (or *divisions* in botany). By that level you're all the way up to describing very basic body plans, and only the extremely broad *kingdoms* lie above that to embrace enormous blocks like "plants" or "animals." From an evolutionary point of view, it's important to remember that the higher you go on the taxonomic scale the *farther back* you have to search to find a common ancestor.[48]

When a paleontologist looks at the anatomy of a dinosaur from the iguanodontid family dating from the early Cretaceous, that skeleton *objectively* looks like a slightly enlarged version of the camptosaurid family, which developed tens of millions of years earlier. The loaded language of "mere chance" and "accidentally" used in the creationist definition above are not factors here, just open eyes and a good memory. Since even creationists now admit speciation takes place, the unanswered question for creationism is in what respect it is *inconceivable* for those so-similar dinosaur families to have originated through precisely that known process of speciation? Are all such empirical inferences supposed to be tossed aside on account of the uncertainty about the creation of primeval bacteria three billion years before?

If creationism had a viable alternative explanation for all this, of course, that would be a different matter. But while the evolutionist is talking about clearly delineated species, the creationist has a whole other vocabulary. However they define "evolution," they are certain it can only take place within fixed boundaries established by God. The traditional term for this basic unit of life used to be "kind," but once the Supreme Court started sniffing the Biblical aroma inherent in the term, some creationists began substituting the word "type" instead. But "a rose by any other name" still governs the world of nomenclature, and the significance of the concept remained unchanged no matter what it was called.[49]

The point here is that *creationists* contend there are such immutable categories of life. The "kind" is their baby, part of their own theoretical framework. A measure of their scientific dedication would then be how much trouble they have taken to assemble an authoritative listing of

just what these purported "kinds" are. You would think they would do so, if only for their own education. So imagine a creationist counterpart to Margulis and Schwartz's *Five Kingdoms*, which lists all the known phyla. Or perhaps Colbert and Morales' *Evolution of the Vertebrates*, specifying all the orders falling under phylum *Chordata*. From my favored niche down reptile way, *The Dinosaur Data Book* by Lambert and The Diagram Group catalogues all described dinosaur families and their respective subsidiary genera. If the creationist is in need of models to emulate, evolutionary science offers a wide sampling.[50]

And yet, in all the creationist writings I have so far endured not a hint of just how many "kinds" there are, and precisely what constitute them. Insofar as rigorous nomenclature is a prerequisite for informed scientific discourse, creationism has yet to join the club. Consider what the Institute for Creation Research has to say on the subject. They currently publish as a "basic textbook" *Scientific Creationism*, edited by Henry Morris. It exists in two editions, a trimmed public school version and a "general" one intended for the faithful. That latter appends a caboose chapter devoted to "Creation According to Scripture," which further contains a section, "Creation of Distinct Kinds Precludes Transmutations between Kinds." There one may read:

> The Scriptures are very clear in their teaching that God created all things as He wanted them to be, each with its own particular structure, according to His own sovereign purposes. The account of creation in Genesis 1, for example, indicates that at least ten major categories of organic life were specially created "after his kind." These categories are, in the plant kingdom: (1) grass; (2) herbs; (3) fruit trees. In the animal kingdom the specific categories mentioned are: (1) sea monsters; (2) other marine animals; (3) birds; (4) beasts of the earth; (5) cattle; (6) crawling animals. Finally, man "kind" was created as another completely separate category.[51]

This is *all* the ICR "textbook" has to offer the field of Biblical taxonomy. For anyone familiar with the enormous diversity of life, both living and fossil, such frothy generality augurs poorly for creationism's status as a "science." Though there was no room at the *Scientific Creationism* inn for even a preliminary enumeration of these created kinds, Morris nonetheless could spare three pages for an index of Scriptural citation. As for how to reliably distinguish "sea monsters" from "other marine animals," in view of Duane Gish's evident sagacity regarding sea monster hunting (Great War vintage), perhaps subsequent editions will include a pithy paragraph or two from him on this particular fish story.[52]

Whether the approximate 9000 living species of birds are indeed the same created "kind" leads to another question. Does this mean the ICR entertains the notion that natural speciation can generate not only the Galápagos finches that so impressed Darwin, but hummingbirds and condors as well, without divine intervention? Conceding so much to internal variation runs the risk of blurring the distinction between "microevolution" and the forbidden "macroevolution," so it shouldn't come as much of a surprise to discover Morris' oracular pronouncements are not always conclusive for his fellow ICR flock. Possibly because the Galápagos finches have been studied so prominently by real scientists that creationists can't avoid dealing with them, Duane Gish decided they "are probably of one basic type." Which only leaves those few thousands of other bird species remaining to be roosted with whatever "kind(s)" they may be.[53]

Contriving a Scripturally acceptable avian taxonomy is complicated somewhat by the book of Leviticus, which declares *bats* to be birds—but then, for that perceptive Old Testament naturalist, there also existed winged insects with only *four* legs. (For some reason, the otherwise alert Biblical literalist overlooks these passages.) But even if bats (classified as the order *Chiroptera*) are allotted their own tidy "kind," as Gish seems perfectly willing to allow, this only raises more flighty questions. There are some 900 known species of bats, running the gamut from bloodsuckers and fruit eaters to insectivors and even a flightless ground model. If all that variation can still fall under a single "type" no evolutionist will lose much sleep over it.[54]

Creationists have to be wary about just how far down the taxonomical ladder they are willing to slide. Fortunately, the "kind" can be telescoped to fit. To maintain our special isolation, the

creationist *mus*t fix the human "kind" at the species level (though that idea was already set in stone long before science began digging up australopithecines to distract the unfaithful). Stroll out among the nearby primates with Duane Gish, however, and "perhaps" the ape genus *Pan* (comprising two species of chimpanzees) may be pegged as a distinct "kind" on that rung. For awhile Gish widened his "perhaps" to hold the entire dog family *Canidae* as one "kind," but later leashed them back to the range of the subsidiary genus *Canis*.[55]

I find it revealing how pedestrian the creationist "kind" always turns out to be. Henry Morris speaks of familiar "cats" and "dogs," while Gish restricts his prehistoric examples only to broad categories that are also safely extinct, like ichthyosaurs or dinosaurs, which have no living counterparts to muddy the morphological waters. What they consistently leave out are all those unusual "dog-like" creatures and "almost" cats that inhabited the fossil world, like the creodonts, or the weasel-like miacids that eventually branched off into the modern felines and canines. Because the average creationist reader seldom explores the mainstream paleontological literature, they are not likely to know about these beasts, and apologists like Morris and Gish display no haste in educating them. Consequently, questions about what manner of "kind" all these transitional models may have belonged to never arise.[56]

Any optimistic expectation "scientific" creationists would employ their own terminology with exactitude failed the Gish test, who declared mammals and reptiles were different "kinds," but so too were crocodiles and turtles. How the larger group (reptiles) and a subordinate one (crocodiles) could *both* be "basic kinds," when the whole point of a "kind" was that it couldn't grade into any other, drew critical evolutionary fire. It was like saying the "element" water was composed of the "elements" hydrogen and oxygen. In that case, an "element" wouldn't be particularly *elemental*.[57]

Instead of owning up to having written imprecisely, though, Gish took the offensive and dismissed this criticism as "confused." He compared his own use of "kind" to the standard classification hierarchy (species within genus within family, and so forth). This was a "bait-and-switch" analogy if ever there was one, for that system really does rest on a fixed unit of taxonomic measure, the species, and builds larger groups precisely on the basis of their related characteristics. Gish offered no instances of any evolutionist so clumsy as to assert reptiles and mammals differed as "species." But that is precisely what would have to be the case were evolutionists using their nomenclature as loosely as creationists do theirs.[58]

Among paleontologists the relevant evolutionary concept is the *monophyletic* group: "A group of organisms that has a single ancestor and contains all of the descendants of this unique ancestor (synonymous with clade and 'natural group')." Evolutionary common descent thus means all clades are necessarily related in nested hierarchies. Mammals are held by most evolutionists to be monophyletic, meaning they derived from a single ancestral population (back in the Triassic when dinosaurs were getting started). Perforce that includes later mammalian developments like Morris' cats and dogs, which comprise monophyletic groups when viewed at the familial level. From an evolutionary perspective creationism's reticence to enumerate their "basic kinds" was inevitable—the As, Bs, Cs, Ds etc. will pile up until the kind has spilled over into macroevolution. Just like the Renaissance occult tarot, there are no "basic kinds" to define.[59]

With a strong dose of irony, creationism's endemic taxonomical fluidity came back to haunt them at the 1981 Arkansas trial to decide the constitutionality of their "balanced treatment" law. Section 4 of the act had defined what the proposed "Creation-science" model was supposed to teach, and clause four explicitly proclaimed that to include a "Separate ancestry for man and apes." Which prompted one critic of creationism, Gene Lyons, to observe with evident relish:

> In nearly two weeks of testimony, no scientist, whether "creation" or otherwise, could enlighten the court as to the exact meaning of "kind." Creationist Wayne A. Frair of King's College, Briarcliff Manor, N.Y., said it could mean "species," "genus," "family," or even "order" in which case number four above stands contradicted, since Adam and Eve, Governor White, and Bonzo the Chimp all belong to the order of primates.[60]

Though in no hurry to classify the vast majority of living things, Flood Geologists do find their notion of "created kind" handy when they need to cut down on the number of stall-hogging giant sauropod dinosaurs aboard Noah's Ark. How much more convenient it would be if only a pair of the "sauropod kind" sauntered up the gangplank, preferably small juvenile specimens, which obligingly nodded off into torpor as soon as they settled in (thus further minimizing the amount of fodder required to carry them through the rain). However coy creationists may be about saying so in the publications they aim at the secular world (where they are apt to raise a few adult eyebrows), in their works for *children* they discard the mask and honestly say what they believe. In *Dinosaurs by Design* Gish wrote:

> The Ark was gigantic, and designed to accomodate [*sic*] the large number of animals God intended it to hold. There were many small animals and insects, but consider also that there were some large animals. It seems likely that God would send young animals instead of full-grown versions of the larger species. A young *Apatosaurus* would take up a lot less room than an adult.
>
> Next problem—the care (stall-cleaning, etc.) and feeding of so many animals. And, don't forget there's the matter of how to keep the *Tyrannosaurus* from nibbling on his nearest neighbor. Again, not a problem for God. The God who created them could have very easily have put most of all of them into a form of hibernation. Hibernation can be described as "a state in which normal functions are suspended or greatly retarded, enabling the animal to endure long periods of complete inactivity."[61]

Gish may have experienced such periods himself, for in another of his books aimed at pliable young minds, *The Amazing Story of Creation from science and the Bible* (note the uncapitalized "science"), he put things this way:

> Did all the animals fit on the Ark, including dinosaurs? How could Noah put millions of species of animals on the Ark? Where would he put a 50-foot high, 80-ton *Brachiosaurus*? It was not necessary to put huge, adult dinosaurs on the Ark. The preservation of the kinds was served just as well by preserving baby dinosaurs. This would greatly simplify the size issue. Furthermore, millions of species were not put on the Ark. The Bible tell us that God said two of each "kind' of *land-dwelling, air-breathing* creatures were to be placed on the Ark, except for the "clean" animals suitable for sacrifice—seven of each of these were placed there. Today, there are about 20,000 species of land-dwelling, air-breathing creatures in existence (i.e. mammals, birds, reptiles, amphibians). If we assume that another 20,000 species have become extinct, then 40,000 species, or approximately 80,000 animals had to fit on the Ark.
>
> Some of these animals are big, but many of them, like rats, mice, lizards, and birds, are quite small. The average size of all these animals would be approximately equivalent to the size of a sheep. The Ark was about 450 feet long, 45 feet high, and 75 feet wide. That means that, with its three decks, the Ark had slightly more than 100,000 square feet of floor space. These 80,000 animals could be caged in an area of approximately 50,000 square feet, leaving half the Ark's space for storage of food, air space, living space for Noah and his family, etc. Furthermore, it is possible God caused most of the animals to hibernate, in order to minimize the problems involved in their care. The Flood was an event brought upon the earth by God, and it was His will that Noah, his family, and two of every land-dwelling, air-breathing creature should survive, including the "terrible lizards!"[62]

At the risk of appearing "confused" to Gish, I couldn't help noticing how he included insects on Noah's passenger list in the first passage, but excluded them in the second. There are over a

million known species of insects (350,000 described for the beetles alone). Virtually all live on the land and breathe air, and most do not take especially well to dog paddling for several months until the Floodwaters receded. But even restricting the loading list to vertebrates, Gish spared the reader precisely how he arrived at his assumption regarding the number of extinct land creatures he deigned to allow. Since fossilization doesn't preserve everything, the number of extinct species far exceeds those preserved in museums. Estimates are living forms represent only about 1% of the total, which would suggest a couple million extinct vertebrate species for God to trundle off to Noah (just about equal to those missing 17th century French tarot decks).[63]

Of course, creationists like Gish do not concede the uniformitarian assumption that fills in all those missing millions of creatures. As far as they are concerned, the Flood is a onetime catchall, and whatever got preserved pretty much covered the whole show. But that doesn't let Flood Geologists off the hook when it comes to the creatures that *were* preserved. And most of all for those creationists make a point of bringing up themselves when trying to indoctrinate children in the dogma, for these offer a measure of just how they value the care and feeding of young intellects. In the details one is supposed to find God (or the Devil, depending on one's perspective). Gish does not disappoint.

Questions such as whether Noah carried both African and Indian elephants (which belong to their own genera, but are at least in the same family) are utterly upstaged by Gish's dinosaur examples. He already has two families of sauropods on his hands, represented by the genera *Apatosaurus* and *Brachiosaurus*, which he noted under the section "Big Plant-Eaters" in *Dinosaurs by Design*. Under the diplodocids he listed three names: *Apatosaurus*, the very similar *Diplodocus*, and the still largely unexcavated "Supersaurus." Under the brachiosaurid family he noted only *Brachiosaurus*, and another new find similarly in the process of description, "Ultrasaurus." Nothing in the text would suggest to the young reader that these names represented whole genera, rather than individual species. Furthermore, an accompanying map indicated all lived in one spot in the western United States.[64]

Perhaps it would do to examine the sauropodomorph dinosaurs a bit more closely than Gish had. They are all of the "long neck, bulky body, long tail" style—just think of the classic *Brontosaurus* in a host of incremental variations, from little ones all the way to heavyweights. The earliest forms, the *prosauropods*, appeared in the late Triassic. They started with the dog-sized anchisaurids, ranged to the cow-sized plateosaurids, and finally the more elephantine melanorosaurids. (Gish didn't mention any of these in his text, though the illustrators inadvertently included one genus, *Plateosaurus*, among "The World of Dinosaurs.") The earliest true *sauropods* arrived with the Jurassic, and started out with the melanorosaurid-sized cetiosaurids, and the later titanosaurids and euhelopodids. That latter family featured the exceedingly long-necked Chinese genus, *Memenchisaurus*, with a body about as large as the smaller Jurassic giants, the diplodocids and camarasaurids, by which time we've graduated into the "heavier than a 10-ton truck" category. Finally, at upwards of 50 tons, the camarasaurid-like brachiosaurids occupied the top of the body mass scale for all land animals, living or extinct (only modern blue whales weigh more).[65]

Gish seems oblivious to what a can of worms (or rather, sauropodomorpha) he opened in only a few paragraphs. Far from being restricted to a tiny North American clump as his map suggested, the diplodocids are also found in Europe, Asia and Africa, as are the brachiosaurids (with Australia thrown in for good measure). As a group the prosauropods and giant sauropods are known from all continents. Beyond their spatial diversity, these dinosaur families embrace alone nearly a hundred genera. The diplodocids involve not three examples, but *fifteen* genera; the brachiosaurids not two, but *fourteen*. Even granting some of the doubtful genera will eventually be merged, that still leaves nine similar yet separate *families* for Gish to decide (one of these days) whether to lump under one "kind" or not. But that is rather difficult to do so long as he avoids discussing them.[66]

When it comes to serious taxonomy, because Intelligent Design advocates do not suffer from the Flood Geology imperative to book Noah's stall plan that might otherwise have prodded them to think about it, none of their dogged curiosity is unnecessarily frittered away in this area. Phillip Johnson, for example, couldn't be less interested in figuring out on his own whether all these varied sauropodomorphs might comprise one "sauropod type." The "type" àla Johnson is just as squishy as the ICR brand of "created kind." Nomenclature is not employed to further their own

understanding of the extraordinary diversity of living things, but solely as a bludgeon to keep the unruly fossils from coalescing into macroevolutionary cabals. Apart from that, it has no evident utility.[67]

This creationist daisy chain may be closed with an "Impact Pamphlet" put out some years ago by the Institute for Creation Research. It proclaimed: "A kind may be defined as a generally interfertile group of organisms that possess variant genes for a common set of traits but that does not interbreed with other groups of organisms under normal circumstances." That sounds awfully precise, doesn't it? As well it should, because that's just a more technical way scientists define a *species*. As we have seen, except for human beings, the creationist "type" is allowed to be almost everything *but* a species. That is why it was so important to examine the *list* of their proposed "kinds." While a term "may be defined" in many ways, it is only through the application of that definition to specific examples that whatever *meaning* it may have is made plain. Clearly, creationism has failed that test by a wide margin.[68]

As to how creationists can get themselves into such a mess, and particularly why they stay there, again the tarot example offers a clue. Playing card historians only started to get a grip on their field when they stopped perceiving uncut sheets and stray preserved cards as isolated visual objects, and started looking at them as the remnants of *decks* living people used to play card games with. Once the switch was made to the gaming perspective (which got into full swing in the 1970s) the history and development of the tarot fell into place quite easily. But the occult tarot buff never gets to that stage. When they examine a 15th century hand-painted tarot deck (used by Renaissance nobility to play the early game of *trionfi*), they see only the occult symbolism their modern theories have grafted onto it. The occultist carries no *conceptual map* of the general history of playing cards, and shows no inclination ever to acquire one. For that reason the early gaming tarots remain but anomalous divergences from the metaphysical tarot "type."

From Henry Morris' Flood rhapsodies all the way to Phillip Johnson's "theistic realism," when it comes to the fossil record there is a comparable Olympian seclusion. Prehistoric life seems neatly stuffed and settled in sealed cabinets, shorn of all interpretive implication. Duane Gish didn't feel he needed to thoroughly grasp dinosaur diversity before pronouncing on their suitability for passage on Noah's Ark. He already knew what "the answer" was supposed to be, and simply grabbed a few familiar targets for illustration. The raiding sorties the creationist makes on the scientific literature to gather their "evidence against evolution" takes place at this superficial level. This will be most obvious in the chapters to come, when creationists are observed dealing with scholarly criticism.

The Alphonse-Gaston Problem

To see why a valid fossil "map of time" matters so, and how decisive its absence is for creationism, take a snapshot in your mind of the entire world of living things as you imagine they are *right now*. Without knowing every single beetle species or how many genera of carnivores inhabit Africa, you still should come away with an image of a planet teeming with life. The nuts-and-bolts details you can get from any competent source—what's important is the larger landscape of a vast interlocking network, each living thing part of a greater unity, while still working out its own individual fate. And past worlds should have been just as richly detailed. That is a fundamental percept of natural history consistently missing in the creationist literature, and particularly so for the Biblical literalist. Although Henry Morris or the ICR may spend a great deal of effort attempting to dynamite the standard geologic sequence, it never occurs to them that at some point they have to offer a plausible discourse on how their imaginary pre-Flood hothouse functioned as a legitimate cascade of integral ecosystems.

But the real mismatch for creationism comes when the template of inherent biological diversity is laid down on what is actually preserved in the fossil record. Because all science has to go on is what was lucky enough to last through the intervening ages, the hard fact is we can *never* retrieve those high resolution snapshots of prehistoric life that could have been taken if only the Wayback Machine were running. Instead of those crisp glossy photographs, paleontologists have to make do with an incomplete stack of happenstance collages, by turns impressionistic, pointilistic,

or even cubistic: a scatter of teeth and incomplete skeletons, a leaf or some microscopic pollen grains, a stray burrow left over from a creature itself not preserved. But for every precious slice of time, and no matter how different the cast of characters, always remembering that the totality must have been as busy as the contemporary world you can see out the window. *Something* must have been going on over the next rise, let alone the far mountain range, as well as just a little while before and inevitably so directly after.

This is no idle abstraction. It is what has to stay parked in your mind whenever the subject of fossil life comes up. Say a creature is found (let's call it the genus *Alphonse*) from the Late Whatsit deposits of Freedonia. When a paleontologist down the valley, poking around in the Early Whatsit strata (dating about 10 million years before), unearths a specimen that looks just like *Alphonse*, are they to be regarded as the same genus, or what? You can't take it's temperature, you can't look at its gene sequence, you don't know how many brothers or sisters it had—and maybe not even whether *Alphonse* was a male or female, young or old. Yet their preserved features are so much alike the paleontologist has no justification for not classifying them as one and the same *Alphonse*.

