Chapter 3. Dinomania

Dinosaurs were the most successful of land vertebrates, dominating life on earth for 130 million years. That's roughly one quarter of all the time since the Cambrian Explosion. Yet for all their sustained success the non-flying ones nonetheless went extinct, along with the pterosaurs and marine reptiles, which means not only that few things in nature last forever, but also that there once existed a world wonderfully unlike the one we know now. Accepting that dinosaurs flourished in their own milieu therefore plops a discontinuity into the picture of life as static tableau fixed since Creation. If things were once so different, how and why did the present condition come about, and how did the dinosaur world relate to what had come before? Curious youngsters ransacking their local library for answers to those questions would inevitably bump flat into the evolutionary big picture underlying modern paleontology, a situation not at all congenial to the Biblical pageant Scientific Creationism has in store for them.

But venture outside the Creation Science studio and dinosaurs don't intrude much on the thinking of antievolutionists. Michael Denton or Phillip Johnson didn't touch on them, and they warranted only a passing nod in Davis and Kenyon's *Of Pandas and People*. This general omission may be due again to the reactive character of creationism. None of the major works lambasting traditional creationism were penned by dinosaur paleontologists, and so the particular lessons to be gleaned from studying the Mesozoic world were inadequately explored by them. Unless creationists had a really good reason not to ignore the dinosaurs, they had no reminder to tackle them in their own rejoinders. Such is the daisy chain of scholarship when motivated by apologetics instead of curiosity.

Only Flood Geology has an overriding need *not* to skip them. Examples of every "kind" of land animal alive before the Deluge had to have been preserved aboard Noah's Ark; there was simply no escaping that theological imperative. And while few children were going to be aware of *Moschops* or *Probainognathus* (especially if creationists didn't incautiously blurt out their names), the legions of youngsters slavering over *Velociraptor* and company made the dinosaurs far too familiar to overlook. With volumes of detailed scientific interpretation lining the public library shelves as potentially the last word, something had to be done to steer young minds back to the Biblical straight-and-narrow. Especially so after the deluge of another sort: the dinosaur mania following Steven Spielberg's extremely popular film version of Michael Crichton's *Jurassic Park*.[1]

The interesting methodological challenge for creationists concerns this lack of dinosaur-specific critiques of creationism. Without knowing beforehand what was supposed to be critical information, how could they tell what to parry and when to thrust? To rescue their imperiled youth from the insidious clutches of evolutionary thinking meant researching the topic from scratch. An involved enterprise, to be sure, reducing the field of willing defenders to a complement of one: the tireless Duane Gish.

The dozen pages Gish devoted to arguing his case against dinosaur intermediates in *Evolution: The Fossils STILL Say NO!* certainly reinforced his reputation for superficial scholarship and dated analysis. It also exposed the soft underbelly of Creation Science methodology. Creationism in general is resolute about not discerning the pattern in the chronology and distribution of living things, but Scientific Creationism as a subgroup goes beyond to insist that the underlying chronology doesn't exist either. Given what a large chunk of life is represented by the dinosaurs, it would seem both essential and desirable for Creation Science advocates to press their case with utmost vigor.

But if dinosaurs and people really weren't contemporary and didn't die out in a single Flood event, Creation Scientists are going to have a tough time arranging the pieces to make that seem reasonably true. Their only recourse will be *misdirection*. They'll have to focus on the inevitably missing evolutionary data, without giving the audience a clue as to what's going on—that some

geological periods are better represented than others because erosion can erase former deposits. The luck of the fossil draw is unlikely to capture more than a sampling of the success stories, let alone a representative series of all the microevolutionary wiggles that occurred along the way. But should a few evolutionary intermediates have the ill fortune to turn up in the right time and place anyway, the creationist can simply not mention them.

The lack of a functional creationist "map of time" turns critical as Gish began his version of the dinosaur adventure story. His first target concerned what the early archosaurs were up to. Gish's sharpened spear consisted of a single quotation drawn from the 1966 edition of Alfred Romer's *Vertebrate Paleontology*:

> That this supposed ancestry is highly contrived seems to be immediately apparent by a reading of evolutionary literature. Speaking of *Saltoposuchus*, a pseudosuchian thecodont (see figure 4), Romer says:
>
> > It is obvious that it was forms of this sort from which arose the pterosaurs, birds, and dinosaurs. There are no known thecodonts which show positive indications leading toward the first two groups mentioned, nor toward one of the two dinosaurian orders, the Ornithischia.
>
> How can it be obvious that something like *Saltoposuchus* was ancestral to flying reptiles, birds, and ornithischian dinosaurs if these creatures reveal no "positive indications leading toward" flying reptiles, birds, and ornithischian dinosaurs? It seems apparent that Romer has simply adopted the thecodont reptiles as ancestors for birds, flying reptiles, bird-hipped dinosaurs, and crocodiles (mentioned by Romer elsewhere) for lack of a better candidate, because the fossil record fails to produce any actual ancestors and the necessary transitional forms.[2]

This was an ingenuous passage on several levels. The most obvious one concerned why paleontologists connected pterosaurs, birds and dinosaurs to thecodonts in the first place. We already know it was their basic diapsid anatomy, which Gish naturally did not discuss. If you wanted to define what a generalized ancestor for those three specialized groups might look like, the thecodonts certainly fit the bill. But the repetitive Three Card Monte Gish played with "flying reptiles, birds, and ornithischians" actually flagged the very item we weren't supposed to notice. If the thecodonts then known to science didn't rigorously bridge that particular trio, as Romer properly noted, what about the *other* "of the two dinosaurian orders," the Saurischia? And on that front, had anything at all happened paleontologically in the three decades since?

The first true dinosaurs are known from only a handful of Late Triassic sites, most notably the Ischigualasto Formation of Argentina.[3] Over the last thirty years that region has become a magnet for fossil collectors interested in uncovering the evolutionary history of the major dinosaur groups (though it is a trifle hot, dusty, and remote for practitioners of armchair creationist paleontology). The earliest and most primitive of the saurischians (*Eoraptor*) and ornithischians (*Pisanosaurus*) have been found there, along with more representatives of that curious third contender, the herrerasaurs, with their intermediate anatomy that hints at the variety of the initial dinosaur radiation.[4]

But the Ischigualasto Formation is particularly useful in that sectors of it extend back into the Middle Triassic, where our familiar therapsid stars show up, like *Probainognathus*. It was from such earlier deposits that a new model of thecodont emerged in 1971. Named *Lagosuchus* by its discoverer (Alfred Romer!) it had a body far more similar to the early saurischian dinosaurs than *Saltoposuchus*. So Gish was derisively wagging his finger at the wrong animal, decades after paleontologists like Romer had already discovered a more exact intermediate, *Lagosuchus*. By 1995 dinosaur cladists had moved on to look for links between *Lagosuchus* and the likes of *Eoraptor* and the herrerasaurs. But as these forms were already so similar to one another, by then the game had become one of nodal hair-splitting.[5]

That Gish could be so out of sync with the material was a clue to the depth of the (non-Flood) waters into which he so confidently waded. In a 1993 appearance on D. James Kennedy's periodic "Creation Week" antievolutionary broadcasts, Gish recounted how dinosaurs were a special interest of his. He stressed how he had pored through a dinosaur encyclopedia (unspecified) and visited the British Museum of Natural History whenever he was in London, all in that dedicated quest for the elusive dinosaur intermediates. Certainly the conclusions he reached could not be accounted for by any lack of enthusiasm.[6]

Yet the survey in *Evolution: The Fossils STILL Say NO!* was remarkably lean on references. Apart from a short section on polar dinosaurs (discovered by and not even remotely unsettling to established paleontologists) the only dinosaur information Gish provided citations for concerned the horned dinosaurs. The comparative wealth of detail there may have been occasioned by the fact that they were the single dinosaur example Arthur Strahler chose to criticize Gish on, thus lending further credence to the theory that creationists depend on evolutionists to stake out the field of inquiry for them.[7]

When it came to the horned dinosaurs, like Joshua fitting the battle of Jericho, Gish couldn't keep *horns* off his mind:

> The unique feature of horned dinosaurs (suborder Ceratopsia) was, of course, the horns, from one to several in number. The bony horn cores of these ornithischian dinosaurs were similar in appearance to those of a modern bison. *Triceratops* weighed about eight to ten tons and varied from sixteen to twenty feet in length. It had three large horns, one above each eye and a central horn in the nasal region. *Triceratops* had a large bony frill, several inches thick, formed by an extension of the parietal and squamosal bones of the skull. This shield offered considerable protection to the neck region. *Centrosaurus*, which also was equipped with a bony shield, had a single horn in the nasal region.
>
> *Protoceratops* was the name given to a dinosaur found in the Upper Cretaceous of Mongolia. A variety of similar dinosaurs, placed in the family Protoceratopsidae, have been found in Mongolia and North America. As Romer has pointed out, *Protoceratops* has been misnamed, since it had no horns at all. It did have a bony nasal region and rugosities (wrinkles) were present in some individuals. Evolutionists imagine that horns could have developed on such a creature, but no transitional forms have been found. Furthermore, as mentioned above, *Protoceratops* is found in the Upper Cretaceous where are found all of the horned dinosaurs. In fact, what is characterized as one of the most primitive of the protoceratopsid dinosaurs, *Leptoceratops gracilis*, was, according to evolutionists, one of the last dinosaurs in North America. If *Protoceratops* was the ancestor of the horned dinosaurs, it should be found in geological formations such as the Middle or Lower Cretaceous, presumed to be older than the Upper Cretaceous. *Protoceratops* thus fails miserably as an ancestor for the horned dinosaurs.
>
> Two dinosaurs have been mentioned as possible evolutionary variants of *Triceratops*. One, *Sterrholophus*, is now believed to have been an immature *Triceratops*, and *Diceratops* is now said to have been a pathological form of *Triceratops*. Weishampel et al. state:
>
> > There is a sharp discontinuity in size and correlative allometric features between protoceratopsids and ceratopsids [ceratopsids are true horned dinosaurs], and there is never confusion between members of one family and members of the other.[8]

Right from the start there was confusion as the "unique feature" of the horned dinosaurs consisted in fact of *three*: the horns, the neck frill, and the distinctive *rostral bone* that formed the upper part of the parrot-like beak in both the protoceratopsids and the later North American

ceratopsids. If understanding the ceratopsia meant knowing fully what you were looking at, Gish was setting off with Parker-sized chunks missing again. That was particularly true when it came to the earliest recognized ceratopsian ancestors, the *psittacosaurids*.[9] These modest Early Cretaceous Asian bipeds were the first to possess that rostral bone. As Gish knew full well, since he'd already written about them in *Dinosaurs by Design*: "The first fossils found in Mongolia caused scientists to believe they were related to horned dinosaurs; *Psittacosaurus* had only small cheek horns and a bone under the upper beak like the horned dinosaurs."[10]

With clearly unintended irony, Gish relegated *Psittacosaurus* in that 1992 children's book to a catch-all section with the Cretaceous "bone-head" *Pachycephalosaurus*, because "These two types of dinosaurs had one thing in common—their unusual heads."[11] Although not as comprehensive as dinosaur paleontologists would like, the fossil representation of the group has still improved enough for cladistic analysis to relate pachycephalosaurs as fairly close cousins to the ceratopsids. But instead of examining that logic and offering some cogent creationist counter-argument, Gish simply locked the characters in separate rooms, never to examine their specific anatomy.[12]

From the psittacosaurids there is a considerable gulf of ten million years or more before the first protoceratopsids show up in the Late Cretaceous. Now was this situation due to special creation, or could there be a more mundane reason? More specifically, where exactly were paleontologists supposed to encounter those revealing "Middle Cretaceous" deposits to plug the vexing fossil hole? Here is where the creationist appreciation of the finer points of geology is at its most evasive. For Gish wrote as though scientists were failing to find specimens in the extant Middle Cretaceous strata of Asia, when the geological reality was there simply aren't abundant rocks of that age and location to dig in. Hence the gap.[13]

Behind Gish's view of the protoceratopsids is a network of assumptions about geology and what evolution is supposed to do. For someone convinced all dinosaurs were contemporaries, finding the "primitive" *Leptoceratops* alive at the end of the parade only reinforces the conviction that evolutionary paleontologists are congenitally mistaken. But remember it is creationism that maintains that "evolution" requires animals to be on a steady track from "primitive" to "complex." From a Darwinian point of view, that *Leptoceratops* existed in North America meant only that its basal relatives made it across from Asia some time before. The stability of that particular genus would suggest its lifestyle remained fairly constant, so what was a stumbling block for creationists becomes a paleoecological clue for evolutionists.

Now add a second piece of the puzzle, one Gish didn't mention. Among the most developed of the protoceratopsids was another North American form, *Montanoceratops*, which had a nice little nasal horn to boot. It's also one of the *earliest* of the protoceratopsids.[14] That suggests two things to an evolutionist. First, that finding such diverse branches of the protoceratopsids so far afield from the main Asiatic group makes it extremely likely their evolutionary history stretched back well before the observed forms show in the Upper Cretaceous. It also means animals that looked just like miniature ceratopsians, complete with head frills and the start of horn ensembles, had made it across to North America before the ceratopsians made their bow.[15]

Of course evolutionists would love to have a richer mid-Cretaceous fossil record to draw on, but they can live with that particular "gap" given what information has surfaced through happenstance. The lineage of psittacosaurids, protoceratopsids, and ceratopsids are traceable down to their shoulder and limb arrangement, which gave the quadrupedal descendants a distinctive splayed front leg configuration that has provoked considerable paleontological argument about whether the later ceratopsids could gallop. The odd stance was even visible in the fairly crude illustrations of *Protoceratops, Centrosaurus* and *Triceratops* in Gish's *Evolution: The Fossils STILL Say NO!* So when Gish casually stated in *Dinosaurs by Design* that *Triceratops* "probably could charge like a rhino," he did so without realizing how that debatable inference cascaded back to the very limb anatomy that served to connect the various ancestral links in the ceratopsian chain.[16]

By treating all the "Late Cretaceous" suspects as if they were *literal* contemporaries, Gish was playing out a variation on his "no cousins" objection. But that wouldn't explain why the starting runner off the ceratopsian block, *Brachyceratops*, should serendipitously have been a short-frilled form so like what an ancestral *Triceratops* would be expected to look like, right down to the blunt

nose horn and rudimentary brow horns. As it's known primarily from juvenile specimens, paleontologists are understandably uncertain about what youthful *Brachyceratops* might have grown into, but those observed features were all the basic components that would be shuffled around among the many ceratopsians to follow, including *Triceratops* some ten million years later.[17]

In proposing what a fossil *Triceratops* evolutionary sequence was supposed to look like, Gish fixated exclusively on the horns. In his 1993 radio appearance he spoke in terms of fossil *Triceratops* with lengthening horns, but lengthening from what initial condition and to what result? It happens that quite a variety of horn lengths have been observed for the *Triceratops* genus, a situation which has resulted in a persistent squabble about how many species there actually were. Depending on which fossils were available and given what diagnostic weight, counts over the years have ranged up to fifteen—though in light of current views on the variability of populations (and the extent to which speciation springboards off such variety) recent thinking has whittled the number down to perhaps only one or two.[18]

In this matter of horn length Gish was assuming something that was neither obvious nor necessarily even justified, namely that *Triceratops* would have to be an evolutionary instance of ancestral horns getting *longer*. The nasal horn in the preserved specimens shows rather more variation than the brow horns, but either could have been inherited as is and modified up or down afterward. To assess what the horns of *Triceratops* meant as an evolutionary problem would have required investigating in detail what the fossil record of the specimens and their potential relatives were, and that of course Gish did not do.[19]

Any natural speciation that jumps beyond generic bounds will produce two phenomena in an incomplete fossil record. A more distant ancestral form will appear comparatively less like the derived descendants living long after—while examples closer to the species divide would provoke a labeling problem because they would look so much alike. So what was one to make of that *Diceratops* example Gish sloughed off as but an inconsequentially deformed *Triceratops*? The details of its anatomy turned out to pose special difficulties for the taxon, as Peter Dodson recounted in his recent book on the ceratopsians:

> It has several peculiarities that are usually explained away as pathologies or variants within the expected range of *Triceratops*. The poorly developed nasal horn core that gives *Diceratops* its name is one example, the large openings in the squamosal another. However, several other characters seem less easily waved away. Where *Triceratops* should have a thick parietal lacking in fenestrae, *Diceratops* has a thin parietal that shows evidence of parietal fenestrae. Although this is a typical character for horned dinosaurs with few exceptions, it is completely unexpected for *Triceratops*; however, it may possibly be found in a species ancestral to *Triceratops*. The typical squamosals are short compared to the length, broad and thick. In *Diceratops*, the squamosals apparently extend farther back on the frill and are comparatively thin and narrow, somewhat reminiscent of a separate genus of horned dinosaur, *Torosaurus*, to be discussed in the next chapter. Forster believes that *Diceratops* should be considered as separate from *Triceratops*, in a more basal position in phylogeny, possibly as the nearest outgroup or relative. This conclusion is aesthetically unappealing because the specimen is solitary (no others having been found), appears to have some frank pathologies, and is poorly preserved to boot. Nonetheless, I cannot refute it, and I accept it provisionally, hoping that further finds may resolve the matter.[20]

Triceratops is able to guard its origins so closely partly because it's such a typical ceratopsid, notable chiefly not for its long horns but for its solid frill, meaning ancestors would fall within the range of many of its cousins. Such could not be said of the curious Late Cretaceous *Pachyrhinosaurus*. Known by only two skulls, this was an oddball ceratopsian by any standard. With an extremely "rugose" nasal protuberance in place of a conventional horn, it looked rather as

though a blunt bony mesa had landed on its nose. But in the 1990s several species were discovered from a new ceratopsid genus *Achelousaurus*. Spanning a range of only half a million years, they appear to be directly transitional to *Pachyrhinosaurus*. Finding distinct traces for the appearance of so unusual a feature would be entirely consistent with an evolutionary view that transitional forms did indeed exist and occasionally get trapped in the fossil maw.[21]

So Gish was proceeding as if all ceratopsians were of cookie-cutter uniformity, even though he was aware of some information suggesting otherwise. And that was in an area he did at least have a few footnotes for. When he ventured past his resource base he simply rushed in with *ex cathedra* claims of "no transitionals" to cover subjects where the fossil facts were much more complicated. This was certainly so for *Stegosaurus*, where Gish declared that "we do not find a series of transitional forms showing the gradual evolutionary origin of the spikes and plates. *Stegosaurus*, numerous fossils of which have been found, appears fully-formed, contrary to what would be expected on the basis of evolution, but precisely as predicted on the basis of creation."[22]

But how "fully formed" was the available *Stegosaurus* record when paleontologists couldn't tell from the fossils how the plates were supposed to be arranged? Had Gish stopped to think about this, he should have realized the configuration was being debated because so few of the known stegosaurs preserved more than a scattering of plates and spikes. The "best" type specimen known in 1995, in fact, was a jumbled mess. Since then a fine *Stegosaurus* example has turned up to resolve the longstanding arrangement dispute (they were in an alternating double row). But that would still establish nothing about how much or how little "evolving" was going in the *unpreserved* plates of most stegosaur samples.[23]

By homing in on missing limbs instead of looking at the whole tree, let alone the forest, Gish failed to spot the significance that early stegosaurs started out with rows of spikes, not plates. Only later were these showing up as standing plates, and finally as the triangular ones of *Stegosaurus* proper (where they may have performed a thermoregulatory function as well as for defense or species recognition).[24] The patchy record of stegosaurs suggests most of the connecting links will not be found, but a pretty good ancestor for the stegosaurs would be a group of Jurassic animals with bony scutes on their body. And indeed, there were basal forms in the Early Jurassic of just that layout, which the diligent Gish again overlooked: the bipedal Scutellosaurids and quadrupedal Scelidosaurids.[25]

Now evolutionary processes seldom remain boxed up. Animals have this tendency to adapt in many ways. So might those scutes have turned into spikes in *another* group, along a parallel course that developed not into standing plates, but into more flattened lateral armor? That's what appeared to have happened with the nodosaurs that first appeared in the Early Jurassic, and the ankylosaurs that branched off later in the Cretaceous, whose early members likewise showed a mixture of spikes and fused armor. Even more poorly represented than the stegosaurs, none of the known genera of nodosaurs or ankylosaurs were either abundant in their range or especially well preserved where they were found. Yet Gish felt he could summarily dismiss them as appearing "fully formed" without mentioning the scutellosaurs and scelidosaurs paleontologists offer as the ancestral form for all the distinctive armored and plated dinosaurs.[26]

It was the same one-note tune for the toothless "ostrich-mimic" *Struthiomimus*. After stressing they couldn't be ancestral to birds (as though any paleontologists were saying they were) Gish pronounced "All of the specializations found in *Struthiomimus* appear in that creature complete all at once, with no transitional forms, as is also the case with all other coelurosaurians." But those "specializations" consisted mainly of some fiddly bits with the skull and the loss of teeth. So wasn't it relevant that the early ornithomimosaur *Garudimimus* retained the most typical theropod aspects in its skull, or that basal ornithomimosaurs with teeth have turned up?[27]

As Gish went on with the travelogue, seemingly so ripe with detail, yet vague when the background paleontology was exposed, he had no way of telling when he was skirting past observations that seriously tripped his own case:

> In contrast to the small coelurosaurians, the carnosaurian dinosaurs of the infraorder Carnosauria were very large carnivorous bipeds. *Allosaurus* was about thirty to thirty-five feet long, with powerful jaws equipped with large,

> sharp teeth. *Tyrannosaurus* was the largest known carnivorous dinosaur, standing nearly twenty feet high and nearly fifty feet in length. Its jaws were about six feet long, with teeth nearly six inches long. Once again, the fossil record fails to produce the transitional forms required by evolutionary theory.[28]

Bringing up the coelurosaurs was a blunder, for in the meantime paleontologists had been busy sorting out that formerly amorphous block of "carnosaurs." Fossil discoveries of smaller examples and their cladistic analysis were leading to the recognition of three main lineages. The Ceratosauria were the oldest, stemming from the very early small coelophysids. Later on there was a split into the Carnosauria that covered *Allosaurus*, while the Tetanurae wing embraced the small coelurosaurs, theropod bird ancestors, and the later giant tyrannosaurs. So *Tyrannosaurus* was actually a jumbo coelurosaur. The main anatomical oddity to account for concerned the development of their dwarf front limbs with only two fingers. Fortunately, the smaller Mongolian tyrannosaur *Tarbosaurus* retained that vestigial third digit, as yet another instance where nature seemed not up on what transitional forms were disallowed by Gish's solemn decree.[29]

The many intermediate prosauropods and sauropods already encountered apropos what Gish had to say about Noah's Ark were of course nowhere to be found when it came to the cropped description in *Evolution: The Fossils STILL Say NO!* Instead of comparing their anatomy, which tracked the adjustment to quadrupedality and increasing size, Gish affixed his tightest telephoto lens on one particular nose:

> The nostrils of *Brachiosaurus* were not on the end of the snout but were located in a bony dome on the top of the head! No one knows why *Brachiosaurus* had this unusual arrangement, but we do know that not a single transitional form has been found showing the nostrils migrating from the snout into the bony dome on top of the head.
>
> Supposedly some earlier bipedal creature or creatures had reverted to a quadrupedal mode of locomotion and then evolved into these herbivorous dinosaurs. No transitional forms can be found, however, to document the origin of these monstrous creatures from some little fellows. *Diplodocus* is *Diploducus* [*sic*], *Brontosaurus* is *Brontosaurus*, and *Brachiosaurus* is *Brachiosaurus* right from the start.[30]

Alas, the heads of many sauropodomorphs are not known for certain (including the granddaddy *Brontosaurus/Apatosaurus*), but there are enough examples around to tag a few of the changes involved. The nostril shift in the diplodocids and brachiosaurids was due to the expansion of the maxillary bone at the front of the prosauropod snout. The Early Jurassic prosauropod *Massopondylus* was a "little fellow" that showed the start of that process, with its enlarged nasal opening positioned further back. This continued through the subsequent Jurassic cetiosaurids such as *Shunosaurus*, where the nostrils had moved higher up on the top of the head. Like the apocalyptic stock gurus predicting a market crash right before the giant 1980s bull kicked in, when it came to dinosaur morphology Gish often seemed inversely attuned to the course of paleontological discovery. Dinosaurologists kept digging up the very things he insisted couldn't be true.[31]

For his remaining dinosaur example, the Cretaceous "duck-bill" hadrosaurs, Gish refocused his telephoto again, on their teeth:

> If these dinosaurs had evolved from a thecodont reptile or from an ordinary dinosaur, then surely we would be able to find numerous transitional forms in the fossil record showing, for example, duck-bills gradually evolving from ordinary jaws and teeth. Not a single such transitional form has ever been found. All of the duck-billed dinosaurs appeared fully formed, offering positive evidence for creation.[32]

Yet the flattening of the toothless premaxilla bone that constituted their "duck-bill" was found to an increasing extent as you moved from the small ancestral hypsilophodontids in the Early Cretaceous, through the larger camptosaurids and iguanodontids, and finally into the true hadrosaurs of the Late Cretaceous. The developmental process involved was actually quite modest, as a comparison of an adult *Hypsilophodon* with an infant *Maiasaura* hadrosaur suggested. Their dental arrangement also showed an evolutionary progression from the jaw layout of the hypsilophontidae, adding a more complex battery of replacement teeth in the next group, the iguanodontids, which resulted in the full-blown layout of the final duck-bills. As Gish drew no connections between the hadrosaurs and any of those antecedents, it would have been difficult for him to spot the transitions.[33]

What makes the hadrosaurs of particular interest for the Creation Science debate, though, concerns what Gish had written about them in his earlier book, *Dinosaurs by Design*. On that occasion teeth mattered less than their unusual, and often convoluted, crests: "No one really knows what purpose was served by the bony crests on many of the duck-billed dinosaurs. Scientists have offered several different ideas. The bony structures on all of these dinosaurs were hollow and were connected to their noses by tubes. We don't know either, but later on when we talk about 'dragons,' we are going to make an interesting suggestion."[34]

Gish never did get around to explaining what those "several different ideas" might be that scientists put forward (most notably thermoregulation and as resonating chambers for low frequency herd calls).[35] But he was especially loquacious when it came to his own suggestion. To appreciate the full scale of what "interesting" contribution Gish had in mind for hadrosaur paleontology, it is worthwhile quoting in its entirety. Though not nearly so entertaining as *King Kong* or *Dragonslayer*, Gish's creationist sideshow was unintentionally quite hilarious—something of a "Mystery Creation Science Theater":

> Dinosaurs, Dragons and Beetles—a really dumb title? What in the world do they have to do with each other? A lot more than you'd think. Read on, you may be surprised.
>
> Stories of dragons come from people all over the world, not from just a few isolated places. The tales come from the oldest of traditions and history. They were part of the cultures, and, in many cases, their religions.
>
> Dr. Henry Morris writes in his book *The Genesis Record*:
>
> > The frequent references to dragons in the Bible, as well as in the early records and traditions of most of the nations of antiquity, certainly cannot be shrugged off as mere fairy tales. Most probably they represent memories of dinosaurs handed down by tribal ancestors who encountered them before they became extinct.
>
> It would be very hard to believe that so many people from so many different places could have come up with such similar stories and similar descriptions if such things never really existed.
>
> According to ancient stories, dragons came in many shapes and sizes. Some could fly, some could swim, while other breathed fire.
>
> Nebuchadnezzar had a dragon called Sirrush carved into the Ishtar Gate in Babylon. Dragons were very common subjects for statues, carvings, and paintings.
>
> In the East (China, Japan, etc.), dragons were revered and considered to bring good luck. Dragons of Imperial China were believed to attend the births of wise emperors and philosophers. A great blue dragon was said to hover over the house where Confucius was about to be born. The bones and teeth which they thought belonged to dragons were ground up and used as medicine.
>
> They said dragons laid eggs. (Remember, dinosaurs also laid eggs.) However, these young Chinese dragons, according to legends, were believed to incubate in the egg for 3,000 years before hatching.