Every creationist I've ever read just *loves* all the isolated *Alphonses* found in the fossil record. Similar "types" remaining obediently static over 10 million years, what better contradiction of evolutionary change? But what have they just done here? Creationists do not pursue the logic of their own position and propose the two *Alphonses* were actually independent acts of special creation (that just *happened* to look alike). No, they momentarily reason exactly like naturalistic evolutionists and link the two creatures as part of a living lineage. Yet in doing so, the creationist has likewise just conjured onto earth 10 million years worth of *Alphonses*, for which no *physical* evidence exist whatsoever. Their reality is an *inference*, though a perfectly reasonable one. But whatever were all these invisible *Alphonses* doing those 10 million years? That's a lot of time on your hands.

Before we consider that, what about another genus that looks really a lot like *Alphonse* (let's call it *Gaston*), but known only from a single specimen from the splendid Middle Whatsit beds 500 kilometers away in Sylvania? Now we have a similar creature, temporally smack-dab between our two *Alphonses*, but also spatially disparate. Creationists are less fond of the *Gastons* that turn up in the fossil parade, for their existence requires them to put on their thinking cap and decide just how far one of their petrified "types" can vary. To make matters worse, *Gaston* too could have had millions of years worth of unpreserved examples, because we don't have any Early or Late Whatsit deposits in Sylvania. Just three specimens (two *Alphonses* and one *Gaston*) and already we have quite a paleontological knot to untangle.

After careful consideration of their respective features, suppose our paleontologists decide *Gaston* derived from *Alphonse*. The creationist has two options. If they can sleep nights with the pair nestled in the same "kind," the *Alphonse-Gaston* group will become another instance of nonevolutionary stasis. But if the differences between them are uncomfortably wide, allowing *Alphonse* and *Gaston* to settle down together might hamper their hairsplitting the human fossil record later on. In that case, the lack of "transitional forms" between them will become salient (forgetting that, to be picky about it, there are no "transitional forms" between *Alphonse* and *Alphonse* to establish they are related either).

Should an intermediate subsequently be discovered, however, this offers no obstacle for the diligent creationist, for its appearance only improves their ability to confuse the picture. With *Alphonse* – Intermediate – *Gaston* there are now *two* gaps to fill, instead of one. This "divide and conquer" strategy is employed so ubiquitously by creationists, geologist Robert S. Dietz drolly decided to honor its Grand Master practitioner by codifying it as Gish's Law: "As the fossil record becomes ever more complete, the number of gaps increases."[69] It is only through a relentless application of this tactic that creationists can denature all sense of *sequence* in the fossil record. It means staring at all the "gaps" instead of the animals in between.

Now for a fly in the ointment: what if the earlier *Alphonse* example had never been preserved? As far as the fossil record is concerned, the only evidence would then show the derived *Gaston* appearing millions of years *before* its presumed parent *Alphonse*. The physical reality represented by the two animals wouldn't have changed, of course, only the perception of it occasioned by the accident of fossilization. Although such artifacts of preservation *must* have happened in the past, at

least once in awhile, there is no recognition of this in creationist accounts of the fossil record. Instead, the creationist instinctively pounces on the seeming absurdity of "descendants" *preceding* "ancestors."

So the failure to possess a valid mental "map of time" does indeed have consequences. The creationist technique of focusing on all the "gaps" and "discontinuities" in the fossil record is very similar to the process of infinitesimal slicing that got the classical Greek philosopher Zeno into so many quandaries. His most famous paradox, Achilles and the Tortoise, supposedly "proved" motion an illusion. Placing Achilles and the tortoise as opponents in a footrace, the slower tortoise was granted a head start. Achilles quickly crossed the intervening space, but by then the tortoise had certainly toddled on some smaller distance. To traverse that required some time, during which the tortoise must have pressed on somewhat further, and so on and so forth, the tortoise always remaining slightly ahead. Even though it was contradicted by common experience, Zeno thought he had established through pure reason Achilles could *never* catch up.

Sometimes there is a critical piece to getting the right answer in science, and the one Zeno was missing was the concept of *speed*, which measures motion relative to time. Lacking that insight, Zeno faced the daunting task of adding up an infinitely long series of all those incrementally smaller motion slivers Achilles and the tortoise were piling up. Unfortunately, what Zeno needed to accomplish this was differential calculus, a tool unavailable until the 17th century when Leibnitz and Newton independently hit on it. Armed with such mathematics, a moment could be calculated when both contestants had to have covered equal distances, which could only mean Achilles had caught up after all.[70]

In spite of the fact that you could clearly see Achilles sprint past the tortoise, Zeno could never admit the possibility it was his reasoning that was faulty. Creationists likewise can slice and dice the fossil evidence without ever wondering why there were so many extinct and intermediate forms to begin with. For that reason, it also never occurs to them to ponder what *Alphonse* and *Gaston* were up to all that time. Was it likely any of them had cousins, just over the next valley, and if so, what might they have looked like? It is an inevitable consequence of natural science to apply what is observed concerning *living* species, and how extensively they apparently differentiate.

If it were true new species could *not* branch off from existing ones, clearly it would be impossible for more divergent ones to share a common ancestor, because they could never have begun the process of splitting. Back in 1860, when Darwinism was just beginning to shake things up, antievolutionists were confident only God could make a species or genus. But since then, a lot of fieldwork has been done to study the living world, and it has become glaringly obvious Darwin was right after all: species are not immutable. As we have seen, creationists have backpedaled considerably on this point, but now dig in their heels by refusing to specify just how broad this speciation thing can get.[71]

Consider a living example, the lowly fruit fly, which has been studied from its distribution in the wild all the way down to its genetics in the lab. Such investigation has allowed geneticist Francisco Ayala to discern two distinct phases to natural speciation. The first step hinges on the physical isolation of segments of the parent species, which may be reversible if the groups regain contact. Should this isolation persist, the subspecies can move to the next stage, where natural selection serves to lock in the genetic variations that lead to individuals not interbreeding naturally. That second part is given the intimidating moniker of "prezygotic isolation mechanisms." Ayala goes into some detail to explain this:

> The two stages of speciation are apparent in a group of closely related species of *Drosophila* that live in the American Tropics. The group consists of 15 species, six of which are morphologically very similar and so are termed sibling species. One of the sibling species, *D. willistoni*, consists of two subspecies (races of a species that inhabit different geographical areas): *D. willistoni quechua*, which lives in continental South America west of the Andes, and *D. willistoni willistoni*, which leaves east of the Andes and also in Central America, Mexico and the islands of the Caribbean. These two subspecies do not meet in nature; they are separated by the Andes because the flies cannot survive at high altitudes. Tests

> have shown that there is incipient reproductive isolation between the subspecies, particularly in the form of hybrid sterility, although the result depends on the direction of the matings. When a female *willistoni* is crossed with a male *quechua*, the male and female offspring are fertile. If, however, a male *willistoni* is crossed with a female *quechua*, the female offspring will be fertile and the males will be sterile. If these two subspecies came in geographical contact and crossbred, natural selection would favor the development of prezygotic reproductive isolation mechanisms because of the subspecies' partial hybrid sterility. The two subspecies are therefore considered to be in the first stage of speciation.
>
> *Drosophila equinoxialis* is another species that consists of two geographically separated subspecies: *D. equinoxialis equinoxialis*, which inhabits continental South America, and *D. equinoxialis caribbensis*, which lives in Central America and the Caribbean islands. Laboratory crosses between the two subspecies always yield fertile female offspring and sterile male offspring, independent of the direction of the cross. Thus there is somewhat greater reproductive isolation between the two subspecies of *D. equinoxialis* than there is between the two subspecies of *D. willistoni*. Natural selection in favor of prezygotic reproductive isolating mechanisms would accordingly be stronger for *D. equinoxialis* because of all the hybrid males are sterile. There is no evidence, however, of prezygotic isolating mechanisms among the subspecies of either *D. willistoni* or *D. equinoxialis*, and therefore they are not yet considered different species.
>
> The second stage of the speciation process can also be found within the *D. willistoni* group. *Drosophila paulistorum* is a species consisting of six semispecies, or incipient species. As in *D. equinoxialis*, crosses between males and females of these semispecies yield fertile females and sterile males. In places where two or three semispecies have come into geographical contact, however, the second stage of speciation has advanced to the point where ethological isolation—the most effective prezygotic isolating mechanism in *Drosophila* and many other animals—is nearly complete. Semispecies from the same locality will not crossbreed in the laboratory but semispecies from different localities will; the reason is that the genes involved in ethological isolation have not yet fully spread throughout the populations. The semispecies of *D. paulistorum* therefore provide a striking example of the action of natural selection in the second stage of speciation. When ethological isolation is complete, the six semispecies will have become fully distinct species.
>
> The final result of the process of geographical speciation can be observed in the species of the *D. willistoni* group. *D. willistoni*, *D. equinoxialis*, *D. tropicalis* and other species of this group coexist over wide territories without ever interbreeding. Hybrids are never found in nature, are extremely difficult to obtain in the laboratory and are always completely sterile.[72]

Clearly speciation is no simple matter of "A turning into B." But its relevance here goes much deeper. Imagine if you had only a few of those fruit fly species tucked away in your fossil record, and not a single observation available about their living behavior. You would have no "evidence" of all these graded subspecies, but pretending as if they didn't exist would in fact be quite wrong. And this is just regarding forms even creationists should have no trouble describing as the same species. Extend that understanding to the past (where such fragile forms as insects really are rarely preserved), and why is it so inconceivable that some ancestral genetic stock might have branched to the point now labeled *fruit fly*?

What do creationists have to say about such fissioning *Drosophila*? Not much. Neither of Duane Gish's current "serious" books on evolution felt it relevant to allude to this specific point, nor does the ever-informative ICR "textbook" edited by Henry Morris. I did spot a discussion of it

by biologist Gary Parker, in the book he wrote with Morris, *What Is Creation Science?* Compared to Ayala's terse and vague paragraphs above, Parker inundated the reader with detail: "But varieties of one type may also lose the ability to interbreed with others of their type. For example, fruit flies multiplying through Central and South America have split up in many subgroups (Fig. 21). And since these groups no longer interbreed, each can be called a separate species."[73]

Parker felt no compulsion to dwell on the particularities of fruit fly distribution and gene flow because he very quickly clambered onto a higher defensive plateau. Picking up where he left off:

> Whoops! Two or more species from one type! Isn't that evolution???
>
> Some evolutionists certainly think so. After I participated in a creation/evolution debate at Texas A & M, a biology professor got up and told everyone about the flies on certain islands that used to interbreed but no longer do. They've become separate species, and that, he said to a fair amount of applause, proves evolution is a fact—period!
>
> Well, what about it? Barriers to reproduction do seem to arise among varieties that once interbred. Does that prove evolution? Or does that make it reasonable to extrapolate from such processes to real evolutionary changes from one type to others? I think the answer is simply, no, of course not. It doesn't even come close.
>
> Real evolution (macroevolution) requires the *expansion* of the gene pool, the *addition* of new genes and new traits as life is supposed to move from simple beginnings to ever more varied and complex forms ("molecules to man" or "fish to philosopher"). Suppose there are islands where three varieties of flies that used to trade genes no longer interbreed. Is this evidence of evolution? No, just the opposite. Each variety now has a *smaller* gene pool than the original and a *restricted* ability to explore new environments with new trait combinations or to meet changes in their own environment. The long term result? Extinction would be more likely than evolution.
>
> Of course. If someone insists on defining evolution as "a change in gene frequency," then the fly example "proves evolution," but it also "proves creation," since varying the amounts of already existing genes is what creation is all about (Fig. 22).
>
> If evolutionists really spoke and wrote only about observable variation within type, there would be no creation/evolution controversy. But as you know, textbooks, teachers, and television documentaries insist on extrapolating from simple variation within type to the wildest sorts of evolutionary changes. And, of course, as long as they insist on such extrapolation, creationists will point out the limits on such change and offer creation instead as the most logical inference from our observations. All we have ever observed is what evolutionists themselves call "subspeciation" (variation within type), never "transspeciation" (change from one type to others). (See Fig. 22.)
>
> Evolutionists are often asked what they mean by "species," and creationists are often asked what they mean by "type." Both terms are hard to define. Evolutionists recognize certain bowerbirds as distinct species even though they interbreed, and they can't use the interbreeding criterion at all with asexual forms. Creationists sympathize with these problems, because they also associate "types" with groups that normally interbreed. However, both creationists and evolutionists are divided into "lumpers" and "splitters." "Splitters," for example, classify cats into 28 species; "lumpers" (creationist or evolutionist) classify them into only one![74]

Although Parker and Ayala's accounts comprise about the same amount of text, there could hardly be more contrast between their technical content. The main reason for quoting Ayala on *Drosophila* at such length was to permit the reader to observe an evolutionist *using* the term

species. There was no sense whatsoever in which Ayala was tentative or uncertain about what that meant, or how it was to be applied. Since Parker professed to being a former evolutionist, and having taught *university* level biology, he cannot possibly claim not to be familiar with the proper vocabulary. Yet turn to the index in *What Is Creation Science?* to learn of Parker's definitions for "species" and "type" and the reader was directed to the sublime extract quoted above. If you can spot a specification of either there, you're welcome to it. Whether through ignorance or intent, Parker grounded himself on a quite unwarranted equation of their respective use of terminology.[75]

But what of Parker's larger point? Is it true no *new* genetic structures can emerge through natural processes, and therefore nothing much can change over time? This is a common refrain across the creationist spectrum. Phillip Johnson drew similar boundaries around *Drosophila* when he briefly touched on them in *Darwin on Trial*. "The important question is not whether rapid speciation in peripheral isolates has occurred, however, but whether this mechanism can explain more than a relatively narrow range of modifications which cross the species boundary but do not involve major changes in bodily characteristics." Even the experimental generation of new fruit fly species signified nothing for Johnson, who was "not interested in pursuing the question, because what is at issue is the capacity to create new organs and organisms by this method, not the capacity to produce separated breeding populations."[76]

Parker offered no evidence the many *Drosophila* variants represented a *diminution* of the fruit fly gene pool, and neither delved into what sort of genomes they would summarily exclude from any potential ancestral forms. Both also left tactfully unexplored their own rhetorical flourishes: what *does* produce "major changes" in body structure? The objective facts available to Parker or Johnson should have thoroughly disabused them of any notion that gene replication is simply a tale of conservation. Whether creationists admit it or not, the genome is *constantly* being changed and expanded, and evolutionary genetics has learned a great deal about just how that happens.

First, a few basics. Whether you're looking at prehistoric life or living examples, every individual organism possesses a unique genetic inheritance, the DNA that performs what is certainly the grandest "which came first, chicken or egg" trick in nature. The DNA tells which proteins are to be put together to make the machinery that is used to build those proteins into the organism itself. This is what mathematicians blithely call a "self-referential system," and is precisely the sort of structure prone to unexpected state changes. It is also one of those legitimate "mysteries of the universe" that should never cease to amaze anyone who studies it, be they evolutionist or creationist.[77]

The crucial part for the evolutionary question is how this DNA is passed on to any progeny. Whether accomplished asexually like bacteria, or through the mating mode so popular among multicellular organisms, DNA is not usually handed over *unchanged*. The very mechanisms of reproduction can slip a cog and duplicate genes, shuffle them around on the chromosomes, or snip out a section altogether. Usually fiddling about with the code this way causes big troubles, but not always. Whole genes can be "switched off" by the cell machinery, and carried along like a coiled spring until reactivated. The random mutations that pop up quite frequently, where the "letters" of the DNA alphabet (there are only four) get misprinted, don't necessarily produce a problem either because the DNA triplets (called "codons") that specify protein sequencing have some redundancy. And among more complex organisms, often very long strings of seemingly inactive code ("introns") are somehow disregarded entirely during regular protein assembly. So there are many ways for variant genes (known as "alleles") to flow through a population without manifesting an overt effect.[78]

Either by accident or intelligent design, Phillip Johnson acknowledged none of this in *Darwin on Trial*. But Gary Parker did. He devoted all of a portion of a paragraph to it, in fact, deciding these genetic processes involved nothing beyond the "shuffling of existing parts, e.g. insects with legs where their antennas normally are, or with the extra pair of wings thanks to duplication of the second thoracic segment."[79]

Where the creationist Parker saw only a limited genetic mixing bowl, an evolutionist detects a vital clue to understanding fundamental development. Failing to yield at Parker's impenetrable barrier, biologists blundered on to decipher the genes governing the placement of arthropod body parts. By the mid-1990s these *homeobox* genes were turning up all over the metazoan map, from

insects and mammals among animals … all the way to plants ("types" not customarily accounted especially "similar" by creationists). The homeobox genes of a fruit fly and mouse are virtually identical sequences positioned in the same locations on their respective chromosomes, yet result in very different body plan effects. An insect's skeleton is external, its body segmentation far more pronounced, so any changes to a fruit fly's *HOM* complex will modify how wings and legs are to be attached. But mammals have experienced a few hundred million years of their own non-arthropod evolution, adding to that ancestral substrate considerable genetic modification for things like a vertebrate's internal skeleton and musculature. During this adventure the mammalian *Hox* has undergone assorted gene doublings and duplications, and now exists in four copies on separate chromosomes (just as amphibians, birds, and worms have worked their own variations). When a mouse embryo expresses its primary *Hox* ensemble, it's not to attach wing membranes or antennae, but to produce transient brain tissues, ultimately discarded in later development. Similar shared sequences have been found relating to light sensation (*eyeless* in fruit flies, *Small eyes* in mice, *Aniridia* in humans, and *Pax-6* in squid and flatworms) that guide the embryology that eventually manifests as their respective eyes.[80]

Nor does this nasty habit stop at the DNA level. Fresh findings continually remind biologists how pervasive it is for living things to evolve by *borrowing*. Consider the neurulation process whereby vertebrates construct their central nervous system. A contemporary biology textbook told what takes place along the way:

> The story of neural crest cells is among the most amazing tales in all of developmental biology. When the neural plate involutes to form the neural tube during neurulation, and the neural tube detaches from the ectoderm, a series of cells is left over on either side. The cells are neither integrated into the neural tube nor taken up into the ectoderm. Instead, they set off on travels; colonize in various regions of the body; and give origin to a bewildering variety of cell types, tissues, and organs (Fig. 13-1).[81]

These include some rather disparate items common to all vertebrates, from the dentine-forming cells of the teeth to pigment cells found in bird feathers and mammal hair. But even more intriguing are some of the specific ways in which these initially undifferentiated neural crest cells have been pressed into service: the dorsal fins and gill arches of fish, or the sound-transmitting cartilage that link incus, malleus, and stapes within the mammalian inner ear. To make things even more fun, as we'll see next chapter, for entirely different reasons evolutionists had already traced quite an interesting path for those fish gill arches. Seen as the source for the vertebrate jaw, by the time you get to reptiles several component jawbones have developed, three of which end up subsequently refitted for use as (drum roll, please) the incus, malleus and stapes of the mammalian inner ear.[82]

Clearly, something very interesting is going on deep inside the genome. But to paraphrase the low opinion of golf clubs attributed to Winston Churchill (or Woodrow Wilson): creationism would seem an implement singularly ill suited to the task of figuring it out. Saddled with so many false assumptions and defunct analogies, no wonder they can't anticipate what secrets will be extracted from the genetic book of life.[83] Just as some people are unable to absorb the surreal microcosmos of quantum indeterminacy, and so cling to visualizing atoms as miniature solar systems, the genetic model Parker has in mind is an elemental one:

> Perhaps creation produced a design in living things similar to the one we find in the nonliving world. Only about a hundred different elements or atoms are combined in different ways to make a tremendous variety of nonliving molecules or compounds. Maybe creationists will one day identify a relatively few genes and gene sets that, in unique combinations, were used to make all the different types of life we see. It would take a tremendous amount of research to validate this "mosaic or modular concept of a created unit," but the results would be a truly objective taxonomy that would be welcomed by both creationists and evolutionists.[84]

Parker is a day late and a dollar short here. Genetic research has left far behind any stage where this "element" analogy makes much sense. There is no isolated set of standard genes you can draw on that stack one way as a spider, or in another to get a platypus. All you have in a *gene* are a concatenation of codon triplets directing which of twenty amino acids are to be attached to the growing protein before a "stop" codon terminates the chain. The completed protein is then carried off to join the sea of fellow proteins already doing whatever it is their chemistry dictates. From homeobox in the basement, all the way up to expressions like the neural crest cells, the lesson is how minimal adjustments to the *same* genetic sequence end up doing radically different things. DNA is not an array of building blocks, or even a static blueprint for the finished organism. As a growing system, the useful analogy is that of a computer program, where the instructions *will* do whatever they *can*, no stopping them. Life makes the most of its own genome, submerging and modifying and reviving ancestral code in ways shaped by the countless contingencies of its history.

While evolutionary biologists out in the field were doing all the heavy lifting Parker was proposing his creationist colleagues undertake, back at the ICR ranch the "mosaic or modular concept of a created unit" gathers dust, as though locked in one of Baron Cuvier's museum display cases. The modern genetic perspective of life is just too inimical to creationist dogma for them to do more than indulge in retroactive campaigns to "plug the hole." I have no doubt a future edition of Morris and Parker's tome (or Phillip Johnson, for that matter) will eventually include some agile pirouettes to dispose of the implications of homeobox genes or neural crest cells. But in the meantime, evolutionary biology will have advanced to further discovery. Unlike Achilles with the tortoise, this time creationists really are never going to catch up.[85]

Given how creationists are unable to define their terms, and remain so consistently opaque to the import of new findings, how are they to advance as a discipline to the really significant part of scientific reasoning, offering what they think *did* happen regarding the nature and history of life? The short answer is, they can't, and don't. Their absolute certainty about what did *not* take place (any manner of naturalistic "macroevolution") is balanced by a steadfast refusal to specify their own theoretical interpretation, against which the strength of their case may be judged. Within that ubiquitous fog evolutionists are driven up the debating wall, for how can creationism ever be proved wrong when you can never quite pin down what it is creationists *believe*? Biologist Kenneth Miller, a frequent critic of both Creation Science and Intelligent Design, described this as a frustrating game of "hide the ball."[86]

However infrequently creationists disport on their essential doctrine, there are notable positions to identify. Creation Science harbors no doubt all "kinds" were created only once, during a literal Creation Week sometime within the last 10,000 years (more or less). That leaves all the rest (including Intelligent Design) to reject the Young Earth suitor, and implicitly accept the sequential creation of natural "types" throughout the geologic ages.[87] For the analytical purposes of this present work, henceforth "kind" shall refer exclusively to the proposed Creation Week forms, while "type" will mean those the Intelligent Designer littered along the traditional geologic trail.

Both views perform an invaluable diagnostic role in that they pose a host of intractable questions, ones wholly independent of the validity of evolution, that arise by thinking through the consequences of a particular version of *creationism* being true. Whether the contentions themselves have any scientific plausibility shall be examined in the chapters to come, but creationists still have to answer why it is *they* think so little about them on their own. The creationist failure commences at this very bedrock level, sheering along the sizable imaginative fault of methodological evasion.

The perennial problem confounding Scientific Creationism is the bottleneck of Noah's Ark. Every organism in the fossil record had to have been alive only some five thousand years ago, and the only specimens of those terrestrial "kinds" to be preserved were those taken aboard. Moreover, all contemporary animal distribution (including human beings and, arguably, a wide range of *flora* as well) *must* be consistent with those surviving creatures spreading out from Mount Ararat after the Flood to repopulate the earth. The facts of biogeography would therefore seem not only a prime area for creationist defense, but also a particularly promising one were Creation Science to

resound with the ring of truth. Yet a thorough examination of animal distribution turns out to be something conspicuously *absent* from creationist writings.[88]

The compression of geologic time that allowed White's Flood Geology to disconnect the fossil record from evolution leads to some rather interesting results when we consider the endemic fauna of isolated spots like the Galápagos Islands (including those finches even creationists now agree have apparently derived from mainland stock by means of natural Darwinian speciation). To adopt the literal Flood means these forms did not slowly differentiate over *scores of millennia*, but migrated to the locale and proliferated into their present diversity so rapidly it would make an ardent evolutionist faint. Individual cases of adaptation and speciation can occur in a few thousand years, but a complete ecological ensemble takes quite a bit longer, and creationists offer no evidence such blinding speed is possible. For this reason, creationists have yet to properly appreciate the irony of their rejecting *evolution* on the grounds it demands too much of speciation.[89]

But we're not done. Whatever happened to those giant Carboniferous dragonflies, and the finback *Dimetrodons*, and the creodonts and miacids and dinosaurs and pterosaurs? Again, these varied terrestrial "kinds" *must* have been on the Ark, yet somehow, mysteriously, and without post-Flood trace, *all* disappeared from the living world. Rather careless, one would think, since the whole idea of the Ark was to *preserve* everything. Later on we'll see creationists mutter a little about "behemoth" and "leviathan," and try thereby to Biblically bag the dinosaurs and marine reptiles, but that's barely a whiff of the fossil zoo they have to account for.

The main problem facing creationists is to figure out why so many of these subsequently extinct "kinds" are only found in strata evolutionists assign to the geologically ancient past. Horses and cattle never turn up beside trilobites or *Triceratops*, but are only known from more "recent" deposits, whose denizens all seemed to fare quite well after the Floodwaters receded. Creation Scientists think to defuse this particular bomb by claiming paleontologists only classify extinct fossils to past eras on their prejudiced whim, supposedly organizing the geologic evidence entirely on the grounds of evolutionary expectation. But since the current geological system was worked out *prior* to Darwin, was based on literally *solid* evidence, and was established by geologists embracing no evolutionary assumptions whatsoever (they were creationists), this approach can't get them very far.[90]

But even if this were true, it would still not explain why the pre-Flood counterparts of living forms should have actively *avoided* settling in certain deposits, just because uniformitarian geologists say they don't belong there. One idea creationists might consider to resolve this puzzle is that perhaps some "kinds" preferentially retained a psychic link with their relatives buried in the great Flood layer. So blessed, they may have grown despondent considering how turbidity currents and hydraulic sorting had dumped their drowned cousins so embarrassingly low on the arbitrary evolutionary ladder, and ended up worrying themselves to extinction sometime before Caesar crossed the Rubicon.

Normally there is a driving curiosity behind the human intellect to understand everything it can about a favored specialty. Sports fanatics can merrily rattle off player statistics long after the listener's eyes have glazed over. Michael Dummett couldn't stop gathering the rules of tarot games until he'd exhausted all resources, just as paleontologist Peter Wellnhofer embodied his own fascination with pterosaurs by writing a comprehensive book on them.[91] So what strange obstacle keeps Creation Science from doing the same with the Flood? If the fossil record fits their own model so graphically, as they perpetually aver, why haven't we seen a proud display of this emerge from the otherwise verbose Henry Morris or Duane Gish, let alone all the remaining Creation Science satellites? Their belief in the Flood involves more than just a transient meteorological event—it is a critical lynchpin of their theology and nonevolutionary view of the universe. But all you can find out about it from *them* are snippets and allusions, scraps of scholarly minutia that belie the very momentous nature of the tenet.

Now it might seem the Flood hath no comparable fury for Intelligent Design, since they've cast aside the option of squashing their "types" into a geologically recent accordion. But this only puts them back in the spot creationism was in before White and Price came along. Without the Deluge to drown its implications, the fossil record looks unpleasantly like evolution has been going on.

Biologist Douglas Futuyma summed up what that meant in his fine book on the creationism controversy:

> For the British naturalist John Ray, writing in 1701, organisms had no history—they were the same at that moment, and lived in the same places, doing the same things, as when they were first created. For Darwin, organisms spoke of historical change. If there has indeed been such a history, then fossils in the oldest rocks must differ from those in younger rocks: trilobites, dinosaurs, and mammoths will not be mixed together but will appear in some temporal sequence. If species come from common ancestors, they will have the same characteristics, modified for different functions: the same bones used by bats for flying will be used by horses for running. If species come from ancestors that lived in different environments, they will carry the evidence of their history with them in the form of similar patterns of embryonic development and in vestigial, rudimentary organs that no longer serve any function. If species have a history, their geographical distribution will reflect it: oceanic islands won't have elephants because they wouldn't have been able to get there.[92]

Had they only they stopped to think about it, that latter point presents a considerable difficulty for Intelligent Design. Unlike Creation Science (which has all "kinds" appearing once, filtering through the sieve of the Flood, then scampering off at breakneck speed to obtain their present distribution), there is no theoretical reason why the Intelligent Designer should have restricted the *geographical* range of his creative handiwork undertaken over all those millions of years. Yet, as Darwin and Wallace first noticed, isolated islands seem invariably off limits for such divine attention. Why should that be so? Among Intelligent Design advocates, only Michael Denton managed to broach the subject at all:

> This phenomenon was not restricted to the Galapagos Islands. To any well traveled naturalist it is immediately apparent that in different continents similar environments are generally occupied by quite unrelated species and that adjacent geographical regions within any one great continental area are generally populated by different, yet basically related, forms. Why had God not created the same species for the same environments even if these environments did occur in widely separated geographical regions? Perhaps creation had proceeded according to some geographical rule which demanded that only closely related species be created within any one great region of the earth. Or had the curious pattern of geographical variation resulted from some sort of directed migration following the deluge? Such questions were bound to have occurred to Darwin while still aboard the *Beagle*, and they must inevitably have had the effect of rendering the biblical framework increasingly obsolete in his mind[93]

A paragraph that began as a potential generalization about the distribution of life was quickly particularized into something a Darwin might have thought about—but what about *Denton*? The remainder of his book avoided the implications of this completely. Perhaps because this tentative rhetorical head scratching was as far as Denton thought it necessary to go, later Intelligent Design proponents have regressed to where they avoid the subject as assiduously as their Creation Science rivals. The redoubtable Phillip Johnson, for example, who showed no more reluctance to rely on Denton than Gary Parker had (when convenient), displayed his customary flare in this area. His complete characterization of biogeography consisted of a single sentence submerged in one paragraph of *Darwin on Trial*:

> If critics are sophisticated enough to see that population variations have nothing to do with major transformations, Darwinists can disavow the argument from microevolution and point to *relationship* as the "fact of evolution." Or they

> can turn to biogeography, and point out that species on offshore islands closely resemble those on the nearby mainland. Because "evolution" means so many different things, almost any example will do. The trick is always to prove one of the modest meanings of the term, and treat it as proof of the complete metaphysical system.[94]

Now biogeography consists of the current and prehistoric distribution and character of every living thing on earth. That naturalistic evolution alone has been able to explain that distribution convincingly seems fairly obvious from the fact that no creationist is willing to take a stab at it. So in what respect is this one of the "modest meanings" of evolution? Clearly evolutionists haven't got the memo on this, for they persist in treating it as if it were of some importance. Even with what little was known in the 19th century, Darwin thought enough of the matter to put two chapters on it *The Origin of Species*, as paleontologist George Gaylord Simpson noted in the sizable chapter he devoted to the subject himself in one of his own books.[95]

But like someone with the field glasses the wrong way around, Johnson missed that elephant Futuyma mentioned.[96] You see it's not only what living things are found on such isolated islands which is so important, but also what is *not* found on them. The rule of biogeography applies even for real estate capacious enough to sustain quite large mammals introduced later by man. Why then shouldn't God have dropped a few new "types" (or even a fully functioning ecosystem occasionally) on fresh archipelagos, instead of always leaving nature to take its course there? This restriction seems doubly contrived when you consider just how perplexed evolutionists would be to account for it, had something like ponies or giraffe been found on the Hawaiian Islands. Was the Intelligent Designer deliberately avoiding doing such things for all those millions of years out of solicitude for Darwinist anxiety?[97]

And while we're about it, what exactly does it mean for new life to be *created*? What was a side issue for "kinds" appearing virtually simultaneously moves to center stage once creation is seen as engaging previously developed ecosystems. If "creation" means *literally* without physical antecedent, are we talking an empty field one moment, then a blinding *zot* as matter is assembled *ex nihilio* into a whole population of the new "type" strolling about? If the creator modified existing "types" instead, performing some manner of saltational genetic engineering, would there be any way for scientists today to distinguish these miraculous effects from the changes permissible under naturalistic mutation? However the feat was accomplished, are the new "types" of a generalized genome, or did they step out of the box with a whole repertoire of alleles? Was their dentition designed to accommodate an existing diet (plant or animal), or did the author land a whole integrated package of predators and prey on the scene? Would such a "modular micro-ecosystem" come equipped with its own specialized parasites and bacterial hitchhikers, or are already extant ones free to gum up the perfectly created product afterward by colonizing new hosts without divine instruction?

Supposing Intelligent Design has any pretensions to being a scientific discipline, why are they not asking these questions themselves? If what they seek is a fuller understanding of their own philosophy, how could their imagination be *prevented* from doing so? Judging by the works of Michael Denton or Phillip Johnson, the "creation hypothesis" is a vague fait accompli indistinguishable from the one offered by Scientific Creationism. Just as Flood Geologists don't actually offer a "flood geology," Intelligent Design exhibits no native inclination to probe how objectively "intelligent" the design was.

Both schools endeavor to disarm the implications of the paleontological record by focusing on the supposed lack of fossil intermediates. As they tell it, evolutionists try to pull a fast one here by always having macroevolution take place invisibly over in the next fossil county. This is not a fair characterization of the facts, but even if it were, Intelligent Design is exposed to much the same ironic inconsistency as Creation Science, with its lightning fast post-Flood diversification. In all human history, no one has ever reported novel new "types" materializing on the veldt like UFO crop circles, or been shocked when their barnyard livestock metamorphose before their eyes into something else. Once so committed to generating new "types" over millions of centuries, just when humans appeared on the scene to really appreciate such marvels, the Intelligent Designer turned

inscrutably shy and closed up shop, to let the whole shebang run on the natural autopilot of Darwinian speciation. A most unfortunate turn of events for those scientifically trained observers, especially Christian ones so uniquely qualified to remark conclusively on how impressive were the wonders of divine creation.

Creationists are in such a hurry to detoxify all the fossil life they encounter that they overlook something else rather important. Whatever "kind" or "type" they may be, and whenever they actually lived, there is the historical fact that they were not all *discovered* at once. Virtually all dinosaurs appeared on the museum scope after Darwin, as have the mammal-like reptiles of the Permian, and so on through contemporary paleontology. Now a created "kind" or "type" is by definition a one-off, unrelated to prior forms. So if prosauropods really are a different "kind" or "type" from the sauropods, for instance, there could be no reason for the latter being created when or where they were, other than God's own intention to do so (stuck in some sauropodomorphic rut perhaps). Which means, if creationism is true, there should be no way in principle to *predict* what "kinds" or "types" God really had made.

Evolutionists, of course, come to the same information with a very different package. Everything they have to say about what fossil forms should (or should not) be discovered in the geologic record is informed by their recognition of a most distinctive *pattern* to the nature of life. Futuyma again:

> One of the most remarkable revelations of comparative anatomy, in fact, is how seldom truly novel structures are found. We can imagine cherubs and flying horses with wings sprouting from their shoulders; but the wings of vertebrates are always modifications of the front legs. As Darwin's colleague Milne Edwards expressed it, "Nature is prodigal in variety, but niggard in innovation." Take any major group of animals, and the poverty of imagination that must be ascribed to a Creator becomes evident. For example, *all* of the peculiarities of the various modern mammals are simply modifications of the structures possessed by primitive insectivorous mammals such as hedgehogs; and these in turn are modified reptilian features."[98]

So even such a modest chimera as a terrier-sized Pegasus, however perfectly capable of flight it might be in a design sense, would nonetheless give evolutionists fits, for they hold all vertebrates to have descended from four-limbed models, which have yet to acquire the genetic wherewithal for adding new ones. For similar evolutionary reasons, all taxonomical "mosaics" are not created equal. Some are most plausible, while others are genuinely preposterous. Just within the chordates, mammal-like *reptiles*—yes, mammal-like *amphibians*—no. *Fish*-like amphibians—certainly, *lancelet*-like amphibians—never. By studying the history of life with a sensitivity for pattern and continuity, evolutionary theory has repeatedly interpolated the existence of hitherto unknown *categories* of creatures, while excluding an equal menagerie of forms which, for some curious reason, God never did get around to trying out.

Assuming some brand of creationism is indeed true, how have evolutionists managed to pull off this little trick of so consistently anticipating the mind of God? Either they are just exceptionally good guessers, or the deity was in the habit of creating things deliberately (or inadvertently) to comport to evolutionary expectations. Had the transcendent and omniscient Intelligent Designer obtained an extremely advanced copy of the *Origin of Species*, and so liked what he read that he decided to use it as a "style manual" for generating new lifeforms? Whatever the case, having tossed the Darwinian hound such treats as 50 million years worth of mammal-like reptile bones, evolutionists can derive comfort from how the creator has once again spared their feelings. It is legitimate to wonder, though, why God went to so much trouble, since this only helped persuade them of the pernicious doctrine that mammals had *evolved* from those reptiles.

All these questions (even those draped in sarcasm) coalesce in the end under a single grand query: how do you know when you're *wrong*? The creationist can tell you a thousand reasons why the *evolutionist* is supposedly in error, but not under what circumstances *they* would concede an issue. The assorted "thought experiments" posed over these last pages to illustrate this distinction

are nothing out of the ordinary when it comes to scientific speculation. In the film version of Carl Sagan's *Contact*, the tenacious astronomer Ellie Arroway summed up this attitude most succinctly when she challenged her colleagues to "make me a liar." But when it comes to consciously trying to poke holes in a pampered dogma, creationism has not embraced this particular scientific hobby, and it's not hard to figure out why.

Let us suppose Judge Bork has ruled sagely, and the fossil record does constitute a "major embarrassment" for evolution. If the observed sequence doesn't indicate mammals evolved from some aberrant reptile, what would? Creationists, *if they thought like scientists*, would not require prompting to work out on their own what a "true" reptile-mammal transition would look like; it would be an obvious course of action to evaluate whether the evidence supports that contention. Of course, this would mean reasoning out precisely what features the fossils ought to display, and that in turn would require a thorough comprehension of both evolutionary theory and the fair extrapolation of its consequences. Finally, this would lead them back to the point under dispute: in what respect does this ideal sequence *differ* from what is actually seen in the fossil record?[99]

Because macroevolutionary transitions are not allowed on the creationist option list, in principle any evidence suggesting them *must* be wrong. This is not the sort of attitude that has historically fostered brilliant scientific inquiry. With all the insouciance of the Cardinal who supposedly refused to look through Galileo's telescope (lest he faithlessly observe the moons of Jupiter which the Church said did not exist), Henry Morris dismissed in advance any experimental vindication for evolution. "Even if modern scientists should ever actually achieve the artificial creation of life from non-life, or of higher kinds from lower kinds, in the laboratory, this would not *prove* in any way that such changes did, or even could, take place in the past by random natural processes."[100]

How then do creationists circumvent the fossil obstacle? For those knowing only what they've read in the ICR papers, the first and easiest option is to deny there are any transitions. This naturally becomes increasingly tortuous to the extent the nonexistent intermediates are discussed, as Duane Gish illustrated in *Evolution: The Fossils STLL Say NO!* Kurt Wise's paleontological background moved him along the more perilous second course of conceding the obvious—that the fossil record looks like evolution—but claiming this was merely an observational fluke, and that the creation hypothesis would explain the data even more satisfactorily. The downside comes from having to present that "creation hypothesis." So far this step has eluded him. Fortunately, Phillip Johnson's novel third approach has resolved the problem—dynamite *everything*: dismiss all evolutionary fossil inference and recognize no obligation to provide a creationist alternative. By ending up as Gish minus the details, Johnson does for creationist paleontology what homeopathy has for pharmacology.

It is instructive to contrast the embalmed creationist imagination with the way reasoning carries on in the workaday world, never mind the sciences. While in Arkansas to testify on behalf of evolution at the 1981 "balanced treatment" trial, Stephen Jay Gould had a revealing exchange with the plumber dispatched to stop a micro-deluge at his hotel.

> He explained to me that a leak in the room below had caused part of the ceiling to collapse and he was seeking the source of the water. My commode, located just above, was the obvious candidate, but his hypothesis had failed, for my equipment was working perfectly. The plumber then proceeded to give me a fascinating disquisition on how a professional traces the pathways of water through hotel pipes and walls. The account was perfectly logical and mechanistic: it can only come from here, or there, flow this way or that, and end up there, there, or here. I then asked him what he thought of the trial across the street, and he confessed his staunch creationism, including his firm belief in the miracle of Noah's flood.
>
> As a professional, this man never doubted that water has a physical source and a mechanically constrained path of motion—and that he could use the principles of his trade to identify causes. It would be a poor (and unemployed) plumber indeed who suspected that the laws of engineering had been suspended

> whenever a puddle and cracked plaster bewildered him. Why should we approach the physical history of the earth any differently?[101]

Why, indeed? So long as creationism defends a battery of *a priori* conclusions, they have little choice in the matter. If creationism approached broken pipes the way they do the evidence for evolution, this condition would be absurdly plain the moment any of them opened their mouths. While the Creation Scientist preached the torrent as unfathomable miracle, Intelligent Design (ignoring the leak entirely) would stomp off to the lobby to denounce the naturalistic theory of plumbing instead. Meanwhile, there's water pooling on the floor and *somebody* needs to grab a mop.

Creationism plays at "science" but never graduates to the level of serious discourse, where the object is to explain things—not explain them away. But in the creationist *Kulturkampf* the outcome is already known, so their argument turns on the equivalent of arranging miniature battalions to recreate the Battle of Waterloo, only this time Napoleon has to win. The only discretion allowed them concerns the tactical challenge of how to properly deploy (or conceal) the facts of nature in order to present a convincing tableau that corresponds as closely as possible to the version of events their religious perspective has ordained.

Since creationism doesn't qualify as *science* by any methodological criterion, how then should it be described? The arts and religion are clearly *non-scientific* pursuits, insofar as they concern qualities like Truth and Beauty, or Justice and Purpose. About such esthetic or teleological verities science can say practically nothing. The optical properties of pigments can be specified, for example, but no conclusion can be reached as to whether Caravaggio was a "better artist" than Mondrian or Norman Rockwell. Similarly, cosmology can be rather authoritative about the morning sunrise not depending on Quetzalcoatl being propitiated with an adequate supply of human hearts (that Aztec practice having discontinued some centuries ago without producing any consequent interruption of apparent sidereal motion). In that capacity science can legitimately remark on the plausibility of the underlying religion. But venture beyond this realm of detectable extrovert effect, to the spiritual teachings recounted in historical texts about a Jesus or Buddha, and no degree of "scientific reasoning" can contribute much to understanding whatever "transcendent reality" they may possess.