In most of the rest of the world, dragons are symbols of evil and destruction.

When it comes to dragon stories, few images are as interesting as St. George and the dragon. There are many famous paintings immortalizing the dramatic moment when St. George drove his spear into the fierce but doomed dragon.

But what is the story of St. George? When did he live and what events led up to the famous event?

The story begins approximately between the years A.D. 250 and 300. It seems there was living in a great lake a terrible dragon with breath so bad it poisoned the countryside around the lake. The local people were forced to feed this beast two sheep a day to keep it content. Pretty soon they ran out of sheep and, so the story goes, began feeding it their sons and daughters. Well, they ran out of those, too. In desperation, they took the king's daughter and tied her to a stake in the field to wait for the dragon to come and eat her.

It was her lucky day because St. George just happened to be passing by. He saw the king's daughter tied up and crying, so he went to investigate. She warned him to run for his life since there was no point in both of them being eaten. Well, St. George, being a brave man, met the dragon head on and drove his lance through the dragon's evil heart. Because St. George gave the glory to Christ for the victory, the princess and then the entire population were baptized as Christians.

How much of this legend is true? We may never know how much is fact and how much is fantasy. Legends are stories about things that happened long, long before the people later telling the stories were even born. Nobody can really know, then, whether or not the stories are true, because nobody now living was there to see whether those things actually happened. Many legends, however, are believed to be about things that really did happen, although all the details in the story may not be true.

This is one of those legends that probably has a lot of truth in it. We know St. George was a real man who lived during that time period, and unfortunately we have the record of his martyrdom (put to death because of his faith) on April 23, 303.

St. George was held in the highest regard by the crusaders, and in 1350 was made patron saint of England. Great churches were named after him all over the world. We may never know the exact truth, but you can be sure he did something very special and brave.

The "dragon" in this illustration is the meat-eating Baryonyx, a dinosaur whose fossil remains were discovered in Great Briton [*sic*] in 1983.

God has given many animals living today very specialized and effective defense capabilities that have nothing to do with teeth or claws. If the fossil skeletons of a skunk, porcupine, or an electric eel were dug up by a scientist who had never seen a living animal, would he have any idea that these animals had unique defense mechanisms?

In Job, there is a terrible animal described, called a "leviathan," that could not be stopped by swords or spears. The Bible describes a very unique defense mechanism:

> His sneezings flash forth light, and his eyes are like the eyelids of the morning. Out of his mouth go burning lights; sparks of fire shoot out. Some goes out of his nostrils, as from a boiling pot and burning rushes.
>
> *Job 41:18-21*

Legends about fire-breathing dragons may have had more to them than you think.

Remember the duck-billed (or hadrosaurs) dinosaurs, on pages 38 to 41, that had bony crests or inflatable sacs of skin connected to their nostrils?

> *Parasaurolophus* had a great bony crest with hollow chambers. Perhaps a *Parasaurolophus* could combine chemicals in his hollow crest and spray a combustible mixture, which would spontaneously ignite when contacting the oxygen in the air. Just think of how offensive a 5-ton dinosaur could be! If this sounds a little farfetched, let me tell you about a very special little beetle that is only about half an inch long.
>
> The bombardier beetle has a marvelously complex and extremely effective defense mechanism. When threatened, he sprays a vapor, out of miniature cannons in his tail, that is not only noxious but is heated to 212° F. When predatory ants, spiders, birds, frogs, or mice get a face full of this hot, irritating gas, they back off quickly and leave him alone.
>
> The bombardier beetle has twin chambers at the rear of his body, in which he stores two chemicals—hydroquinone and hydrogen peroxide in dissolved water. If a chemist mixes these two chemicals, the hydrogen peroxide oxidizes the hydroquinone and the mixture looks like brown soup. The bombardier beetle adds a mysterious inhibitor which prevents the hydrogen peroxide from oxidizing the hydroquinone. In the beetle, this mixture of chemicals is combined with no reaction at all. The solution remains crystal clear.
>
> When the bombardier beetle is threatened, he squirts the chemicals from the two storage chambers into two combustion tubes. In the combustion tubes, the beetle provides two enzymes—catalase and peroxidase. (An enzyme is a catalyst which makes a chemical reaction happen rapidly, without any change in the catalyst.)
>
> The chemicals and catalysts react to form another chemical, called quinone, which is very irritating. All of this happens extremely quickly in the bombardier beetle's combustion tubes, heating the liquid and gases up to 212° F., and generating a lot of pressure. When the pressure gets high enough, the bombardier beetle opens the valves on the end of his combustion tubes, and the hot gasses shoot out with great force. Scientists using special high-speed cameras have recorded both audible pops and puffs of smoke when the bombardier beetle sprays. They have also discovered that some species emit sprays in violent pulses at the rate of 500 feet per second.
>
> If a tiny beetle can do something this impressive, what could an animal as large as a *Parasaurolophus* do? Those hollow crests must have been used for something. Why not a method of defense?
>
> The little bombardier beetle is a mighty argument for creation. His defense mechanism is so complex and exacting that if it doesn't work *exactly* right, he could explode! Evolutionists believe that he evolved from an ordinary beetle by a series of thousands of genetic mistakes (mutations). Besides the fact that all mutations are bad, the first time one of those intermediate beetles mixed the chemicals together, without the whole system in place. He'd blow up. End of beetle family line.[36]

This farrago far transcends merely being "a little far-fetched." It was both gratuitously stupid and tendentious. Supposing that the lambeosaur branch of the hadrosaurs did possess some hitherto unknown mechanism for producing flame (with no counterpart observed in any living vertebrate), how would that explain the nasal arrangement? If the air chambers were where the (unspecified) chemicals were mixed, unless there were membranes and valves the contents would leak out. So to use the crests for the purpose Gish suggested meant actively *blocking* the breathing path to the nose.

Parasaurolophus was shown defending itself from an unidentified attacking carnosaur (judging by its horned snout and three fingers, apparently a *Ceratosaurus*, a Late Jurassic form that lived about 60 million years before the lambeosaurs) by spraying fire from its *mouth*. That anatomical detail is another problem for Gish's argument, given that the air intake connects back in the

vertebrate throat—as even the cross-section illustration of the skull in *Dinosaurs by Design* indicated. Unless the animal was going to risk incinerating its own innards, the supposed flaming apparatus would be more reasonably positioned near the snout. But that would leave the shape of the nasal crests completely unaccounted for. After all, they "must have been used for something."[37]

Gish's foray into comparative anatomy on "unique defense mechanisms" was similarly coy. Porcupines use their quills defensively, but they do have to have quills to begin with to perform the trick, and that trails back to the presence of mammalian hair. Nor does the shocking system of eels exist apart from the quite widespread acuity of electrical fields found in aquatic animals, including sharks, rays, and some bony fish. It is interesting that while the monotreme platypus has been able to develop electroreceptors in its beaklike snout, the placental dolphins have adapted their acoustic specializations to hunt for concealed prey with ultrasound, not electrical fields. Natural adaptations don't occur willy-nilly except in the fantasy world of Creation Science.[38]

This was certainly true for the bombardier beetle, only one of many insects that marshal for defense a plethora of chemicals being produced for other purposes. Quinones in particular play a pervasive role in insect metabolism. They are found in the salivary sheaths of plant-suckers like aphids, are used as a general brown pigment, turn up as a substrate to anchor egg cases, along with providing the cross links that firm up their outer body cuticle.[39] That they also taste terrible is a handy side effect the bombardiers have pressed to good advantage, though their fellow beetles have a wide arsenal to chose from:

> Ground beetles (the Carabidae) possess defensive glands at the posterior end of their body that produce a variety of hydrocarbons, aldehydes, phenols, quinones, esters, and acids, which are released as a stream from the abdominal opening. The large African carabids *Anthia* and *Thermophilium* are brimming with formic acid, the same chemical deterrent employed by and named after ants, and they deliver their caustic loads with amazing accuracy from the tip of the abdomen.[40]

So all the component parts involved in the noxious package were part of the beetle kit bag. But was Gish correct in contending everything had to function "correctly" to prevent the bombardier combination from *exploding*? Gish relied on creationist Robert Kofahl's inaccurate translation of the original research on the bombardier beetle to insist the hydroquinones and hydrogen peroxide were themselves explosive unless mediated by a catalytic inhibitor. (The two actually react only slowly together, and would appear to require exposure to air for the brown quinone pigments to more actively settle out.) When informed of the goof Gish accordingly revised his lecture text and eventually adjusted the printed versions, such as the one in *Dinosaurs by Design*.[41] But he still framed the outcome as if all intermediate evolutionary stages had to lead to the beetle blowing up—hardly surprising, since Gish was the one defining the arbitrary steps. For instance, one scenario presented in *The Amazing Story of Creation* involved the reactants coming together without an escape outlet, a peculiar condition indeed given the structure of the existing beetle pygidial glands.[42]

A clue to how the present system could have emerged comes from knowing in detail what was going on down in the bombardier's reaction chamber. As Lorus and Margery Milne explained in their 1980 book *Insect Worlds*, "peroxidase causes the hydrogen peroxide to decompose into water and free oxygen, while catalase helps the hydroquinines change into toxic quinones and hydrogen. At the instant of the explosion, the hydrogen and oxygen combine to form water and release energy."[43] Understanding that it's only the final hydrogen/oxygen reaction driving the steamy expulsion of the quinones allows for the component chemicals to come together incrementally without triggering beetle detonation.[44]

One of the few times Gish was caught *comparing* animal forms, and he bungled the job. He had given no more consideration here to the physical ramifications of his "interesting suggestion" than Tomoyuki Tanaka did when he had *Godzilla* vomiting radioactivity. Except that the 1950s Japanese director was not trying to pass off his particular theatrics as science.[45] Gish's *Parasaurolophus* was a creationist stage prop, and a puerile chimera at that—part transparent bid

to give some substance to the idea that fire-breathing dragons might really have existed, but also as a slim excuse to field a favored hobbyhorse, the bombardier beetle. It reminded me of the scene in *The Mikado*, where fictitious relatives were included in a cover story as corroborative detail to "give artistic verisimilitude to an otherwise bald and unconvincing narrative."

Reduced to rummaging around the mythology bin, Gish demonstrated how Scientific Creationism concedes nothing to von Däniken's Ancient Astronauts or Charles Berlitz's Bermuda Triangle when it comes to strained interpretation. Conventional Biblical scholarship concurs with the naturalists who believe that Leviathan may have been a garbled account of whales.[46] Their blowhole sprays could easily have been mistaken for real steam, which subsequent retelling might exaggerate as internal fire. But as Gish had need of a Biblically acceptable incendiary dragon, and the marine Leviathan was the only character at hand, he had no alternative but to quote just enough of Job 41 to justify having the distinctly terrestrial *Parasaurolophus* flame broil a few carnosaurs.[47]

Flood proponents have to show similar care when it comes to snaring that other formidable Biblical pest, the Behemoth of Job 40. As a dangerous grass-eating marsh denizen it would appear a reasonably fair description of a hippopotamus, a tremendously strong animal perfectly capable of snapping small boats in half with its jaws when annoyed. But Creation Scientists have decided Job was describing the likes of *Apatosaurus* or *Diplodocus*, and to this end Paul Taylor was happy to provide some fancy footwork: "Today, some people have mistakenly guessed that the behemoth mentioned in the Bible might be an elephant or a hippopotamus. But these animals certainly do not have tails like the thick tall trunk of cedar trees!"[48] Unfortunately, neither had Behemoth, for Job had only claimed the beast could stiffen its tail "like a cedar," not that it had the dimensions of one. But of greater concern in the misplaced concreteness department was the fact that Job had said nothing about Behemoth having either a long neck or an especially huge body—features one might have thought particularly hard to miss for anyone looking at one. And diplodocids didn't have teeth suited for cropping grass, either, and didn't live in marshes. Other than that—a perfect match.[49]

Once an apologetic strategy was adopted where *any* evidence was better than *no* evidence, there was nothing to impede the Creation Science freefall into full-blown pseudoscientific credulity. As if the mere existence of a contemporary prehistoric animal would somehow offset their otherwise barren fossil argument, Paul Taylor, Duane Gish, and Scott Huse gamboled down the cryptozoology trail pioneered by Ogopogo and Bigfoot hunters. Each showed a photograph of the heavily decayed remains of a "possible plesiosaur" caught at sea in 1977 (though Gish dispensed with the "possible" qualifier). Writing in the period 1987 to 1997, none offered any alternative conventional explanation.[50] Yet the very Japanese team whose initial enthusiasm had sparked the flap had continued their research, analyzing the animal's preserved parts, and in 1978 had issued a report conclusively identifying the "plesiosaur" as a large basking shark, *Cetorhinus maximus*.[51]

Anyone primed to perceive Behemoth and Leviathan as "very explicit descriptions" of dinosaurs and marine reptiles, as John Morris put it during the 1993 "Creation Week" broadcast, had no compunction about swallowing whole the "worldwide" (actually Eurasian) legends of dragons. To this end Paul Taylor provided an extensive, if poorly referenced, hearsay laundry list—replete with dinosaurian dragons, pterosaurs as the "flying snakes" Herodotus heard infested Arabian frankincense groves, and of course the aforementioned sea monsters. Some of Taylor's bestiary required artful posing, however, such as when he decided the hadrosaur *Edmontosaurus* resembled a small and problematically vague Grand Canyon Indian rock carving. All that had to be done was paint the dinosaur with head contorted, its large arms pulled down so as to match the lack of them on the drawing, and arbitrarily bending up the end of its tail to fit.[52]

The telling irony was that not one of the creationist trio considered the obvious way belief in dragons really did relate to prehistoric beasts. Consider what would happen in ancient China were someone to encounter the weathering bones of a long-necked fossil sauropod. What other interpretation would they have given it but as some extraordinary dragon?[53] Over in Europe, until the advent of modern paleontology such deposits were routinely mistaken for dragons, natural geological sports, or (huzzah) remnants of the Deluge. As late as the 1730s Swiss naturalist Johann Jakob Scheuchzer was sure he'd found a human "witness of the Flood." A century of paleontology later, Cuvier recognized it as an extinct giant salamander.[54]

In his own survey of dragon lore, paleontologist Peter Wellnhofer noted how a 1678 German dragon painting could easily have been inspired by the long necked plesiosaurs visible as fossils from the nearby Jurassic strata in Württemberg. And a late 16th century Austrian "dragon" sculpture was evidently based on the discovery of an ice-age woolly rhinoceros skull.[55] Nor are dragons the only mythical fauna traceable to fossils. Prospectors passing through the Gobi Desert in search of gold in the nearby Altai Mountains may well have conflated sightings of weathering *Protoceratops* bones into tales of the gold-guarding griffins.[56]

Why are Biblical creationists so hooked on such rigmarole, especially at the risk of committing "misplaced concreteness" of von Däniken proportions? Why not just cut to the chase and trot out some solid physical evidence that dinosaurs and humans were contemporaries who perished together in the Flood? Sauropod carcasses washed into ruined villages, perhaps? Theropods caught gnawing on sinners as the sediments overwhelmed them? How about a few human artifacts swept among the coastal trilobites as the continents were convulsed—that sort of thing. Creation Scientists prove that dinosaurs and humans never met for the same reason Kurt Wise failed to address the therapsids when he had his chance at bat. There are simply no corroborating fossils like that for Biblical creationists to muster in favor of their "Alley Oop" model of earth history. That's why we never read about them.[57]

The closest Flood advocates ever got to a "smoking gun" were the Paluxy River "man tracks" supposedly interspersed among the dinosaur prints preserved along a stretch of river bottom at Glen Rose, Texas. Roughly 100 million years old, the Paluxy tracks would fall in that "Middle Cretaceous" zone Gish mentioned, occurring at the boundary of the Early and Late Cretaceous. Initially spotted in 1908, the tracks were first scientifically studied in the late 1930s by paleontologist Roland Bird.[58] The notoriety given Bird's Paluxy finds prompted a brief flurry of interest in "mystery tracks" (anything vaguely resembling a human hand or foot), which creationists eagerly siphoned off as evidence for antediluvian man.[59]

A few of the natural prints at Glen Rose were shaped enough like a human foot to start the creationist ball rolling. This process was assisted over the years by several enterprising locals who improved on the fossil record by carving some tracks of their own (ones with more conspicuous toes) either *in situ* or as individual footprints in blocks extracted from the site. Such artificial prints (along with casts of them) have circulated among the creationist fringe ever since, especially the "Burdick" print, named for Clifford Burdick, one of the original promoters of the authenticity of the Glen Rose "man tracks."[60]

In another classic instance of missing the forest for the trees, the creationists who jumped on the Paluxy tracks to fill their own "gap" ended up focusing far too tightly on the individual prints to listen to the paleontological story the tracks were trying to tell. Such as claw impressions mysteriously associated with the "heels" of these antediluvian pedestrians. Or how theropods normally walking on their toes (digitigrade) might occasionally flatten their whole foot on the ground (plantigrade). This became clear enough when you followed the whole track course, where the "human" feet merged into the typical three-toed theropod layout.[61]

It took a considerable amount of prodding by skeptical investigators like Glen Kuban to get some Young Earth creationists to examine the site personally. To their credit, many eventually did bow to the facts and gave up on the Paluxy "man tracks" as evidence dinosaurs and people coexisted. This did not mean those Scientific Creationists were abandoning their *belief* that dinosaurs and people coexisted—only that they stopped citing the Glen Rose prints as proof.[62] John Morris was a case in point. Appearing on the same 1993 "Creation Week" broadcast as Duane Gish, the younger Morris was no less convinced dinosaurs strode up Noah's gangplank, as he was before when he accepted the "man tracks" as authentic. Creation Science simply shut up about them, leaving the sideshow barkers, like Kent Hovind, to plug away with the prints on their church lecture circuits as if nothing had happened.[63]

Creationist "Geology" and Richard Milton

This combination of selective amnesia and evangelical compartmentalization means Creation Science never dwells on its own mistakes long enough to learn anything from them. Such hastiness

is an appropriate failing for a doctrine whose inherent flaw is its misconception of *time* and the role it plays in geological processes. It's one thing to claim that some deposits may have been laid down under catastrophic circumstances. Flood Geology mandates far more than that. It requires that virtually *all* fossil-bearing formations are the product of cataclysm. And then goes way beyond that to insist these strata were produced in one grand gush, during a constricted period of, at most, a few hundred years occurring sometime around 2350 BC.[64]

An amazing proposition, to be sure. However, saying it don't make it so. A lot of serious groundwork will have to be established first. Not least of which would involve explaining what was wrong with the initial reasoning that led to the acceptance of the modern geological system in the first place.

The problem began with observant late 18th century naturalists like James Hutton, who couldn't help noticing geological "unconformities" in their own backyard, such as Siccar Point in southern Scotland. Here was more than just a jagged spur of rock. Obviously ancient deposits had been radically tilted and eroded—then further sediments laid on top of those, well weathered in turn. Now how long would it take to bring that sort of thing about? Evidently longer than the few thousand years available if the Biblically calculated age of the earth were taken seriously. It was because of features like Siccar Point that the first cracks began to appear in the static Biblical chronology.[65]

And how do Scientific Creationists deal with the historical development of modern geology? They don't. It's a complete non-subject for them. Although the names of Hutton and Lyell do surface from time to time in works from Morris' *Scientific Creationism* to Huse's *The Collapse of Evolution*, they appear only as icons of the uniformitarian view, not as scientists who might have had a fact or two lurking behind their opinion. By acting as if the founders of modern geology had presented no evidence at all, Creation Science failed again to play that fairness game—the one where you're supposed to at least try to check the pulse of your opponent's presentation before jumping in with the obituary.[66]

Whether Creation Scientists believe historical geology has no evidential foundation or merely adopted that mythology as a tactical dodge is beside the point. The effect is to spare Flood Geologists the laborious homework of actually having to impeach the uniformitarian argument directly. Why bother anyway, when the outcome is known. As Morris put it in his 1963 work *The Twilight of Evolution*: "The Biblical framework, therefore, requires that we categorically reject the fossil record as a record of the history of the *development* of life on the earth. It cannot possibly be ascribed to the period and events recorded in the first chapter of Genesis, during which God was creating the heavens and the earth and everything in them."[67]

Not much wiggle room there. Playing now the Queen of Hearts from *Alice in Wonderland*, it can be seen that Morris was ready at the first deal to lop off the uniformitarian head on Biblical grounds alone. "Sentence first—verdict afterwards." With the Flood ordained as the default condition, he could dismiss the century of hard scientific work that established the foundation of contemporary geology as merely a specious ideological interlude:

> This was, in fact, exactly the interpretation placed on the fossil record for several generations prior to the time of Lyell and Darwin. The philosophy of uniformity and evolution later displaced "flood geology," but this was more on the basis of philosophical preference than scientific necessity. In view of all the considerations outlined above, especially the scientific weakness of the theory of evolution and of geological uniformitarianism, we propose that a return to a clear-cut doctrine of Biblical creationism and catastrophism is amply justified at this time. It is recognized that there are many serious problems involved in such a position, and that we do not by any means have all the answers to these problems as yet, but the basic framework seems much more realistic than that of evolutionary uniformitarianism, and the problems and objections much less serious.[68]

Now there was an understatement. Creation Scientists weren't able to account for specific fossil formations then, or even for why there was *rock* to begin with. Their certainty that the Flood was responsible for it all was based on nothing more substantive than was their conviction about dinosaurs aboard Noah's Ark.[69] And the years since 1963 have not been kind. The "serious problems" for Flood Geology have only accumulated, because mainstream geology has been far from idle. Just as the space program turned prior works written about the planets into decorative bookends, so too geology underwent an upheaval as plate tectonics swept through the field, explaining everything from mountain building and mineral deposits to volcanic seamounts and earthquake distribution. Obsolete as it was when it first appeared, the twentieth 1996 printing of Morris' *Scientific Creationism* could truly be described as *antediluvian*.[70]

The 1980s were awash with splendid science, especially in dinosaur paleontology, yet none of that percolated through the clogged interstices of Flood Geology. That was because fossils were regarded as inherently catastrophic and therefore tautologous proof of the Deluge, never mind the specifics. That's how Henry Morris approached this quartet of dinosaur formations in *Scientific Creationism*:

> And what about the great beds of dinosaur bones, found on practically every continent? Dr. Edwin Colbert is probably the chief authority on dinosaurs, and the following are typical quotations from his writings:
>
> 1. *In New Mexico*
>
> > "As the layer was exposed (the workers cut a large scallop into the hillside) it revealed a most remarkable dinosaurian graveyard in which there were literally scores of skeletons one on top of another and interlaced with one another. It would appear that some local catastrophe had overtaken these dinosaurs, so that they all died together and were buried together."
>
> 2. *In Wyoming*
>
> > "At this spot the fossil hunters found a hillside literally covered with large fragments of dinosaur bones…. In short, it was a veritable mine of dinosaur bones…. The concentration of the fossils was remarkable; they were piled in like logs in a jam."
>
> 3. *In Alberta*
>
> > "Innumerable bones and many fine skeletons of dinosaurs and other associated reptiles have been quarried from these badlands, particularly in the 15-mile stretch of river to the east of Steveville, a stretch that is a veritable dinosaurian graveyard."
>
> 4. *In Belgium*
>
> > "Thus it could be seen that the fossil boneyard was evidently one of gigantic proportions, especially notable because of its vertical extension through more than a hundred feet of rock."
>
> Similar dinosaur graveyards are found on every continent, all over the world. Again the uniformitarian is challenged to point to any such phenomena occurring anywhere in the world today.[71]

Here is where the armchair paleontology of Creation Science wore really thin. That Colbert might have been indulging in a certain hyperbolic prose when it came to conveying his enthusiasm to a general public would have been apparent had Morris not tactfully left out every revealing particular. His first example, the Triassic period Ghost Ranch formation, was indeed a *local* catastrophe, as a few numbers would have quickly established. Nearly all the animals found where *Coelophysis*, a small theropod about ten feet head to tail. An adult weighed around sixty pounds,

roughly that of a collie, and many of the specimens were juveniles, meaning the hundred that were dug up didn't take up much space. The whole quarry was 6 x 20 meters—about the dimensions of a typical suburban tract home.[72]

Anyone who has seen the piles of dead African wildebeest or Canadian caribou drowned trying to cross a river in flood during one of those "slice of life" PBS nature specials should have no trouble envisaging what can happen to a dense pack of panicky *Coelophysis* caught in the rain. All that needs to happen is for some of the carcasses massed under such circumstances to be preserved, once in a while.[73] Which meant Henry Morris needed to explain in clear terms why such things weren't to be expected in the fossil record—not continuously, of course, but *occasionally*. For the Flood argument to hold water, as it were, it is necessary to insist that such natural concentrations *never* occur, and that the observed processes of deposition and preservation are physically incapable of accounting for them.[74]

The big problem for Creation Science here has to do with that geological history they are so unmindful of. A lot has been learned over the last century about the ways in which wind and water conspire to cement particles in very characteristic formations. Geologists are able to identify beds laid down by swift young rivers, ones occurring in tidal estuaries, along meandering floodplains, or as the result of desert sand dunes.[75] These processes have even been observed experimentally, as I saw some years ago during an extended series of crushingly thorough geology programs presented on our local educational cable system. By varying the rate of flow and the constituents, the distinguishing configuration of water and wind borne sediments were recreated in the lab.[76]

So field workers do not require a divining rod to identify particular formations as floodplains, which included Morris' next two examples, the Late Jurassic Como Bluff in Wyoming and the Late Cretaceous Red Deer River in Alberta.[77] Animals dying naturally in such a non-catastrophic environment would from time to time get snagged on meanders and sandbars, where you'd expect bits and pieces to show up more often than complete skeletons. Keep that up for tens of thousands of years and you can get quite a pile, although concentrated assemblages like those at Ghost Ranch would still be unusual, and may not turn up at all. As there are no mass graveyards at Como Bluff or Red Deer, only the litter of body parts, these two sites actually work against the catastrophic Flood model Morris was trying to advance, where complete specimens ought to be the rule not the exception.[78]

As paleontologists know from sweaty experience, the fossil reality is the opposite of the catastrophist mythology that massed dinosaur bone beds of the Ghost Ranch style are the norm. Finding an articulated specimen is so out of the ordinary it's cause for breaking out the champagne. That was the situation with Morris's fourth example, the celebrated mother lode of Early Cretaceous *Iguanodon* skeletons discovered in the 1870s lodged 900 feet underground in a coal mine at Bernissart, Belgium. Remains of thirty-nine were recovered in all, many of them completely articulated. But again, under what conditions? At just the time Morris was chalking them off as more Flood residue, the living world authority on *Iguanodon*, David Norman, had this to say about them:

> One rather misleading aspect of the way of life of *Iguanodon* relates to the discoveries at Bernissart. The concentration of skeletons at Bernissart has been used as evidence that these animals lived in herds, and in the case of Bernissart that they plunged into a ravine after being stampeded by a predator, or some other dramatic event. Unfortunately, appealing though the story is, it is certainly not what happened at Bernissart. Re-study of the material has shown that there was no ravine to fall into, the skeletons simply collected in a marshy or lake-like depression; furthermore there was no large herd, but rather there were separate phases of deposition, with carcasses being washed in and buried from time to time.[79]

But such humdrum conclusions are not at all what catastrophists want to hear, so they pay no attention to them. That was the fascinating case recently with British antievolutionist Richard Milton, who casually absorbed Henry Morris' version of dinosaur taphonomy while skipping David

Norman's sizable contributions here, especially apropos the paleontologist's own acknowledged specialty.[80] Although very adamant about not being a "creationist" of Biblical stripe, when it comes to buying into the gaudier novelties of Young Earth geology Milton nonetheless does a pretty convincing impression of one.[81] As Henry Morris represents the Queen of Hearts face of Biblical catastrophism, where offending foliage is summarily repainted to match the strict Creation Science esthetic, so Richard Milton offers us the secular sequel of the White Queen in *Through the Looking Glass*. Perfectly capable of believing "six impossible things before breakfast," Milton breezed through his checkerboard strata with mad math logic like this:

> The very size of some specimens, such as the larger land-living dinosaurs makes it absurd to suppose that they could have been preserved in a few millimeters of sediment. To preserve by burial an adult brontosaurus, or diplodocus, would require tens of meters of sediment, and these quantities can only be explained by catastrophic rather than uniform deposition.[82]

Although Milton got it into his head that a Jabberwocky Class sixty-meter "brontosaurus" existed, a normal adult *Apatosaurus* actually runs about twenty meters long.[83] Customary behavior for dead sauropods would involve extended periods being flat on their side, in which circumstance approximately *two* meters of sediment would serve to cover the corpus diplodocid. That is, assuming you were dealing with a complete carcass in the first place—something not at all common outside the confines of Wonderland. Which is why the London Natural History Museum has a *cast* of a *Diplodocus* in their main hall for Milton to mismeasure, rather than a type specimen they'd dug up themselves.