Although creationist motivation manifestly derives from their faith, both Scientific Creationism and Intelligent Design enter the public arena specifically to press the *scientific* merits of their case. They insist their analyses adhere only to the loftiest standards, and frequently end up accusing *evolutionary theory* of being the guilty party when it comes to committing fatal methodological sin.[102] This conceit puts the facts of the matter exactly backwards. Creationists do not define their terms with the precision scientists do, and fail (both in principle and practice) to follow them through to offer a carefully reasoned theoretical alternative to the evolutionary edifice. For this fit of hubris alone, creationism deserves to be tagged with the rubric *pseudoscience*.

Now "pseudoscience" is one of those nicely pejorative terms never sought by the recipient, but always bestowed on it by its philosophical enemies. Yet only a blockhead would contend there is no such thing as pseudoscientific thinking. Medical quackery and the Flat Earth would seem safe bets here—unless, of course, you happen to be a medical quack or a Flat Earther. But in looking back on Martin Gardner's *Fads and Fallacies in the Name of Science*, which first appeared over fifty years ago, it is striking how stable the Pseudoscience Club membership has been. Naturally some of the labels have changed (Dianetics is now Scientology, and mediums today are "channelers"), but astrology and Atlantis, UFOs and parapsychology, as well as *creationism*, are all grinding along as persistent subcultures pretty much as they were back when Eisenhower was in office.

The defining measure for all pseudoscience is the lengths it will go to avoid dealing with contrary evidence. For the extremely delusional, the sort who is convinced Altarians are beaming microwaves into their pineal gland, that body of data can embrace most of the observable universe. The pamphlets they produce to explain their position are exemplars of incoherence, jammed with inexplicable charts and pointless CAPITALIZATION. For them the sobriquet "kook" is quite appropriate, and perhaps even charitable.[103] But these tend to be loners, and so have no cadre of

followers to advance the social status of their "scientific" qualifications in the secular world, as creationism most certainly does.

But look more closely at the Flat Earth movement, as science writer Robert Schadewald did, and the differences between it and Creation Science begin to blur. Like everyone else, Biblical cosmology started out thinking the world was flat, and a few early Christian apologists (most notably Cosmas Indicopleustes in the 6th century) strenuously defended the traditional view against the rising tide of the pagan Ptolemaic system, which placed a spherical earth at the center of the universe. By the 12th century the flat earth was theologically déclassé, only to make a bit of a comeback late in the 19th century among several fringe Christian sects, a situation which continues to the present. The resemblance to creationism concerns not the popularity of Flat Earth theory, which is negligible, but their methodology. Both rely on the rigid interpretation of Biblical doctrines to derive sweeping geological conclusions, and their gymnastic debating tactics in furtherance of this are surprisingly alike. There is even the shared conviction that acceptance of a spherical earth (or evolution) is of *satanic* origin.[104]

Because belief in a Flat Earth today is so patently stupid, Duane Gish didn't much appreciate Schadewald's comparison. But he had to be careful how he tackled the subject, since ancient Biblical cosmology believed that very thing. Had the historical material been incorrect or irrelevant, Gish could have taken the straightforward approach and challenged them, but he did not. Instead, Gish routed himself onto a detour, pointing out that Isaiah 40:22 spoke of the *circle* of the earth. Whereupon he executed a deft "von Däniken" by laying on some misplaced concreteness: "From every point in space, the earth appears as a circle, which it must, of course, if it is a sphere." So the Bible was "scientifically accurate" after all! But on what occasion was Isaiah *in orbit* to have observed this phenomenon? What Gish sidestepped was how the "circularity" of the earth could be reasonably inferred *from the ground* by the shadow it casts on the moon during an eclipse, and that would be just as true for a planet believed to be shaped like a pie plate than a soccer ball.[105]

One can appreciate Gish's discomfort here. Debating with a secular humanist is one thing, for then he could stake out the Biblical turf for his own exclusive use, and play on whatever sympathies he could arouse among Christians in the audience. But having to share the Scriptural terrain with someone just as certain of their own absolute interpretations is something else again. Since the world is not actually flat, whatever following the Flat Earth model has today can only be attributed to the considerable power of *persuasion*. Anyone sitting down with a committed and articulate Flat Earther, especially before an audience sufficiently "open minded" to take any of this seriously in the first place, is therefore more likely to confront a formidable buzz saw than a pushover.

As Gish should know, since he has been known to perform the role of the *saw*—for example, in a 1992 debate with Hugh Ross, held under the auspices of conservative Christian activist James Dobson. Since all three accepted Biblical authority and rejected organic evolution, Gish found himself tethered on fields not of his own choosing (astronomy and physics), where Ross would seem to hold the home court advantage. Except Hugh Ross has none of Gish's serpentine debating skills. When Gish made the mistake of starting to question the reality of the expansion of the universe, Ross began to box him in. But Gish quickly recovered, and soon had Ross derailed on a side issue (whether functionally invisible "cold dark matter" exists to account for certain aspects of galactic motion). Meanwhile, moderator Dobson floated around the debate in a state of complete uncertainty, unable to make up his mind how old the universe was or what this meant for Biblical exegesis. Even though the objective facts about the size and age of the universe reflected in Big Bang cosmology are as much a minefield for Creation Science as topography is for the Flat Earth, a suitably agile debater like Gish is perfectly capable of navigating around them without getting his toes blown off.[106]

If Duane Gish was finicky about how he swatted the Flat Earth mosquito, that is nothing compared to the reluctance Intelligent Design has shown when it comes to criticizing the far larger pest of Creation Science. Never mind how inane their arguments are, or how concerted their legal or scholastic campaigns have been, as far as Michael Denton, Phillip Johnson, or Michael Behe are concerned, Scientific Creationism is so completely inconsequential it warrants no substantive

comment at all. Since no evolutionist is allowed a comparable leeway, this double standard may reveal more about the priorities of Intelligent Design than they intended.

Michael Behe touched on this topic once in *Darwin's Black Box*, and managed to have mainstream science come out the heavy:

> The Scopes trial and the Huxley-Wilberforce debate happened long ago, but more recent events have kept the conflict simmering. Over the past several decades groups that, for religious reasons, believe that the earth is relatively young (on the order of ten thousand years) have tried to have their viewpoint taught to their children in public schools. The sociological and political factors involved in the situation are quite complex—a powerful mix of such potentially divisive topics as religious freedom, parental rights, government control of education, and state versus federal rights—and are made all the more emotional because the fight is over children.
>
> Because the age of the earth can be inferred from physical measurements, many scientists quite naturally felt that the religious groups had entered their area of expertise and called them to account. When the groups offered physical evidence that they said supported a young earth, scientists hooted it down as incompetent and biased. Tempers flared on both sides, and much ill will was built up. Some of the ill will has been institutionalized; for example, an organization called the National Center for Science Education was set up a dozen years ago—when several states were passing laws congenial to creationism—to battle creationists whenever they try to influence public school policy.[107]

But Behe is a rank amateur compared to Phillip Johnson, who won't discuss the subject even when he brings it up himself. In *Reason in the Balance*, Johnson mentioned the Dean Kenyon case as an example of an ex-evolutionist convert to "intelligent design" who suffered persecution after raising challenging questions in his San Francisco State University lectures. One can justifiably defend Kenyon's academic freedom in this area, but it might have seemed a tad relevant to note Kenyon's brand of "intelligent design" happens to be the Creation Science of Henry Morris. In *Defeating Darwinism*, Johnson put a similar "inquiring minds" spin on the case of an Ohio physics teacher, Mark Wisniewski, called on the carpet in 1996 for including Creation Science material in a unit contrasting competing views on the origin of life and the universe. Tucked away in Johnson's endnotes was a newspaper report that half of Wisniewski's students ended up thinking the creationist positions were more plausible. Since he expressed no concern over this outcome, Johnson apparently regarded this as a sign of progress.[108]

Johnson's most revealing scholarly example occurred in *Reason in the Balance* when he lined up Martin Eger, a professor of physics and philosophy of science at the City University of New York, to demark how evolution was being taught within the purported "value neutrality" approach of the liberal educational system:

> Eger observed that the prevailing educational philosophy is entirely different when the question is whether teachers and students ought to come to grips with creationist challenges to naturalistic evolution. The educators have no doubt that on this subject, right thinking involves a total rejection of creationism and embrace of evolutionism, and they are determined that students will hear only orthodox teaching. Eger did not think this difference could be justified on the ground that scientific knowledge is objective whereas moral values are subjective and hence always fairly debatable. Our society is in fact quite definite about certain moral doctrines, such as that slavery and racial discrimination are wrong, and on these doctrines the educators are not relativists. The difference is not between science and morality, but between those doctrines that educators are really determined to induce children to believe and those that they do not care

> about so much. When it comes to important matters, the educators understand very well that immature minds cannot be trusted to come to correct answers.
>
> Eger quotes Philip Kitcher, a leading Darwinist philosopher of science, who explained why it is not a good idea to expose secondary-school students to creationist arguments:
>
> > There will be … much dredging up of misguided objections to evolutionary theory. The objections are spurious—but how is the teacher to reveal their errors to students who are at the beginning of their science studies? … What Creationists really propose is a situation in which people without scientific training—fourteen-year-old students, for example—are asked to decide a complex issue on partial evidence.
>
> In matters of ethics and morality, fourteen-year-old students are invited to challenge the standards of their parents and make their own decisions. When it comes to evolution, however, the same pupils must be protected from spurious notions that may seem valid to their untutored judgment. Eger observes that a great many parents think it would be much wiser to do the reverse: to tell the adolescents firmly what limits on behavior they must observe and to encourage them to practice their critical thinking on more theoretical subjects like evolution, where mistakes are much less likely to cause permanent damage.[109]

Putting side (for just a moment) the issue of whether educators are promoting evolution only because their dogmatic worldview feels strongly about it, we immediately trip over a rather bulky magician's screen Johnson has put in the way. When we are told that something called "creationism" has offered criticism of "evolutionism," that is as much detail as Johnson was willing to go into on the subject. Nor did he elaborate what these "spurious notions" might be that so exercised Kitcher's concern. So how was the reader to decide whether they were worth fretting about or not?

While the Kitcher quote itself had been lifted (ellipses and all) from Eger, we know from Johnson's endnotes (providing page numbers for his excerpt) that he had consulted the original. As the issue then turns on what Eger (and Johnson) decided to leave out, maybe we ought to let *Kitcher* tell us what Kitcher was talking about. Here are the two paragraphs in which Johnson's cited passage occurred, with the quoted text exposed in bold:

> Evolutionary theorists and educators do not fear the evidence. There is no doubt that a fair presentation of the evidence, and a careful review of the arguments, will support evolutionary theory and unmask "scientific" Creationism for what it is. The previous chapters show that there is no genuine contest, no true comparison. What is in doubt is the possibility of a fair and complete presentation of the issues discussed above, in the context of the high school classroom. Morris advertises *Scientific Creationism* as a work that can "equip the teacher to treat all of the more pertinent aspects of the subject of origins" (Morris 1974a, 3). So we can expect that the discussion of Creationism envisaged will consist of a rehearsal of the arguments whose foibles have been examined. **There will be** little evidence on the positive achievements of Creationism (for there are none) and **much dredging up of misguided objections to evolutionary theory. The objections are spurious—but how is the teacher to reveal their errors to students who are at the beginning of their scientific studies?** (Would it even be permissible for the teacher to expose Creationist distortions?) As we have seen, Creationists scatter their criticisms, using whatever ammunition they can find. Even a gifted teacher would not be able to expound enough of the scientific background to make it clear that all the salvos had missed the mark.

> **What creationists really propose is a situation in which people without scientific training—fourteen-year-old students, for example—are asked to decide a complex issue on partial evidence.** Creationists can purvey their rhetorical wares for a sufficiently long time—recall the abuse of thermodynamics, the misreading of the fossil record, the vague appeals to the Flood, the obfuscating calculations about the time needed for evolution, the distortion of methods of radioactive dating. They can make enough criticisms to prevent a biology teacher from identifying all the errors. In short, they can muddy clear waters.[110]

So what Kitcher was lathered about was the literal Creation Science of Henry Morris and company, which entails a great deal more than just nitpicking macroevolution. The distinguishing characteristic of that brand of creationism is its promotion of a *young earth*, and for Johnson (via Eger) to dismember Kitcher's text to remove any hint of the contrary was ingenuous at best. By giving the impression that Kitcher was talking about the sort of amorphous "creationism" that Johnson embraces, he was playing a shell game. As we shall see in the chapter on Intelligent Design, this is one of Johnson's favorite ploys. If the subject matter insists on playing on the wrong court, simply hack off the recalcitrant parts and drag the body back over to your side, where it can be propped up for a faux contest under your own rules.

Because Phillip Johnson has never overtly defended the scientific credibility of the ICR, why then single out *someone else* for not doing the same thing? In his public debates Johnson maintains that he regards the young earth issue as simply peripheral to the main goal of defeating Darwinism. But I do wonder whether another factor may play a role: Creation Scientists are fellow Christians. Spending time beating up on them in public would therefore not only be a distraction; it would do a painful disservice to Christian solidarity. Stopping to criticize even their most ridiculous claims would divide a potentially united flock, and so render aid and comfort to their common enemy, naturalistic evolution.

But if Creation Science doctrines like the recent global Flood are indeed arrant nonsense, and certain activists are indisputably trying to infiltrate these views into the secular school science curriculum, just how long can Intelligent Design scrape along pretending this isn't happening? (Can we use Hal Lindsey's "countdown clock" for this?) If they don't think it *matters* what is being taught about the age of the earth or the fundamentals of geology, they should come out and say so. If not, when are they going to stand up for the *truth*? Kitcher himself put the issue plainly enough, just the page before the part Johnson elected to remark on: "My conclusion can be summarized in a sentence. It is educationally irresponsible to pretend that an idea that is scientifically worthless deserves scientific discussion."[111]

Ideas have consequences.

The closer we approach Johnson's intervening screen the larger it turns out to be. This is because it not only has to conceal the deranged cousin of Creation Science; it has to hide Intelligent Design as well. Johnson wrote about how the educational establishment should consider the "creationist challenges to naturalistic evolution." Fine, but what about the "evolutionist challenges to supernatural creation?" Aren't they allowed? Johnson wants a one-way street here, where "creationism" can sit comfortably behind the screen, a cooling beverage and tasty snacks at hand, and be free to lob whatever criticism it sees fit at "evolutionism," without ever being subjected to any discomfiting counter-argument. Johnson has elevated "hide the ball" to a new level of sophistication.

I would agree with him that the issue is not one "between science and morality." But Johnson was being too clever by half when he went on to reduce the conflict to one of mere philosophical predilection. Would he think it equally inappropriate to teach conclusively the sphericity of the earth because educators are really committed to it? I don't think so, but because Johnson adamantly refuses to consider these alternatives, one is forced to speculate. Of course, he might huff that this was a silly analogy, that "everyone knows" the world is round. But as we've seen, "everyone" *doesn't* know that. So just how many "challenges" are to be allowed in public school science education, once his "theistic realism" takes hold?

This is ultimately an *epistemological* question. Whether any subject, not just evolution, should be taught in the schools is just a fancy way of asking, please hand us everything from the "good reasoning" basket. The spherical earth was a *conclusion* properly drawn from the data—*all* the data, not just selected bits. And because there has been no convincing alternative explanation, that conclusion has weathered into something of a given. Everything we "know" in the sciences has run the same theoretical gauntlet: heliocentrism, gravitation, the atomic theory of matter, the genetic basis of life, plate tectonics. And so has *evolution*. The verdict of scientific history would seem rather final: it's the only player left standing.

That creationists find this victory philosophically abhorrent is no secret, but neither is how they plan to conduct their rematch. Phillip Johnson is only the latest incarnation. Having relegated the entire field of biogeography to a castaway sentence, he stalks the lecture circuit brandishing the new ultimate weapon of Michael Behe's "irreducible complexity" argument. Meanwhile, anyone familiar with the details of the fossil record can only try to keep their mammalian jaw from dropping to see how superficial his criticisms were in *Darwin on Trial*. Instead of addressing any of these issues in his later books, just like Erich von Däniken, Johnson regurgitated the same conclusions as though no one could ever challenge them.[112]

But in science this is one trick you can't afford to *fake*, because reality is a most unforgiving audience. The graveyard of extinct ideas is littered with them, often along with the reputations of their defenders. Just as some physical scientists are attracted to creationism, others have had a penchant for psychical research, from chemist Sir William Crookes in the 19th century all the way to the modern flock of physicists who upheld the credibility of spoon-bending psychic Uri Geller in the 1970s. (For reasons entirely unknown, geologists, biologists, and paleontologists seem comparatively immune from this malady). The root of the condition may be the delusion that people can be observed as disinterestedly as electrons, and so fall into the trap of thinking *they* can't be fooled by mendacity.[113]

The Skinner-Johnson Gambit

But the price to be paid for deviating from the rules of sound reasoning often translates into years of effort wasted on thrashing out fruitless dogma. Psychology stepped perilously close to that precipice half a century ago when Freudian psychoanalysis battled with Behavioral Science over what "minds" were and what exactly was to be done with them. Freud died early enough for his personality cult to fade (though Freudianism is not yet moribund).[114] But the younger B. F. Skinner lingered on into the space age and Vietnam War, anxious times ripe for pseudoscientific silliness. Skinner's outrageous 1972 book *Beyond Freedom and Dignity* came out just after von Däniken's ancient astronauts landed, Hal Lindsey started winding the countdown timer, and the Aquarian Age occult boom deposited tarot decks on the counters of otherwise stodgy department stores. Oh yes, that was also the year of Henry Morris' *The Remarkable Birth of Planet Earth* (about which much more will be said later).

What provoked howls of controversy in Skinner's case was his recommendation that society needed to abandon their old fashioned muddle-headed belief that people had "minds" that could be made up. He assured us behavioral science had conclusively shown all that was going on inside the brain was a complex of contingent stimulus-response loops. Having declared there were no moral or ethical "oughts" and people had no "minds" to change, Skinner then indulged in one of the grandest question-begging episodes in scientific history, by proposing that those same mindless people *ought* to adopt behaviorism because it would be for the betterment of society.[115] One of Skinner's legion of critics picked up on the absurdity of this, calling him a practitioner of "the useful art of open, manly self-contradiction, of freely admitting a point that destroys one's whole position and then going on exactly as before."[116]

From the methodological standpoint the defect of Skinnerian behaviorism was the same as Phillip Johnson's creationism. Both cycled on a Möbius loop of foregone conclusions. Just as Johnson kept writing new books that alluded to *Darwin on Trial* as having dealt with all the scientific arguments, Skinner claimed he had laid his evidential foundation back in his 1959 work *Science and Human Behavior*. But a check back to that book revealed Skinner had done no such

thing—no "scientific evidence" there to justify his sweeping extrapolations of operant conditioning. Yet obviously *he* thought he had. The ideological tail was wagging the dog again.[117]

Just as Duane Gish can't peer into the Flat Earth mirror and see his own reflection, so Phillip Johnson banishes Skinner to the methodological antipodes. As he put it in one e-mail to me, Skinnerian behaviorism harbors the same "scorn for believers" as Robert Bork's troika of Freudian psychology, Marxism, and Darwinian evolution. Consequently they must share the same "methodology"—an obviously faulty one, from his point of view, though he didn't go into details. Because Johnson is hung up on the *outcome*, rather than the method, he is unable to appreciate how he and Skinner share the scholarly foible of referencing prior works as though they had established things they clearly had not.

Behavioral psychology did leave a scientific legacy, but one tinged with irony. As Daniel Dennett summed up recently in his book *Darwin's Dangerous Idea*, "Skinner was a greedy reductionist, trying to explain *all* the design (and design power) in a single stroke. The proper response to him should have been: 'Nice try—but it turns out to be much more complicated than you think!' And one should have said it without sarcasm, for Skinner's *was* a nice try. It was a great idea, which inspired (or provoked) a half-century of hardheaded experimentation and model-building from which a great deal was learned."[118] Every dry hole behaviorism so ostentatiously drilled ended up providing modern cognitive psychology with one more clue about where not to look.

To the extent that Skinner was guilty of greedy reductionism, creationism has erred on the side of "greedy irreductionism," the insistence that *nothing* of any consequence is known (or even knowable) about the evolution of life. To accomplish this feat critical information like biogeography has been suppressed, and the fossil record subtended into Zeno-friendly slices to keep the creationist tortoise perpetually ahead. But there is no getting around the fact that creationism has inspired (or provoked) *no* comparable spurt of "hardheaded experimentation and model-building" in their own domain. Instead of earning their ticket through hard work and accomplishment, creationism parties by the bus stop, toasting their own imagined success, waiting for a free ride to scientific respectability.