Now the only way for "tens of meters of sediment" to be required for this operation would be if the animal were stuck in the ground vertically like a tent stake, perpendicular to the bedding plane. While so distinctive a pose would be a solid point in favor of the cataclysmic interpretation, there is one minor paleontological snag to overcome: no fossil sauropods have ever been found that way. When I posed this conundrum to Milton via e-mail his reply was to ingenuously remind me of the Bernissart *Iguanodons*—evidently still unaware that those much smaller (non-sauropods) weren't deposited that way either. The downside to not reading David Norman thoroughly.[84]

That natural processes are fully capable of dumping a few meters of sediment on large obstacles now and then is amply supported by observations from the real world, one of which I pointed out to Milton. Back in the 19th century a riverboat stranded on a Mississippi sandbar was abandoned as not worth the trouble to salvage. Some years ago diligent archaeologists located the buried hull, and the media reported their discovery with pictures of busy bulldozers plowing down through the meters of sediment now covering the wreck. But the really interesting thing about all this was where the dig was taking place: not in the river, or even at its edge, but well back on a farmer's field. For the Mississippi River had done more than just lay down matter quickly enough to entomb the hull—the river had in the meantime completely shifted course, at which point the sedimentation process *stopped*.

The implications of this were bad news for Milton's catastrophic conception of geology, especially when it came to his idiosyncratic notion that only "a few millimeters of sediment" were available to do the dirty work. The origins of that idea were explained some pages earlier, where Milton exhibited some applied mathematics:

> Curiously, too, no geologist seems to have checked out the geological column dates with an electronic calculator on a commonsense basis. Let us go back to the illustration of the column in Figure I and look again at the thickness of the rocks in each period compared with the length of time assigned to those periods. Note that there is a remarkable consistency between assigned age and thickness of deposit. For instance the Cretaceous period is said to have lasted 65 million years and is 15,000 meters thick—an average annual rate of deposition of 0.2 millimeters. Now look at the Silurian period: this, too, yields as average rate of deposition of about 0.2 millimeters per year—as does the Ordovician, the

> Devonian, the Carboniferous, and the rest. It is only when we come to relatively modern times in the Cenozoic era that rates of deposition vary much, and here they appear to speed up slightly.[85]

Whether obtained by pocket calculator or long division, Milton's "commonsense" analysis of sedimentation was still based on two assumptions, both of them wrong. Taken in swaths of millions of years, geological formations are not deposited uninterrupted nor do they remain pristine. By his own reckoning 31,000 meters (a whopping 19 miles) of sediment had accumulated in one place or another since the Precambrian. View that stack as a unit and the average over 500 million years drops to only 0.06 millimeters annually—in other words, the farther back the spread was taken, the lower the average got (duh). This should have been a big clue about how sporadic deposition was and how much was being recycled—and why simply dividing the thickness into the time was a mistake to begin with. But Milton only recognized erosion in the abstract, and left it off the menu when it came to his numerical tea party.[86]

Supposing his calculations represented anything at all, they would yield at best a rough ballpark floor for the *minimum* rate of accumulation. But Milton had far grander ambitions for his opus, nursing it along until it meant something far from "average." In one instance it became the "typical" rate of sedimentation.[87] And later, picking on the Bernissart *Iguanodons* one last time, Milton morphed it into a functional synonym for the *maximum* value. "For their bodies to be rapidly buried would require rates of deposition thousands or even millions of times greater than the average of 0.2 millimeters per year proposed by uniformitarians."[88]

Except it wasn't uniformitarians who were proposing that rate—only Milton.[89] So had he finally ended up talking himself into thinking his own pet scenario wasn't even his idea? "Curiouser and curiouser."

Believing your own propaganda is the sorry fate of many a dedicated ideologue. That's what Henry Morris was up to when he similarly challenged the "uniformitarian" to point out where graveyards like those of the dinosaurs were being formed today. But working paleontologists come across buried life like that all the time, in pretty much the same spotty concentration as seen in the living world. Only if the digging invades older geological strata are the specimens likely to be fully fossilized, and of course it takes a long haul before you encounter those rarer "mass graveyards" catastrophists obsess on. Stick closer to the present, as anthropologists are prone to do, and the remains of associated animals still turn up, both peripherally and as human litter from those hunted for food or used as tools.[90]

As Christopher McGowan pointed out, the Creation Science difficulty here may be as simple as one of not getting out enough:

> We have already seen examples of pollen, leaves, and the occasional fish skeleton as fossils in the making on a lake bed in southern Ontario. For scuba divers, dead fish lying on the ooze at the bottom are not an uncommon sight, especially in poorly oxygenated lakes where there are no bottom-feeding scavengers. They can be seen in various stages of burial, all of them fossils in the making. When we discussed deep-sea cores we could have pointed out that the soft sediments at the top, the rocks in the making, are invariably crammed full with dead marine organisms, especially foraminiferans (minute shelled animals). Similarly, the hard rocks below, with which the soft sediments merge, are replete with fossils. Indeed, it is these fossils that give geologists clues to the mineral potentials of the rocks they are drilling through. For some other examples of fossils in the making we will visit some caves and a swamp on the other side of the world.
>
> While in New Zealand a few years ago, I spent a little time looking for moa bones. Moas are large, flightless birds, related to the emu, which became extinct some time during the period of colonization by Polynesians, that is, within the last six hundred years. Skeletal remains of moas, some with skin, dried meat, tendons, and even a feather or two still attached, are quite common in many parts

> of the country. The first locality I visited to do some exploring in caves was set in rolling chalk country just outside Wellington. These were not the great underground caverns that come to mind when we think of caves, but rock fissures and sinkholes, most of them just about large enough to clamber down into. Because their openings are often easily overlooked, they form natural traps, and the soil which accumulates at the bottom is a veritable graveyard. Aside from moa bones, I found remnants of kiwis (still living in New Zealand), *Sphenodon* (the lizard-like animal mentioned in Chapter 3 as an example of a "living fossil"), several ground-dwelling birds, and, in one cave, a particularly smelly sheep. I am sure that the sheep regarded his neck-breaking plunge to the bottom of the cave as catastrophic, but I doubt whether it was accompanied by bolts of lightning, tempest, and all the usual trappings of a good old-fashioned catastrophe.
>
> A few miles outside the beautiful city of Christchurch, on South Island's Canterbury Plain, is a low-lying, swampy area called Pyramid Valley. Moa bones were discovered there in 1937 and since that time hundreds of skeletons, many of them complete and all of them extremely well preserved, have been collected. It seems that these great birds became mired in the mud, and many of the skeletons were found in an upright standing position, just where they had become trapped. Being mired in a swamp was certainly serious from the moa's point of view, but this could not be described as a New Zealand catastrophe, far less a global one.
>
> There is obviously nothing supernatural about fossilization. That is not to say that we thoroughly understand the process, because we do not, but we do not have to invoke catastrophes to explain it. Nor do we have to go far afield to see fossils in the making. All we have to do is know where to look, and how to see. The problem is that creationists have never taken the trouble to look for fossils in the making, and they are the very ones who are telling us that they just do not exist.[91]

For those moas their excavation permanently interrupted the fossilization process. Had they been allowed to steep for a few million years, as more and more sediment piled up on them, the deposit would have seemed a ripe candidate for a future *Lagerstätte*. By then geologists ought to have figured out a bit more about the finer points of their preservation—much as in our own times solutions have come for such persistent puzzlements as why water expands when it freezes, or how bumblebees are able to fly with only stubby wings.[92]

But we can also be reasonably certain that if there is a Scientific Creationism in that far-off epoch (and the psychology of man suggests no reason why not) the works of Henry Morris *et al*. stand a good chance of still being in print. Unrevised and even farther behind the scientific times, perhaps, but such is the legacy of *ideological* fossilization.

One can appreciate the problem Biblical creationists are up against here, literally between the rock and a hard place. It's one thing to imagine that pressure and time could force sediment into new configurations, or twist and fold existing strata, bringing fossil shells to mountaintops. It is quite another to suppose the muck resulting from the Deluge only 4300 years ago would have done anything but just sit there, like the amorphous debris field left over from the 1980 eruption of Mt. St. Helens.[93] The strains and grunts Flood Geologists have had to go through to keep the show moving often become quite labored, as the section on "Sandstones" Henry Morris put in *Scientific Creationism* illustrated:

> Sandstones once were loose sands, transported and then deposited by moving water. Sands, of course, are transported along river beds and beaches today by hydraulic action, but they only become sand*stone* under very unusual conditions. The primary requisite is the presence of a cementing agent, which would in turn require previous erosion and dissolution of materials containing such chemicals. If such a cementing agent were available, however, the

> transformation of a sand into a sandstone could be accomplished in a few hours (e.g., production of a cement sidewalk from sand, water and Portland cement), not at all requiring a million years of compaction!
>
> Furthermore it is significant to note that sandstone formations frequently cover wide regions. For example, the so-called "St. Peter's Sandstone" and its correlative formations cover practically all of the United States from California to Vermont and from Canada to Tennessee. Nothing like this is being formed today and it would seem that only a continent-wide flood could accomplish it.[94]

That was it. There were no references, no consideration of whether most sandstones could indeed congeal as quickly as sidewalk cement, or would end up looking the way they do under such conditions. Nor did Morris stop to explain why the geological view that sand can become hardened under compression by overlaying deposits was faulty.[95] Instead he waved a finger at the "St. Peter's Sandstone" as though there really were a single homogeneous deposit running like a linoleum floor from coast to coast. Gary Parker picked up on the same formation, though he adjusted its boundaries somewhat:

> Some geologic formations are spread out over vast areas of a whole continent. For example, there's the Morrison Formation, famous for its dinosaur remains, that covers much of the mountainous West, and there's the St. Peter's Sandstone, a glass sand that stretches from Canada to Texas and from the Rockies to the Appalachians. Sediment does build up slowly at the mouths of rivers, such as the Mississippi delta. But slow sediment build up could not possibly produce such widespread deposits, such broadly consistent sedimentary and paleontological features, as we see in the Morrison and St. Peter's formations. In this case, knowledge of the present tells us something happened on a much larger scale in the past than we see it happening anywhere today. That's not appealing to fancy; that's appealing to fact.[96]

Since neither Morris nor Parker thought to share any of their documentation on these "facts," it's hard to tell from what referent font they obtained their ideas about such continent-spanning sandstones. The Ordovician period "St. Peter's" appears to have skipped the intervening state of Colorado, for example, as the term doesn't even come up in one recent treatment, Halka Chronic's *Roadside Geology of Colorado*.[97] Nor is the Jurassic Morrison Formation something catastrophists ought to be wagging a finger at. Extensive it may be, but the formation is by no means "broadly consistent," representing a natural topography as varied as the present world, where pieces of Colorado look different from Wyoming to the north and Utah to the west. The varied features of the Morrison Formation (including the Como Bluff slice Morris used above) are believed by mainstream geologists to have taken some seven million years to accumulate, starting around 155 million years ago.[98]

The profound blind spot for Flood Geology is that features like the Morrison Formation are a preserved *landscape*, not a splash of Flood debris. Understanding that distinction is particularly important, for Creation Scientists can't have it both ways (though they try). They cannot have fossils being deposited in the slurry of an overpowering Deluge that still gently leaves intact all the fine details of meandering rivers in one place and sand dunes in another. The fossils are found *in* the preserved features, as real bones are seen to do in the living world—not in a hydrodynamically sorted wash laid on top of an earth scoured by turbulent Flood action. If they had been, the geological fingerprints would have been unmistakable, the record of the rocks impossible to ignore.[99]

The doctrinal certainty that the fossil record is a Flood story impels Scientific Creationism to plainly adopt the tactics shared with other pseudoscientific pursuits, where the convert hunting for "evidence" becomes attuned to seizing on the approved buzzwords. It's like the believers in lost advanced civilizations. Ever since Ignatius Donnelly decided there were globetrotting Atlanteans, any culture with the temerity to stick up a pyramid on their own was inevitably linked. That the

Egyptian and Mayan versions were built for entirely different primary purposes (tomb versus temple), along completely disparate architectural lines, and three millennia and one ocean apart, matters not to the dedicated enthusiast.[100]

Biblical creationists similarly have their eyes peeled for signs of "flood" or "catastrophe," quite unconcerned whether the author might have been discussing something unpleasant enough but far less transcendent and still perfectly natural: volcanic eruptions, earthquake-spawned tsunami, or even just an especially bad spring runoff.[101] The current Creation Science poster child in this area is the "Spokane Flood," a series of stupendous cascades released by collapsing ice dams from glacial Lake Missoula around 15,000 years ago. Torrents more than 500 feet high in some places carved distinctive channels through the volcanic rock, scouring the Palouse scablands as well as steep escarpments along the Columbia Gorge.[102]

Creation Scientists take all this as immediate proof of how even a teensy weensy flood can do stupendous damage—so imagine how much more *The* Flood could accomplish![103] Steven Austin pointedly invoked the Spokane Flood as model for the erosion of the Grand Canyon (positing his own giant post-Flood lake upstream). Unfortunately, the details of the Spokane example don't help much. The cataracts breaching from Lake Missoula left mammoth ripple marks in the bottom, while grinding the exposed terrain downstream to bedrock (the only topsoil being what has accumulated in the 12,000 years since the flooding sequence ended). The vast debris moraines and the litter of erratic boulders were originally mistaken for glacial deposition, which can produce similar features, though on a less Brobdingnagian scale. No one comparing the enormous nested V-shaped valleys of the Grand Canyon with the narrow sheer-walled channels of the Columbia Gorge should have reason to confuse the two.[104]

Those Creation Scientists who adopt the Spokane Flood for their own purposes are being as methodologically inept as they are factually wrong. The Spokane Flood was first recognized because geologist J Harlen Bretz (1882-1981) had both the imagination and the solid principles of his discipline in his favor. That it took a long while to convince his fuddy-duddy colleagues of this was a sociological phenomenon familiar to students of institutional bureaucracy, and not one of the technical propriety of Bretz's geological analysis. (That Bretz was also a pugnacious ass who antagonized everyone didn't help.) But Flood Geologists should understand that all too well, for their rigidity in adhering to the Deluge in spite of all evidence to the contrary far transcends any resistance mainstream geologists may have exhibited when it came to evaluating Bretz's Columbia flood two generations ago.[105]

Advertising the Famous Grand Canyon Hat Trick as Austin did, then trying to wire long ears to a Washington marmot as substitute when the Arizona rabbit skips off, was bad enough. But Flood Geologists don't even deliver on that performance. They have yet to show how the Deluge could deposit the upper fossil bearing strata and transform them into rock in jig time, *before* the surge came along to erode the canyon. That is one "Metamorphosis" no amount of practice will ever make perfect. An illusion of most demanding timing, its schedule will not accommodate *intermissions*. Unfortunately for the Creation Science magic act, the Grand Canyon has a big one.

Preserved in the Cambrian Tapeats, Bright Angel, and Muav formations are bands of marine fossils. These not only chronicled a very gradual rise in sea level—they remained in parallel when the rocks were subsequently tilted. Arthur Strahler considered this configuration the *coup de grace* for the Deluge theory of the Grand Canyon, for to bring this setup about meant having the Flood waters lay down a repeated sequence of parallel chevrons. It was the equivalent of having a mudslide sweep through a teashop and knocking over all the furniture—but ending up with every cup still in its saucer, fixed in place on the tipped tablecloths. It would have been genuinely fascinating to read a Flood Geology explanation for so unusual an arrangement, but this was one aspect of Grand Canyon stratigraphy that did not come up in Austin's book.[106]

The extent to which Scientific Creationists skirt around data like that is not likely to be recognized within the community of believers so long as clerical field agents like D. James Kennedy or Jerry Falwell mediate their views for the flock. *Darwin's Leap of Faith* by John Ankerberg and John Weldon was an unctuous example of that, illustrating the pitfalls of their relentless dependence on secondary citation. To support their claim that "Austin shows how a creationist/flood interpretation is superior to an evolutionary/uniformitarian model," they drew not on the book

itself, but on a creationist review in praise of it. With such insulating buffers as that, the compliant reader would never get within a mile of the facts.[107]

The conceit that all the earth's fossil deposits were produced under Flood conditions trips up on something else captured in the rocks of the world: volcanic ash. When lava erupts under water the surface quickly cools into a crust, extruding in spurts like toothpaste. It would be perfectly reasonable for such "pillow lava" to be formed during the Flood, though it would still have to be shown the eruptions took place uniquely around 2350 BC. But that positive caveat wouldn't apply to *airborne* ash. Any source volcano would have to be sticking out of the waves and the ash then settling out on dry land, two conditions Creation Scientists pointedly rule out. So the presence of interbedded volcanic ash and ejecta in fossil deposits would pose an intractable obstacle for Flood Geology. Little wonder then that Morris and company aren't anxious to dwell on the subject in their recent apologetic literature.[108]

Imagining the Flood as intermittent drippy faucet, or the churning waters parting like a curtain to permit fine ash to filter down unsoaked, is not quite the spectacle Creation Science had on the playbill. But such are the overlapping absurdities when trying to cram together events and processes that didn't actually happen all at once. It was like a deranged historical novelist resolving to compress all that took place at Fifth Avenue and 34th Street into one very hectic New York City afternoon. So the B-25 bomber slamming into the Empire State Building in 1945 terrifies "The 400" hobnobbing a thousand feet below in Caroline Astor's 1880s mansion, while thirty years' worth of hotel guests ring the bell, trying to simultaneously register at the original Waldorf-Astoria that existed in between.[109]

Farce, to be sure, but no more so than the ritual of historical denial Scientific Creationism performs as hundreds of millions of years are squeezed into one. Carnosaurs and hadrosaurs stomped the same North American real estate as *Dimetrodon* and friends had a hundred million years before, and early horses would roam fifty million years later. Yet somehow, a cataclysmic Flood capable of rearranging the global landscape left all the victims sorted in tidy strata as though the living earth were a game preserve fenced off to prevent interlopers—or a Darwinist theme park, deliberately arranged to illustrate the benchmarks of macroevolution. Creation Scientists are well aware that animals should have been crushing together to preserve themselves on high ground, yet don't fret over the lack of such commingling in the rocks. Forget "Alley Oop"—dinosaurs and horses never met either.[110]

The situation gets even more absurd offshore, where marine fauna show just the same ubiquitously restricted assemblages. Unless there were segregated beaches in the sea, how could advanced vertebrates like modern teleost fish, seals, or dolphins have been prevented from raiding the larder, and thus show up in every marine environment?[111] And what about all those extinct Triassic ichthyosaurs and Cretaceous mosasaurs? During the Mesozoic, extensive seas interbedded the land in just the same way volcanic ash did. Nebraska was once a coastal address, and chunks of Europe were islands. Trying to construct a coherent set of Flood Geology "faunal zones" from all this is as doomed to failure as finding the ancient metaphysical tarot is for occultists.[112]

There is a piquant irony to catastrophists divorcing the geological past from visible contemporary processes, for in so doing they practically *underestimate* the power of nature. The hurricanes that rage every year pack as much punch as nuclear weaponry. The 1964 Alaska earthquake raised an area the size of Oregon up to forty feet, while dropping immediately adjacent terrain by six feet. But such "routine cataclysms" pale compared to the impact of rarer events. The largest of the Bretz floods released the energy equivalent of *ninety* hydrogen bombs, while the Thera eruption in the Aegean Sea that blindsided the Bronze Age Minoan civilization (and was probably the source for Plato's legend of Atlantis) was five times more powerful still. Multiply by four again and you have a dinosaur-annoying meteoric splat.[113]

Then there is the matter of *scale*. The massively wrinkled surface features we are familiar with, places with names like the Alps or Andes, dwindle into insignificance when viewed on the planetary level. It's a sobering realization to learn from microphotographs that the smoothest billiard ball turns out to have deeper chasms and massifs than any on earth. Since the advent of space travel this bland uniformity has been easier to spot, where the Himalayas hardly dent the arcing horizon. That the earth's surface seems static is due only to our Lilliputian perspective. We

don't live long enough for our everyday experience of "reality" to properly appreciate the leisurely convection currents playing out in the upper mantle—that is, until those miniscule slips take place every so often and city walls topple to remind us.[114]

Measuring the uplift of mountain ranges and the spread of ocean basins used to be beyond the pale of science. But ever since satellite global positioning and laser interferometry the tectonic pulse can be calibrated to the centimeter, accomplishing by electronic means the same approach long employed for tracking the progress of Antarctic glaciers. The principle is simple enough: tunnel in a ways and embed a grid of spikes in the wall—then check back in a few years to see how far the alignment has been distorted. Such measurements overturn the intuitive convictions about what solid objects can do, for given enough weight and the right angle even the steady nudge of gravity will have its say. A natural force so weak that a child's toy magnet can counteract it, gravity more than makes up for its puny stature by being *relentless*—as one careless step from a fifth floor window will demonstrate (giving you just enough time to contemplate its cumulative effect on the trip down).

That such destinies can await even rock is graphically shown by geological "anomalies" like the Lewis Overthrust in Waterton-Glacier Park straddling the Canadian-American border. The folding of ancient Precambrian strata under ages of tectonic stress eventually piled over adjacent rock when the region was tilted in a spurt of mountain building around sixty million years ago. Rather like snow sheeting off a roof, two thin slivers (as such they were on a global scale) were edged down slope to end up as the Whitefish and Livingston/Lewis mountain ranges, leaving in their wake two intervening valleys, the Flathead and North Fork.[115] Because the Lewis part was eventually forced all the way out to extend over the younger Cretaceous strata to the east, Creation Scientists like Henry Morris latched onto that situation as a pure sign of cataclysm. But this was another dither of "misplaced concreteness," for if the jagged peaks really were laid down in the Flood, how then to account for the presence of the narrow valleys in between—the spigot turn off again?[116]

There's a revealing pattern to be seen in these favored examples of Flood Geology. The Lewis Overthrust, the Grand Canyon, the Spokane Flood—yes, they're all unusual, big, or spectacular. But they're also *someplace else*. For Creation Science suffers from an overload of observational wanderlust. Since the Flood is supposed to have taken place *everywhere*, locating the "Flood layer" should be as easy as stepping outside. But neighborhood case studies are hardly going to cut it if the Deluge didn't actually happen, which leaves only the razzle-dazzle fireworks of such exotica to provide distraction from the absence of solid local fieldwork.

This "big game hunt" attitude contrasts markedly with the "meat and potatoes" focus of mainstream geology. Since before even the days of Hutton naturalists have tried to account for the features they saw around them, including the mundane ones. They wanted to know why their own backyard looked the way it did, be it Tuscany or Scotland, and the findings of early European field geology accumulated in just that parochial way, as the description of familiar localities. This tradition continues with modern geologists who assemble detailed histories for whole regions, plate shift by ocean transgression by ice age, to satisfy their own insatiable curiosity to understand what was going on as best they can.[117]

But this productive state of affairs can never emerge in Creation Science, blocked as it is at every turn by the core logic of their analysis. The geological record cannot tell a coherent story to those who will not perceive it as a unified whole, even in terms of the imaginary "faunal zones" postulated by their own theory. Particular fossils may be represented as confounding evolution, or a geological formation offered as an example of catastrophe, but the two topics rarely converge. The Big Picture is inevitably lost in a scattering of mosaic pieces employed temporarily as grenades in the tussle with Secular Humanism.[118]

Recognizing the nature of this disassociation explains a great deal about the character of modern creationism. Without a coordinated perception of the living world in its chronological and spatial context, Flood Geology is reduced to merely a controversial option, like ordering a gas guzzling performance engine for the new car. But the fruits of that disconnection are identical whether it's Duane Gish polishing off *Triceratops* with the "Middle Cretaceous" or Phillip Johnson crumpling seventy million years of Ediacara fauna into a "shortly before" immediacy. That's why Johnson and Gish sound so much alike when dismissing their common foe of evolution.