Now why don't the "believers" recognize any of this? We already know the answer to that; it is the same reason why Erich von Däniken is so popular. The enthusiastic follower depends on their creationist sources not only to inform them what creationism stands for, but also to educate them about what *evolution* means. Because both Creation Science and Intelligence Design rely on virtually identical arguments and data sets when it comes to evaluating naturalistic evolution, this phenomenon applies regardless of which quiver they draw their arrows from. Christopher Toumey saw the Biblical side of this when he conducted a survey of North Carolina creationists, which assessed the name recognition for a variety of evolutionary and creationist *dramatis personae*:

> To keep this in perspective, I say again that the creationists I interviewed were generally well educated, many possessing good scientific credentials. Their critique of evolutionary thought was sincere and impassioned. They worried deeply about moral issues, social problems, and scientific standards, all of which they cited to denounce evolution. I did not set them up to make fools of them by posing the names of Niles Eldredge, Alfred Russel Wallace, or T. D. Lysenko to anyone unconcerned about evolution and creationism. But even with their concerns and credentials, they possessed surprisingly superficial knowledge about the details of the thing they oppose so passionately. Indeed they knew much about the media celebrities of evolution, particularly Stephen Jay Gould, Carl Sagan, and Isaac Asimov, but very little about the prickly nuances of sociobiology, punctuated equilibria, or the history of Darwinism. What they knew about creation and evolution was generally limited to what they learned from Henry Morris and the Institute for Creation Research, plus some other sources that amplified the Morris-ICR line of authority.[119]

Something even more telling occurred when Toumey's friendly relationship with the group led to their "often asking for my professional opinions and personal feelings about creationism. I participated modestly by contributing my knowledge of the history of evolutionary and creationist thought, which they liked to hear about but lacked the curiosity to look up. I became by default the group's unofficial historian of creationism. This was a strange thing for me, an evolutionist explaining the history of creationism to creationists, but I was honored and pleased to make myself useful with my esoteric expertise."[120]

Lacked the curiosity to look up? What a dismal observation to make about a *study* group. If there's one profound lesson to be learned from the history of scholarship, it is that the surest road to ignorance is to only read people you agree with. We know all too well what a high price tag that omission carries. Every oppressive system endeavors to restrict the free flow of information, but what the creationist example illustrates is how some people can willingly do this to themselves. They march of their own volition straight into an Orwellian limbo, bereft of history and context, where the only guide to acceptable thought is the dictate of ideology. This is the very antithesis of the scientific method.

Since the methodological elevator has now arrived at the nadir, we may as well step out and pay a short visit to the musty basement to inspect a pair of fundamentalist folktales that circulate around the creationist grassroots. These are part urban legend (comparable to alligators living in the New York sewer system) and part morality tale (like Washington chopping down the cherry tree), which combine to reflect whatever it is the believer values. Such diagnostic myths are by no means unique to creationism. An enduring one for technology boosters is the story that sometime during the 19th century (dates vary) the head of the U. S. Patent Office (unnamed) recommended the department be shut down because there was nothing left to invent. It was just the sort of cautionary tale of bureaucratic myopia any inventor would welcome, with even Bill Gates apparently getting taken in.[121]

One of the tales is about Darwin, and so plays directly to the prejudices of creationism; the other concerns NASA and the space program, and therefore appeals to a more general Christian audience. I've heard both the Darwin and NASA canards on several occasions over the years, most recently in the early 1990s. Neither tale pops up in the "mainstream" creationist literature, except for the one instance noted below where Donald DeYoung put his foot down to stress the NASA story wasn't true. They evidently do appear occasionally in some Christian magazines, though I have only seen the NASA example in a clipping to confirm this. The Darwin story came to me twice, entirely by hearsay from two fervent Christian fellows not otherwise noted for their scientific literacy or commitment to the canons of scholarship. For this reason I suspect both myths probably owe much of their resistant longevity to the social process of believers chatting things up at the local church level.

The first story claims Charles Darwin recanted the evolutionary heresy on his deathbed, pulling something of a Constantine by embracing once more the bosom of his lost faith. Even if this had happened, though, what possible difference would that make to the acceptance of modern evolutionary theory? Scientific belief in the common descent of life and the role of natural selection is based entirely on the quality of the evidence, only an initial trickle of which was known by the time Darwin passed on. The fossil therapsids that filled in the reptile-mammal transition, homeobox genes, and all the rest, were discovered long after, and would still need to be accounted for whether or not evolution's most famous advocate had suffered last minute spasms of doubt a hundred years ago.[122]

This myth tells us far more about the psychology of the believer than it does the biography of Darwin. It's just the sort of comforting story that would appeal to less educated Christian antievolutionists, themselves fully acclimated to the idea that convictions stem from authority—the Bible in their case, or at least a minister's interpretation of it. With nothing in their experience to suggest everyone else doesn't think exactly the same way, this would be further reinforced by those theologians and authors who emphatically paint evolution as a stealthy "atheistic religion" (never mind how oxymoronic that sounds). Because they know so little firsthand about the scientific process and the history of evolutionary theory, many can believe they only need to drive a stake through Darwin's heart and the whole evolutionary monster will evaporate at the next sunrise.[123]

Even more succulent is the NASA story. Supposedly while preparing for the first Apollo moon launches, a group of engineers were testing the reliability of a new computer program used to calculate stellar positions for the mission. Letting it run on retrograde long into antiquity, all went well until a time in the pre-Christian era when it suddenly snagged up and would go no farther. A room full of puzzled scientists did everything but rend their garments trying to figure what had gone wrong. That is, until a Christian engineer stepped forward to remind them that, according to the Bible, Joshua had commanded the sun stand still during the battle of Jericho at just that point. Well, as soon as they had taken that added day into account the program ran right as rain. What a perfect denouement: the haughty priests of the new Apollo shown their comeuppance by the humble servant of the Lord.[124]

But what was NASA doing with a program to *retrocalculate* star patterns in the first place? A flight to the moon required knowing where the stars were *now*, and that wanted no reverse figuring at all, just an accurate ephemeris. In fact, it would needlessly complicate matters, since you'd have to chart in all the apparent motions of the relevant celestial objects. Why bother, since the change during a lunar excursion would be nil? Even worse, as anyone familiar with computer programming knows, unless you built the "Joshua factor" into it to begin with, a program would literally have no way of knowing when it was supposed to stop. It could "calculate" the positions of the stars back a hundred billion trillion years, if you asked it to, or until you pulled the plug. This story was so glaringly preposterous anyone with the barest sensibilities should have smelled a rat from square one.[125]

Such are the weeds choking the garden of literal thought. These thrive on the inattentiveness of any gardener who practices pseudoscientific horticulture. Von Däniken, the tarot readers, and centuries of Biblical literalists have nurtured their respective plots in exactly this manner. Visitors who happen by are readily invited on tours, of course, since display was the whole point of the effort. The caretaker is primed and ready to enthusiastically indicate all the vibrant colors and lush foliage of the imaginary specimens their ideology has planted there. But because only *their* arrangement can embody true beauty, gardeners of this character rarely concern themselves with what the neighbors may be up to, no matter how extensive or attractive their presentations may be. This class of ideologue tends to its own mulch.

But organized pseudosciences like creationism actively challenge an established discipline, and so must adopt a far more demanding garden regimen. Although their mailing address may be the primeval glade of Biblical doctrine, they spend precious little time there. Creationists are normally spotted as interlopers on the evolutionary preserve, axe in hand, hacking their way through the landscape with pronounced concentration. They freely rip out any potential transplants they find for salvage, and casually lop off the rest. Working their way from flowers to shrubs to trees in an obsessed progression, they become so engaged in felling anything they don't plan to take, they never pause to wonder why it is there are so many varieties there to chop.

This is the ultimate failure of the creationist imagination, and is what so annoys people familiar with the breadth of scientific evidence for evolution. The creationist methodology engages in action without introspection, "scholarship" without history. When evolutionists try to explain what is so significant about the fossil record, for example, what they are trying to do is the equivalent of tapping the creationist on the shoulder to catch their attention. Please, take a deep breath and look around at the verdant evidential forest spreading off in all directions. Once the scale of the vista has sunk in, then softly ask: "Wasn't the Darwinian field supposed to be a bleak desert?"

NOTES to Chapter 1

[1] Johnson's view came via e-mail, though it hovers all through his books. Kennedy expresses himself in his "Truths That Transform" series, which devotes a week to antievolutionism seasonally. Past guests included traditional Young Earth creationists like Parker and Gish, while the March 2000 radio edition intersected Intelligent Design, broadcasting Johnson's address to the 1999 crowd at Kennedy's "Reclaiming America for Christ Conference." Interestingly, Bert Thompson (1995, 16-18) was more charitable concerning why evolutionists believe as they do.

[2] The earliest version of the Copernican model was actually *less* accurate than Ptolemaic geocentrism, and remained that way until Kepler overcame the longstanding religious and philosophical bias toward circles being more "perfect," and realized orbits were elliptical. Even more ironically, a factor playing a role in Kepler's epiphany was a job he'd once done calculating the volume of wine barrels, which made him familiar with the mathematics of their elliptical shape, James Burke (1985, 150-151) from his *The Day the Universe Changed* series. Cf. Owen Gingerich, "The Copernican Revolution," in Ferngren (2002, 95-104).

[3] See Loftus (1997), reprised in *Scientific American* (1999, 119-127), Blackmore (1998), Piper (1998) or Schick & Vaughn (1999, 48-50, 247-258) for why skeptics question the validity of recovered memory ideologies. It has certainly complicated the investigation of genuine sexual abuse cases, as noted by Shermer (1997, 94-98, 106-113).

[4] Sagan (1996, 115-168).

[5] Henry Morris (1963, 77-78). The italics, ellipsis and inclusion were in the original. (Unless otherwise specified, all emphases and ellipses in quoted text derive from the source; any inclusions will be my own). The theological volume in *The Modern Creation Trilogy*, Morris & Morris (1996c, 53-56), affirms the satanic origin of evolution. Ankerberg & Weldon (1998, 65) express the same opinion more concisely.

[6] Kennedy described the "theocratic republic" in a 1993 radio sermon. The lofty principles included "individual liberty under God," but how the "sanctity of human life" would translate into civil abortion regulations wasn't explained. Given Kennedy's conviction that the teaching of evolution is educationally spurious, a "universal education in self and civil government" would appear no more congenial to Darwinism than his Coral Ridge Ministry's continuing campaign against the Disney organization for its acquiescence to "gay friendly" employment and park attendance policies. However, the Kennedy fringe is not especially representative of American evangelicals, Christian Smith (2000) and Webber (2002, 111). Jerry Falwell is also seen as a peripheral figure by the anti-Liberal Anne Coulter (2002, 174-175) and more scholarly Alan Wolfe (2003, 257)—though neither work evidenced much familiarity with the *Kulturkampf* creationist worldview Falwell exemplifies.

[7] Von Däniken (1970a). Other writers have dabbled with historic oddities before, from Charles Fort (1919; 1923; 1931) to *The Morning of the Magicians* tomes of Pauwels & Bergier (1960; 1968; 1972). Quite a few also linked these to UFO lore, such as Robert Charroux (1971a,b), as well as Raymond Drake, Peter Kolosimo and Brinsley le Pour Trench. Once von Däniken defined the niche, these authors reframed subsequent tomes with an "ancient astronaut" slant, though not giving von Däniken much credit for the change. To follow the copycat trail with someone who took many fringe views more seriously than they deserved, but still couldn't swallow von Däniken, see Hitching (1978, 144-149). Ancient astronauts gave a fresh technological twist to the smug bias of 19th century Europeans who balked at the idea the natives might have erected great civilizations and monuments on their own. In his own piquant way von Däniken elevated a cultural inferiority complex to truly cosmic proportions. The extreme claims of cultural diffusionism, whether from the "Lost Tribes" of Israel or Atlantean refugees, are wittily covered in de Camp (1970). Nigel Davies (1979) provides an excellent introduction to the more mainstream theories about possible pre-Columbian sea voyagers, all of which (apart from the Newfoundland Viking settlements) remain today highly conjectural. For the connoisseur, John Sladek (1974) condensed every absurdity of the ancient astronaut school into his merciless parody, "Space Shoes of the Gods"—from inaccurate history (those cave-dwelling Egyptians) to nascent persecution complexes (they laughed at Darwin when he said man descended from the beagle, now they laugh at me!).

[8] Von Däniken (1970b; 1973a,b; 1980; 1982; 1984; 1995) provide a representative, if monotonous, sampling of his oeuvres, and several television specials have recently touted his theories (ABC in 1997 and the cable TLC channel in 1998). Critics of ancient astronauts include Thiering & Castle (1972), White (1974), and Story (1976; 1980a). It took a decade before von Däniken (1980, 215-217) alluded to his critics at all, devoting only three pages to it in *Signs of the Gods?* Calibrating his ego by the volume of books excoriating his theories, he claimed none were "scientific." Characteristically, he mentioned not a single specific example of what they entailed. He reserved

special bile for Carl Sagan and the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), whose *Skeptical Inquirer* magazine routinely annoys believers in UFOs, psychic phenomena and creationism.

[9] Clifford Wilson (1972; 1976).

[10] Clifford Wilson (1974).

[11] DeYoung (1989, 104-105) and Henry Morris (1972, 67). Sagan (1996, 128-129) described some of the millennialist UFO believers; see Numbers (1992, 285) on Segraves. Toumey (1994, 254) compared the ICR position to the more credulous Bible-Science Association. Norman Geisler's UFO remarks at the Arkansas evolution trial were noted in the introduction (and Hal Lindsey is a graduate of the Dallas Theological Seminary). Before his involvement in Ankerberg & Weldon (1998), John Weldon co-authored Wilson & Weldon (1978). For the "satanic UFOs" view by an extremely doctrinal conservative Biblical purist, see Hunt (1998, 359-372).

[12] Henry Morris (1963, 93-94).

[13] Ross (1994, 117).

[14] The Millerite fiasco ultimately split liberal "social gospel" Christians from the more "sin-conscious" forebears of today's Christian Right, Weisberger (1997). Ex-Millerites formed the core of Adventism, from which sprang Flood Geology—and modern breakfast cereals, via Ellen White's eccentric health advisor John H. Kellogg, James Burke (1999, 45-46). See Hill & Cheadle (1996, 127-130), Boyer (1992) or Baumgartner (1999) on millennialist prophecy in Christian thought—and Lindsey & Carlson (1970), Hal Lindsey (1973, 1976, 1980), Wilkerson (1974) or LaHaye (1999) for representative examples. The 2003 Iraq war (Babylon country, recall) naturally threw the "He's a-come'n" set into high gear: Tim LaHaye's "Left Behind" operation at Tyndale House (leftbehind.com) launched a new service promising "Weekly Insight" to keep the subscriber abreast of all the latest wrinkles leading up to Armageddon.

[15] See Story (1980b) on UFOlogy's *dramatis personae*; cf. Gary P. Posner, "Metamorphosis: A Life's Journey from 'Believer' to 'Skeptic'," in Kurtz (2001, 150-152) on Hynek.

[16] Just as Wilson was writing his UFO book, Flindt & Binder collaborated on *Mankind—Child of the Stars*, Kossy (2001, 19-21). Ironically, the pair equally impressed von Däniken, who supplied a laudatory foreword to Flindt & Binder (1974, 12) that concluded: "I know of no work since Darwin that deserves as much attention with regard to the evolution of man." Given von Däniken's scholarly myopia, this was probably true. For a tidy refutation of the alien intervention theory, see J. Richard Greenwell, "Tiptoeing Beyond Darwin: An Examination of Some Unconventional Theories on the Origin of Man," in Story (1980a, 153-166).

[17] Clifford Wilson (1974, 191).

[18] For example, the late Maria Reiche's meticulous fieldwork mapping the Nazca patterns to discover their subtle astronomical and animal symbolism was alluded to only once, and then just to dismiss her conclusions in favor of his own flippant guesswork, von Däniken (1970b, 104-105). He likewise spun yarns of vast cosmic battles deep in space (producing the asteroid belt as shrapnel), yet never pinned down when all these things were supposed to have happened, or how they related anyway to the rest of his interventions, von Däniken (1973a, 180-183).

[19] William Thompson (1974, 128-129).

[20] See de Camp (1963, 100) and Galanopoulos & Bacon (1969, 129).

[21] Behe (1996, 205).

[22] For Palenque and the realities of Maya iconography, compare von Däniken (1970a, 100-101; 1973b, 88) to Stiebing (1984, 98-101). Perched atop von Däniken's supposed "rocket ship" was a quetzal bird, of as much religious significance to the ancient Maya as crucifixes are to Roman Catholics. E. C. Krupp, "Observatories of the Gods and Other Astronomical Fantasies," in Krupp (1978, 272) dryly observed von Däniken's interpretation had reduced it to a mere "hood ornament." A fine illustration of the vibrancy of current Mayan archaeology may be found in Demarest (1993) or Robin (2001).

[23] Von Däniken (1980, 215). Not that that he wasn't above sheer revisionism: "Dr. Krupp says I claim that the tracks on the plains of Nazca were laid out by extraterrestrials. Although Dr. Krupp uses quotes, my readers know that I never offered the explanation imputed to me. I merely

recommended it as an intelligent assumption. It does not make a good impression for a new science to cheat. It is certainly not in the old academic tradition," von Däniken (1982, 79). Perhaps this was less incoherent in the original German.

[24] The definitive work in this field is currently Decker *et al*. (1996). Because the tarot has no actual occult tradition, believers have had to continuously reinvent their Wheel of Fortune. Rather like English versus Metric, external occult elements like the Hebrew Kabbalah or astrology have over the years been arbitrarily grafted onto the tarot in several competing (and ultimately incompatible) systems. The tarot contains a broad range of visually interesting iconography, and so affords artists an outlet for their talent in a way astrology or palmistry do not. Being pictorial, it is also a self-contained divination tool requiring no complicated astronomical ephemerides to consult. For these reasons, the tarot fills an important niche in the occult market, and is therefore destined for a long and profitable future, independent of its functional predictive merit.

[25] Dummett & Mann (1980) catalogue all known tarot games and relate their origin to more general playing card history. The Italian forms are still played with decks resembling the older models, while the French and Germanic offshoots employ French-suited packs many occultists may not immediately recognize as "tarots." None of this historical information filtered into the section decrying tarot cards at The Ankerberg Theological Research Institute (online at ankerberg.com), which swallowed the occult tarot mythology hook, line, and sinker. As we'll see, John Ankerberg employs similar erudition when dealing with evolution. Interestingly, Blackmore (1996, 39-41, 61-70, 221-223; 1999, 182-183) appeared equally unaware of the actual history of the tarot in her own experimental steps toward parapsychological skepticism.

[26] Giles (1992, 20). Symptomatically, Giles (1992, 206) claimed without example that the mountain of evidence marshaled by Dummett "seems biased and occasionally even inaccurate."

[27] Kurt Wise, "The Origin of Life's Major Groups," in Moreland (1994a, 224-225). At Harvard he studied under Stephen Jay Gould (which must have been an educational experience for them both). Brilliant and enthusiastic, his iconoclastic career is described in Numbers (1992, 281-282); see also Kenneth Miller (1999, 173-174, 187) and Witham (2002, 52-53, 103-107).

[28] Dummett & Mann (1980, 202-206).

[29] Giles (1992, 191-196). An example from Kaplan (1990, 634) was the "Tarot of the Golden Stairs," a beautiful 1978 deck packed to the rafters with occult symbolism, which he described in great detail. Yet he missed the artist's obvious mistake of showing the supposed Kabbalistic attribute of each card with Hebrew letters grabbed from one system and the corresponding "Tree of Life" paths taken from the contradictory one of Aleister Crowley (chess player, mountain climber, sexual libertine and avowed Satanist). Kaplan, incidentally, heads U. S. Games Systems, one of the few major distributors of occult tarots in America, so he has a market incentive not to clarify tarot lore *too* much.

[30] Larson (1985, 9-15).

[31] Gish (1992, 12-13, 18, 24-25, 86). This happens to be the *only* compendium of prehistoric creatures I know of from the creationist perspective. Compared to books intended for a juvenile audience it is frankly terrible, but measured against the sort of encyclopedias real scientists produce, it conclusively demonstrates creationism has nothing to offer the field. For stark contrast, see Norman (1985a,b), written for adult and young reader respectively. Gish's sea monsters play a role in convincing creationists that prehistoric beasts survived past the days of Noah. All this will be explored in the chapter on Biblical Flood theory.

[32] Robert Root-Bernstein, "On Defining a Scientific Theory: Creationism Considered," in Montague (1984, 71). This state of affairs is hardly new. Mark Ridley (1985, 124): "Writing a review of some long since forgotten anti-Darwinian work in this journal [*Nature*] 95 years ago, Raphael Meldola remarked that 'it is hardly necessary to say that many of the most weighty objections have been culled from the writings of Darwin himself.' *Toutes ces la même chose*."

[33] Kitcher (1982, 145-149) nominated Duane Gish as the most energetic player of citation table tennis, but that was before Phillip Johnson entered play—cf. Gish (1995, 339-356) with Johnson (1991, 45-62). Morris & Morris (1996b, 101-111) carry on the tradition, though. For sheer *volume* of secondary citation (quoting somebody quoting someone else) the creationist title there is

presently a toss up between Wendell Bird (1989) and Ankerberg & Weldon (1998). Bird's two volumes—praised in turn as a "masterful analysis" by Ankerberg & Weldon (1998, 145)—were three times longer than their shallow content warranted due to stupefying repetition.

[34] Four wordy examples of "saturation quotation" are Morris & Parker (1987, 2-26), Gish (1993, 367-386), John Ankerberg & John Weldon, "Rational Inquiry & the Force of Scientific Data: Are New Horizons Emerging?" in Moreland (1994a, 270-293), and Bert Thompson (1995, 11-87).

[34] Moreland (1994a, 36).

[35] Moreland (1994a, 36).

[36] Simpson (1983) or Gould (1989) would be representative of their views. John Ankerberg & John Weldon, "Rational Inquiry & the Force of Scientific Data: Are New Horizons Emerging?" in Moreland (1994a, 283) for the Mayr quote. Interestingly, Ratzsch (1996, 84-85, 208) didn't mention either author by name, saying only the appendix was "written by two people, neither of whom has an advanced degree in science or philosophy."

[37] Morris & Parker (1987, xiii). I was personally most amused by Parker's citing Garrett Hardin for an assortment of "challenges" to evolutionary theory (like the symbiotic relation of cleaner fish to their hosts), Morris & Parker (1987, 72-75). A dedicated environmentalist, Hardin coined the phrase "tragedy of the commons" to describe his sour view of 1960s public land policy. Wearing his evolutionist hat, a short 1980 piece was included in Ashley Montague's *Science and Creationism*: Garrett Hardin, "'Scientific Creationism'—Marketing Deception as Truth," in Montague (1984, 159-166). But Hardin held a slot in my research notes for a different reason: his 1974 polemic *Mandatory Motherhood*, which sought to show the deleterious effects of restrictive abortion laws; its shrill tone may be contrasted with the more temperate Nolan (1978). At one point Hardin cited a 1966 Swedish study for some "statistically significant" findings about the poorer health and antisocial behavior of those born unwanted instead of aborted. This report so impressed Hardin he reprinted it for the reader's education—an incautious move, since it flatly contradicted three of the five conclusions he'd drawn from it, and seriously undermined the other two, Hardin (1974, 36, 105-133). Even topping creationists and occultists, this episode has always stuck in my mind as the most blatant example of ideology only seeing what it wanted.

[38] Morris & Parker (1987, 72, 98) and Henry Morris (1985, 66-67).

[39] Morris & Parker (1987, 131-132). Ratzsch (1996, 89-90) wrote as though most creationists accepted horses as allowable speciation, but only Denton (1985, 182-186) qualified. Wendell Bird (1989, Vol. 1, 223-225), Gish (1978, 157; 1993, 129-131; 1995, 189-197), Paul Taylor (1995, 42-43), Morris & Morris (1996b, 73-76), Huse (1997, 144-146), Milton (1997, 99-104) and Wells (2000a, 195-207) reject any natural lineage here. As did Discovery Institute compatriot Stephen Meyer when I asked about them at the 1998 Whitworth "Creation Week" … or Young Earth creationists Bert Thompson & Brad Harrub in an online rejoinder to Rennie (2002b) at apologeticspress.org/docsdis/2002/dc-02-sa13.htm. Johnson (1991) and Hanegraaff (1998) skipped the subject. Sarfati (1999) comes closest to Denton's concession by regarding them all as variations "within the equine (horse) kind." Which would put Gary Parker in the role of spoiler, as he would have used Huxley's mathematics to "disprove" variation within a *kind*. Gould (1991, 166-181; 1996c, 57-73; 2002a, 580-581, 905-908) surveys the evolution of thinking on the horse sequence, which actually involved mainly dropping the simplistic idea that there was some natural tendency for mammals to evolve larger bodies.

[40] Morris & Parker (1987, 137). Somewhat ingenuously, Morris & Parker (1987, 1, 6) also included Denton in a parade of quotations from "leading evolutionary scientists."

[41] See Fastovsky & Weishampel (1996, 294-298) and Shipman (1998, 72-81, 217) for avian flight anatomy in relation to *Archaeopteryx*. A seventh *Archaeopteryx* specimen discovered in 1992 had a slightly more robust sternum, though still far from fully avian, Shipman (1998, 45).

[42] Denton (1985, 175-178, 199-212) focused on the metabolic rate of birds and the proposed evolution of feathers. Comparison sources: Lambert & The Diagram Group (1983, 52-53), Simpson (1983, 180-182), Norman (1985a, 191-194), and especially McGowan (1984, 110-126). Paul (1988, 218) considered the flying ability of *Archaeopteryx* "was still on the crude side." The dynamic analyses of Speakman (1993) and Speakman & Thomson (1994) doubted its ability for

sustained flapping, and Bock (2000, 480) regards *Archaeopteryx* as a glider. Gee (1999, 179): "*Archaeopteryx* could have flown far more efficiently than a sack of potatoes, but may not have had the endurance or maneuverability of a modern bird." See Shipman (1998, 250-273) for further detail.

[43] The *inductive method* goes from particular to general (deciding what "dog" represents after seeing a lot of Fidos and Lassies). It is the reverse of the *deductive method*, where reasoning proceeds from defined principles (as in mathematics). Stating "all dogs are animals" and "Spot is a dog" implicitly contains the conclusion "Spot is an animal," so in a sense nothing "new" is discovered through deduction. Hidden within the *deductive* assumptions of natural science are a host of *inductive* conclusions, of course, for otherwise how would you know what "dogs" or "animals" were. George M. Marsden, "Understanding Fundamentalist Views of Science," in Montague (1984, 95-116) described creationism's historic fascination with Baconian analysis. For spice, physicist/theologian John Polkinghorne (2000, 30) reminded that "A Baconian account of scientific method just does not work." Though cf. Gould (1999b) or Friedberg (2000). Gardner (2003, 23-28) notes how the inductive method has bothered a few overly finicky philosophers of science through the years.

[44] Eve & Harrold (1991, 85). Possibly because evolutionary scientists employ Bacon's inductive reasoning more than creationists do, the latest crop of creationists don't offer the Baconian defense. Ankerberg & Weldon (1998, 53) illustrate the newer creationist logic by declaring evolution isn't really a "theory" at all, but only a "materialistic postulate."

[45] Though not so terse, see Gamlin & Vines (1986, 9) or Whitfield (1993, 14-16). From the dinosaur end of things, Czerkas & Czerkas (1991, 244) summarized evolution on an ecological level: "The continuous adaptation of organisms to a changing environment by natural selection."

[46] Huse (1997, 20). This definition would be perfectly consistent with the Creation Science ones in Morris & Parker (1987, 192), DeYoung (1989, 137), Gish (1995, 1) or Bert Thompson (1995, 12-16), as well as the Intelligent Design versions in Johnson (1991, 9, 10, 12, 56, 69, 113, 139, 151) or Behe (1996, x-xi). The term "descent with modification" only rarely pops up in creationist writings. Johnson (1991, 15-16) mentioned it as one of Darwin's primary precepts (though he didn't think this merited inclusion in his index listing of evolutionary definitions). Stephen Meyer, "The Methodological Equivalence of Design & Descent," in Moreland (1994a, 100) briefly touched on it as part of "evolutionary dogma," a characterization which might be contrasted with Michael Behe's previously noted acceptance of it.

[47] Also known as *clines*, a prominent example is the "ring species" of herring and lesser black-backed gulls (distinct species in Europe) that grade through interbreeding members in Asia and North America, Futuyma (1982, 155-156), Gamlin & Vines (1986, 17), Schwartz (1999, 255-257), Schilthuizen (2001, 47-49), Zimmer (2001g, 83-84), Wake (2001) on Irwin *et al.* (2001)—or even Denton (1985, 81-82)! Ken Miller (1999, 47-48) added a "spectacular ring of salamander species" covered by Wake (1997). Cf. Simpson (1961b, 178-180) with Storz (2002) on the theoretical side of clines. Futuyma (1982, 152-153), Kitcher (1982, 17-25), Mayr (1991, 26-34; 2001a, 161-173), Whitfield (1993, 211), Ayala & Fitch (1997) on Avise & Wollenberg (1997), Avise & Walker (1999), Avise & Johns (1999) and Sites & Marshall (2003) tackle species definitions (see also note 136, chapter five).

[48] Getting this point askew leads to trouble in how creationists perceive evolution. Robert C. Newman, "Progressive Creationism," in Moreland & Reynolds (1999, 116) illustrated this when he claimed that evolutionary theory has the first life diverging "to form families, then orders, classes, and so forth, with the basic body plans—phyla—formed last. Thus, according to evolution, the 'tree of life' should be formed from the bottom up (speaking in terms of the hierarchy of categories in the biological classification system). But in fact, the phyla appear suddenly at the Cambrian explosion, and then these subsequently are subdivided into the various lower order categories, so that from the Cambrian explosion onward, the biological classification system was formed from the top downward!" As will be seen next chapter, contemporary evolutionary thinking holds the opposite view: like a switchyard, fundamental phyletic splits have to occur early in the history of life, amplified by subsequent diversification.

[49] Gish (1995, 29-30) replaced "type" for "kind" in almost every instance compared to earlier editions, such as the 1979 version quoted by Joel Cracraft, "Systematics, Comparative Biology, and the Case Against Creationism," in Godfrey (1983, 164). According to Eve & Harrold (1991, 187), this nomenclatural shuffleboard began early in the 1980s.
[50] Margulis & Schwartz (1988; 1998), Colbert & Morales (1991, 428-437), Lambert & The Diagram Group (1990, 107-171). When a rival scientific taxonomy is being offered, by the way, like the reclassification of predatory dinosaurs proposed by Paul (1988), you get *more* terminological detail, not less.
[51] Henry Morris (1985, 216-217).
[52] Scriptural index in Henry Morris (1985, 279-281). By contrast, listing just the example genera Margulis & Schwartz cited for the phyla (also in double columns like Morris) required 18 pages in the 2nd edition, and 25 in the 3rd, Margulis & Schwartz (1988, 288-307; 1998, 426-450).
[53] Gish (1995, 29). Of the 6 genera of Galápagos finches, involving 14 species, Gish hedged his bets by putting "genera" in quotation marks (as well as the aforementioned revised use of "type"). Gish (1995, 31) intimated herons were separate from finches, while John Morris at the Institute for Creation Research website (icr.org) suggests the 400 species of hummingbirds ("with only minor differences in color, size, and habitat") probably "come from only one or a few kinds" (cf. note 356, chapter five). Phillip Johnson (1995, 57) similarly decreed the Galápagos finches were but "cyclical variations within the type." Quirky British antievolutionist Richard Milton insisted these finches were not separate species at all, Milton (1997, 146-150). Both Johnson and Milton arrived at their respective conclusions after purported familiarity with Weiner (1994a), who described the diligent recent fieldwork documenting their continuing evolution (explored in more detail in chapter four). See also Larson (2001) and Peter Grant & Grant (2002a).
[54] Leviticus 11:19,23 for bats and bugs respectively. Gish (1995, 30) listed bats as a distinct type, but did not otherwise differentiate them. Ronald Nowak (1994) offers a recent survey of their diversity, which includes one of the smallest known mammals, the thumb-sized Kitti's Hog-nosed bat. A flightless bat (with vestigial membranes) was only recently spotted during the filming of a PBS nature documentary in the Pacific.
[55] The family value in Gish (1993, 243-244), with Gish (1995, 29) as the genus edition. Within family *Canidae* three genera apply to foxes and fennecs, presumably part of the "dog kind" so long as defined at the family level, but Gish did not elaborate to what typological limbo they were consigned once he changed to genus. Cf. Lange (2002, 8-9) on the evolutionary version.
[56] Henry Morris (1985, 70, 180) on cats and dogs, Gish (1995, 30) for dinosaurs and ichthyosaurs. From the deep freeze of Steady State cosmology, Hoyle & Wickramasinghe (1993, 135) similarly pronounced that "it is obvious that we can see no evidence whatsoever of part-cat, part-dog. Bears are always obstinately bears and horses and always obstinately horses." See Lambert & The Diagram Group (1985, 162-167), Christine Janis, "Victors by Default," in Gould (1993, 203), or Tudge (1996, 158-166) for an overview of some of the ancestral skeletons in the carnivore closet. As Rich *et al.* (1996, 547) noted, "Until the Oligocene, all carnivores were so much alike that they have been put in a single family, Miacidae. All were rather small, the largest being about the size of a collie."
[57] See Awbrey (1981), Kitcher (1982, 151-155), Strahler (1987, 361-363) or Ecker (1990, 190-191) on the functional vacuity of Biblical "kinds." Cf. the 2000 exchange between evolutionist Dave Thomas and Young Earth creationist Jonathan Sarfati at nmsr.org/sarfati.htm.
[58] Gish (1993, 241-244), citing Eldredge (1982, 116-117), which in turn quoted a passage still to be found in Gish (1995, 30), unchanged except for the noted substitution of "type" for "kind." Similar claims were made by Gish (1993, 310) against the remarks of Joel Cracraft, "Systematics, Comparative Biology, and the Case against Creationism," in Godfrey (1983, 165-167). Incidentally, Eldredge (2000, 120-121) reprised his criticism of Gish's 1970s version—evidently not up on Gish's 1993 & 1995 *oeuvres*.
[59] The glossary in Fastovsky & Weishampel (1996, 437) supplied the definition. The creationist lawyer Wendell Bird (1989, Vol. 1, 42) slipped that term "natural group" in as his surrogate for the now-verboten "kind." Notwithstanding that he avoided defining the concept (and gave no

examples of how evolutionists used it), Bird assured the reader that the idea was "rather subjective at and above the species level." The "clade" Fastovsky and Weishampel allude to refers to cladistic analysis, a method of charting organisms by shared characteristics. While not the same as mapping an evolutionary tree, it has proven a particularly powerful tool for working out likely lines of descent. See note 193, chapter two, for further details on cladistics.

[60] Gene Lyons, "Repealing the Enlightenment," in Montague (1984, 354). Frank White enthusiastically signed the measure and supported it even after being unseated the following year by Bill Clinton. Frair couldn't make up his mind whether the turtles he had studied for "many years" might be one of the 10,000 or so created kinds, Roy A. Gallant, "To Hell with Evolution," in Montague (1984, 295-296). Nor has Frair made much progress in the 20 years since (see note 343, chapter five). See "Decision of the Court," in Montague (1984, 395), and Gilkey (1985, 261, 299) for Overton's remarks and the relevant clause. Incidentally, creationist Lee Spetner dived down a similar hole in a 2001 essay (origins.swau.edu/papers/man/hominid/default.html) by attributing intermediate fossil hominids to human-ape hybridization!

[61] Gish (1990, 72). Cf. Robert Moore (1983, 25-26) on the practical absurdities and *ad hoc* character of the hibernation hypothesis. *Apatosaurus* is the sauropod "formerly known as" *Brontosaurus* (except for mavericks like Robert Bakker, who stick by the old name out of habit), and falls under the general family of diplodocids. The genus name was changed in the late 1970s after it was realized the *Camarasaurus* skull being used as a stand-in for the missing head of *Apatosaurus* (which meant "deceptive reptile" due to its lack of preserved skulls) was unlikely for a diplodocid. Ironically, what was probably the real head had been known all along from nearby deposits, but had gone unrecognized for nearly a century. Perhaps because this qualified as "confusion" among paleontologists, this time Gish (1990, 54) was able to name the researchers involved (D. S. Berman and J. S. McIntosh). Inaccurate accounts of this crop up in various spots on the Creation Science landscape. In a 1996 creationist video, "Fossil Evidence for Creation," Gary Parker was seen lecturing to children that *Brontosaurus* "turns out to be the head of an *Apatosaurus* on the body of a *Diplodocus*" (getting it exactly backwards). Fellow-creationist Paul Taylor (1987, 12) similarly fumbled in *The Great Dinosaur Mystery and the Bible* when he said the first skull used was from *Apatosaurus*. Incidentally, because Taylor insists (on Biblical grounds alone) no carnivory existed prior to the Flood, from that point of view Gish's fears about nibbling tyrannosaurs were Scripturally spurious (Taylor's novel interpretation of dinosaurs will be examined in conjunction with the Deluge). For a more coherent account of the change to *Apatosaurus*, see Fastovsky & Weishampel (1996, 250), or Gould (1991, 86-93) for more detail.

[62] Gish (1992, 75). Paul Taylor (1987, 32) is comparable. By ignoring fossil forms, Archer (1982, 82-84) trimmed the Ark list to a paltry 2405 "land animals." The Old Testament did not specify whether sauropods qualified as "clean" animals (and so warrant seven instead of a pair), if we "assume" for the sake of argument the Saurischia being lizard-like, they could be classified as "unclean" per the rules in *Revell* (1990, 133).

[63] See Gamlin & Vines (1986, 83-86) on the insects. Paleobiologist M. L. McKinney estimates there are anywhere between 5 & 50 million current species (insects are the tricky ones to determine there), Fastovsky & Weishampel (1996, 391-392); cf. Peter Ward (2000, 268-270). There may have been 1 to 3 billion species over the last 3.5 billion years, with 99% extinct. Only a few millions of those would be likely to undergo preservation, of which some 10% (about 250,000) have been discovered so far. For comparison, Tudge (1996, 112) figured a minimum of 200,000 mammal species have lived on earth since they first showed up in the Mesozoic age.

[64] Gish (1992, 52-57).

[65] The *Plateosaurus*, drawn by Earl and Bonita Snellenberger, is shown in Gish (1992, 7). See Lambert & The Diagram Group (1990, 138-146) for the serious scientific data.

[66] At the ICR website John Morris suggested there were maybe 100 dinosaurs aboard Noah's Ark. With about 50 families presently known, the ICR apparently takes dinosaur families as "kinds." For fairly obvious reasons Antarctica has been the last region to give up its fossil ensemble, but recent expeditions have discovered prosauropods at Beardmore Glacier in central Antarctica, which back in the Cretaceous was nestled next to Australia. Though Ecker (1990, 53) cautioned how

creationists have problems with continental drift too. This was seen when Gish (1995, 125-127) declared polar dinosaurs a "startling development and a challenge to evolutionary scenarios." Apart from remarking how cold it is there today, Gish did not mention that Antarctica wasn't centered on the South Pole during the Mesozoic, or that changed oceanic circulation precluded icecaps at either pole. As for how "startling" all this was, paleontologists had been anticipating their discovery for at least a decade, as evidenced by Simpson (1983, 29), Lambert & The Diagram Group (1983, 210), and Norman (1985a, 198). See Vickers-Rich & Rich (1993) or Benton (1996, 121) for general surveys, and Thomas H. Rich, Roland A. Gangloff & William R. Hammer, "Polar Dinosaurs," in Currie & Padian (1997, 562-573) or Rich *et al.* (2002) for more detailed assessments. Gish's distance from the details was noted by Donald Wise (1998, 171): Gish (1992, 36) thought an Antarctic ankylosaur was found "buried in the ice" (instead of having been excavated from the rock of the Santa Maria Formation). One might add that Gish also got the expedition date wrong ("1988" instead of 1986), per David B. Weishampel, "Dinosaur Distribution," in Weishampel *et al.* (1990, 139).

[67] I posed the sauropod question to Johnson in an e-mail exchange in June 1998. Johnson evidently had no idea himself how to identify what "types" were involved—nor was there any body of extant research available in the creationist camp to assist him.

[68] Duane T. Gish & Richard B. Bliss, reviewed by Wendell R. Bird, "Summary of Scientific Evidence for Creation," in Zetterberg (1983, 203). Incidentally, the glossary in Gish (1995, 369-378) did not include the critical *kind* or *type* (basic, created or otherwise), nor *species* (though the derivative *genus*, *family*, *order*, *class*, and *phylum* all made it in).

[69] Noted in Strahler (1987, 400).

[70] See McLaughlin (1994) on Zeno's paradoxes; Hofstadter (1979, 29-32, 610) warns of the dangers of theoretical slicing games that overlook the larger context. Cf. Barrow (2000, 55-57).

[71] Creationism's 19th century antipathy and 20th century acquiescence to speciation was noted by John A. Moore, "Creationism," in Zetterberg (1983, 122). Gary Parker illustrates Creation Science's ambivalence on this point by rejecting that variation within species can produce new ones, while citing the Galápagos finches (which involve separate species) as examples of mere variation within the type, Morris & Parker (1987, 84, 89). Parker must also have missed Michael Denton's sweeping concession of Darwinian speciation, Denton (1985, 85-86).

[72] Francisco J. Ayala, "The Mechanisms of Evolution," in Ruse (1988, 139-140). Ayala (a former Dominican priest) deftly parried creationist claims at the 1981 Arkansas trial, Gilkey (1985, 138-141). For more on *Drosophila* genetics and species isolation mechanisms: Ayala (1978, 67-68), Futuyma (1986, 304-305), Hartl (1994), Hudson (1994), Popadic & Anderson (1994), Ting *et al.* (1998; 2001), Sawamura *et al.* (2000), Doi *et al.* (2001), Noor *et al.* (2001), Orr & Irving (2001), Coyne *et al.* (2002), Cheverud (2003) re Wolf (2003), Barbash *et al.* (2003), Noor (2003) on Presgraves *et al.* (2003), and Ranz *et al.* (2003). The principles underlying reproductive isolation don't apply just to fruit flies, of course, as Price & Bouvier (2002) indicate re birds. As for the rate at which such effects can kick in, see Barton (2000) re Higgie *et al.* (2000) on rapid reproductive isolation in Australian fruit flies and Hendry *et al.* (2000) on Washington State sockeye salmon. Cf. Baker (2002) re Roelofs *et al.* (2002) on the origin of divergent moth sex pheromones.