Creationism as a general avocation has no practical alternative but to actively employ the "Bermuda Triangle Defense"—the practice of pointing to "missing" intermediates without explaining that it's the *rocks* that are missing, and not a case of transitions genuinely absent from an otherwise complete geological record.

The most obvious case of this would be the Triassic period. From the perspective of evolutionary science the Triassic was a busy time for life on earth. The Pangea supercontinent had formed and an exciting faunal rebound was taking place following the Permian mass extinction. Mammals, dinosaurs, ichthyosaurs, plesiosaurs, pterosaurs, turtles, and the advanced teleost fish all made their debut during the Triassic. Unfortunately, anyone hoping for an easy go of sorting out the available threads (evolutionary or otherwise) runs smack up against the geological reality that the Triassic record is the weakest of the Mesozoic, where the known fossil congregations are heavily weighted to the later Cretaceous.[119]

Even so, the hit-and-miss of fossilization still managed to pick up the lagosuchids Duane Gish somehow missed, along with the mammalian therapsid intermediates (and we've already seen how creationism deals with them). But those represent only a sampling of the more available land animals. Fossil hunters have been nowhere near so lucky for either marine fauna or the pterosaurs sporadically associated with them (likely casualties of miscued diving for fish). Evolutionary scientists fully recognize these limitations, and the reasons for them, as one paleontologist recently lamented:

> Restricted geographic distribution is the single greatest problem facing those who will use the marine reptile record for Mesozoic biochronology. Most marine reptiles lived in both epeiric seas and oceanic basins, or at least some must have crossed those basins. Yet, most of the marine rock record exposed on the continents is that of relatively shallow epeiric seas, not of abyssal oceanic sediments. This means a relatively high percentage of marine reptile fossils will never be found. For the Mesozoic prior to the Middle Jurassic, subduction has eliminated virtually all the oceanic crust, and during this interval epeiric seas were at a minimum during the Pangaean lowstand. Therefore, the Triassic and Early Jurassic record of marine reptiles must be less complete than that of the later Mesozoic.[120]

From the creationist point of view this dearth of fossil remains collapses into one dimension only: some more dandy "fossil gaps." So for those who touch on them at all, primarily Duane Gish, the Triassic story is the same Pavlovian sputter of pterosaurs and marine reptiles materializing "fully formed" in their environments.[121] Much as he had with *Triceratops* horns, Gish demanded intermediates with features he must have already known the fossil record had yet to deliver (such as pterosaur ancestors with lengthening fourth fingers). Naturally nothing was said about the geological background for those finds, otherwise the reader might come to understand that the absence of intermediates in those cases was not merely understandable but inevitable.[122] As for those fossil links that inconsiderately showed up anyway (such as the nothosaurs, the smaller aquatic precursors to the plesiosaurs) Gish was Johnny-on-the-spot to apply his catchall "no cousins" rule to quickly nip them from the family tree.[123]

Gish had even more of a problem with the turtles, another fossil topic he had not previously investigated. That meant, as he had with the dinosaurs, having to get the matter straight on his own recognizance.[124] An activity fraught with peril this time—lunging ahead, rhetorical throttle wide open, Gish decided to impeach a new study on turtle evolution and egregiously overplayed his hand:

> Recently, Michael S. Y. Lee published an article entitled "The Origin of the Turtle Body Plan: Bridging a Famous Morphological Gap." From the title, one would be led to expect a real breakthrough by the discovery of the fossilized remains of some as yet unreported transitional form bearing incipient stages of unique characteristics, such as the skull or inversion of rib cage and girdles.

> What Lee's paper incorporates, however, is nothing more than a restudy of pareiasaurs. According to Lee, his study of the characteristics of pareiasaurs and turtles shows sufficient similarities that pareiasaurs should be judged the closet relatives of turtles among primitive reptiles. What were pareiasaurs? They were large, clumsy reptiles, almost ten feet in length. The limbs were stocky and supported a massive trunk. Carroll terms them "elephantine animals." Of course, one glance at their fossils would immediately label them as the most unlikely ancestors of turtles, far, far removed from anything that bears even the faintest resemblance to turtles. Lee's attempt to ally pareiasaurs to turtles is added proof of the vast, unbridged gap between turtles and any possible ancestor among other reptiles.[125]

Apparently Gish's "one glance" ricocheted right past the advanced Early Triassic pareiasaur *Anthodon* Lee had discussed in detail. The same size as the first turtles showing up thirty million years later at the end of the Triassic, this three-foot animal had clusters of body plates wrapping its back and sides in the beginnings of a shell. Its shoulder also had a characteristic protrusion (the acromion process) which Lee explained "initially evolved in pareiasaurs as a mobile articulation between the shoulder bones, and initially had nothing to do with anchoring the shoulder blade to the shell. Not surprisingly, in the most primitive turtle, *Proganochelys*, the acromion process retains the old function, and meets the collarbone, not the shell. Only in more advanced turtles did it shift position and come into contact with the shell."[126]

So far this has been vintage Creation Science. But there's one more group of Triassic beasties that allows us to track back to the root of Gish's scholarly standards. These are the teleost fish, a fascinating bunch that adapted their ancestral lung apparatus to the new function of swim bladder, and so proliferated in the Cretaceous that they dominate the seas to this day.[127] What is interesting is that Gish did not focus on them in his discussion of fish evolution. He certainly never wondered why they weren't found in the same deposits as all those other fish mainstream paleontologists believed made their first appearances several hundred million years before the teleosts. And the reason for this omission was that Gish's binge of "list the missing intermediates" was going on at a much higher taxonomic level. Concentrating on the main fish classes, the teleosts literally didn't matter.[128]

No surprise, Gish played the Bermuda Triangle Defense here in all its boldface certainty:

> Even more convincing, if that can be said, is the total absence of intermediates between invertebrates and fishes, and the total absence of ancestors and transitional forms for each major class of fishes. Many billions of fossil fishes exist in rocks upon the earth, with very diverse forms of many kinds. The rocks should be full of the fossils documenting the transition of some invertebrate into a fish, and a rich fossil record of the various transitional forms should exist linking the various major types of fishes to each other, if evolution is true. There should be no difficulty whatsoever in finding vast numbers of fossils of the ancestors and transitional forms. Again, **it is physically impossible for millions of years of evolution to take place, producing a great variety of major types of fishes, without leaving a trace.[129]**

Of course, there were a few things Gish didn't think to explain. While fish are certainly ubiquitous animals in the aggregate, individually they aren't particularly great candidates for fossilization (especially the small ones). That Late Cambrian agnathan roadkill Luther Sunderland so exaggerated was all too typical of much of the fossil record for fishes, where teeth or scales or scavenged leftovers are more likely to be encountered than complete specimens.[130] It likewise escaped Gish's attention that three of the five fish classes made their debut at the Late Silurian/Early Devonian boundary, a period for which practically no useful formations have survived intact. As for what the earliest members of the fourth fish class (the sharks) were up to, that depended again mainly on the evidence from a single primary Late Devonian horizon.[131]

But just leaving out such relevant information wasn't good enough for Gish. Unable to resist an authority quote, some of those he netted were extracted from Arthur Strahler:

> Even Strahler must concede defeat concerning the effort to find ancestors and transitional forms for the fishes. He must admit that "Origin of the vertebrates is obscure—there is no fossil record preceding the occurrence of fishes in the late Ordovician time." His book includes an extensive critical review of my earlier book on the fossil record and an edition of a later book (1985). This is what he has to say concerning ancestors and transitional forms for fishes:
>
> > Duane Gish finds from reading Alfred S. Romer's 1966 treatise, *Vertebrate Paleontology*, that mainstream paleontologists have found no fossil record of transitional chordates leading up to the appearance of the first class of fishes, the Agnatha, or of transitional forms between the primitive, jawless agnaths and the jaw-bearing class Placodermi, or of transition from the placoderms (which were poorly structured for swimming) to the class Chondrichthyes, or from those cartilaginous-skeleton sharklike fishes to the class Osteichthyes, or bony fishes (1978a, pp. 66-70; 1985, pp. 65-69). The evolution of these classes is shown in Figure 43.1. Neither, says Gish, is there any record of transitional forms leading to the rise of the lungfishes and the crossopterygians from the lobe-finned bony fishes, an evolutionary step that is supposed to have led to the rise of amphibians and ultimately to the conquest of the lands by air-breathing vertebrates.
> >
> > In a series of quotations from Romer (1966), Gish finds all the confessions he needs from the evolutionists that each of these classes appears suddenly and with no trace of ancestors. The absence of the transitional fossils in the gaps between each group of fishes and its ancestor is repeated in standard treatises on vertebrate evolution. Even Chris McGowan's 1984 anticreationist work, purporting to show "why the creationists are wrong," makes no mention of Gish's four pages of text on the origin of the fish classes. Knowing that McGowan is an authority on vertebrate paleontology, I must assume that I haven't missed anything important in this area. This is one count in the creationists' charge that can only evoke in unison from the paleontologists a plea of *nolo contendere*.
>
> *Nolo contendere* is, of course, a guilty plea by a defendant who must admit he has no defense.
>
> The fossil record has thus not produced ancestors nor transitional forms for the major fish classes. Such hypothetical ancestors and the required transitional forms must, on the basis of the known record, be merely the products of speculation. How then can it be argued that the explanation offered by the evolution model to explain such evidence is more scientific than that of the creation model? In fact, the evidence *required* by evolution theory cannot be found. The evidence, of [*sic*] the other hand, is precisely what would be expected if creation is true.[132]

Here's where Gish's bottom feeding caught up with him. For Arthur Strahler had compiled over five hundred pages of unremitting criticism of Creation Science, numerous examples of which having already been noted. Yet none of that surfaced on Gish's analytical scope—an instrument finely tuned only to the narrowest of apologetic wavelengths. In a manner reminiscent of Phillip Johnson's spasmodic attributions of Stephen Jay Gould, just this once Strahler was allowed to be

oracular. In the reactive world of creationism, after all, you have to grab what you can when you can. So Gish scooped up Strahler's lone concession with all the single-minded determination of a starving hawk descending on a stray barnyard chick.[133]

While a terribly dangerous thing to do around eagle eyes like Gish, gifted in the manly art of scholarly opportunism, Strahler may have felt able to take a breather on fish evolution because of what he'd explained directly after the shorter quoted sentence. "Origin of the vertebrates is obscure—there is no fossil record preceding the occurrence of fishes in the late Ordovician time. From that point on, the record is clear for the evolutionary succession from fishes to amphibians, then to reptiles, birds, and finally mammals."[134] In other words, Strahler was focusing on what fossils had been hooked later, especially the big ones like Aves and Mammalia, instead of fretting about the ones that got away in the erosion of eons. But as we've already seen with Chris McGowan, that solid end of the argument was one Gish chose to ignore rather than refute.[135]

The scholarly problem for Gish this time is that there was good reason for the absence of early fish intermediates (scarce rocks) so his source, geologist Strahler, could legitimately be faulted for having overlooked this factor in his discussion. What then would Gish's excuse be for not realizing this on his own? The necessary information to figure this out was available to him too—provided he understood the paleontology of early fish evolution, and was willing to report on it accurately. Was it, therefore, the philosophical position of the ICR that all serious thinking had to be done by their evolutionary opponents first? Judging by this juicy incident recounted by biologist Joel Cracraft, apparently so:

> If the stratigraphic position of a fossil is an important criterion for recognizing it as an ancestor, it should come as no surprise that it would be extremely difficult to find a specific fossil species that is both intermediate in morphology between two other taxa and is also in the appropriate stratigraphic position. This is no doubt the reason for many of the quotes cited by creationists about the prevalence of gaps, but other citations are distortions, tailored to suit the creationists' own purposes. For example, in 1972 Schaeffer, Hecht, and Eldredge published an influential paper in which they were critical of paleontological methodology about the construction of ancestral-descendant hypotheses. In support of his argument that there are no transitional forms, Gish (1979, p. 169) quoted from a review of that paper:
>
> > Three paleontologists (no less) conclude that stratigraphic position is totally irrelevant to determination of phylogeny and almost say that no known taxon is derived from any other.
> >
> > [Van Valen 1973, p. 488]
>
> Although the Van Valen quote gives the appearance of support for Gish's arguments against transitions, a reading of Schaeffer et al. (1972) shows that Van Valen is overstating their position. They clearly do not believe stratigraphy is "totally irrelevant" for examining ancestral-descendant hypotheses nor do they deny the possibility of identifying ancestral species. Rather than engage in a critical analysis of the scientific issues raised by Schaeffer et al., Gish prefers to use Van Valen's statement in a highly biased manner. Gish's unfamiliarity with the scientific literature adds irony to this example: Van Valen, perhaps more than any other contemporary paleontologist, has postulated innumerable phylogenetic connections among fossil taxa and thus offers the poorest support for Gish's viewpoint of anyone he could have misquoted.[136]

To which Gish responded in *Creation Scientists Answer Their Critics*:

> First, he claims that Van Valen is overstating the position of the paleontologists, and Cracraft then accuses me of using Van Valen's statement in a highly biased fashion. Let us suppose that Cracraft is correct, and that Van Valen did overstate their position. Who then is guilty of distortion—Van Valen

> or Gish? Furthermore, even if Van Valen did overstate their position, their position would still lend support to creation scientists. Later, on that same page, Cracraft accuses me of misquoting Van Valen. This is outright falsehood. I quoted Van Valen's statement precisely correctly—not one word was misplaced; not one word was left out; not one word was added. Cracraft could not help but know that—he had both my book and Van Valen's article before him, and if he did not, he is guilty of inexcusable carelessness. Cracraft has thus proven himself guilty of the very charges he makes against creationists—distortion and misquoting.[137]

Gish's rhetorical question coyly restricted the options to exclude the evident reply: "Both." The issue had now progressed beyond whether or not a particular source had originally overstated something, to Gish's own lack of initiative and wherewithal to decide which. As we've already seen with the dinosaurs and turtles, Gish was perfectly capable of pontificating on technicalities he had explored only at a superficial level. Now we discover him energetically rowing the same boat as Ankerberg and Weldon, when they signed off on a partisan review of Steven Austin's Grand Canyon Suite as a substitute for the composition itself. And therein lies the essence of sloppy scholarship.[138]

But with only one oar in the water Gish spun around so quickly trying to circumvent admitting that he'd simply relied on somebody else's opinion without checking whether it was true or applicable, he wound himself a little too tight. For it would take a severe parsing indeed of Cracraft's concluding sentence to transform that conditional "could have misquoted" into a direct accusation of misquotation, especially since Cracraft had been so explicit about Gish's oversight being the much plainer one of *miscomprehension*. Gish's combative evasions here provide yet another clue why the "science" in Creation Science has remained largely a grammatical construction.[139]

Given how many charges have been leveled at Biblical creationism over the years, the interesting thing is how *few* examples of genuinely inept criticism Gish had available to decry. The section on "Scientific Integrity" in *Creation Scientists Answer Their Critics* had really only one undisputed trumpet to blow—and a pretty small one, at that, consisting of Kenneth Miller having mistakenly slipped a word into a quotation on plant evolution and then criticizing Gish for its absence.[140] Compare that to the gold mine of vituperation swirling around Immanuel Velikovsky's *Worlds in Collision*, where many of his scientific critics from the Nineteen Fifties and Sixties practically fell over one another with shoot-from-the-hip arguments. In fact, that critical misfire contributed to the extended popularity of his views well beyond the warrant of the evidence, under the mistaken suspicion that "where there's smoke…." But the authenticity of an argument does not depend on the incompetence of its opponents, no matter how outrageous or entertaining their mistakes may be.[141]

If it was Gish's intention to demonstrate in *Creation Scientists Answer Their Critics* how meticulous and scholarly they all were, he failed miserably. Gish ended up only reinforcing the caustic diagnosis of Creation Science research standards delivered a decade before by Philip Kitcher in *Abusing Science*.

> In the case of the Creationist authors we have studied, there is no great difficulty in seeing how muddles arise. They want to use scientific data and scientific principles to attack evolutionary theory. So they skim, searching for ammunition. When they find a claim that seems to be at variance with evolution, they seize it as a trophy to bring back to the Institute for Creation Research for public display. If they actually tried to understand the terrain they scavenge, they would have learned some interesting science. Instead, they seem to acquire only the most tenuous grasp of complex theories and then offer their muddled caricatures of important scientific works to as wide an (inexpert) audience as they can reach. (It is possible, of course, that their understanding is greater than that

> revealed in their confused discussions. But I am loath to accuse them of perverting ideas that they actually comprehend.)[142]

Fightin' words, indeed! Gish ultimately described *Abusing Science* as "a virulent attack on creation science and creation scientists," corrosively pervaded as it was by "Kitcher's own dogmatism and almost religious devotion to evolution."[143] That was because Kitcher openly reflected the current scientific reality, which considers evolution (descent with modification and speciation through natural selection, remember) to be as much a confirmed "fact of nature" as gravitation or particle physics. After all, in a living science there does come a point where the accumulating pile of circumstantial "trout in the milk" itself forms a pattern: that the reason why the trout keep appearing is because the explanatory model is reasonably *true*. That degree of scientific certainty kicked in for evolution sometime between therapsids showing up in the fossil record and the discovery of homeobox genes. From that viewpoint of basic empiricism, Gish's harrumph sounds exactly as silly as railing about the "dogmatism and almost religious devotion to the spherical earth" professed by contemporary cartographers.[144]

This preeminence of evolutionary thinking in modern scientific circles pleases Scientific Creationism about as much as it does Phillip Johnson. And so Gish delivered a similar stinging criticism of Kitcher when it came to the need for a scholastic remedy to root out this invidious infestation of evolutionary dogma. Whatever could be wrong about students being given the opportunity to hear both sides of the creation/evolution debate and then be allowed to decide things for themselves?[145] Though, unlike Phillip Johnson, at least Duane Gish could never be accused of being soft on Creation Science, and so we do have some idea about what manner of creationist pedagogy he has in mind: the evidence for a Biblically young earth and the reality of the Flood.

Or do we? For the most striking thing about *Creation Scientists Answer Their Critics* (besides the fact that it didn't do a bang-up job of answering those critics) is that it wasn't properly a defense of *creation science*. The core doctrines of Flood Geology and the Young Earth were nowhere to be found.[146] And certainly not the Paluxy River "man tracks" or Henry Morris' inflated meteoric dust rates. Instead, Gish restricted his argument to restating the already held antievolutionary sentiments of creationism generally. With nothing specifically about "Creation Science" in *Creation Scientists Answer Their Critics*, the book might as well have been written by Phillip Johnson. Which in one respect it was, since Gish on several occasions avoided discussing unpalatable information by playing the Skinner/Johnson Gambit of referring the reader back to source material that hadn't dealt with them either.[147]

As a topic the Flood itself showed up exactly once in Gish's book, a remarkably timid appearance for so central a Creation Science belief. It came in a response to something Joel Cracraft had written. To appreciate the full scale of what was being left out of Gish's argument, it's instructive to pick up the thread at the end with his rejoinder:

> Cracraft claims (p. 183) that creationists have to explain how all the different kinds of organisms were able to find their way to Noah in order to avoid the Flood. If Cracraft is going to criticize ideas based on Biblical data, he should at least read it first. The Bible does not indicate that the animals had to find their way to Noah on their own, but rather, the suggestion is clear that God would direct them to Noah. Further, creationists believe that the nature and distribution of land masses, and thus biogeographical distributions, were drastically different before the Flood than now.[148]

Now Gish's sole reference for this passage was to Genesis 6:20. As he did not quote this "Biblical data" explicitly (even in the footnote), let's do that now: "Of fowls after their kind, and of cattle after their kind, of every creeping thing of the earth after his kind, two of every *sort* shall come unto thee, to keep *them* alive." Well, that explains a lot, doesn't it? But what exactly *was* the altered "nature and distribution" of landmasses prior to the Flood, that we may observe the *scientific* correctness of the Creation Science interpretation of animal biogeography? Would this not have been a splendid opportunity to display the superiority of the Flood approach by actually

explaining something? At least as well as the evolutionary model, if you please—better even, if you can manage it.

The very fact that Gish was not forthcoming with citations on this point gives the game away right there—you can't reference what you don't have. But things only get worse when his remarks are compared to what Cracraft had himself written on this topic. Gish's minimalist molehill turned out to be quite a mountain, as Cracraft expounded:

> Modern biologists have always looked upon biogeography as one of the main sources of evidence for the evolutionary hypothesis. Indeed, biogeography presents such strong support for evolution that creationists have simply ignored the evidence rather than concocting outlandish stories based on revelation (major creationist writings not discussing biogeography include Morris 1974; Wysong 1976; Morris 1977; and Gish 1979). The reasons why biogeographical data present so many problems for the creationists are obvious: (1) they have to explain the great diversity of organisms; (2) they have to explain how all these different kinds of organisms were able to find their way to Noah so that they could avoid the Flood; (3) they have to explain how these different organisms found their way back to their respective areas (from high up on old Mount Ararat, no less); (4) they have to explain why most species (and higher taxa) are endemic to a restricted geographic area when a creationist scenario, in which taxa are dispersed from Ararat, would predict that most species would be widely distributed; and (5) they have to explain why widely separated areas seem to share related kinds of organisms.
>
> From this list of problems, a critical reader should have no difficulty understanding why it is that creationists have ignored the evidence of biogeography. Either they must rely on revelation, pure and simple, or they are compelled to erect a "scientific explanation" that so strains one's credulity it makes them look patently silly. But creationists have an answer for everything. Consider the following examples, from Whitcomb and Morris (1961, p. 87), of their inexhaustible ability to rise to the occasion:
>
> 1. Whitcomb and Morris dismiss much of the data of biogeography merely by *ad hoc* argument, claiming that there was a "difference of climatic and zoogeographical conditions before the Flood as compared to the postdiluvian area" (1961, p. 87).
>
> 2. And how did the animals get to the Ark and survive for more than three months (away from their native habitats)? By "the possible impartation of migratory instincts and powers of hibernation to the animals by God with respect to the gathering and caring for the animals during that year of cosmic crisis" (1961, p. 87).
>
> 3. What about after the Flood? Simple: "It is by no means unreasonable to assume that all land animals in the world today have descended from those which were in the Ark." (1961, p. 87).
>
> 4. And how did these animals distribute themselves from Mount Ararat? Whitcomb and Morris, as do virtually all good creationists, offer a simple answer: "It would not have required centuries even for animals like the edentates to migrate from Asia to South America over the Bering land bridge. Population pressures, search for new homes, and especially the impelling force of God's command to the animals kingdom (Gen. 8:17) soon filled every part of the habitable earth with birds, beasts, and creeping things" (1961, p. 87).
>
> Whitcomb and Morris wrote their book at a time when even many professional biogeographers clung to the idea that distribution patterns could be explained by massive waves of dispersal. Nevertheless, the most ardent dispersalist would never accept the idea that all the animals dispersed from Ararat to the far corners of the globe, and differentiated into a myriad of forms, within a

> few thousand years. That scenario is childish myth—it is fundamentalistic religion, not science.
>
> During the last decade biogeographers have come to realize that when the postulated phylogenetic relationships of organisms—both plants and animals—are examined relative to their distributions, many highly congruent, nonrandom patterns emerge. Many of the taxa endemic to tropical South America have as their closest relatives taxa endemic in Africa; taxa endemic to the cool temperate regions of southern South America have as their closest relatives taxa endemic to New Zealand and the cool temperate regions of Australia and Tasmania; and some taxa endemic to western North America have as their closest relatives taxa endemic to China and eastern Asia; and so on. Given these many patterns of distribution, it has become apparent that biotas now separated were once connected and that after separation the individual components (taxa) of these biotas differentiated in isolation. In other words, dispersal from one area to another, followed by differentiation, is apparently not as important as once thought. And as biogeographers study the problem in more detail, it is becoming apparent that these patterns of biotic separation are correlated with changes in earth history, continental drift being the most obvious example. The literature on this new approach to distribution, called vicariance biogeography, is already very large and promises to change many of our ideas about the history of life (see Platnick and Nelson [1978]; Nelson and Platnick [1980, 1981]; Cracraft [1980]; and Nelson and Rosen [1981]).
>
> While professional biologists struggle with the enormous complexity of the system relationships of organisms, their distribution patterns, and the correlation of those patterns with hypotheses about earth history, creationists take the easy road to "knowledge" and simply force a Biblical interpretation on nature. The most detailed biogeographic analysis by a creationist in recent years is that of Howe (1979), who attempts to "explain" the distribution of angiosperms. Let's examine his method of analysis:
>
> 1. Howe informs us (p. 38) that plants present "an array of unrelated types," a ludicrous assertion in this day and age. If Howe were working in a monastery in the fourteenth or fifteenth century he might be excused, but no modern scientists with any competence could make that statement. Of course, he ignores the large literature on plant systematics.
>
> 2. He proclaims (p. 41) that in angiosperms the genus is probably the "created kind," but presents no evidence informing us how he made that decision.
>
> 3. He interprets (pp. 40-43) endemics as having been isolated by Flood-related events, particularly by continental drift, which is said to have occurred *after* the Flood. This is so manifestly silly as to require little comment. Any person claiming that the vast literature on plate tectonics and continental drift supports a time scale for these events on the order of a few thousand years is suffering a delusion of religious faith and is definitely not gifted with any faculties for scientific reasoning
>
> Howe is a typical example of extreme creationist thinking and reasoning when it comes to biogeographic data: ignore the evidence, claim that the evidence (which you have ignored anyway) fits a literal interpretation of Genesis, and then claim that what you are doing is science. Who can take such a view seriously?[149]

Cracraft had posed a lot of very specific challenges to Creation Science beliefs about the Flood, all of which would seem to merit serious reply in a work ostensibly titled *Creation Scientists Answer Their Critics*. But worse than that, Gish hadn't even scored a point on the one item he *did* bring up. Cracraft was more than merely aware of the Biblical opinion on animals being inspired to go to Noah—he had positively quoted Whitcomb and Morris to that effect. Cracraft was

enumerating their arguments precisely as examples of the vacuous and *ad hoc* character of Creation Science thinking. The best way to refute that contention, of course, would have been for Gish to so cogently explain those beliefs that Cracraft's accusation would be blunted by the persuasive facts of Biblical biogeography. Easily done—provided there *are* any facts of Biblical biogeography to present.

By giving the impression that it was Cracraft who was being superficial and unresponsive, Gish's Olympian disdain only served to cement Cracraft's main contention: that Creation Science notions about the Flood were based on Biblical sentiments alone, with no appeal to the facts of nature (either required or even encouraged).[150] But lurking behind all this was the highly refined irony that Cracraft seemed significantly more anxious to share with his readers the details of the creationist literature on Flood biogeography than "Creation Scientist" Gish was. What's wrong with this picture?

Biogeography, Continent Drift and the Flood

Since Cracraft's remarks have brought us at last to the normally *verboten* subject of biogeography, we now have an ideal opportunity to ride Gish's logic train through to the station. As Cracraft pointed out, biogeography is one of evolution's star witnesses, so Gish would have every incentive to fire his heavy guns in reply, especially if Creation Science really had something useful to offer in this field. That Gish *mentioned* Cracraft's "section on biogeography" was true enough—that this constituted anything like a meaningful response to those points was highly debatable. Immediately preceding the Flood paragraph previously quoted, this is exactly what Gish had to say:

> Beginning on p. 182, Cracraft has a section on biogeography, that is, the distribution of organisms, both living and fossil, throughout the world. He states that the predominant explanation which was accepted by many pre-evolutionary (evolutionists cannot bring themselves to frankly call pre-evolutionary biologists and other scientists "creationists," which almost all were) and post-evolutionary biologists as well was that of dispersalism. He says that dispersalism has been, until quite recently, the primary explanation used by evolutionists. He claims that biogeography has been ignored by creation scientists, since it offers such strong evidence for evolution. As a matter of fact, one of the earliest books marked the resurgence of the modern creation science movement, the book by Whitcomb and Morris, *The Genesis Flood*, has a section on animal distribution, or biogeography, as Cracraft acknowledges. Furthermore, this subject should be an embarrassment to evolutionists because, until about 20 years ago, biogeography was explained by evolutionists via dispersalism, assuming that all the continents have always been right where they are now. Cracraft informs us that dispersal from one area to another, followed by differentiation, is now apparently not as important as once thought. What do they believe today? Cracraft tells us that:
>
> > … it is becoming apparent that these patterns of biotic separation are correlated with changes in earth history, continental drift being the most obvious example [p. 185].
>
> How plastic, how fluid is this theory of evolution! No matter what the data may be, they can be accommodated in vastly different evolutionary mechanisms and earth history. The concept of static continents versus the notion of continents drifting all over the world are *drastically* different versions of earth history. Previously, evolutionists took the data of biogeography, the data of plant and animal distributions, and fit them into a theory of earth history that assumed the continents have always been where they are today. They felt smug in their explanations, while ridiculing the attempts of creation scientists to fit the data into their views of earth history. Now geologists have adopted a totally different view of earth history, assuming that sometime in the past all land masses

> consisted of one massive continent, Pangea, which then somehow, by some as yet unknown mechanism, began to split apart, and continents have been drifting apart ever since. Evolutionists take the same old data (certainly fossils didn't hop from one continent to another) and claim they can fit these data into this new and drastically different view of earth history! It is obvious that either their present view of earth history, incorporating the notion of continental drift, is incorrect or what they were teaching previous to this was nonsense.[151]

Apart from footnoting *The Genesis Flood*, Gish offered no corroborative citations here, and no specific illustrations. That is, except to try to turn the rout to his advantage by holding up Whitcomb and Morris' isolated instance as though that excused all subsequent omissions—including those of Gish himself. As Cracraft had done more than just "acknowledge" Whitcomb and Morris' biogeographical rhapsodies (he had brought them up to *criticize* what little they had offered) Gish's gingerly sidestep to the subject of dispersalism was pure evasion.[152] And at that, it was Gish, not Cracraft, who contended that "the same old data" was being plastically interpreted under the new continental drift model. What then were his examples of this? No wonder he didn't offer any references—it would have meant finding out about the history of biogeography. (One may now insert Philip Kitcher knowingly nodding his head again.)

Continental drift superceded dispersalism in much the same way Einstein's relativistic cosmology overturned Newton (where apples still fell—you just had a subtler understanding of why). It also served to pull the rug out from under attempts to revive overt geological catastrophism, whether Biblical or Velikovskian.[153] That was because many instances of "anomalies" purported to be of cataclysmic character turned out to have prosaic, if not truly elegant, solutions in the continental drift context. One such seeming mystery offered in the Velikovskian brand of catastrophism concerned the evidence for an ancient glaciation in India that appeared to proceed *north* from the equator. Now that sort of thing just had to be cataclysmic, didn't it? That is, until you learned that when India was undergoing its deep freeze it wasn't *in* the Northern Hemisphere. That subcontinent was nestled beside Africa and Antarctica around the South Pole. Once you knew that, the "puzzling" glaciation there was anything but, with the sheets advancing northward from the polar regions exactly as ice is supposed to do.[154]

Gish missed the continental drift mark by just as wide a margin as Velikovsky. But Velikovsky at least had the tenuous justification that he hadn't written anything new about it since 1955. For Gish to fluster in 1993 about the "as yet unknown mechanism" responsible for the Pangean breakup, as though oceanographers hadn't been physically measuring mid-Atlantic rifting for many years, put him in another category altogether. Penning such anachronistic drivel so late in the game not only reaffirmed Cracraft's observation on the delusional features of Scientific Creationism—it put Gish squarely in the disparate but select pseudoscientific company of Richard Milton and Vine Deloria.[155]

Even as a sequence of logical thinking Gish's argument tended to, shall we say, *drift*. Because the continents arrived at roughly their present positions shortly after the dinosaurs checked out, anything biological going on long after wouldn't be affected much by the formation of Pangea hundreds of millions of years earlier. Or wasn't Gish apprised of that? To assess how continental drift might have changed the way evolutionists looked at the paleontological evidence (both old and new) requires stepping back to those dim and distant times for a closer look at specific examples, not skipping around among generalities. Unfortunately, as it appears not to be Gish's practice to indulge in that sort of thing on his own initiative, what we need are the scholarly equivalents of a few hefty 2x4s to obtain his technical attention.

The most obvious illustration would be the extraordinary proliferation of highly specialized marsupials found only in Australia. Ranging from kangaroos to koalas, it was as though the place had "Placentals Keep Out" signs posted all around it. Which in a way it did, of course, for continental drift has carried everything beyond the reach of later placental colonization—save for human visitors and their not always welcome animal baggage. But Philip Kitcher had already brought up the Australian example in *Abusing Science*, only to have Gish ignore it completely in *Creation Scientists Answer Their Critics*.[156]

Fortunately there are plenty of other biogeographical cases to ponder, ones that actually allow us to penetrate even deeper into the Creation Science mindset.

Let's start with what can happen to fish when landmasses part company. Freshwater forms were so widely distributed during the Carboniferous that there seemed only two equally unattractive alternatives. Either vast land bridges once interconnected the continents (allowing migration along natural river systems) or an otherwise inexplicable parallel diversification from saltwater ancestors had taken place (though there were enough marine sediments preserved to render that unlikely). So here was an example of fossils that were *not* readily explained by dispersalist reasoning. It was precisely because "fossils didn't hop from one continent to another" that there was a conundrum to resolve. Then continental drift debuted to offer a simple and logic solution—the freshwater variations didn't have to skip across that ocean barrier because at the time the ocean wasn't there.[157]

Or how about something Gish was already aware of, but which his Creation Science myopia evidently prevented him from seeing? Trot on back to the South Pole and observe that dinosaurs once lived there (or at least in territory presently parked there). All that crossed Gish's mind when he wrote about them was, Antarctica—*brrrh!* Sounding like the very incarnation of the hidebound uniformitarian that catastrophists typically deplore, this time it was Gish who appeared incapable of imagining how changes in continental arrangements might alter climate patterns. But that wasn't his only blunder. Because dinosaurs existed in Africa and Australia, evolutionists who recognized the reality of continental drift fully expected them to turn up in the spot in between: Antarctica. Which they ultimately did—so why wasn't this successful evolutionary prediction mentioned when it came to evaluating how continental drift and animal distribution might have cross-fertilized one another? Doesn't anything ever connect up?[158]

It would seem not. And that even applies when it comes to working through the implications of Creation Science itself, as may be observed concerning another biogeographical sample, this one courtesy of Philip Kitcher about what insectivores are (and not) to be found on the island of Madagascar off the coast of Africa. There are no hedgehogs living on Madagascar, for instance, only modified tenrecs that mimic them. Nor are there any moles—only modified tenrecs that mimic them. There aren't any tree shrews, either, only modified tenrecs that mimic them. Are you getting a pattern here? Kitcher certainly did, and inquired, "Why are these peculiar animals found on Madagascar, and nowhere else?"[159]

This is biogeographical thinking at its purest, and Kitcher's challenge deserved a good answer. That Gish obviously felt he had one was measured by the considerable space he devoted to dispatching it. The factual merits (demerits actually) of his argument are of scholarly interest, of course, but the really provocative thing about his reply was what Gish *didn't* think to say. Through it all, Gish proceeded as though his own Creation Science worldview didn't exist. See if you can spot the golden opportunity gone missing:

> Kitcher illustrates the supposed power of Darwinian "problem-solving" strategies and story-telling by "explaining" why tenrecs, a group of insectivorous mammals, are found on Madagascar, an island off the east coast of Africa (pp. 51-52). He says:
>
> > A straightforward evolutionary story makes sense of what we observed. In the late Mesozoic or early Cenozoic, small, primitive, insectivorous mammals rafted across the Mozambique Channel and colonized Madagascar. Later the channel widened and Madagascar became inaccessible to the more advanced mammals that evolved on the mainland. Hence the early colonists developed without competition from advanced mainland forms and without pressure from many of the normal predators who made life difficult for small mammals. The tenrecs have been relatively protected. In the absence of rigorous competition, they have exploited unoccupied niches, which are filled elsewhere by more

> advanced creatures. Tenrecs have gone up the trees and burrowed in the ground because those are good ways to make a living and have nobody but one another to contend with.

There you have it! A perfectly reasonable story, Kitcher believes, to explain the presence of tenrecs on Madagascar, and demonstrating the power of Darwinian problem-solving strategies and story telling to provide the true history of the colonization of Madagascar by tenrecs. First of all, every word of Kitcher's story could be true (which it isn't), without providing one shred of evidence for evolution. Kitcher's story, for example, doesn't even pretend to explain where tenrecs came from in the first place, and isn't that what evolutionary theory was invented for in the first place? Even Kitcher supposes these creatures were tenrecs when they rafted on his ark to Madagascar. Isn't it possible, even probable that the burrowing, the tree-climbing, and the other varieties of tenrecs existed before they rafted to Madagascar?

Not only does Kitcher's story fail to explain anything significantly related to evolutionary theory, but important details are obviously incorrect. He suggests that tenrecs rafted over to Madagascar in the late Mesozoic (about 75 million years ago on the evolutionary time scale) or early Cenozoic (65-70 million years ago). He apparently is unaware of the fact that the earliest fossil record of tenrecs on Madagascar is found in the Pleistocene, or about three million years ago on his time scale. This is 60 million years too late to fit Kitcher's story. According to reconstructions by those geologists who hold to the reality of continental drift, Madagascar was essentially in its present position by the Pleistocene, so the Mozambique channel was as wide then as it is now. Furthermore, in contradiction to Kitcher's story, there are and were other mammals on Madagascar, and they were there as early as the tenrecs, because their fossils are found in Pleistocene deposits of Madagascar. Furthermore, they are not "primitive" mammals, but they are found in the most "advanced" mammalian order, the Primates. These creatures are, of course, the lemurs. According to Kitcher, the tenrecs rafted across to Madagascar and colonized the island before the more advanced mammals had evolved. Even assuming the standard evolutionary scenario, this story is clearly contradicted by the evidence. If tenrecs did raft over to Madagascar from Africa and some clambered up the trees, they would have been staring right into the face of the lemurs.

Kitcher says, "In the absence of rigorous competition, they have preserved their simple body plan." Regardless of whether or not the tenrecs faced rigorous competition on Madagascar, Kitcher is faced with the problem of explaining why similar creatures, such as the otter shrew, Potamogale, of West Africa, and the Cape golden mole of South Africa, did manage to survive in spite of vigorous competition. In fact, representatives of the tenrec, otter shrew, and golden mole types are known from the Miocene of East Africa. No fossil ancestors are known. No wonder Kitcher made no attempt to employ his Darwinian problem-solving strategy to explain the origin of tenrecs!

Another difficulty intrudes to muddy up Kitcher's story. According to A. Franklin Shull, then professor of zoology at the University of Michigan:

> The fauna of Madagascar is most similar, not to its continental neighbor, Africa, but to that of Asia, the gap being bridged over by the Seychelles Islands, whose animals are similar to those of Madagascar.

The Seychelles Islands are 700 miles from Madagascar, and Asia is another 1,500 miles from the Seychelles, while Madagascar is no more than 300 miles from Africa. Yet, according to Shull, the fauna of Madagascar is more Asian than African. If the tenrecs rafted over from Africa, why did most of the animals found on Madagascar reach there from Asia rather than Africa? Is it not very

> likely that at the time tenrecs migrated to Madagascar, prevailing currents favored migration from Asia to Madagascar rather than from Africa to Madagascar, regardless of the distances involved? The route of migration of tenrecs thus could have been opposite to that suggested by Kitcher.
>
> In any case, we can see that Kitcher's story is directly contradicted by several important facts. So much for the power of Darwinian problem-solving strategies to invent historical narratives![160]

Gish had all the pieces in front of him to make sense of the Madagascar puzzle, yet never got close to fitting them together because his ideology already knew what the proper antievolutionary answer was supposed to be, and the superficiality of his resource base did nothing to contradict it. Gish's research here consisted of nothing more than dashing through Romer's *Vertebrate Paleontology* until he spotted something on the tenrecs, then falling back on his trusty copy of Whitcomb and Morris, rummaging there to extract the Shull quote—which did indeed "muddy up" the story. Dating from 1951, *forty years* before Gish was writing, that obsolete reference was the clue to unraveling his whole argument.[161]

The first thing to know about Madagascar is that 85 percent of the plants and animals living there are endemic, including most of the earth's chameleons (in much the same way that the majority of fruit flies occur in Hawaii—they got there first and made the most of it). Apart from a heavy contingent of bats, able to fly there, Madagascar's mammalian fauna is a most select terrestrial list of small and distinctly *African* forms, from the Bush Pig and recently extinct pygmy hippopotamus to the tenrecs and lemurs.[162] Tracing what those animals were up to paleontologically is hampered by the geological circumstances of the island, only part of which Gish alluded to in his sprint through the "obviously incorrect" details. Roughly the size of California, erosion has been winning out over deposition on Madagascar for quite some time. The result is that only recent material is found over a basement of rocks dating back to the dinosaurs. It's the Bermuda Triangle Defense again—and it is really getting tiresome.[163]

That Gish thought it was to his advantage to bring up the survival of "the otter shrew, Potamogale, of West Africa, and the Cape golden mole of South Africa" was doubly ingenuous. For the *giant* otter shrew *Potamogale* is one of only two tenrec genera known outside Madagascar. It's also among the largest known insectivores, which should give some hint as to why it's managed to get by in its particular venue. The other tenrec genus likewise calls Africa home, the *small* otter shrew—an accomplished predator whose "considerable strength" for its size again helps account for its isolated persistence. As for the Cape Golden Mole, that animal is not a tenrec, but it is from an allied family in the same insectivore order, where it would appear to owe its present success in the hectic competitive world of moles to the fact that it happens to *be* a mole.[164]

Given all these consistently African taxa, whatever then could Shull have meant by *Asiatic* animals? That Gish proffered no specific illustrations here was per usual, of course, but it was the date that gave things away: 1951 was long before continental drift transformed the nature of the debate. In those days Madagascar's lemurs were taken to be far more closely related to the comparably primitive "lemurs" scattered around Asia (such as the lorises in India or the *Colugos* "flying lemurs" of Southeast Asia) than they are today.[165] With India being so firmly attached to Asia by 1951, how else would a pre-continental drift dispersalist speculating on things like the Madagascar-India "lemur" connection describe them but as "Asiatic" fauna? Indeed, it was to explain away that very "mystery" that lead some mid-19th century biogeographers to propose in desperation that a *really long* land bridge once linked the two regions across the Indian Ocean.[166]

While we're on the subject of desperation, hats off to Gish's equally valiant attempt to steer things around to tenrec ancestry in the first place (as though that issue presented an insoluble evolutionary obstacle). But in the paragraph preceding the one Gish quoted, Kitcher had already noted: "All tenrecs share certain features that mark them out as relatively primitive mammals. They have poor vision, their excretory system is rudimentary, the testes in the male are carried within the body, their capacity for regulating their body temperature is poor compared with that of most mammals."[167] So unless Gish wanted to actively delve into what characteristics would have

precluded linking the basic tenrec anatomy with early insectivores in general, what point was there in bringing it up?

However diverting Creation Science scholarship may be as agitprop siege ballet, dancing through the technical minefield while dispensing obsolete authority quotes, that still leaves Kitcher's main question waiting in the lobby. Independent of how tenrecs originated (whether by evolution, special creation, or Martian invasion), why are the *specialized* ones to be found on Madagascar and nowhere else? (We may throw in the lemurs and chameleons as lagniappe, while we're about it.) Rather than timorously hinting at prevailing currents from Asia, "regardless of the distances involved," why didn't Gish just say what he actually believed happened? Namely, that the presence of every animal everywhere was the direct and logical outcome of the post-Flood dispersal from Mt. Ararat. If Creation Science convictions were to be taken at all seriously here, Gish ought to have actively employed Madagascar's tenrecs as a case study to extol the explanatory virtues of their model. Remember: an idea worth having is one worth *defending*.

So how might Gish have gone about doing that? The overall parameters would seem straightforward enough. All of Madagascar's fauna (and flora?) had to make it there from the Turkish highlands sometime before humans first settled the island around AD 500. Maybe that was why Gish hinted at an Asiatic course, to have them embarking somewhere from the Persian Gulf, or maybe launching from the tip of India. (Had India made it all the way to Asia by then, dare we ask?) In order to make sense of the Creation Science model the reader clearly needed to have some coherent statement of what their position was supposed to be regarding the nature and distribution of those antediluvian landmasses and biogeography that were so "drastically different."[168]

But beyond that, which "tenrecs" are we talking about exactly? If it was indeed "probable" that the modified tenrecs were already in existence before arriving in Madagascar, does this mean they were separate "kinds" from the start, or had they differentiated *en route* from some ancestral form preserved aboard the Ark? And by what objective criteria could Creation Science tell the difference—or doesn't it matter? It's precisely at junctures like this that the studied vagueness of "created kinds" comes back to swallow them as Jonah by the whale. Because Madagascar's tenrecs display such a range of adaptations, if that sort of thing can appear merely as variations within the tenrec "kind" then all creationists would be doing is presenting an evolutionary line of descent—except on steroids. Move over Punctuated Equilibrium, science would now have a dandy new benchmark for *rapid* microevolution: from standard issue mammal hair to the highly adapted quills of the hedgehog-like tenrecs in less than 2800 years flat! Somehow I doubt this will be the preferred ICR position.[169]

Back to the drawing board. The only nonevolutionary alternative is to presume that the specialized tenrecs were themselves independently "created kinds" from square one. That would seem much safer—but only if you don't think too much about it. After the water leaked away (to where?) this intrepid band of tenrecs pressed down the gangplank along with their potential competitors (the true hedgehogs, moles, and tree shrews) to help repopulate the Flood-scoured world, a blasted landscape littered with rotting dinosaurs, therapsids, and an assortment of Noah's recalcitrant neighbors. Amid tremendous post-Flood upheavals (mountains popping up, continents sliding around like funhouse rides, Grand Canyons being carved, and ice ages flash-freezing mammoths in one place while steamy coal seams congealed in another) all the tenrecs independently avoided settling in anywhere along the intervening course, whether Asian or African. Instead, like a corporate excursion packet on a group discount, the plucky tenrecs (and lemurs and chameleons) all appear to have made a prompt beeline for Madagascar. How reasonable does that sound?

Well, now couldn't God have just made it happen that way, much as he had directed the animals to Noah in the first place? Certainly—but the moment that seductive escape valve is released Creation Science uncouples its own tenuous grip on scientific credibility. So long as the pretext was to boldly follow the scientific facts wither they may lead, secure in the belief that everything will end up inevitably docked at the Biblical pier, there was at least the proviso that they not get lost at sea in the meantime. But at every turn the momentum of the physical evidence (including the material Gish thought to mention) pushes the argument in another direction altogether.

Say the fossil record for tenrecs really did mean what Gish implied—the literal absence of the animals rather than the dearth of suitable deposits. Why not then take this information at face value and conclude the tenrecs had been created "fully formed" directly on Madagascar from the start? Why suppose any migration at all? This would still be suitably miraculous and nonevolutionary—but the problem is, it would also be non-Biblical, at least under the scrupulous interpretation Creation Scientists give it.[170] That's because they believe all "creation" concluded with the appearance of Adam and Eve. Then things muddled along until the Flood took place as a global punishment for subsequent misbehavior. As neither of those theological doctrines can be reasonably inferred from any serene *in situ* "creation hypothesis" for Madagascar or anywhere else, this otherwise attractive alternative simply doesn't appear on the Creation Science menu.[171]

This is an attitude that poses something of a public relations problem for Creation Science, because everything that is most silly and implausible about the Flood scenario develops directly from their trying to stick too closely to the Bible instead of looking to nature for the evidence. Take vertebrate population genetics, for example. Zoologists know that population size is critical to survival in the real world. Restrict an animal's habitat to the point where the number of breeding pairs dips below a critical level (typically less than several hundred) and you're on the road to extinction, as white rhinos and very probably tigers are. This is a situation all too familiar to zookeepers, who would blanch at the prospect of calling a species "viable" on the basis of only a few dozen available mating pairs, especially if they're close relatives.[172]

Yet Creation Science requires exactly that to be true, where all extant "kinds" have physically descended from no more than *seven* breeding pairs each preserved aboard the Ark. That's for the "clean" animals, mind you—only *one* pair for the "unclean" ones (which would presumably include the pawed tenrecs). Working off such a small population base the odds would favor *everything* going extinct, which would at least correspond better to the paleontological reality. If the Ark was intended as a shelter for living things during the cataclysm it objectively did a pretty poor job. Rather than arbitrarily claiming that everything made it aboard but only suffered decimation after, based purely on the physical proportion of extinct forms to survivors (99 to 1 on a good day) the evidence would best fit the idea that only a tiny scattering of animals were protected. Except that concession comes at the price of shredding more of the theological underpinning—and it still wouldn't explain how the tenrecs got to Madagascar.[173]

The issue concerns more than just gross body count. Even supposing selected animal life could have successfully prospered after enduring so drastic a bottleneck, there would have been no time available in the few thousand years since for random mutations to shuffle their restricted alleles. Why then do animal species today show so much diversity at the genetic level, right down to the variant sequencing of their assorted proteins? Arguing that contemporary fauna are somehow "degenerate" versions of the ideal originally created "kinds" would only beg the question, propelling the argument back to the point at issue: how much genetic transformation is "natural" and how fast can it occur?[174]

Nor are we talking just the beasts of the field here. The human equation is affected, too, though not in quite the way Creation Scientists think. Paul Taylor has reminded the faithful that, "Every person living today came from one of Noah's three sons—Shem, Ham and Japeth."[175] And what does that entail? With exactly the bleary enthusiasm of Erich von Däniken's account of extraterrestrials battling in the asteroid belt, Duane Gish summarized the essential doctrine for the kids in *Dinosaurs by Design*:

> During the Ice Age, so much water was frozen that the sea level was lowered 600 feet. This helped to connect the continents. Therefore, it was not difficult for Noah and his family and the animals to go forth and multiply their kind to fill the earth, as God told them to do. When the people built the Tower of Babel and God confused their languages, the Bible records how different language groups went in different directions to start their own communities and countries.[176]

But expressing this demographic opinion out of theological conviction and demonstrating it historically or archaeologically are two very different things. That this distinction hasn't struck many Biblical creationists yet may be partly due to their parochial background in the physical sciences, where the tendency has been to obsess on disposing of organic evolution while trying to explain away (or ignore) the Flood's many geological quirks.

On a superficial level the problem involved how to generate our present teeming billions in four thousand years from that select genome aboard Noah's Ark. Henry Morris addressed that challenge mathematically by calculating how quickly population might grow after the Flood, using parameters set at merely a quarter of the 2 percent growth rate currently seen. In fact, Morris decided this was proof humanity *couldn't* have been around for tens of thousands (let alone millions) of years, otherwise we'd be up to our armpits in people by now (more than the number of electrons in the universe). Of course, Morris recognized that "war or pestilence" might depress the growth patterns somewhat, but he felt his model had enough leeway to accommodate such transient wiggles.[177]

And therein lay Morris' logical mistake, for if those factors could slow the rate for a short while, they could do so indefinitely. Which is indeed what has happened on earth over the last few millennia, where global population has remained fairly constant—a static birth rate kept in check by consistently high death rates (particularly infant mortality) to produce an overall growth rate way below the 0.5 percent value Morris adopted. Only in the last century has the balance shifted, entirely due to technology and medicine.[178] While birth rates have actually tended to decline in industrializing societies, it was an otherwise desirable reduction in mortality rates in the Third World due to medical advances that pulled the lid off there and produced the "population explosion" policy planners and demographers have been grappling with ever since. Morris relied on that artificially high 20th century growth rate as though it had prevailed since time immemorial.[179]

But that's not the really fun part when it comes to the Creation Science argument on population growth, for what Morris didn't consider was the impact of his formula at the other end. It's like the old story of gulling the king into repaying a service with grains of wheat placed on a chessboard, doubling the number each square. Somewhere along the line it will begin to dawn on the patsy how they'd been royally had—a quarter of the way along and you're at 2^{16} (a fairly noticeable 65,536). Whether the headsman is called in at this stage of the tale depends, of course, on how finicky the regime is about honoring verbal contract law. But although 64 doublings does saddle the monarch with a phenomenally steep payment schedule by the last count, the point of the scam depends on the reassuringly low values at the start. Even 2^{10} is only a paltry 1024.