[73] Morris & Parker (1987, 118), no references given. Parker's Fig. 21 showed human faces in one corner (all one species) and an arrangement of presumed fruit flies in the other. The caption did not specify to which species (or subspecies) any of these fly illustrations referred. As noted, Henry Morris (1985) and Gish (1993; 1995) did not discuss this point for comparison.

[74] Morris & Parker (1987, 118-119), stuttering punctuation in the original. Besides not identifying his "biology professor" debating foil, Parker's Fig. 22 was another meaningless pictogram: a swirling evolutionary stream had a bacterial blob at one end and an assortment of vertebrates at the other, contrasted with the creation model of distinct circles of dogs splitting off into various breeds (cf. Gish's uncertainty regarding how to classify the *Canidae*). Similarly, Muncaster (1997, 7) illustrated "The Evolutionary Model" with a zigzag line linking a bacterium, sponge, starfish, fish, crocodile, bird and dog, ending with a cherubic human baby. The caption proclaimed the "TOTAL lack of solid transitional life-form evidence"—a broad but empty brush indeed, given that none of

the intermediates for birds and mammals were shown on the chart, nor has any evolutionist ever claimed that dogs evolved from birds.

[75] As noted in Morris & Parker (1987, 32).

[76] Johnson (1991, 53, 159). Gish (1995, 32-33) similarly circumscribed fruit fly variations, while Lubenow (1992, 75) decreed more generally that "evolutionary changes that result in increased complexity" require "new genetic information" that observed processes of natural mutation and genetic recombination are incapable of accounting for. Johnson (2000, 131) is similar.

[77] The implications of DNA as a recursive system are masterfully explored by Hofstadter (1979), one of those benchmark works of such exhilarating scope everyone ought to read for its own sake. For the progress of applied chaos theory: Briggs & Peat (1989, 154-166), Zimmer (1999a), McKee (2000), and Robert May, "The Best Possible Time to be Alive: The Logistic Map," in Farmelo (2002, 212-219). Not surprisingly, Morris & Parker (1987, 25) pigeonhole chaos theory as an "unscientific" idea emanating from ancient paganism!

[78] See Benjamin Lewin (1994, 100-106, 149-155, 202-225, 711-717) or Li (1997) for textbook surveys, Futuyma (1982, 136-141) or Gamlin & Vines (1986, 24-25, 28-30) for intros, and Huynen & Bork (1998), Rutherford (2000), Yanai *et al.* (2001) and Theißen (2002) for further context. Viruses and bacteria can trade genes directly without sexual reproduction, Whitfield (1993, 188-191). Kitcher (1982, 97) noted the frequent creationist "charge that mutations are rare depends on confusing the mutation rate per locus (of the order of 1 mutation per 100,000 loci) with the rate per zygote [fertilized egg] (of the order of 1 mutation per zygote) or the rate per population (of the order of 1 billion per population)." Yeast DNA (where most genes are functional) is especially resilient: 70% of experimental random insertions had no overt effect at all, Lewin (1994, 707). Cf. Li (1997, 177-196), Yang & Nielsen (2000), Kumar & Subramanian (2002), Itoh *et al.* (2002) and Forster *et al.* (2002) on mutation rates and site sensitivity.

[79] Morris & Parker (1987, 150). By himself, Henry Morris (1985, 72-73) didn't get so far as Parker in recognizing just what the replication process actually does with DNA.

[80] Whitfield (1993, 192-193), Krumlauf (1994), Benjamin Lewin (1994, 1173-1178), McGinnis & Kuziora (1994), Gould (1994e; 2002a, 1095-1155), Lumsden & Krumlauf (1996), Müller (1996, 206-216, 243), Li (1997, 292-297), Axel Meyer (1998), Coen (1999, 101-130), Maynard Smith & Szathmáry (1999, 120-122), Schwartz (1999, 33-38, 338-377), Carroll (2000), Duboule (2000) on Greer *et al.* (2000), Mayr (2001a, 108-112) and Wray (2001). Gamlin & Vines (1986, 168): "The 60-amino-acid protein chain that the homeobox produces differs by only one amino acid between the fruit fly and the frog *Xenopus*. This extremely small degree of difference in the amino acid sequence is a clear indication that the protein is of critical importance in the developmental process." Wada *et al.* (1998), Murakami *et al.* (2001) and Kudoh & Dawid (2001) illustrate regulatory genes as developmental guides rather than explicit blueprints, such as Irx4 re chicken and mammal hearts. "The roles that Irx4 plays in regional specification within the heart tube is reminiscent of the functions of other *Iroquois* family members in regionalization of the *Drosophila* wing discs, eye disc, and neural precursor domain in *Xenopus*," Bao *et al.* (1999, 1163). Cf. Arias (1994) re Warren *et al.* (1994), Stauber *et al.* (2000; 2002) on insects, J. Chen *et al.* (1997) or Tsiantis (2001) re plants, Bromham (2002) on a *Pax* puzzle, and Stollewerk *et al.* (2003) on the role of *Notch* in vertebrate and arthropod segmentation. Beyond the considerable challenge of identifying which genes are involved in these processes, there is still the matter of figuring out why and how they do what they do. The preliminary character of work in this area is reflected in Fisher & Méchali (2003).

[81] Unlike Parker, Müller's Fig. 13-1 actually explained something: the internal placement of the derivative features described in the body of the text, Müller (1996, 237-238). Testaz *et al.* (2001) is an illustration of recent work exploring the genetics of neural crest cell development.

[82] Although aware of the developmental aspects of the middle ear canals, Morris & Parker (1987, 64) missed the connection to the vertebrate jaw—as did Hanegraaff (1998, 203n) who relied on Parker secondarily, or Muncaster (1997, 7) with no references at all. The summary in Gish (1990, 86) veered closest: "The so-called gill slits in the embryo are in reality pharyngeal pouches that develop into the lower jaw, parts of the middle ear and certain glands." Cf. Gould (2002a, 1108-

1109) re Raff (1996, 343) on embryological neural crest rhombomeres migrating to form the pharyngeal arches, and McDonald & Hall (2001) on issues of developmental timing.

[83] By contrast, Rennie (1993) describes how all these genetic discoveries are revolutionizing theories of disease inheritance as well as evolution. Ideas *do* have consequences.

[84] Morris & Parker (1987, 121).

[85] *Homeobox* didn't slow Morris & Morris (1996b, 241) on their way to the exit: "This is hardly an appropriate place to try to discuss all these terms and concepts. Even specialists in molecular biology are still trying to sort them out. A little seems to be known about many things, but not much is known about anything specific in this unique field of study." Or compare the rarified assessments by Paul Taylor (1995, 30-31, 85-87) and Dembski (1999a, 174-183; 2002a)—though Conway Morris did arise peripherally in Dembski (2002a, 376-377n). Wells (2000a, 73-77) touched on developmental genes only insofar as they play multiple roles in varied structures—thus supposedly refuting the general concept of homology (physical structures inherited from a common ancestor). The issue is of course whether developmental complexes might be retained just as well, even when eventually manifested in non-homologous structures. Thus concerning Laufer *et al.* (1997) and Rodriguez-Esteban *et al.* (1997), two sources cursorily referenced by Wells (2000a, 284), Gaunt (1997) noted that "the whole of this signalling pathway may be largely conserved between insects and vertebrates." See also notes 214 & 254 below. Although the term never appeared in Wells' main text, it did arise *en passant* when Wells (2000a, 41, 272) extracted a quote on the abrupt appearance of Cambrian phyla from "Jeffrey H. Schwartz, 'Homeobox Genes, Fossils, and the Origin of Species,' *Anatomical Record (New Anatomist)* 257 (1999), pp. 15-31." Cf. Conway Morris (1998a, 148-151; 2000b).

Non-biologist Phillip Johnson (1991, 164-165, 172; 1993b, 208; 1998a, 57-66) laid a similar trail, citing or reviewing works that tracked the matter without following through himself. Gould (1983, 187-198) had discussed the related fruit fly *antennapedia* mutation (where legs are experimentally induced instead of antennae), as did Dawkins (1986, 230-231) more peripherally. Mayr (1991, 158, 181) highlighted *homeobox* and included it in his glossary of evolutionary terms, while Dennett (1995, 353) alluded to it briefly. If Johnson noticed any of this information, it did not inspire him to connect things up on his own, as Gould (1994e) most certainly did with homeotic genes. The self-described "subversive essays" of Johnson (1998a) did reflect great familiarity with the *New York Review of Books* at least, as he expounded on the philosophical ramifications of evolution and secularism (his squibs on Niles Eldredge and Richard Lewontin will be explored later). Instead, Johnson (1998a, 54-56) relied on Michael Behe's *Darwin's Black Box* to articulate where Darwinism has gone astray at the biochemical level. Coming along after Johnson had already arrived at his antievolutionary position, that work fell into place as a congenial corroboration. The problem was that Behe's book hadn't paid any attention to homeobox genes or neural crest cells either—a rather interesting omission for a biochemist writing on the topic of whether evolution might account for aspects of developmental genetics. Somewhat like the befogged explorers who kept sailing past the entrance to San Francisco Bay, the closest Behe got was to dismiss the *antennapedia* mutation as too trivial a change to bother with, Behe (1996, 40-41). All of which may account for the breezy brevity of Johnson (2000, 141-142): "Is there an alternative to Darwinism? When Darwinists ask that question, they have in mind an alternative of the same kind, meaning a new scientific explanation that involves only law and chance. In that sense, I doubt there is an alternative. Many persons have tried to find such a theory by postulating innovative macromutations (perhaps in the so-called *hox* genes that are common to many distinct groups) or vaguely-defined self-organizing systems or chaos theory or new laws of physics." For this, Johnson's first reference to homeobox, there were no citations.

[86] Kenneth Miller, "Answers to the Standard Creationist Arguments," in Zetterberg (1983, 250).

[87] Young Earth creationist dogma floats wraith-like through Henry Morris (1972, 94; 1985, 165, 247), Chittick (1984, 183-186), Paul Taylor (1987, 16, 28), Morris & Parker (1987, 14-16, 190-192), DeYoung (1989, 93-94), Gish (1992, 15), and Huse (1997, 81, 164-165). Despite an Intelligent Design gloss, Ankerberg & Weldon (1998, 287-297) hinted the earth may be less than 20,000 years old. Phillip Johnson (1991, 4, 113) could distance himself from YEC ("Clearing up

that confusion is one of the purposes of this book.") because, as far as he was concerned, chronology was essentially irrelevant. The subject only surfaced in Behe (1996, 22) long enough to pronounce the entire fossil record similarly off-limits for his case.

[88] Creationists cannot claim biogeography has not been brought to their attention, such as by Joel Cracraft, "Systematics, Comparative Biology, and the Case against Creationism," in Godfrey (1983, 183-184), Strahler (1987, 365-366) or Ecker (1990, 42-43). A fleeting allusion by Duane Gish will be explored in chapter three. Morris & Morris (1996b, 237) play coy: "For some reason, the geographical distribution of animals and plants is often cited (and has been, since before Darwin's time) as an evidence of evolution." Although the index listing for "biogeography" indicated pp. 237-240, their short squib terminated at the top of 239. While claiming that migration of created "kinds" could account for the observed distribution of Australian marsupials or dinosaurs, they offered only Galápagos finches as evidence, which they treated as though they were a single species interfertile with their mainland cousins. As we'll see, the misinterpretation of Darwin's finches is a recurring theme in the creationism debate.

[89] In fact, there were those evolutionary biologists who thought the Galápagos chain geologically too young to account for the amount of animal diversity seen there. They were reassured recently to learn the archipelago was only what remained of a much older stretch of islands produced by the same sort of "hot spot" responsible for the Hawaiian islands, Malcolm W. Browne, "Galapagos Mystery Solved: Fauna Evolved on Vanished Isle," in Wade (1998a, 137-142). Beheregaray *et al.* (2004) represent a recent example of biogeographical analysis on the Galápagos tortoises, where "Patterns of colonization and lineage sorting appear highly consistent with the chronological formation of the archipelago."

Futuyma (1982, 156) noted how certain moths in Hawaii have adapted to dine only on banana trees, which were only introduced there about a thousand years ago, and over a few thousand years the isolation of small fish populations can kick in the speciation process Ayala described. Some species do have a propensity for diversity, even when their underlying genetic codes remain fairly conservative, such as the cichlid fishes of Africa, which have proliferated during the last 200,000 years, Roger Lewin (1997, 82-83), Stiassney & Meyer (1999), George Barlow (2000)—though cf. Stager *et al.* (2004) re Verheyen *et al.* (2003; 2004). See also Schilthuizen (2001, 49-52, 58-61, 142-151, 166-176). You'll note, though, all this information emanated from evolutionists, not creationists.

[90] Though noted early in the debate, as by Futuyma (1982, 180), the circular reasoning defense persists in Morris & Morris (1996a, 48-49; 1996b, 287-298) and the 1996 printing of *Scientific Creationism*. Yet Henry Morris (1985, 133) got so riled trying to prove rocks are not dated radiometrically, he let slip: "Many people believe the age of rocks is determined by study of their radioactive minerals—uranium, thorium, potassium, rubidium, etc.—but this is not so. The obvious proof that this is not the way it is done is the fact that the geological column and approximate ages of all the fossil-bearing strata were all worked out long before anyone ever heard or thought about radioactive dating." Ankerberg & Weldon (1998, 297) showed similar confusion, insisting the geologic timetable was arrived at "by assuming that evolution is true and applying circular reasoning" three pages before stressing that creationist geologists had established it prior to Darwin. Morris & Parker (1987, 237) and Gish (1995, 46) also press the circularity claim—along with Native American creationist Vine Deloria (1995, 179).

[91] Wellnhofer (1991). Dummett, whose professional field is philosophical logic, has also contributed to the history of non-tarot card games, further illustrating just how difficult it is to keep a real scholar boxed in when it comes to their avocations.

[92] Futuyma (1982, 36-37).

[93] Denton (1985, 33-34).

[94] Johnson (1991, 151). In his keynote presentation at a 1992 Southern Methodist University symposium on "Darwinism: Science or Philosophy" (available at the "Leadership U" website, leader.com) Johnson said it would only "confuse matters" to discuss biogeography further, as this supposedly only illustrated "the kind of evolution nobody disputes." He didn't elaborate what that might involve, though the context suggested what Johnson had mind was the allowable

"microevolution" that he and his fellow Intelligent Design advocates have persistently failed to rigorously define. Biogeography has so far continued to resist ID curiosity, as noted in the critical review by Peterson (2002, 18).

[95] Chapters XII and XIII of Darwin (1859), Simpson (1983, 94-120), Futuyma (1986, 374-395), the articles in Eldredge (1987, 97-136), or Gould (2002a, 109-115)—cf. the creationist textbook, *Of Pandas and People*, Davis & Kenyon (1993), where the topic didn't come up at all.

[96] Presumably Johnson has read him. "The primary source for the defense of neo-Darwinist natural selection used in this chapter is Douglas Futuyma's 1983 book, *Science on Trial: The Case for Evolution*," Johnson (1991, 158). Stanley (1981, 28-34) made similar points—another work Johnson (1991, 167, 175) cited in other contexts.

[97] The classic *King Kong* is a perfect illustration of just the sort of thing evolutionists are positive *cannot* happen. Beyond the impossibility of a normally-proportioned primate as tall as an office block (the square-cube rule would cause his bones to snap under his own weight), see Nicholls (1983, 194-195), the real absurdity are all those large vertebrates mucking about Kong Island, an anachronism compounded by their being extinct dinosaurs. Cf. Burness *et al*. (2001).

[98] Futuyma (1982, 62).

[99] In recent e-mail correspondence with Phillip Johnson, I posed exactly this reptile-mammal problem. He not only refused to think in such terms, but positively advised against doing so, on the grounds that it plays into Darwinist hands by focusing on individual examples instead of looking at the "evidence as a whole." Just how anamorphic Johnson's "big picture" vision really is will be explored in due course, but the creationist track record is already painfully clear. Kenneth Miller (1999, 99): "I have never read, nor do I ever expect to read, an explanation of any event in natural history in which the explanation of design is correlated with actual events."

[100] Henry Morris (1985, 5-6). Ecker (1990, 195-196) described other literal creationists who are as forthcoming in admitting no transitional forms can exist.

[101] Stephen Jay Gould, "Creationism: Genesis vs. Geology," in Montague (1984, 135).

[102] Examples are all too plentiful. The opening chapter of Gish (1995, 1-23) pronounced "Evolution—A Philosophy, Not a Science" (with Phillip Johnson now part of his ammo, by the way). Johnson (1997, 37-52) himself advised "Turning up Your Baloney Detector" to spot all the purported deficiencies in evolutionary reasoning (this included a section titled "Vague Terms and Shifting Definitions"). In a 1998 appearance at Whitworth College in Spokane, Washington, Johnson answered an audience questioner by explicitly declaring "Darwinism" a pseudoscientific theory. And Johnson (2000, 141): "In the final analysis, it is not any specific scientific evidence that convinces me that Darwinism is a pseudoscience that will collapse once it becomes possible for critics to get a fair hearing. It is the way the Darwinists argue their case that makes it apparent that they are afraid to encounter the best arguments against their theory." Denton (1985, 348-351) compared the "mental gymnastics" of evolutionists to Ptolemaic geocentrism and the defunct phlogiston theory of combustion, as did Huse (1997, 20-21), and Ankerberg & Weldon (1998, 113-121) in a chapter entitled "The Retreat from Good Science." By contrast, Ankerberg & Weldon (1998, 80) stated that Morris & Parker's *What Is Creation Science?* demonstrated "that creation can be scientific." As a solo act, the venerable Henry Morris (1985, 4-16) took a more seesaw attitude (that evolution and creationism are equally unproved and religious), but welcomed a full presentation of the facts, confident in the superiority of the creation model. Morris & Morris (1996b, 13-17) is similar. Over in ID territory, Hunter (2003, 7, 8) declared "Evolution is not good science," but rather "a religious philosophy that has found a home in science and dictates the underlying assumption."

[103] For a witty and rather touching survey of the world of "kooks," see Kossy (1994). This is not to be confused with the kookiness of another sort described by Sokal & Bricmont (1998) with equal wit but far less sympathy: the "deconstruction" view that scientific "truths" are merely social constructs. The late philosophy professor Barry Gross hit the rather glaring flaw in the reasoning of deconstruction: "Is one meant to think that if 'society' (another abstraction) changed its mind and came to a different consensus, then one might happily drink H_2SO_4 with the results one now expects from a glass of H_2O, or hurl himself from the top of the World Trade Center to float down

like a feather?" Barry R. Gross, "Flights of Fancy: Science, Reason, and Common Sense," in Gross *et al.* (1996, 83). His was among a series of critical essays compiled by the New York Academy of Sciences on contemporary pseudoscientific beliefs circulating around society and academe, ranging from creationism and medical fads to radical environmentalism, feminism and Afrocentrism. See also Schick & Vaughn (1999, 69-92) and Gardner (1999a) on the varieties of constructivist relativism, whose branches include such New Age glop as Pearce (1971), connecting in turn to the curious world of psychic anthropology represented by the late Carlos Castaneda (1968; 1971; 1972; 1974)—though cf. Gould (2003, 97-102) for context.

[104] Robert J. Schadewald, "The Evolution of Bible-science," in Godfrey (1983, 289-298), and Laferriere (1987, 8-9). Schadewald (1981) deftly rewrote Paul Ellwanger's Balanced Treatment proposal (re notes 27 & 34 of the Introduction) to show how Flat-Earth Theory could be similarly favored. That the flat earth was a minority position among medieval Christian theorists is noted by Gould (1999a, 111-128) apropos late-19th century anti-Catholic Protestant mythmaking about Christopher Columbus overcoming his supposed flat earth clerical opposition, as well as by David C. Lindberg, "Early Christian Attitudes toward Nature," in Ferngren (2002, 54). The text of Cosmas Indicopleustes' naïve Scripture-based "Christian Topography" is available online at ccat.sas.upenn.edu/~awlesner/cosmas.htm. See Henry Morris (1963, 77-81, 93) on the satanic origin and baneful effects of evolution, a portion of which has already been quoted (re note 5 above). N. Patrick Murray & Neal D. Buffaloe, "Creationism and Evolution: The Real Issues," in Zetterberg (1983, 466-467) give a brief summary of the 3-tiered universe of Biblical cosmology, with Lloyd Bailey (1993, 172-185) covering it in more detail.