So you may be spotting the problem here if each step is taken to represent a human generation, as Morris had. No matter how fast the growth rate, you're still starting from Mr. and Mrs. Noah and the families of the three sons. That means *eight* people, and it would take some time to expand that base enough to field a good audience at a little league match, let alone the thousands in a decent city-state, or the millions required for the many empires of the ancient world. Creationists who use exponential growth rates in this way to account for the population *today* have to explain how civilization got by during the period immediately following the Flood, when there would have been so *few* people around to do anything noteworthy.[180]

Things like building prestige projects, such as the pyramids of Egypt.

Which brings us to another problem. Tossing off a date for the Flood of 2350 BC (or anywhere thereabouts) trips over the rather obvious obstacle that the Egyptian civilization was already up and running by then, and quite apparently went through the supposed Noah's Ark bottleneck without noticing anything amiss. This would appear to pose a fatal objection to the Flood theory, which makes it all the more remarkable to observe how little attention Scientific Creationists pay to them. Unlike our chessboard sucker, wising up at some point as the grain piled to the ceiling, Biblical creationists seem particularly slow to appreciate the import of there being so many pharaonic monuments around with datable hieroglyphs attached.[181]

But it gets worse. Although Creation Scientists like to believe garbled Flood tales pop up all over the earth, this isn't nearly true enough to suit their case. Legends of watery catastrophe tend to arise among people who live near the sea (subject to tsunami) or along river systems potentially

liable to disastrous flooding—or from cultures that interacted with the ones that did, and this is where Deluge advocates really foul up. For sorting out which of those elements (if any) derived from *the* Flood is complicated by the historical circumstance that social contact has spread the Noah story far and wide. Ethnologists have been known to write down as a "local Flood tale" something the natives had only recently incorporated from Christian missionaries working the region just before.[182]

Unfortunately for global Deluge believers, such difficulties don't apply to the Land of the Pharaohs, where ample written sources tell us exactly what they thought about flooding. It didn't have anything to do with destruction via excessive rainfall—stories of that type are conspicuously absent from their tradition. The only flooding they were aware of was the one taking place every year on the Nile. And that was no aberrant act of divine punishment, but a benign blessing that brought something on which the very life of the country depended: a fresh wash of the nutrient-rich silt that sustained their agriculture. Serendipitously heralded by the heliacal rising of the star Sirius, and thus reassuringly regular as clockwork, the timely Nile inundation was a cause for celebration.[183]

Indeed, it was whenever the river *failed* to flood on schedule that Egyptian documents took to lamentations and weeping. Which places the Egyptian attitude at the opposite extreme from another culture whose mythological floods reflected a far less predictable river network. China has long suffered from the disastrous surges of the Yellow River, as well as by the Yangtze presently being "tamed" by the ambitious (and ecologically equivocal) Three Gorges Dam project. So both Egypt and China (two of the most ancient civilizations on earth) reflect a polarized concern over persistent *river* flooding. In that respect their legendary systems contrast with the more overtly catastrophic Deucalion flood of Greece, possibly inspired by the tsunami generated from the collapse of the Thera volcanic caldera in the Aegean Sea (the legacy of "Atlantis" again).[184]

No less than with the tenrecs, when it comes to removing the historical roadblock presented by ancient Egypt, Creation Scientists face equally indefensible options. Either they have to pull a Velikovsky and drag the entire Egyptian chronology forward, kicking and screaming, to date it after the Flood—or they have to account for the monotonous *continuity* of Egyptian society. But relocating the dynastic gang safely downstream along the river of time is a far trickier operation than moving the temple of Abu Simbel.[185] Which leaves only the second alternative and its unruly entourage of questions. Supposing the locals who built the Great Pyramid centuries before the Deluge had perished in that event, when exactly was the place repopulated? And how is it that the legends of these ersatz "Egyptians" (seed of Noah all) failed to recount the Flood and their incredible trek from Ararat?[186]

Even if they suffered from a more optimally targeted "collective amnesia" than the general one Velikovsky hinted at in his planetary collision theories, we're left with an amazing coincidence: the post-Flood "Egyptians" looked exactly like the pre-Flood Egyptians. But these were a people whose ways Noah and the family should have had no direct experience of, even had it been the conscious intention of their descendants to mimic them. So there's something odd indeed about the presumed settlers adopting identical dress codes and funerary practices, architectural and artistic styles, along with all the traditional pantheistic deities. They even kept the same written (and therefore spoken) language, a circumstance that directly contradicts the purported confusion at Babel, had it taken place anytime in between.[187]

To be blunt, as far as the Old Kingdom of Egypt is concerned, the whole idea is plain dumb.

And with Egypt, so goes the whole of ancient history. For the process of correlating cultures is a counterpart to how geologists go about relating rock formations from one region to the next. Figuring out what it means to find foreign trade goods cropping up among tomb offerings or references to neighboring states in inscriptions sets an inferential cascade in motion, no less than when encountering trilobites at one stratigraphic level and dinosaurs higher up.[188] Because the long contiguous dynastic history of Egypt straddles the supposed Flood and Babel events, everything historical found along the way can be aligned to that independent measuring rod. Which means the underlying logic of Creation Science is bound for trouble here in much the same way as the Book of Mormon founders on pre-Columbian history (or Erich von Däniken does everything in the known universe).[189]

Accepting the global Flood and the literal confusion of tongues at Babel implicitly requires Creation Science to junk modern archeology as readily as they have the corpus of uniformitarian geology. Historical texts that failed to acknowledge the physical reality of the Biblical Flood would be no less outré than charts showing dinosaurs in their proper geological context (the terms Triassic, Jurassic, and Cretaceous don't even appear in Gish's *Dinosaurs by Design*). With archeological research infusing so much of the literature there would be quite a body of theologically invalid texts to consign to the next fire sale.[190]

When you think about it, Creation Scientists approach the Genesis stories of Eden, the Flood, and Babel in exactly the same spirit of blithe credulity as diehard Atlantis believers do the writings of Plato—as a package deal that's not allowed to be mistaken or convoluted at any point. As far as they're concerned, Genesis was all set down by Moses in one go under the direct inspiration of God. The problem here is that serious Bible scholars have recognized for some time that just isn't true. Regardless of the extent to which they were divinely inspired, at least three separate historical elements were involved, spanning many centuries: the Jahwist, Eloist, and Priestly accounts.[191]

The earliest is the Jahwist version, so called because "Yahweh" is used as the name of God. The "J" may have been compiled as early as 950 BC, but was reasonably complete before the collapse of the Jewish kingdoms in 722 BC (when the nascent Assyrian Empire was running amok). Genesis 2 reflects the "J" version of creation, one congenial to the pastoral longings of the nomadic tribes of southern Israel. Adam was made from the dust on a barren earth, provided with the idealized Garden of Eden, then supplied with the company of wild animals and birds. Finally the celebrated "rib-ectomy" was performed to bring about Eve (to keep Adam even better company). The fact that men and women don't actually have a different number of ribs reinforces the mythological character of the text.[192] So it shouldn't be much of a surprise to discover it's also the "J" version that contains the mythic Tower of Babel story.

The Priestly compilation dates from much later, sometime around 550-400 BC, and thus after the revived Babylonian Empire of Nebuchadnezzar II occupied Jerusalem in 597 BC. That's very important to know, for the Babylonian Captivity that followed was not only traumatic for Jewish cultural life—it also exposed them to the Babylonian creation myth *Enuma elish*, which ended up incorporated in Genesis 1.[193] The general order of created things was even the same: the earth was formed and dry-cleaned on the first and second days, and plants made on the third. There followed that cosmological peculiarity of the sun, moon, and stars not being made until Day 4. After that, aquatic creatures and birds were brought into being on the fifth day—then finally mankind, mammals and reptiles on Day 6.[194]

About all that was required for the Genesis version was to replace the polytheistic elements (in which even the gods were born of chaos) with their own developing "Yahweh alone" monotheism. It's interesting to note that this time creation occurred by fiat, quite differently from the "J" version where Adam was fashioned from clay, and Eve developed from Adam's physical body. With such conflicting views on their hands, the priestly factions in Hebron, Shechem, and Jerusalem eventually compromised and included everything in Genesis, interweaving historical and genealogical material (such as the early patriarchs and Moses) drawn from the Elohist text, which uses "Elohim" to identify God.[195]

So what about the Flood? Both the Jahwist and Priestly sources tell the story of Noah, but differ in substantive details. The version in "J" is fairly short. Noah is informed that he has a week to gather up the appropriate number of clean and unclean animals before the rain starts falling—and the water crests after 40 days. This is the version reflected in Genesis 7:4. The "P" take on the Flood specifies the dimensions of the Ark, but only requires two of every animal and gave Noah only one day's notice to load them. The Priestly account also goes beyond mere rain as a source for the floodwaters: "the fountains of the great Abyss" and the "flood-gates of the sky" were opened. It takes fully 150 days before the waters stop rising in the "P" version, and this element was retained in Genesis 7:24.[196]

Once you know that the story of Noah didn't appear all in one piece, the question naturally arises how much of the 10th century BC "J" was borrowed from the much older Mesopotamian tales. Duane Gish had to pick his words very carefully when he alluded to this in *Dinosaurs by Design*:

> Other than the record found in the Bible, the most ancient account of the Great Flood, also called the Deluge, is a tablet inscription found in Babylonia. The tablet referred to an older tablet from which this was copied, but only fragments have been found of that older copy, which was handed down from a previous king of Babylon. Because many people lived several hundred years at that time, the account of the Flood could easily have been reported by someone like King Amraphel (Genesis 14:1), who was one of the early kings of Babylonia after the Flood.
>
> Another flood account was prevalent during the time of Alexander the Great, probably recorded by a Babylonian historian for the benefit of the Greeks. He wrote of the ante-diluvian (pre-Flood) rulers and of the "great Deluge" that covered the earth.[197]

The particulars are considerably more revealing than Gish let on, and show how the story evolved over time into the familiar Genesis morality tale. The Deluge story appears to have originated among the Mesopotamians, presumably first as an oral tradition like the Homeric epics, only later being written down. A flood story similar to the Mesopotamian model turned up in the late third millennium BC archive at Ebla in Syria, but one of the earliest known written in Sumerian is a fragment from around 1600 BC. The hero was a pious king, Ziusudra, who was made immortal following his effective relief efforts during the Flood. Evidently the work of a court poet, this Sumerian version had a strong political subtext—that of reinforcing the idea of divinely ordained kingship.[198]

About 1800 BC the first Babylonian Empire strode on the scene, and when the Sumerian flood tale was copied into Akkadian there was a shift in perspective reflecting the attitudes of an upstart regime. The oldest surviving Babylonian version is the *Atrahasis Epic* from 1635 BC. According to this account, humanity was created following a strike by the lesser gods assigned to do menial work for the main deities, a collection of surpassingly stupid tyrants. But people grew so prolific that they ended up making such a commotion that the chief god (a dimwit named Enlil) talked his fellow deities into destroying them as a noise abatement procedure. Only Enki (the water god responsible for creating mankind) thought this was a poor idea, and conspired with the mortal Atrahasis (the name means "exceedingly wise one") to preserve something of Enki's creation—as well as keeping alive the gods' unpaid human labor force. Afterward, Atrahasis and his wife received the customary Grand Prize reward of eternal life.

By this time much of the "corroborative detail" tracked the Biblical familiars. Like Noah in the older "J" account, Atrahasis was given only a week's notice to build an ark and collect animals for it (Enki saved loading time by raining down a supply of bread and wheat for them). After the rain stopped, Atrahasis similarly sent out birds to test for the presence of dry land. These elements found their way into the Babylonian *Gilgamesh Epic* known from a 7th century BC copy in the royal library at Nineveh of the Assyrian King Assurbanipal, that highly acquisitive bookworm who sacked Babylon in 648 BC. Dovetailing chronologically between the "J" and "P" texts, the exploits of Gilgamesh (a legendary king of Uruk elevated to demigod status) included his visit to the hero of the Great Flood, Utnapishtim, who imparted what he knew of the gods' secrets for living forever.

But dwell too much on the niggling forensics of who loaded what and when, and the deeper parallels between *Gilgamesh* and Noah might well be overlooked. Utnapishtim was selected to build a giant cubical ark two hundred feet on the side (said to have landed on the mountains of Nizir, roughly on the northern border between modern day Iraq and Iran) because of his steadfast devotion to the traditional god Ea (the Akkadian name for Enki). But no reasons were given to Utnapishtim why mankind was to be destroyed. Gone was the farcical misplaced concreteness of the original Atrahasis story. What remained was an aura of fatalistic mystery and resignation—something also seen in the final Biblical version, as Norman Cohn explained:

> The contrast with the Mesopotamian story could hardly be more absolute. The scribes who composed the *Atrahasis Epic* were concerned to demote the

> supreme god in the interest of a lesser god with whom they could identify. The priestly authors who shaped the Genesis story were concerned to promote their god to a position of unique dignity. The god who decrees the biblical Flood is indeed enormously impressive. Not to be questioned, not to be reasoned with, not even to be understood, in solitary and terrifying majesty he decides the perdition or salvation of the world and all that is in it.[199]

Knowing that the Jews had just endured the travail of the dissolution of their independent kingdoms and the forced removal of many of their people by a forbidding conqueror, this process of divine escalation might appear strange, if not giddy.[200] But one way to respond to their seeming abandonment in the Babylonian Captivity was the priestly fusion that rendered their God even more remote and inscrutable. Drawn from what had once been couched in the rhetoric of Mesopotamian royal propaganda, the lesson of Noah was transformed into one of hope and promise for desperate times—and ultimately into a symbol for Christianity itself.[201]

Which still leaves the question, was any of the Mesopotamian flood tale *true*? Quite apart from whether individuals named Noah or Utnapishtim were involved, it is known that the Tigris and Euphrates rivers were prone to serious flooding. Back in the 1920s archaeologist Leonard Woolley uncovered one fairly bad one at Ur from the fourth millennium BC, and excavations at other sites have turned up more examples since. The Sumerian city of Shuruppak (squarely in between the Tigris and Euphrates, midway between Ur and Babylon) suffered a disastrous flood around 2800 BC. So it is of some relevance to note that, of the three major Mesopotamian accounts, *Gilgamesh* said Utnapishtim came from Shuruppak, while another named its protagonist the same as a king believed to have ruled there at the right time. Some of the Deluge mythology, at least, may be reasonably connected to real events related to unpredictable river flooding.[202]

But recently two geophysicists have proposed a new and far more daring contender for a non-miraculous explanation for the Mesopotamian flood legends. In following this quite ingenious detective story, the contrast between the methodology of real earth scientists and the functionless wheel spinning of Scientific Creationism couldn't be more pronounced.

The trail goes back to 1970, when the new *Glomar Challenger* survey vessel was dispatched to the Mediterranean to explore the seafloor. The very first core brought up near Gibraltar revealed something the scientists at first couldn't believe: the place was once a *desert*. But as the drilling progressed around the Mediterranean the conclusion became inescapable that the northward plow of the African plate had sealed off the basin at Gibraltar for several million years. The Miocene climate was just arid enough that there wasn't enough river influx to sustain the old level, and the sea gradually dried up—while the ubiquitous force of gravity meant those rivers still active had to work to keep pace as their outlet dropped by a vertical mile. What rivers do in such circumstances is to carve deeply incised valleys, rather like what the Colorado was up to right about then with the Grand Canyon (except that in Arizona the elevation differential was due to the land rising rather than the sea lowering). On the eastern end of the Mediterranean the Nile cut a channel just as impressive, as Soviet engineers found in the 1960s when they sounded for bedrock during the construction of the Aswan High Dam. Four hundred miles upstream though they were, still the trench from that prehistoric Nile (long since filled with silt) was nine hundred feet deep.[203]

The really nifty development came around five million years ago when the Atlantic finally broke through the barrier to refill the Mediterranean. Quickly. What began as a trickle, soon became a torrent, and finally the stupendous "Gibraltar Falls." This would have been one of the most spectacular tourist attractions on earth, a roaring cataract eight miles wide (so powerful it sucked deep ocean shrimp species into the muck that settled on the floor of the Mediterranean). The inconvenience for Tertiary travel agents here was that the whole refilling process barely lasted one human lifetime … and took place long before the genus *Homo* invented designer luggage and camcorders.[204]

But imagine were such a thing to happen again, only more within the experience of anatomically modern humans? Say, at a time when we weren't quite advanced enough to exploit the situation with resort hotels and helicopter excursions offered in glossy *National Geographic Traveler* ads?

Enter William Ryan and Walter Pitman of the Lamont-Doherty Earth Observatory. Ryan had been among the team aboard the *Glomar Challenger* who discovered the Mediterranean desiccation, and the implications of that had been nagging his imagination ever since. As Ryan and Pitman explained in their recent book *Noah's Flood* (as well as on an informative 1996 BBC "Horizon" program about the theory shown on TLC cable) the puzzle pieces had begun accumulating since the early 1970s.[205] Because glaciation lowered global sea levels more than four hundred feet, the Black Sea was cut off from the salty Mediterranean and temporarily reverted to a freshwater lake. A warm phase of glacial melting around 12,500 BC drained directly into the Black Sea basin. This raised the "New Euxine Lake" there so high it actually spilled out east of the Bosporus into the Sea of Marmara (at that time another freshwater lake), cascading down through the Dardanelles into the lowered Mediterranean.

But two thousand years later the glaciers expanded again in what is known as the "Younger Dryas" period. It was during this disconcerting climate oscillation that hunter-gatherers switched to farming—a socially revolutionary development that may have occurred almost inadvertently as cold-adapted strains of wild crops (such as wheat) were domesticated.[206] When a second warming phase kicked in about 9400 BC (which we're still in, by the way) one peripheral change in the arrangement laid the foundation for disaster: this time the runoff diverted *westward* into the North Sea. Starved of its inflow, the New Euxine Lake drew down until it was 350 feet below the lip of the Bosporus escarpment.

Meanwhile, the Mediterranean bathtub continued its inexorable rise, reclaiming the Sea of Marmara as a saltwater estuary, and finally overflowing into the Black Sea basin around 5600 BC. The refilling would have taken only about four years, during which the equivalent of two hundred Niagara Falls roared through the Bosporus—a strait *much* narrower than Gibraltar, barely half a mile wide at the end. Like constricting the nozzle of a garden hose, the Black Sea influx did to the Bosporus much as the Spokane Flood had done to the Palouse scablands seven thousand years before, gouging a trough hundreds of feet down into the bedrock.

So far, so good—but how this might have affected the human community is more conjectural. Ryan and Pitman offer a plausible (but as yet unconfirmed) circumstantial case that the prototype for the Indo-European language family grew up around the refuge of the Black Sea lake. A cold snap took place 6200-5800 BC, during which many settlements in Anatolia, the Fertile Crescent, and the Levant were abandoned. Ryan and Pitman believe many of those peoples settled along the inviting warmer waters of the Black Sea oasis, cross-fertilizing their cultures until the flood prompted their unceremonious dispersal. Right around 5600 BC many regional population shifts do appear to have taken place, as seen through changes in building styles, artwork, and burial practices—either through the displacement of indigenous societies or the reoccupation of fallow sites. So the Vinca culture went up the Danube to invade Bulgaria and Hungary, while the *Linearbandkeramik* people (referring to their distinctive pottery, and shortened to "Bandkeramik" or the acronym LBK) moved from the Black Sea along the Dniester River into northern Europe, all the way to the Paris basin.[207]

Perhaps most interesting of all were the Sumerians themselves, a mysterious population believed to have migrated from somewhere to the north, which in this instance would be the headwaters of the Tigris-Euphrates. Currently the politically unsettled Kurdish part of Turkey, the region was known in ancient times as Urartu—this was the "Ararat" the Bible was referring to. It was only after the 11th century AD that the mountain Agri Dagi (about a hundred miles to the east of the Urartu highlands) came to be so associated with Noah under the name of Mount Ararat. So anyone fleeing due south of the Black Sea for high ground 7500 years ago, be they the ancestors of the Sumerians or the tribe of Abraham, would indeed be taking refuge in "the mountains of Ararat."[208]

Certainly the Black Sea flood was something too big to have been missed by the locals. But then, so was the Thera eruption four thousand years later—and we know how muddled a coverage that got in the much more literate Bronze Age, ending up primarily in fancy dress as Plato's Atlantis. Sorting out the legendary Noachian trail is therefore a tricky business.[209] Apart from the Mesopotamian complex of deluge stories, only a cult from the Aegean island of Samothrace (just west of the Dardanelles) seems to have preserved a recollection of the event. A major shrine there

commemorated the high water mark of flooding said to have taken place when the Black Sea overflowed through the Bosporus. But the only source for this is Diodorus of Sicily in the 1st century BC—so if the Black Sea refill was at the root of their tradition, somewhere along the line somebody got the *direction* backwards.[210]

Because of its relevance to the story of Noah (and all the contentious theological baggage that entails) the Black Sea flood touches raw nerves in a way the Mediterranean desiccation or the Spokane Flood never could. But the gauntlet having been thrown, geophysicists and prehistorians will be merrily grappling with the challenge for many years to come, putting the Ryan-Pitman theory to the test in the fiery furnace of scientific investigation.[211]

Just as happened with Bretz's Missoula Flood, however, some Creation Scientists will surely seize upon this marine cataclysm and human dispersal as further confirmation of *the* Flood and its awful aftermath. But even accepted at full intensity, none of the disruptive effects on the Black Sea would offset the overall absence of contemporaneous diluvian deposits in Palo Alto or Melbourne. Nor can the disaster be submerged into the larger scenario of the global Deluge, as places like Hacilar in Anatolia attest. Mentioned by Ryan and Pitman as showing population turnover in the mid-sixth millennium BC, Hacilar had a long history of settlement leading up to the time when defensive ramparts were thrown up, suggesting marauders, and a new group of winners built on the ruins.[212] A planetary flood on the scale Creation Scientists were proposing wouldn't have dented those modest walls of Hacilar—it would have *obliterated* them, taking all traces of the structure with it. There shouldn't be a Hacilar nestled in the Anatolian heights to be overwhelmed in the first place if the literal Biblical Deluge were true.

It took over two decades for Ryan and Pitman to sort through the scientific evidence for the Black Sea flood—information equally available to Scientific Creationists through the published literature. So what were Creation Scientists up to all this time? Well, it wasn't analyzing sediment cores from the Black Sea. Besides jousting with evolutionists, many enthusiasts looked to verification of the Flood via those who claimed to have spotted the Ark itself (or chunks of it) resting on Agri Dagi (sorry: Mount Ararat). Armed with such mighty evidence, thus would the "Last Days" scoffers be well confounded.[213]

As far as some parties were concerned the issue was already settled. In February 1993 CBS aired "The Incredible Discovery of Noah's Ark" hosted by Darren McGavin, based on a book by Executive Producer Charles E. Sellier and his researcher David W. Balsiger. Recycling footage from their 1976 film "In Search of Noah's Ark," Sun International Pictures applied to the Flood the same vaulting credulity and technical ineptitude they displayed on their other programs for CBS (on topics ranging from Bigfoot to the Bermuda Triangle).[214] Sun's documentary style was to intersperse the sentiments of true believers with prepared text read by genuine scholars, who agreed to the arrangement under the presumption their skeptical commentary would also be recorded. Though not necessarily used—an editorial discretion that would come back to haunt the producers in the Noah's Ark case. Meanwhile, the many Biblical creationists who participated in the program were never identified as such: it was Henry Morris speaking as "Professor of Hydraulics" or the "Paleoanthropologist" Dr. Carl Baugh.[215]

The show offered half a dozen eyewitnesses who reported seeing the Ark on Mt. Ararat in recent years, though usually at some distance. Purported photos of the Ark peeking from the glacier were enlarged until they looked even more like the rock outcroppings or dirty ice sheets they probably were. But "one of the most fascinating and moving accounts" (as the narration put it) came from a certain George Jammal, who claimed to have entered the Ark in the mid-1980s and removed from a timber inside some of the precious wood, which he lovingly showed the camera. Jammal's testimony was evidently deemed so impressive the producers lavished a new stage set on a reverential recreation of this historic episode. Unfortunately, the bloom was off before the year was out as Jammal was revealed to be a deliberate hoaxer, who had set out to demonstrate just how gullible some creationists could be when told pretty much what they wanted to hear.[216]

Inspired (if not incensed) after listening to a radio debate between Duane Gish and creationism critic Fred Edwords, Jammal wrote Gish in 1985 about his imaginary Ararat adventures, and the following year John Morris interviewed him. Even though veteran Ark hunter Bill Crouse smelled a sizable rat here (picking up on Jammal's evident unfamiliarity with the lacunae of Turkish terrain

and customs), when Sun International approached Morris in 1992 about people claiming to have seen the Ark, Morris obligingly forwarded Jammal's name.

By now Jammal had encountered Gerald Larue, an advisor to the Skeptics Society who had been burned by his experience with Sun International's previous CBS opus, "Ancient Secrets of the Bible."[217] Larue was more than happy to coach Jammal on how best to play on the expectations of the producers, though Jammal had done a lot of homework on his own. Particularly interesting was the fact that he had seeded his preliminary correspondence to Gish and Morris with vulgarisms calculated to provoke suspicion (a Polish friend was named "Vladimir Sobitchsky," while another was "Mr. Asholian," whose son-in-law was "Allis Buls Hitian"). But the *coup de grace* was the Ark wood Jammal now supplied for the filming—obtained from a railroad tie, the pieces were cooked on his stove in a variety of sauces (presumably to disguise the telltale aroma of creosote). A correspondent for the television tabloid *Inside Edition* who reported on the flap in December 1993 remarked how the wood still reeked of *teriyaki*. Which was the point—anyone with their brain half in gear who stopped to investigate should have tumbled onto the absurdity at once. Only no one at Sun International did.[218]

Unlike garden variety bad reporting, the root of Sun's trouble wasn't that they were clumsily misrepresenting the views of Scientific Creationism. To the contrary: just like the many ingenuous puff pieces done over the years on von Däniken's Ancient Astronauts, "The Incredible Discovery of Noah's Ark" was preposterous in direct proportion to the extent that the underlying doctrine was being reported *correctly*.

Biblical creationists believe Noah's Ark was an admirable object of marine design, for example, capable of weathering 200-foot tidal waves—and they put a model through its paces in a wave tank to prove it. The miniature was duly shown bobbing along without overturning, but what does that tell us? If the model were airtight it couldn't possibly *sink*, so the only aspect of its "stability" at sea confirmed by the experiment would be that a box of Ark proportions (300 cubits long by 50 wide and 30 high) wouldn't necessarily capsize in a swell. But even in this display there was an unexpected element of "misplaced concreteness"—the Ark rode those same waves up and down in a manner that would have been sheer hell on anyone or anything riding inside. As epic spectacles go, the picture of slumbering baby sauropods or crates full of so many thousand beetle species crashing fore and aft at each surge, Noah and the family racing about in panic, is more Mel Brooks than Cecil B. DeMille.[219]

Whether Dramamine existed in Biblical times cannot be ascertained from Genesis, but the issue is moot because of something the tank test didn't establish. Given the going rate for cubits, the *full size* Ark was roughly 450 feet long and built entirely of "gopher wood" as specified in Genesis 6:14.[220] Although Dr. Don Shockey (an optometrist and consultant to the show billed as "Professor of Anthropology") intimated that "gopher wood" was some sort of glued laminate like plywood rather than the pine or cypress it likely was, the question remains whether any wooden vessel of such dimensions could stay together. Naval engineers stopped using wood when it came to building really large craft for good reason: hull deformation and leakage. The longest wooden ships ever built were the six-masted schooners early in the 20th century. Pushing the limits at 320 feet, these required iron strapping as reinforcement to minimize "hogging" (bowing amidships as the ends sagged). Noah's conjectural Ark was over one hundred feet longer still, so unless some "miracle of the timbers" came into play, Genesis naval architecture has a way to go before it can be taken seriously.[221]

One way to end run around such difficulties is to claim ancient peoples were significantly more advanced than we give them credit for, and hope the implications of that would percolate back to resolve the Noachian technological gap.[222] Roger Oakland (identified as "Author" and "Science Professor") took that tack in the Noah's Ark special, and ended up sounding remarkably like the most effusive of Lost Atlantis groupies or Erich von Däniken at peak form:

> If we look at the evidence left to us by ancient civilizations, we find that the further back we go the more amazing are the accomplishments. The ancient Minoans were highly advanced. Some of their [*sic*] reconstructions of their temples that were destroyed catastrophically reveal that they had tremendous

> abilities, architectural skills and artistic design. We see inlaid stone, natural ventilation and air conditioning.
>
> We can go to Egypt and look at some of their artifacts, some of which are electroplated. Such electroplated artifacts have been found literally around the ancient world. The ancients were also able to make batteries and generate electricity. The ancient Mayans were able to calculate the solar year to be three hundred sixty-five decimal two-four-two-zero days, accurate to within two ten-thousandths of a day.[223]

Narrator McGavin then continued with this breathtaking logical sprint: "From this information we can easily draw the conclusion that in fact ancient man had a highly developed technology, easily sufficient to build a vessel the size of Noah's Ark."

Oh, can we now? So the Bronze Age Minoans laid tile and left openings in their residences for ventilation. This was nothing at all like the sort of mechanical system the term "air conditioning" would inevitably conjure up in the modern viewer, of course—but how would that show Noah was able to carpenter a viable 450-foot wooden ship 1000 years earlier? Nor do electroplated objects abound in the ancient world, though there was a small clay pot (known as the "Baghdad Battery") whose image flashed by briefly without explanation. Coming from the Parthian Empire (modern day Iran) this gizmo of the "ancients" belonged to *Roman times*. Theoretically, if you strung enough of them together you might be able to electroplate an ornament or zap a cockroach. Does that mean "gopher wood" had the structural integrity to keep the Ark from buckling in turbulent waters 2500 years before? As for those "ancient Mayans" who (in between blood rituals and flailing sacrificial victims) so patiently observed the heavens until the solar year was pinned down with great accuracy—they were performing their astronomical exercises within the time span of St. Augustine and Mohammed. Thus, step by misleading step, Oakland had hauled the debating field all the way into the early Middle Ages (more than *three millennia* removed from the Ark problem) without even getting winded.[224]

But this archaeological fiddle-faddle is nothing compared to the long procession of logical dominos knocked over once Noah's grand Deluge is taken as an obligatory fact of nature. The primary dynamic problem for Flood theory is that, however much tumult happened during the disaster itself, you still have to end up afterward with the present distribution of continents and water. Thus Creation Science ultimately founders on the same goof that plagued the science fiction film *Waterworld* when it depicted the planet drowned by icecaps melted from global warming. There simply isn't enough water locked up in polar glaciers to raise sea levels by more than a few hundred feet—Denver would still be high and dry. Moreover, in the movie Kevin Costner and the boat people found their refuge on the summit of Mt. Everest—not Agri Dagi. In order for the Ark to settle on Ararat as the highest bump of the landscape, mountains surpassing its 16,850 feet have to be made lower prior to the Flood.[225]

Come to think of it, as Whitcomb and Morris recognized early on in *The Genesis Flood*, Ararat is still too tall to be covered by the waves. To accommodate the Noah scenario it turns out most of the planet has to be flattened, along with squishing up ocean basins to make more fluid available for the inundation.[226] But Biblical creationists can't go too far with that trick, otherwise where to put all those land animals ultimately entombed in the Flood sediments? To maintain sufficient surface habitat, the next step is to slip some of the ocean water down into reservoirs far beneath the earth's surface, providing corroboration as well for the "fountains of the deep" mentioned in Genesis. Mechanical engineer Walter T. Brown called his version of this idea the "hydroplate" theory, illustrated on "The Incredible Discovery of Noah's Ark" via a colorful computer simulation. Stratospheric sprays were shown squirting up during the Flood, eroding the overlying rock—which thus released pressure on the underlying strata, causing that to buckle up and fracture into the oceanic ridges. Continental blocks meanwhile slid away at speeds up to 45 mph (!) on either side, crumpling into mountain ranges and ocean trenches as they encountered resistance.[227]

As plot for a disaster movie this was swell. But the scientific outrage comes from presenting this as a geophysical plausibility, for the plain facts don't fit Brown's "hydroplate" theory in the

least. The parallel folds in the mid-Atlantic ridge aren't *cracks* caused by rock bulging upwards, but the result of magma erupting from the center and elbowing aside the older material.[228] Nor have the continents themselves been *sliding* anywhere—they've ridden along the same plate material as the oceanic rifts that have driven them apart. Nothing about the observed geology of the continents in the 1990s can be reconciled with Brown's fantasy of solid rock careening along at the speed of a freight train.[229]

But the really jejune feature about these "new" Creation Science propositions is the degree to which they *weren't new*. When it came to speculation about flattened topography and subterranean pools, Thomas Burnet had long since beaten Creation Scientists to the punch with *The Sacred Theory of the Earth*—penned in 1681. Likewise, Newton's peculiar protégé and successor at Cambridge, William Whiston, dreamed up a comparable scheme for *A New Theory of the Earth* (with the added wrinkle of cometary strikes àla Velikovsky) back in 1696. So Walter Brown's "hydroplate" confection was casually rewinding scientific thinking here by fully three hundred years. Had Roger Oakland only kept going in his pursuit of "advanced" technology for Noah, he barely had eight centuries to go before he'd bump into Brown devouring geological science from the other direction.[230]

Creation Scientists have comparable troubles ironing out the physical consequences of the "waters above the earth." Although the "vapor canopy" is commonly appealed to as an additional source of H_2O for the Flood, it doesn't hold much water—literally, not just rhetorically. Try to pump in too much and its density climbs so high the cloud collapses of its own accord, meaning the vapor content has to be severely restricted to maintain stability. Provided, that is, there are no wafting breezes to break it up. But the earth's rotation and differential heating by latitude have this annoying tendency to do exactly that—and the mixing efficiency of natural winds would only be enhanced were the pre-Flood earth as mountain-free as Creation Scientists aver (do consult residents of Kansas). Under the most optimal of conditions the best that can be wrung from the vapor canopy is a measly forty feet of moisture, a quantity inadequate on its own to submerge flat-as-a-pancake Florida, never mind rarified Peru or Tibet.[231]

And then there's the matter of atmospheric *transparency*. Creation Scientists like Donald DeYoung concern themselves only with the scientifically trivial (but theologically pertinent) question whether the sun, moon, and stars were anthropocentrically visible for mankind to admire after their indicated creation on the fourth day:

> Since, in large quantities, water vapor will absorb and scatter light, the earth's vapor canopy may have once somewhat dimmed the heavenly lights. One technical concluded that a canopy-covered night sky might have looked the same as a night when a full moon is present. If this is correct, the dim stars would have remained unseen. However, the canopy would certainly not have hidden the sun, moon, or brightest stars. We know from Scripture that from the very beginning, the heavens have served their purpose as lights for the earth, markers for seasons, and reminders of God's great glory.[232]

But for another of God's evident handiwork, the green plants supposedly knocking about since Day 3, these terrestrial conditions would not have been quite so hospitable. A vapor canopy thick enough to do its duty (to the extent that it could stay in place at all in a real-world atmosphere) actively absorbs at the red end of the electromagnetic spectrum. In other words, while Adam's descendents might well have had something of the heavenly splendor to ogle at, the cloud cover itself would have been sopping up the very wavelength of light plants rely on for photosynthesis. So far as leafy creation was concerned, Eden 'neath the vapor canopy would have been gloomier than the proverbial Black Hole of Calcutta.[233]

This is hardly the pastoral idyll painted by Flood adherents, of course, who extol the salutary benefits of the canopy environment without technical qualification. But then, they have other priorities in mind, as may be seen in Henry Morris' compact description of pre-Flood climatology in *Scientific Creationism*:

> On the surface of the primeval world, it is postulated, there was probably an intricate network of narrow seas and waterways whose precise locations need yet to be determined. Though the uniform climate would inhibit air mass movements, as well as storms and heavy rains, a daily cycle of local evaporation and condensation would maintain an equable humidity everywhere. The favorable climate, aided by the highly effective radiation filter provided by the vapor canopy, would favor abundant plant and animal life, longevity of animal life, and growth of large-sized animal organisms.[234]

That last sentence introduces us to the main event in Creation Science Flood redaction: the double-whammy effort to account for the extended life spans claimed for the early characters in the Bible (Noah's 950 years, for example) along with the existence of a host of prehistoric animal giants. As we've seen, apart from *behemoth* and *leviathan* (with their several mythological connotations) the Bible doesn't really have a lot to say about unusual fauna. But modern science definitely does, and bridging that sizable gap has lead Morris to nurse a resilient fascination for the larger beasties of paleontology (including those fictitious "giant ants" he likewise slipped into *Scientific Creationism*).[235] As he put things back in 1963 for *The Twilight of Evolution*:

> Similarly, paleontology reveals that practically every type of living creature in the present world has ancestors in the fossil record which are larger than their present-day descendants. One thinks, for example, of the mammoths, the cave bears, saber-tooth tigers, giant bisons, the dinosaurs, the giant beavers, cockroaches, rhinos, and even giant men! The evolutionary increase in size and complexity supposedly revealed by the fossil record apparently breaks down in the transition from the hypothetical sequences of the geologic past to the actual creatures of the present! And, as we shall see later, these hypothetical phylogenies of the fossil record can be interpreted in an alternate manner which supports, rather than contradicts, the second law of thermodynamics.[236]

What the second law of thermodynamics was doing in this argument will be cleared up in chapter seven, but the salient feature concerned the implication Morris' bestiary of *behemoths* has had for canopy modeling in the intervening years. Contemporary Biblical creationists wanting to buttress the vapor canopy scenario focus on how the shrouded earthly cocoon would have promoted unsullied growth and longevity. And no one has pushed that Creation Science environmental mythology farther out on the limb than Carl Baugh, the Sage of Glen Rose, who in March 1994 made several appearances on Noah Hutchings' "Watchman on the Wall" radio show to explain his cutting-edge research program in this area.[237]

Evidently picking up on the buzzwords then circulating around the Arizona Biosphere fiasco, Baugh declared his intention to construct a "hyperbaric biosphere" in which he would take a conventional "reptilian" form and transform it into a *bona fide* "Dimetrodon dinosaur." That this boast came across like so much parlor magic palaver ("you see before you this perfectly ordinary gentleman's handkerchief…") is due to the fundamental anatomical differences between Gila Monster and *Dimetrodon* Baugh seemed oblivious to. More than just a matter of relative size—or even slapping a fin on its back, in the tradition of Saturday matinee science fiction—the primary problem relates to something noted last chapter. *Dimetrodon* was a *synapsid* reptile, one of those critters on our mammalian side of the evolutionary reptile fence, and not a *diapsid* like any modern lizard Baugh could have recruited to inhabit his terrarium-*cum*-pressure cooker. Which means the last thing Baugh should have wanted was to be *successful*, for easily inducing a mutation from diapsid to synapsid would represent a macroevolutionary leap to make Stephen Jay Gould salivate with saltational delight.[238]

Baugh returned to the "Watchman on the Wall" in August 1994 to report his biosphere experiment was proceeding apace, but in the years since the operation has been shunted off to matters far removed from synapsid taxonomy. Scoring embarrassingly high on the credulity index (as well as showing what can happen when the spell checker is apparently turned off on the word

processor) Ankerberg and Weldon devoted a slice of their current book *Darwin's Leap of Faith* to pass on "Dr." Baugh's "startling" findings:

> One particularly fascinating illustration of creationist research, again relative to the biblical flood and his implications, is now being conducted by Dr. Carl Baugh at the Creation Evidence museum in Glen Rose, Texas. The reults [*sic*] are significant enough that NASA invited him to speak before its scientists and engineers on the scientific (if not creationist) impolications [*sic*]. As with all research, the results must be considered tentative until further confirmation.
>
> In the world's first byberbaric [*sic*] biosphere, Dr. Baugh has simulated (not duplicated) the pre-flood atmosphere by 1) doubling the atmospheric pressure; 2) increasing the earth's magnetic field tenfold; 3) slightly increasing the oxygen ratio; 4) increasing the carbon dioxide ratio tenfold; and 5) eliminating ultraviolet radiation, dominating with pink light. In a personal conversation with John Weldon in December 1997, Dr. Baugh revealed that the results so far are startling:
>
> - Third generation fruit flies have tripled their adult lifespan.
> - First generation pacu piranha have tripled their growth rate from 4 inches to 19 inches in a matter of months.
> - First generation snake venom actually alters its molecular structure.
>
> Creationist research worldwide, though terribly under-funded, is nevertheless proving its value even to some skeptics.[239]

Alas, the authors neglected to identify any of these choice "skeptics" who were impressed by Baugh's work (that we might be impressed too)—though an outraged congressional oversight hearing would seem in order were the claim valid about the NASA speaking invitation.[240] But as Ankerberg and Weldon brought the subject up, why *is* such creationist research so under-funded? One can readily understand why the National Science Foundation wouldn't be caught dead handing out checks to Baugh or any equivalent thinker, but what impediment prevents like-minded religious organizations from ponying up the cash themselves? After all, quite a pile of grants could be squeezed from the millions lavished on broadcast-ready tabernacles and Christian-value theme parks over the years. Isn't this is a matter of putting your money where your convictions are?[241]

Not that there is anything inherently wrong about an investigator showing dogged persistence in the face of strapped finances—most working dinosaur paleontologists would sympathize on that front. There's even an evolutionary precedent for hanging in against serious technical odds, as the seventh chapter will show concerning those trying to fathom the naturalistic origin of life. Where diehard creationists falter is not in their admirable philosophical tenacity, but in their often inept practical *method*. The diaphanous character of Baugh's academic credentials was only the tip of the iceberg—the bigger problem involved how easily Ankerberg and Weldon accepted the biosphere experiment without asking any of the rather obvious questions. For example, piranhas normally grow to eighteen inches anyway, so were control groups employed to isolate random variation in maturation rates? What species of snake venom was studied, how exactly had its molecular structure been altered, and by what technique was this change subsequently detected? And so on, *etc*., and so forth. Even Baugh's closest hit (his purported discovery of fruit fly longevity) hinted mainly that the canopy stimuli might have been chiefly beneficial to insect pests.[242]

None of this made the jump to *Dimetrodon* any more likely, of course, but it does press us closer to the intellectual dry rot prevailing in grassroots creationism, and the perennial danger this poses for contemporary science education. At every turn, some children are going to encounter a secular view that directly conflicts with the "science" their parents are soaking up via Baugh-boosters like Kent Hovind or Ankerberg and Weldon. It's Jammal and his teriyaki-flavored Noah's Ark wood repeated *ad nauseam*—only this time not intended as a critical hoax. Carl Baugh was nothing but sincere in his views, and their acceptance all too predictable among people who do not think like scientists and are thus unable to distinguish the output of those who pass themselves off

as "Dr." of this or that, courtesy of some diploma mill. Imagine then the cumulative effect of Dr. Hovind's hectic travel schedule among receptive church groups, mix in the enthusiastic certainties of Ankerberg and Weldon's own considerable evangelical enterprise—and you have some idea of the level of unvarnished credulity rippling steadily out into the conservative Christian hinterlands.[243]

ID hiding the YEC ball: Robert Gentry and Kent Hovind

It is difficult to say to what extent more "mainstream" creationists (especially those in the ivied cloisters of Intelligent Design) are aware of this situation, or have considered much what to do about it. Unless they paid some attention to the drivel regularly airing on the "American Christian Network" (ranging from Noah Hutchings to Chuck Missler) or parsed one of Kent Hovind's cockeyed lecture videos, these pseudoscientific influences would fall completely off the scope.[244] If the recent forays of Intelligent Design are any indication, there is only the vaguest apprehension that Creation Scientists may believe some silly things, but that so minor a nuisance would doubtless go away once their academic betters properly intoned "theistic realism" at them. Such insouciance certainly held sway at the 1998 Whitworth "Creation Week" symposium mentioned last chapter, where philosopher Stephen Meyer quite literally laughed off the Young Earth challenge posed by Duane Gish.[245]

This "don't sweat the differences" spirit infused an anthology appearing in early 1999, *Three Views on Creation and Evolution*, edited by J. P. Moreland and John Mark Reynolds. Young Earth creationism was represented here not by ICR heavyweights like Duane Gish, but by two relative newcomers to the field: philosophers Reynolds and Paul Nelson (another of the critical reviewers for the creationist school text *Of Pandas and People*). Theology professor Robert Newman put forward the competing interpretation of Old Earth "progressive creationism," and physicist Howard Van Till argued for theistic evolution (a term which Van Till detests, preferring to call it the "fully gifted creation principle"). As for the recalcitrant demon of materialist/atheist Darwinian evolution, its exorcism awaited the elimination of naturalistic assumptions from all aspects of modern intellectual life.[246]

Much as with Moreland's 1994 exercise in creationist fence-building (or straddling), *The Creation Hypothesis*, the new round of authors spilled far more ink justifying the philosophical legitimacy of their various beliefs than they did presenting persuasive scientific evidence for them.[247] More to our sociological point, *en bloc* they politely sidestepped most of the full-tilt Creation Science of Morris and Gish (not to mention Hovind or Baugh). The resulting exchange of "common ground" pleasantries amounted to the inoffensive equivalent of teacakes and doilies. All studiously avoided addressing the theologically distasteful idea that the Bible might have been seriously mistaken about something—particularly the literal Noah (and the globe-punishing Deluge associated with him) that New Testament figures from Jesus on down so evidently believed in.[248]

Among those offering peripheral commentary in *Three Views on Creation and Evolution* was the ubiquitous Phillip Johnson. Though devoting most of his remarks to pummeling once again his bugbear of "methodological naturalism," in between punches he did offer this revealingly ambivalent paragraph apropos our topic:

> Young earth creationism honors the Scriptures and gives specific content to the biblical doctrine that death and suffering entered the world through human sin. If it turned out to be true, some tough theological problems would become a lot easier. But, as Robert Newman shows us, the young earth scenario seems to face insurmountable scientific problems. Paul Nelson and John Mark Reynolds can respond that the young earth camp includes a few distinguished scientists who are working on those problems. That is true, but nothing I have read so far leads me to be optimistic. I state these personal opinions with some diffidence, largely because I am nowhere near as familiar with the crucial geological evidence and radiometric dating techniques as I am with the main issues of biological evolution. Because of these opinions, most people think of me as an old earth creationist; however, I agree with critics of that position that something

> is awkward about the idea that God stepped in at various undetermined points in an earthly history of billions of years to do some more creating or to inject new genetic information into the biosphere. Show me a better scientific position than old earth creationism and I'm open to persuasion.[249]

Even if tongue-in-cheek, Johnson's new openness to persuasion (in an area already so well trafficked by Henry Morris and the gang) reminds us of the need to isolate what (if anything) distinguishes Creation Science reasoning from that of Intelligent Design. Any strategy neo-creationists have of distancing themselves from Bible-spouting traditionalism will work (as the math logic folk would put it) *if and only if* Young Earth creationists have arrived at their more contentious conclusions using some mode of thought fundamentally different from that employed by run-of-the-mill antievolutionism. Is it possible to successfully dispose of the Young Earth *without* invoking wicked methodological naturalism? It's sink or swim time, friends.[250]

First off, we need to know exactly what Phillip Johnson (and those who reason like him) mean by the phrase, since that may not necessarily be the same thing practicing scientists think of when they employ naturalistic assumptions in their daily professional lives. Through Johnson's periscope the "naturalism" underlying modern science is nothing less than full-blown "don't you dare allow God into it" materialism, as the chapter on "The Rules of Science" in *Darwin on Trial* left no doubt:

> Theistic or "guided" evolution has to be excluded as a possibility because Darwinists identify science with a philosophical doctrine known as *naturalism*. Naturalism assumes the entire realm of nature to be a closed system of material causes and effects, which cannot be influenced by anything from "outside." Naturalism does not explicitly deny the mere existence of God, but it does deny that a supernatural being could in any way influence natural events, such as evolution, or communicate with natural creatures like ourselves. *Scientific* naturalism makes the same point by starting with the assumption that science, which studies only the natural, is our only reliable path to knowledge. A God who can never do anything that makes a difference, and of whom we can have no reliable knowledge, is of no importance to us.[251]

Here Johnson tried to slip another fast one over the plate. This philosophical argument hinges on ignoring the difference between "cannot" and "apparently does not." The distinction is not trivial, for it's what separates the *a priori* dictation of absolute materialism (such as might be intoned by an orthodox Marxist evolutionist) from the practical scientific methodology by which purported acts of divine intervention might be discerned (or precluded) in particular natural processes.[252] Many staunch "materialists" proceed under the stiff-necked empirical assumption that extraordinary claims require extraordinary evidence. (Arthur C. Clarke and the late Carl Sagan come handily to mind—and I do count myself among their philosophical company in that respect.) Detecting the hand of God in the cosmos or biology would call for no less taut a line of reasoning than would be required to establish the reality of UFOs or psychic phenomena—a comparison alone sufficient to raise the hackles of the devout on all sides. In the absence of what they regard as such rigorous evidence, the skeptical mind tends to default to a functional atheism.[253]

Given that understanding, Johnson's confusion on this point is intractable—a strained comparison of apples and oranges. Even if God doesn't *appear* to be poking around in the affairs of particular molecules, that condition wouldn't rule out the possibility of communication with man (not excluding the media of burning bush or writing on the wall)—and Johnson offered no examples of anyone who said that it would. Nor was it clear how accepting divine interaction with Moses on Mt. Sinai or Saul *en route* to Damascus would ineluctably cascade backwards to justify the idea that selected genetic point mutations were directly engineered by that same transcendent entity in therapsids or dinosaurs. To make any headway, clearly we have to be talking about specific cases, otherwise everything gets bogged down in an "us or them" clash of absolutist dogma.[254]

But perhaps that is a philosophical environment in which the new species of creationist would most flourish. It not only shields them from the buffeting details of how such heavenly biotic tinkering might be based—it incorporates a quite useful double standard. For Johnson is contrasting "take no prisoners" materialism with . . . *what*? The agile Berkeley lawyer rolls into a ball when it comes to pinning down what "theistic realism" is supposed to mean. Reduced finally in *Reason in the Balance* to the space-saving acronym "TR" (just as "MN" signified methodological naturalism), this is as close as Johnson got: "The term signifies that I am convinced that God is objectively real, not merely a concept or fantasy in my own mind."[255]

A conviction no doubt Duane Gish and Vine Deloria would share. But which "God," known by what revelation, and acting in the natural world in what definable ways? Johnson's "theistic realism" tells us nothing about the task at hand—except to suggest how fruitfully divisive the icon would be should it ever slip into secular science education without any facts attached. Were Johnson out to compare "MN" (where God by definition *cannot* intervene) with its natural metaphysical counterpart, this would be a theistic view in which God is taken to tip the scales *all too often*—and Creation Science's Young Earth is a dandy example of that. Those radiometric dating techniques Johnson professed to be "nowhere near as familiar with" than "the main issues of biological evolution" (is that saying much?) for starters. Maybe there we can detect where in the grand sweep of creation godless naturalism fizzles out and the manifest virtues of "theistic realism" kick in.