[105] Gish (1993, 357-359), the quoted passage on the first page. Isaiah 40:22-23 reads: "It *is* he that sitteth upon the circle of the earth, and the inhabitants thereof *are* as grasshoppers; that stretcheth out the heavens as a curtain, and spreadeth them out as a tent to dwell in: That bringeth the princes to nothing; he maketh the judges of the earth as vanity." Sellier & Russell (1994, 340) cited Hugh Ross for a similar gloss on Isaiah, reprised by Ross (1998, 15). While Reid (1968, 46-48) sought to resolve the problem by a tight parsing of Luke 17:31-34, Archer (1982, 93) drew on Isaiah and Job 26:7, which reads: "He stretcheth out the north over the empty place, *and* hangeth the earth upon nothing." Similarly, DeYoung (1989, 16-17): "Job 26:7 explains that the earth is suspended in space, the obvious comparison being with the spherical sun and moon. By 150 B.C., the Greek astronomer Erastosthenes had already measured the 25,000-mile circumference of the earth. The round shape of our planet was a conclusion easily drawn by watching ships disappear over the horizon and also by observing eclipse shadows, and we can assume that such information was well known to New Testament writers. Earth's spherical shape was, of course, also understood by Christopher Columbus. Some people may have thought the earth was flat, but certainly not the great explorers." Not that Archer or DeYoung offered any evidence *Job* believed the sun and moon were spheres (because of the moon's locked rotation presenting only one hemisphere to the earth, this would not have been obvious at all). But it was entertaining to watch DeYoung try to show Old Testament cosmology did not embrace a flat earth because of a pagan Greek astronomer living centuries after, or European explorers active over a millennium later still. Incidentally, DeYoung (1989, 112-113) listed End Time astronomical signs (Isaiah 13:10; 34-4; Joel 2:10, 31; Matthew 24:29, 35; and Revelation 6:12-13; 8:10-12) wherein the sun and moon darken, stars blink out or fall, and the heavens variously tremble, pass away, or roll up like a scroll. That latter phenomenon would be topologically fascinating to observe for dimensional space-time, but perfectly in keeping with a cosmology that envisaged the heavens as an exceptionally large tarp high overhead, studded with tiny shiny things that could indeed drop off.

[106] The Talk.Origins website reprints the debate transcript (August 12-13, 1992). Cf. Ruth Brown (2002, 174-180) on Dobson's influential Family Research Council. Other run-ins with Gish: Shermer (1997, 127-136) and Massimo Pigliucci (pf.bio.utk.edu/skeptic/Debates/gish.html on a 1998 exchange). Joyce Arthur surveyed Gish's debating tactics (and resiliency in repeating factual gaffs long after being called on their scientific accuracy) for *Skeptic* magazine (Vol. 4, No. 4, 1996, pp. 88-93)—available at holysmoke.org (a *very* unflattering website criticizing the ICR view of the universe). Cf. Witham (2002, 216-219).

As for the cosmological implications of Cold Dark Matter, Kauffmann & van den Bosch (2002), Cline (2003), Cowen (2003), Irion (2003a), and Rowan & Coontz (2003) re Begelman (2003), Irion (2003b), Kirshner (2003), Miralda-Escudé (2003), Ostriker & Steinhardt (2003) and Seife (2003a) offer recent perspectives. Evidence has also emerged suggesting the expansion of the universe has been accelerating, with implications explored in a *Scientific American* special by Dvali (2004), Hu & White (2004), Riess & Turner (2004) and Strauss (2004).

[107] Behe (1996, 236-237). Which young earth arguments he had in mind, what their objective merits might be, and which scientists "hooted" them down, Behe did not specify. More recently, Denton (1998, 269-270, 275, 302) skirted past the issue by mentioning only 19th century creationism, not any of the fractious issues pertaining closer to his own publication date.

[108] Johnson (1995, 29-30; 1997, 49-50, 124), drawing partly on Cohen-Kiraly (1997) for the Wisniewski case (who seemed at least as popular as my old high school physics teacher). Stephen Meyer consistently describes Kenyon only as an "intelligent design" believer, from his December 6, 1993 *Wall Street Journal* piece (apologetics.org/articles/scopes.html) and "The Methodological Equivalence of Design & Descent" in Moreland (1994a, 82) to a chat on Chuck Missler's radio show (June 21, 2000). Ankerberg & Weldon (1998, 100), Colson & Pearcey (1999, 74) and Witham (2002, 162-166) are similar. In a 1996 article ("What Every Theologian Should Know about Creation, Evolution, and Design" available at the Access Research Network website, arn.org), William Dembski said Kenyon ("not a rube or ignoramus") abandoned his Darwinian beliefs "not for religious but for scientific reasons." Although during his evolutionist phase Kenyon co-authored *Biochemical Predestination*, it is unclear to what extent Kenyon simply switched absolutist gears, as many a political ideologue has over the years when decamping to the opposing side (like Jane Fonda assimilating the views of her various husbands). Morris & Parker (1987, 52) note Kenyon became a convert after reading Whitcomb & Morris (1961) in the 1970s—which does put a cap on just how "scientific" his reasons could have been, given the geological absurdities of *The Genesis Flood*. Morris & Morris (1996c, 178) state more obliquely that Kenyon "had become a creationist, partially through reading creationist books." In his introduction to *What Is Creation Science?* Kenyon lauded the authors for their "superb ability to avoid undisciplined speculation and to keep their reasoning in close conformity with the actual facts of nature," Morris & Parker (1987, iv). Kenyon almost testified at the Arkansas creationism trial, but was apparently dissuaded by Wendell Bird, Edwords (1982a, 43). That connection is the probable root for Kenyon's equally enthusiastic preface to Wendell Bird (1989, Vol. 1, xv-xvi), where he described that wandering monstrosity as both "clearly organized" and "of great merit." John Ankerberg & John Weldon, "Rational Inquiry & the Force of Scientific Data: Are New Horizons Emerging?" in Moreland (1994a, 330n) took these remarks as evidence that Kenyon "has extensively reviewed the scientific case for creation and accepts it as legitimate." More recently, the 1998 International Conference on Creationism (sponsored by the Creation Science Fellowship of Pittsburgh, website at csfpittsburgh.org) included Kenyon's "Teaching a Balanced View of Biologic Origins in a Secular University" along with several papers by Mark Wisniewski: "Creation in the Public Schools: Learning by Experience" and a reprise of "The Worldview Approach to Critical Thinking" (given at the 1994 meeting).

[109] Johnson (1995, 165-166), drawing on Eger (1988, 298). Barlow (1994, 274) classifies Eger as favoring a "conciliatory" stance toward creationism.

[110] Kitcher (1982, 175-176). Eger had brought up Kitcher to offer an evolutionist's reply to the rhetorical question: "What *would* happen if creationist views were discussed in schools?" Eger's Kitcher quote was longer than the portion Johnson used, starting back on page 174, with further ellipses that excised examples of how creationists like the Gablers (who we'll meet next chapter) and Henry Morris actually use the two models "equal time" argument. Eger also included the third & fourth sentences of the first paragraph I am quoting here, thus again tiptoeing over Kitcher's further indication of what resources creationists have in mind to be discussed. Since Johnson (1995, 234) cited specifically pages 175-176, he had presumably checked the original text to confirm the location of the shorter portion he had decided to include in *Reason in the Balance*.

Incidentally, the current edition of *Scientific Creationism*, Henry Morris (1985, 3), no longer contains the words "equip the teacher" in the sentence Kitcher cited.

[111] Kitcher (1982, 17). Carter (1993, 157-182; 2001, 152-153, 171-172) similarly distances the spurious "scientific" epistemology of creationism from its deep religious roots. But Carter (1993, 304n) also cited *Darwin on Trial* as "a more thoughtful critique of evolution by a critic of creationism"—as though Johnson had ever actually criticized creationism. Such schizoid sentiments about the Young Earth fringe are more directly evident in the disingenuous caveat by Davis & Kenyon (1993, 92) that design proponents "are divided on the issue of the earth's age."

[112] Here is what Johnson added to the vertebrate fossil argument in his two subsequent books. In *Reason in the Balance*: "Because of this way of thinking, even the notorious discrepancies between the facts of the fossil record and Darwinian expectations do not matter so long as there is *some* evidence (*Archaeopteryx*, Lucy, the 'mammal-like reptiles') that can be interpreted to fit the paradigm—and the critics are unable to propose a credible mechanism for evolution by big jumps. If the contest is between Darwinism and 'we don't know,' Darwinism wins." Johnson (1995, 107). Two years later, in *Defeating Darwinism*: "I've long been fascinated by the conflicting messages Darwinists provide concerning the fossil evidence. On the one hand, they proudly point to a small number of fossil finds that supposedly confirm the theory. These include the venerable bird/reptile *Archaeopteryx*, the 'whale with feet' called *Ambulocetus*, the therapsids that supposedly link reptiles to mammals, and especially the hominids or ape-men, like the famous Lucy. These examples, all from vertebrate animals, are pressed very insistently on me in debates as proof of the 'fact' of evolution and even of the Darwinian mechanism." Johnson (1997, 59-60). He then went on to claim a similar problem with *invertebrate* evolution; these arguments (along with the *Ambulocetus* reference) will be discussed in the chapter on Intelligent Design. Concerning the "small number" of fossils documenting the reptile-mammal transition, Johnson presumably meant those 400 genera, involving thousands of specimens, which happened to be the dominant land animals of the Permian period. Robert E. Sloan, "The Transition between Reptiles and Mammals," in Zetterberg (1983, 264).

[113] For instance, 41 individuals served as president of the British Society for Psychical Research (SPR) from 1882 to 1971, and may be taken as a rough measure of the honored and dedicated elite. Of these, half were philosophers, academics, and interested lay people—with a quarter of them just from one family (Prime Minister Arthur Balfour, his brother Gerald, his sisters Edith and Eleanor, and Eleanor's husband, Henry Sidgwick). Eight came with backgrounds in medicine or psychology. Ten (a quarter of the total) were scientists: chemist Sir William Crookes, astronomer Camille Flammarion, astrophysicist F. J. M. Stratton, zoologist Sir Alister Hardy, and six physicists (Balfour Stewart, Sir Oliver Lodge, Sir William Barrett, G. N. M. Tyrrell, and two Lord Rayleighs, father and son). Koestler (1972, 32-34).

[114] Freud's ideas continue to have their cycles of fashion, from critical skepticism to renewed interest. See Ramachandran & Blakeslee (1998, 152-157), Hellman (2001, 105-124), and Hobson (2004) versus Solms (2004) for a range of perspectives.

[115] Skinner (1972).

[116] Mary Midgley, "Gene-Juggling," in Montague (1980, 117). Skinner reacted to criticism in much the same petulant way D. W. Griffith did in 1915 when non-racists witnessed his flattering depiction of the KKK in *Birth of a Nation*. Just as the pioneer director worked out his frustrations in his next film (the pacifist fiasco *Intolerance*), Skinner wrote another book, *About Behaviorism*. One of the ways you can tell if you understand a subject is whether you can explain your views to someone else. Since Skinner's first work had supposedly been composed in a clear conversational style, the critical furor ought to have started a few Pavlovian warning bells ringing. Except Skinner (1974) was of no "mind" to consider being mistaken, so his argument ended up a rehash of his earlier claims. Cf. Gaynor (2004) taking aim at inaccurate criticisms of Skinner's theories by Steven Pinker and others.

[117] For example, Skinner (1959, 429) played the same translation games of his later books: "'You ought to love your neighbor' may be converted into the two statements: (1) 'The approval of your fellow men is positively reinforcing to you' and (2) 'loving your fellow man is approved by the

group of which you are a member,' both of which may be demonstrated scientifically." Substitute "kill" for "love" and one might in like manner "scientifically demonstrate" Bosnia in the 1990s. What propositioning a Hitler could have done with such gibberish can only be imagined. "If you are positively reinforced by racial purity…." That Skinner never considered how his arguments might be employed to insidious purposes was one of his many failures of imagination.

[118] Dennett (1995, 395). Johnson (1998a, 59) mentioned Dennett's remarks on Skinner's "greedy reductionism" in passing in his 1995 review. (See also note 270 in chapter four on how Dennett's work has spooled out in Johnson's analytical hands.)

[119] Toumey (1994, 248-249). Lysenko was a Soviet "scientist" for whom genetics was contrary to Marxist ideology. Put in charge of Soviet agriculture he managed both to cripple production and retard biology there for a generation, Gardner (1957, 140-151), Kohn (1986, 63-74) or Edey & Johanson (1989, 273-274). See Harman (2003) for a trenchant exploration of how British scientists (Marxists and otherwise) reacted to the Lysenko affair. Francisco Ayala brought the Lysenko case up at the 1981 Arkansas trial as what can happen when ideology drives "science," Gilkey (1985, 140-141).

Sociobiology—the brainchild of entomologist Edward O. Wilson (1975)—covers everything from hunting for "intelligence" genes to deriving universal human rights from allele diversity. Orbital examples include Richard Dawkins (the "selfish gene") and ethologists Konrad Lorenz and Niko Tinbergen. Dennett (1995, 481-493) is willing to classify much of sociobiology as greedy reductionism. See Montague (1980) for a fertile compendium of its early critics, and Horgan (1995), Segerstråle (2000), Alcock (2001), Ruse (2001, 186-204) and Pinker (2002, 108-128) for recent assessments. While sociobiology would seem to fall on the liberal spectrum by Johnson's cliché yardstick, the reality is just as convoluted as 19th century Social Darwinism. Thomas Sheehan, "Paris: Moses and Polytheism," in Montague (1980, 350-351) explored the French case, where an international melange accreted around the anti-liberal anti-communism of Bernard-Henri Lévy (the "new Philosopher" of a god we take for convenience) and Alain de Benoist (an ex-reactionary advocate of the "New Right"). Along with a bouquet of old fascists, de Benoist's magazine *Nouvelle Ecole* gathered Lorenz, philosopher Arthur Koestler, psychologists Hans Eysenck and Arthur Jensen, and conservative editor Louis Pauwels (who with Jacques Bergier penned the neo-Fortean *Morning of the Magicians* books that connects back to UFOs and ancient astronauts). There is also a link to the Pioneer Fund and Holocaust denial, as recounted by Shermer (1997, 242-246); cf. Marks (2002, 149-150) on the Pioneer Fund's research agenda, and Guttenplan (2001, 129-131) on the "loony conspiracy theories" of evolutionary psychologist Kevin MacDonald.

Although Koestler (1964; 1968; 1978) has been critical of Darwinism, his rather vague parapsychological evolutionism falls far enough from the creationist tree that he is rarely cited. Morris & Morris (1996b, 36-37) quoted a few passages from Koestler (1978, 170, 185). Denton (1985, 327) drew on him only to establish that "the number of biologists who have expressed some degree of disillusionment is practically endless. When Arthur Koestler organized the Alpbach Symposium in 1969 [*sic*] called 'Beyond Reductionism', for the expressed purpose of bringing together biologists critical of orthodox Darwinism, he was able to include in the list of participants many authorities of world stature, such as Swedish neurobiologist Holgar [*sic*] Hyden, zoologists Paul Weiss and W. H. Thorpe, linguist David McNeil and child psychologist Jean Piaget." While it was interesting to learn Denton felt one neurobiologist sufficed for his "practically endless" list, the Alpbach Symposium (which was held in 1968) hardly shook the foundations of Darwinism, orthodox or otherwise. Holger Hydén, "Biochemical approaches to learning and memory," in Koestler & Smythies (1969, 85-115), with various discussion, was a reasonably tentative stab at relating memories to neuron states in the pre-neural net days of early cognitive research (most of the Alpbach participants were involved in psychology and philosophy).

The one geneticist on hand was C. H. Waddington, whose "The theory of evolution today," in Koestler & Smythies (1969, 357-394) sketched a fairly benign view of neo-Darwinian population dynamics before homeobox genes got into the act a generation later. Far from undermining the case for Darwinian evolution, though, Waddington's views have been of tremendous value in

current thinking (particularly his concept of genetic "canalization"). See Hall (1992), Gilbert (2000), Gould (2002a, 256n, 584), Stearns (2002) on Siegal & Bergman (2002), and Behera & Nanjundiah (2004) concerning Waddington's influence on modern evolutionary thought. An example of recent research uncovering the mechanisms that Waddington's theories proposed earlier in the 20th century may be found in Cossins (1998) re Rutherford & Lindquist (1998), and Rutherford (2000, 1099-1104). It turns out that heat shock proteins can serve as a sort of genetic buffer zone, storing potential variations that may be called up when adaptively useful.

[120] Toumey (1994, 211).

[121] See Sass (2003) on the persistence of the Patent Myth, and Horgan (1996a) on Bill Gates. Another version of the story surfaced briefly in Parker (2003, 45), offering an interesting argument on the Cambrian Explosion, but also lacking both a bibliography and notes.

[122] Pennock (1999, 70-71) notes Darwin biographer James Moore traced the reconciliation story to a turn-of-the-century temperance enthusiast, Lady Hope, who made her claims on the lecture circuit in spite of protests from Darwin's family. Alters & Alters (2001, 139-141) stress how irrelevant this would be for assessing the validity of contemporary Darwinism. For a description of Darwin's actual deathbed experiences, see Desmond & Moore (1991, 661-663). Michael Ruse, "Charles Darwin and the 'Origin of Species,'" in Ruse (1988, 83-85), Desmond & Moore (1991, 387) and Zimmer (2001g, 340-344) suggest Darwin's increasing agnosticism probably owed more to the death of his daughter than to finch spotting on the Galápagos. Cf. Haught (2001, 12-13). Some of Darwin's equivocation on the subject of religion over the years was also likely due to a desire not to offend Mrs. Darwin, who remained devout. Gould (1999a, 28-43) compares the religious attitudes of Darwin and Huxley (who also lost a child tragically). Huxley was considerably more vocal than Darwin on the matter of religion, as indicated by the essays collected in Huxley (1893; 1896).

[123] Interestingly, Lubenow (1992, 190) remarked that, "As much as we might wish that these reports were true, I am sorry to say that they are actually false." And Johnson (1998a, 15) briefly stated: "Another biographical work I recommend, especially for Christians, is James Moore's *The Darwin Legend* (Baker, 1994). Moore debunks the legend, still persistent among Christians, that Darwin repudiated his theory and accepted Christ on his deathbed." Yet neither Lubenow nor Johnson wondered about how or why such a myth has been sustained in the evangelical subculture. While Hanegraaff (1998, 124-125) chalked the story off as a bad argument, Morris & Morris (1996a, 109) tried to hold onto the myth: "Although there is certainly no firm evidence of Darwin's reputed conversion, there are some possible intimations. See L. R. Croft, *The Life and Death of Charles Darwin* (Lancashire, England: Elmwood Books, 1989), also James Moore, *The Darwin Legend* (Grand Rapids, MI: Baker Book House, 1994)." The ICR ended up acknowledging the tenuous character of the Darwin deathbed story in a "Christian Urban Legends" episode of their *Science, Scripture and Salvation* radio show, aired April 17, 1999 (discussed at religioustolerance.org/chr_cul4.htm). The Young Earth creationist organization "Answers in Genesis" has also joined the "Darwin recanted" debunking parade in 2002 catalogs of "Arguments we think creationists shouldn't use" (available at answersingenesis.org).

[124] The NASA "missing day" myth started around 1970 and gained popularity via a 1974 book by electrical engineer Harold Hill (not to be confused with the ebullient flimflam artist in *The Music Man*) published by the now-defunct Christian publisher Logos International. Jim Lippard touched on this source of the myth in a 1993 *Skeptics* article on Noah's Ark hoaxes, reprinted online at the Talk.Origins Archive, as did the 1999 ICR "Christian Urban Legends" show and the Answers in Genesis 2002 "Arguments we think creationists shouldn't use." Cf. Ecker (1990, 78-79) on Hill. But McIver (1988b, 110, 276) and especially Brunvand (2000, 137-148) relate the tale's more devious historical pedigree, which long antedated moon rockets or computers. Creationist Harry Rimmer retold the story of astronomers being brought to Jesus by the truth of Joshua's missing day, courtesy of one Charles Totten, a lieutenant who taught military tactics at Yale University 1889-1892. Brunvand noted that Totten was also an anti-Semitic crackpot "whose favorite theory was the racial purity of the Aryan race and whose favorite pastime was predicting imminent apocalypse" (such as that the Antichrist would appear on March 29, 1892). Cf. Jefferys (1987, 25-

28) and the follow-up letters in the Spring 1988 *Creation/Evolution* (pp. 36-43) on another creationist effort to buck up Joshua with computer calculations. Finally, Christian commentator John Williams (2001, 63-70) began his debunking of the Missing Day myth with a fast jab at Darwin's "erroneous theory of evolution" (no citations), not realizing that perhaps he holds to a few Christian Urban Legends himself.

[125] DeYoung (1989, 52-54) likewise noted computers weren't that smart. Of course, he had no need for digital verification of Joshua's miracle; the fact that the Bible said it happened was good enough for him. While we are dealing with DeYoung and the restless, he weighed in to dismiss the Bermuda Triangle as mere sensationalism, and refuted the ludicrous but persistent rumor that the old Proctor & Gamble company logo was a satanic symbol, DeYoung (1989, 22-23, 107-108). Since the rest of his book was an unabashed defense of Creation Science astronomy, these examples apparently bottomed out DeYoung's supply of skepticism. The ICR "Christian Urban Legends" show and John Williams (2001, 71-75) also nixed the Proctor & Gamble rumor.