By the turn of the 20th century geologists were confident about *relative* age determinations (the Cretaceous period definitely occurring after the Jurassic, for instance). George McCready Price notwithstanding, uniformitarian science had also settled on pretty good ballpark figures for the *absolute* ages of at least that part of the geologic column containing complex life. But the Precambrian was something else. Recall that, up until very recently, little seemed to be alive then to give a clue about turnover rates, and the plate tectonics that would suggest how much physical turf had been lost in the interim awaited the geological revolution of the 1960s. With nothing much available to "measure," geologists and evolutionists alike tended to radically underestimate the time involved from the Cambrian back to the formation of the earth.[256]

Radioactivity supplied that missing measuring stick: atoms that decayed uniquely and inevitably and *steadily* along specialized paths into particular elemental isotopes. When trapped in a rock sample they ticked away the eons, and you counted the elapsed time by comparing how much of the parent element remained with the quantity of its decay products. The first planetary scientists to tap that radiometric timekeeper were in for a bit of a shock: the Precambrian segment of earth history abruptly got several billion years older. But then, such cosmological vertigo was going around. Astronomers were catching a severe case in the 1920s as it dawned on them that the fuzzy "nebulae" seen through their new jumbo instruments were really "island universes" (we call them *galaxies* these days)—telescopic images quite literally from "a long time ago and far, far away."[257]

Successfully dating objects using radioactivity depends on a variety of factors, all of which Young Earth creationists have picked on as a means to skip their theologically corrosive science lesson. First, there is the inherently naturalistic assumption that radioactive decay did indeed occur in the past, and at the same monotonously fixed rates observed experimentally. More importantly, all radioactive dating methods are *context sensitive*. If any elements of the decay chain happen to flow in or out of the sample before scientists get a crack at measuring them, that will bollix the result.[258] For example, the inert gas argon percolating up through magma can cause fresh volcanic deposits to appear anomalously "old" when subjected to the potassium-argon technique. Likewise, radiogenic carbon-14 is produced at a fairly regular pace by cosmic rays striking atmospheric nitrogen, but human industry has upset the balance in modern times by burning fossil fuels. None of that carbon being radioactive, running recent animals through the radiocarbon hoop will give "ages" inaccurately inflated compared to their pre-industrial counterparts.[259]

For radiogenic isotopes with longer half-lives (the ones that make the world too old for Henry Morris), a particularly clever self-calibrating tool called "isochron" analysis has come along. The recipe starts with carefully obtaining minerals restricted to a single "cogenetic" unit of rock (formed functionally at the same time). The presence of the relevant isotopes in those samples is then measured using the standard instruments. Normally that's where the process ends, but isochron

dating puts the information through a second wringer, relating the multiple readings to the naturally observed isotope ratios. A valid set of datings will result in a straight line—and the steeper the slope, the older the rock. But what if the piece had been heated after its original formation? If it has congealed uniformly (so that none of the decay products have escaped) the isochron will be reset at a higher level on the chart and with a new zero slope (thus *underestimating* its true age, by the way). But if any of the decay isotopes have been lost, the plot will scatter without forming an isochron line. In other words, the technique itself reveals when the individual mineral "ages" have been adversely affected.[260]

Pretty cool, eh? So much so that it probably won't come as a surprise that creationist critics of radioactive dating don't talk all that much about isochrons.[261] But one revealing exception comes from Steven Austin, who has undertaken to prove how easy it is to produce *false* isochrons and thereby slay the new radiometric dragon. The result presented in Austin's *Grand Canyon: Monument to Catastrophe* was one of the more ingenious creationist magic shows. As noted, genuine isochrons require rock reasonably formed at one go (samples from the same lava flow, for example)—lumping together readings from different formations will not do. This is because an isochron chart is something like tracing a bullet's path through a house: where an entry in the front window and an exit out the side ought to align perfectly with holes in all the intervening walls. For that, you need a *natural* layout, not a collection of flats carted in from all over Hell's Half Acre and assembled on site to fake a crime scene. But that's what Austin was doing with his "pseudo-isochrons"—dating *different* samples, then arranging some of them to form a contrived line of points where the isochron formulas would yield unacceptable dates. Nice try, but no cigar.[262]

Someone else who has recently taken a stab at invalidating isochrons is Richard Milton, this time drawing on the "KBS Tuff controversy" from the early 1970s, when competing laboratories attempted to date a Kenyan australopithecine site.[263] One team used a new argon-40/argon-39 technique (converting potassium-39 into argon-39 through neutron bombardment, allowing one mass spectrometer to measure both argon isotopes at a stroke). This eventually yielded a date around 2.4 million years, but that soon came in conflict with other samples dated to 1.8 million years by the more established direct potassium-argon method. Milton took all this as showing how flawed isochron determinations are—only the problem was more involved than a technical tiff about laboratory precision, but whether any of the results dated the *volcanic tuff*. This was because the ash fall had been washed into a lake, dragging older material with it. Which meant that either date could be perfectly "accurate"—yet *wrong*. Nor did it help matters that there were so many competing reputations and theories at stake. Richard Leakey in particular had an incentive to favor the older dating because it would put his exciting hominid fossil find a notch earlier than the established competition.[264]

The older reckoning ultimately lost ground because the animals associated at the site (especially fossil pigs) seemed far too like their neighbors to have dated from much apart. And since these already had what were considered more reliable radiometric datings attached, falling in the 1.8 million-year period, the older value fell out. This process of deciding what the "correct" ages were supposed to be was held up by creationist Marvin Lubenow as illustrating exactly what was most egregious about evolutionary use of radiometric dating. No longer was the sticking point simply that the methods were faulty—now it was that their results were accepted where they fitted the evolutionary expectation and conveniently rejected as "contaminated" when they didn't.[265]

This is a serious charge, and one that cuts to the heart of analytical philosophy. It's also the point where the heavy lifting comes in for "theistic realism." For what scientists are doing when they suspect "wrong" radiometric dates involves more than just an exercise of vile evolutionary prejudice. It's what specialists have to do all the time in any discipline where *chronology* and *pattern* play a role. Take the first recognized appearance of our old playing card pal, the tarot. Just around the time the "KBS Tuff controversy" was getting hot, card historians were coming to agreement that a supposed French tarot deck from 1392 was really an Italian one from the 1470s. They decided this solely on the basis of stylistic considerations—dictates if anything more absolute than any evolutionary fossil taxonomy. And thus at a stroke, half a century of tarot history vaporized as the origin of the game jumped to northern Italy in the 1440s (when the earliest decks were known from the princely courts of Ferrara and Milan).[266]

Or consider the forger's dilemma: which is how to make a fake look attractively novel while not standing out so much from the crowd that it scares off potential suckers. If a score should miraculously turn up for one of Haydn's several misplaced symphonies it better not have Wagnerian harmonies or rhythms àla Bartók, otherwise musicologists are going to raise an eyebrow and be especially quick to call in the manuscript experts to ferret out the fraud. It was just this sort of empirical suspicion that exposed Piltdown Man early in the 1950s. As more and better real fossil material piled up, Piltdown increasingly didn't "fit in" with the developing perception of human origins, and so it was among the first targets of independent scientific dating for anthropologists anxious to see if the bones really were as old as its Anglophile proponents claimed. They weren't—and exit Piltdown Man to the anthropological dustbin.[267]

You will notice how these inferential judgments are surprisingly independent of whether the object in question is a natural phenomenon or an artifact of intelligent design. Though you might think the "naturalistic assumption" would be less applicable to human activity because sentient agents are presumably free to paint tarot decks or compose classical symphonies any way they choose, the practical understanding of human nature virtually rules that out. There is an inertia to artistic style and limits on innovation that cause historians to apply the naturalistic brakes no less stringently than evolutionists do when deciding what the pattern of fossils mean. It's the methodological log one falls off of the moment a collection of *things* are deemed to be temporal *events* that did not happen all at once.

Now direct such hairsplitting at a hypothetical: an archeological dig that is supposed to be an undisturbed Minoan settlement from the Bronze Age. Except sticking from the debris clogging a doorway is the radiator of a '49 Ford. No scholar would jump to the conclusion that the whole dig was an elaborate modern forgery (and definitely not speculate that the Minoans were really 20th century folk who perished in the fallout from Truman's mythical Korean War A-bomb). Nor would the idea cross an archaeologist's mind that passenger cars were known in the ancient Aegean, or that Edsel Ford had discovered time travel. No—without batting an eyelash, the experts would instantly cry "modern contamination," carefully extract the radiator (noting its grid position and orientation) and get on with their work.

From a "theistic realism" point of view, however, haven't we been a tad hasty here? Aren't we meekly swallowing a considerable body of naturalistic archaeological assumptions—that the Minoans (whose culture was unknown until the 20th century) actually existed as a people far back in time, and even that there was a Bronze Age to begin with? And just because an object *looks* like the radiator of a '49 Ford, must it really *be* one? What if there were spirits with a fetish for radiator fabrication? Quite a mountain of prior thinking is buried in that snap judgment to toss out the artifact as an anomalous intrusion. But the reason why archaeologists seldom have to engage the underlying logic of their discipline in this absurd manner is that there is no organized lobby of troglodytes out there questioning the existence of the Bronze Age, or proposing a supernatural vendor for automotive parts. Though, given what we've seen about the Flood and Egyptian history, this may only be a matter of time.

But we do have creationists stomping around the world of evolutionary paleontology, and the Young Earth literalists among them are definitely questioning the geological equivalents of "the Bronze Age." As Whitcomb & Morris set down in *The Genesis Flood*, Creation Scientists likewise propose that seemingly old radioisotope balances were created with an appearance of age, a notion no less arbitrary than radiator-making divinities.[268] Although "creation with apparent age" is the single dumbest idea in all of Creation Science, this doesn't mean the concept is not central to their take on reality. Henry Morris made that plain enough in *The Twilight of Evolution*:

> Now this can only mean that, since nothing in the world has been created since the end of the creation period, everything must *then* have been created by means of processes which are no longer in operation and which we therefore cannot study by any of the means or methods of science. We are limited exclusively to divine revelation as to the date of creation, the duration of creation, the method of creation, and every other question concerning the creation. And a very important fact to recognize is that true creation *necessarily*

> involves creation of an "appearance of age." It is impossible to imagine a genuine creation of anything without the entity having an appearance of age in the instant of its creation. It would always be possible to imagine some sort of evolutionary history for such an entity, no matter how simple it might be, even though it had just been created.
>
> This is seen most clearly in the record of the creation of Adam and Eve. According to the record, Adam was created as a mature man, formed by God out of the elements of the physical earth. He was not created first as an embryo or a baby, and then allowed to develop. Similarly, Eve was created directly out of Adam. In like manner, everything was created as a fully developed, perfectly functioning whole. Soil was created for the plants to grow in; chemical molecules and compounds were created; light from the sun and stars and moon was seen on the earth at the instant of their creation; and so on. Thus, everything in the earth *must* have had an appearance of age, if there had been any true creation at all. The earth and universe constitute a great clock which was originally wound up by God, in a manner and at a time which can only be known, if at all, by means of divine revelation. The "apparent age" at which the "clock" was originally set may have been anything that pleased him. In any case, when the creation was finished, God judged it all to be "very good"—perfectly functioning and fully harmonious, with nothing incomplete or out of order, and then God "rested." And this primeval condition continued until "sin entered into the world."
>
> The possibility of creation of apparent age is recognized by even such a doctrinaire evolutionist as George Simpson, Professor of Vertebrate Paleontology at Harvard University, who says:
>
> > "We cannot disprove the postulate that the universe was created one second ago, complete with all our apparent memories of our own earlier days, or that it was not created in 4004 B.C., with all the apparent record of earlier billions of years. But that would not make sense, and we must pretend, at least, that both we and the universe are sane."
>
> Simpson is obviously caricaturing the problem and, since he is an avowed disbeliever in any divine purpose in the universe, the concept of "creation" of any kind to him would not "make sense." Others would say that the concept of apparent age involves the Creator in some kind of deception and, therefore, they reject it out of solicitude for the divine honor. But, as we have pointed out above, to say that God could not create anything with apparent age is tantamount to saying nothing could be created and, therefore, is essentially the same position as the atheism of Simpson. In fact, rather than honoring God's truthfulness by rejecting any supposed "deception" on his part in creating apparent age, such men in reality are charging him with falsehood, since they deny the truth of his revealed Word concerning the creation. We insist as emphatically as we know how that the doctrine of creation of apparent age does not in the remotest degree involve a divine deception, but is rather inherent in the very nature of creation. Further, God in grace has even revealed much concerning the true age of the creation, in His written Word, but men have simply refused to accept it.[269]

"Creation with apparent age" typically rears its ugly head when it comes to astronomy. The light from any stars further away than 6000 light years cannot have reached terrestrial observers. Yet we see even distant galaxies *billions* of light years away—so what gives? One possibility is that the speed of light hasn't always been a constant 300,000 kilometers per second. The problem with that option is that it throws Einsteinian relativity physics out the window, where everything is pegged to the speed of light. Remember $E=mc^2$? The "c" is the speed of light—start fiddling with that and either the mass (m) has to drop to keep things balanced, or the output energy (E) shoots

off the scale. Trying to resolve that thermodynamic monkey wrench (say, as applied to stellar physics) has not been one of Creation Science's strong suits.[270]

A second approach is to imagine God placed the light in transit, showing all the stars and galaxies as they would have appeared had their light got to our eyeballs the normal way.[271] But this idea is even worse than varying the speed of light, for it intrinsically denies what an astronomer sees when they look through a telescope. The Andromeda galaxy visible in the eyepiece represents light given off by those stars *several million years ago*.[272] But according to Creation Scientists there wasn't any "several million years ago." So what are we seeing? The telescopic Andromeda would literally be an *imaginary* phenomenon. With no light from any "real" Andromeda having yet reached us, what's to say a physical Andromeda galaxy is out there at all? In fact, as we've never actually visited even the closest stars, how do we know any of them exist either? Maybe the visible universe beyond our stellar neighborhood is so much stage scenery—like the far side of the moon depicted in a classic Gahan Wilson cartoon, consisting of wooden scaffolding labeled "Act II Scene IV." It would certainly save on overhead.[273]

The only reason Creation Scientists can think as they do on this subject is that they treat stars as though they were decorator fixtures, as static as the mysterious lights dangling from the old Biblical firmament. Thought of in that way, stars are as interchangeable as light bulbs. But we know today stars aren't *objects* in that sense—they embody *processes*, and often pretty violent ones.[274] When a supernova is observed in a distant galaxy, and a neutron star later seen to emerge from the blast debris, if "apparent age" were involved only a fictitious record would have been witnessed. Even if the neutron star were still pulsing away in the galaxy (assuming there is one—real light from which we have never seen, of course) the depiction of its birth would have been nothing more than a cosmological fantasy, of no scientific moment.[275]

All of this is utterly alien thinking to Creation Science astronomy. From that perspective, the heavens pose one lesson only, which Henry Morris summed up in *The Remarkable Birth of Planet Earth*:

> The study of the heavens ought by all means to convince men of the necessity of a Creator. As the great astronomer Herschel used to say: "The undevout astronomer is mad!" Yet today it is sadly true that there are perhaps fewer creationists among professional astronomers than in almost any other branch of science. Theories of stellar and galactic evolution have become so inextricably interwoven with the study of the stars that it is almost impossible to separate between fact and speculation in modern-day astronomical writings.[276]

Imagine such cheek—astronomers allowing their theoretical backgrounds to intrude on what Morris presumably imagines to be the proper Baconian evaluation of the non-development of stars and galaxies! Is there any wonder why so few professional astronomers are Creation Scientists? It's one thing to suppose God would sprinkle the cosmos with matter and even add a wash of generalized light in transit—but a whole spectrum of electromagnetic radiation specifically tuned to represent the signature of stellar detonations? When no primeval stars actually exploded? The idea of it makes Old Earth creationists quite uncomfortable.[277] As well it should anyone with even a scintilla of scientific imagination. Considering the cost of a Kitt Peak or an orbital Hubble instrument, to accept "creation with apparent age" in astronomy threatens to transform the discipline into a very expensive waste of time. For what possible scientific value could there be in trying to deduce physical laws and stellar histories from "events" that never took place?[278]

There is no intellectually defendable fence to straddle here. When astronomers peer through a telescope they are looking at what amounts to the delayed home movie of creation. Adding "apparent age" to the mix means more than just having the first man appear fully-grown with a navel, buck naked in the grass. The Creation Science version presents us with the astronomical equivalent of Adam showing up in Eden in a business suit, boutonniere in place, with an expired library card in his wallet.[279]

But there is yet more methodological gold to be mined in all this talk of "apparent age." For in dismissing Simpson's point about instantaneous creation as but an obvious caricature, Morris was

actually exercising the same inferential backbone Lubenow fumed over in the KBS Tuff case: rejecting things that don't "make sense" under the model. In this instance, Morris' Biblical chronology already told him when things were made and in what order. Universes called into being in the last second were ruled out on theological principle. But not impossible based on scientific evidence or even common sense—and therein lies the major distinction between the workaday application of "theistic realism" and "methodological naturalism."

Simpson understood the problem: once you accept the idea that aspects of nature can be artifacts *in spite of their appearance*, then nothing in theory precludes anything or everything being objects of contrivance. Natural science has no meaning in such a context. It's not that miracles of discontinuity are ruled out of scientific court on principle, but anyone thinking to bring them up needs to recognize (or define) the standards by which such things would be identified. Consider how creationism critic Kenneth Miller applied the naturalistic assumption when he ticked off what you'd expect to find under the Young Earth theory:

> If the world had been created 10,000 years ago, the radiometric methods used by modern geologists could prove it. The rubidium-strontium isochrons would be nearly flat (the slope of an isochron for a 10,000 year old rock is very slight), potassium-containing rocks would show only miniscule amounts of trapped argon, uranium-based minerals would show very little lead accumulation, the lunar regolith would show only 10,000 years of bombardment, and the most distant star in the night sky would be 10,000 light years away. Such observations are *exactly* the kinds of empirical evidence a scientist would expect to find in a recently created universe. Needless to say, we don't find that kind of evidence. By any fair and reasonable standard, the most basic prediction of scientific creationism, a recent creation, is disproven.[280]

In this exercise, Miller treated the Biblical Young Earth exactly as he should any other statement professing scientific credibility, as a hypothesis to be tested. What he wasn't obliged to do was to approach the idea as a sacred "TR" postulate for which only validation is permitted.[281]

Would it then be an unacceptable display of "methodological naturalism" to contend that the only reason why Creation Scientists resorted to "apparent age" arguments was to circumvent observable facts like the ones Miller gave? If so, are we not in turn permitted to inquire why God would have gone to the trouble of seeding the planet with radioactive decay products whose presence would have as their only effect that of making the earth appear older than it really was? And is such a situation any different in kind from the proposition that God created mammal-like reptiles without realizing the impression they would make? If God didn't want us to think the universe (speed limit = c) was really big and old, he shouldn't have put Andromeda galaxy so far away—and if he didn't want people to believe in evolution, he shouldn't have created therapsids. As circumstantial trout go, for naturalistic thinkers these are twins in the milk.

That Phillip Johnson wouldn't agree may be partly due to the fact that he doesn't think like a scientist—but more because such methodological scruples play no part in his anti-Darwinist equation to begin with. His is a metaphysical position, where the chronology of "creation" and the evidential inferences inevitably attached to such a consideration are supremely irrelevant. On this point, *Darwin on Trial* simply pulls in the gangplank:

> I am not interested in any claims that are based upon a literal reading of the Bible, nor do I understand the concept of creation as narrowly as Duane Gish does. If an omnipotent Creator exists He might have created things instantaneously in a single week or through gradual evolution over billions of years. He might have employed means wholly inaccessible to science, or mechanisms that are at least in part understandable through scientific investigation.
>
> The essential point of creation has nothing to do with the timing or the mechanism the Creator chose to employ, but with the element of design or

> purpose. In the broadest sense, a "creationist" is simply a person who believes that the world (and especially mankind) was *designed*, and exists for a *purpose*. With the issue defined that way, the question becomes: Is mainstream science opposed to the possibility that the natural world was designed by a Creator for a purpose? If so, on what basis?[282]

There's quite a stroll from the extremes of Duane Gish to Richard Dawkins, and where Johnson's own view resides on that rugged landscape remains a more closely guarded secret than the recipe for Coca-Cola. But at some juncture we shall need to know how Johnson supposes to isolate "design" and "purpose" in creation when there is still so significant a dispute on the theistic side about what that "creation" consists of in the natural world. We've already seen how little Johnson had to say about specific instances of presumed design like the therapsids—and how closely those opinions matched those of Gish, not Dawkins. We also know that Johnson has offered no speculation as to what "purpose" God may have had in promulgating therapsids or dinosaurs or flesh-eating bacteria, so this aspect of "theistic realism" qualifies as a coming attraction no less than a convincing Flood Geology. But if *Probainognathus* really did perish along with *Triceratops* and the double-vision trilobites in the Deluge, is Johnson trying to tell us that such an understanding would be of no relevance whatever to how "theistic realism" should view God and nature today? If there *weren't* billions of years of organisms dying prior to humanity's appearance, wouldn't the Creation Science interpretation that death entered the world through the sin of Adam be more of a winning hand, scientifically as well as theologically?[283]

So if any conception would deserve a reservation at the "TR" table, it would seem to be Duane Gish's Biblical creationism. Who then is Phillip Johnson to leave him out?

While we're poking around the "theistic realism" seating list, consider another candidate: Robert Gentry's claim that "polonium halos" were the direct handiwork of God. Presumably Johnson was aware of the case, since he cited Gentry's book *Creation's Tiny Mystery*, though without remarking on its intriguing scientific content.[284] The "tiny mystery" concerned how the continuous shower of radioactive alpha particles (functionally a helium atom, 2 protons and 2 electrons) discolors certain minerals like mica. The diameter of the halo is a function of how high the particle energy was, penetrating the matrix until it runs out of oomph, and this differs from one element to the next. Investigators had known since the 1930s that isolated halos existed for polonium, a comparatively transient element (one isotope has a half-life of only microseconds) found on the otherwise leisurely uranium-238 decay sequence—but without the rings you'd expect from the previous links in the chain. Those appearing in *uncracked* micas were particularly hard to account for by simple elemental diffusion, and Gentry interpreted that as nothing less than the fingerprint of God touching primordial rocks with polonium sparks—a sort of nuclear virgin birth.[285]

Enter the dreaded naturalistic assumption, and how creationists like Gentry apply it at their discretion. That the halos were from polonium depended, of course, on the conventional interpretation of physics—where Gentry got off the bus was in how he defended the God hypothesis as more likely than that the radioactive parents of that polonium had somehow leaked from the main chain. Critics noted flaws in his geological analysis, as well as experiments suggesting the antecedent lead could potentially slip through the forming mica crystals fast enough to account for the process (and recently it was found that copper atoms have done exactly that in uncracked mica). But the most suspicious character looked like the immediate precursor to polonium-218 in the U^{238} line: the highly diffusive gas *radon*.[286]

Which gives us pause to wonder: is Phillip Johnson going to be the spoil sport to tell Robert Gentry that God *isn't allowed* to inject polonium tracers into ancient rocks? Isn't the sort of "tiny miracle" Gentry has in mind exactly what "theistic realism" cannot possibly forbid?

Looking beneath the technicalities there is a wide and deep methodological gulf between how Robert Gentry approached the polonium halo problem compared to someone like Brent Dalrymple. It's the practical difference between being guided by the question "How do I rule out a *supernatural* reason?" rather than "How do I preclude a *natural* explanation?" The slippery aspect to his method was not that Gentry criticized the existing natural mechanisms as inadequate. As

we'll see, such cavils play a considerable role in the origin of life debate, but are not methodologically objectionable *per se*. It wasn't even the presence of Gentry's often strange religious assumptions (he had long before embraced a literal Six-Day creation belief, though flirting with "theistic evolution" for a time before his polonium epiphany in 1965).[287]

Where Gentry gets into trouble (sucking "theistic realism" along in the theoretical undertow) was in how he framed the experimental issue—specifically in what he challenged his critics to do to prove him wrong. In order to rule out his supernatural explanation, geophysicists would have to synthesize in the lab a "hand-size" mica-bearing clump with polonium halos in place. Gentry apparently knew this was a practical impossibility—both because present technology could never make so large a piece, and because the relevant decay chains involved time scales far longer than any laboratory experimenter could hope to address.[288]

But reversing the charges in this way ("Believe in X because you can't do Y") is not how empirical science got to be where it is. Negative argument is a poor substitute for the absence of positive evidence, and distracts the matter from the point at issue: the *scientific* choice between a supernatural origin for the halos and any one of several circumstantial natural explanations. Were Gentry restricting his thinking to purely inferential logic, untainted by "methodological naturalism," his acceptance of the supernatural theory would still have to be a statement of confidence that this explanation accounted for the facts better than the naturalistic alternative. In that case, there would be no need to interpose the hurdle of polonium halo synthesis. Its presence in Gentry's defense is therefore a clue.

The creationist temptation to call on that negative genie is great—and, once released, is no more likely to stay put in the pseudoscientific bottle than radon in primeval mica. Gentry illustrated this when he described his position on evolution:

> But evolution is neither confirmed theory nor fact. If life actually originated by chance, as evolution requires, evolutionary biologists should be able to reproduce that process in laboratory experiments. Still, despite decades of intensive efforts and generous funding, all attempts to produce life from inert matter have proved fruitless. Likewise, if life evolved by the transformation of one major group into another, where are the numerous transitional forms expected on the basis of evolution? Biologists could long ago have put to rest embarrassing questions about the general absence of transitional forms in the fossil record if they had produced examples of missing links under laboratory conditions. All attempts to create new forms in the laboratory, such as inducing mutations through nuclear irradiation, have produced only variation of existing types. Developing new features in fish, for example, until they begin to develop into amphibians should certainly be simpler than creating life itself and would be the presently observable evidence needed to make evolution a science instead of speculation.[289]

Certainly there's nothing here for "theistic realism" to object to, is there? Hardly, since it sounds identical to Phillip Johnson. But here's the catch: if the geological system is not as Gentry described, then the earliest fish lived hundreds of millions of years ago. Whether or not macroevolution took place, the genes of modern fish would still be as far removed from the common ancestor they might have had with amphibians as a contemporary lizard from its extremely distant synapsid cousin *Dimetrodon*. Evaluating any evolutionary theory (pro or con) would clearly require recognition of that empirical fact. Gentry's glib proposition about the ease of creating an amphibian in the lab was just another invocation of the negative genie, with no more substance to it than Carl Baugh's biosphere experiment. And with that fundamental confusion, the whole mislabeled baggage train of creationist complaints about missing links and macroevolutionary novelty tumble after.

That Creation Science actively vaults off such principles, and proceeds to suck up the factual universe like a Black Hole in a way Intelligent Design has avoided, is not a function either of theory or attitude. Creationists like Phillip Johnson simply carve off the "awkward" parts as a public

relations tactic, and hopes no one ever pays any attention to them. But nothing in the way any creationist *thinks* precludes sliding down the same rabbit hole. All it takes is to disconnect the rules of evidence that keeps you tethered to the facts rather than the ideology. And this is what unites the scholarly lawyer Phillip Johnson to more untutored loose cannons like Kent Hovind. As evidence of that, I submit Hovind's 1996 videotape "Seminar No. 1" on the Age of the Earth.

To start with, we need to recognize that (rather like Richard Milton) *numbers* are not always Hovind's friends. Along with the meteoric dust myth already examined, Hovind said the earth's rotation was slowing by a thousandth of a second every day (thus about a third of a second per year). Had dinosaurs and the earth actually existed 70 million years ago, calculated Hovind, they would have been holding on for dear life from the 5000 mph Coriolis force-induced winds and centrifugal spin brought on as the planet whirled four times faster to produce a five-hour day. A compelling horror story marred only by the tiny difficulty that Hovind had his initial fact wrong. He had confused what astronomers have to do every so often with the Gregorian calendar (slip in a few leap seconds occasionally) with the physical year ostensibly being measured. The earth's rotation *is* slowing down, but at *1/50,000* of a second annually, putting Hovind off by a factor of 16,000. To be charitable, this goof was only a third as bad as his inflation of the meteoric dust rate. Though we might wonder less what life was like for dinosaurs on the centrifugal earth than imagine conditions back in that Christian high school science class Hovind likes to remind us he taught for fifteen years—especially when grading the evidential logic in examination papers.[290]

The earth rotation claim falls into the same class of mistake as the meteoric dust: drawing conclusions based on patently false premises. That the faulty information was extracted from fellow creationists is another indication of how they fail to tend their own scholarly garden with anywhere near the diligence required of a functional science.[291] But this combination of innumeracy and selective reading is not where Hovind intersects Phillip Johnson. After all, Johnson doesn't fret over the details very often, so that category of blunder doesn't arise. To see where the two creationists do cross paths we have to dig a bit deeper—to uncover what Hovind thought to do with *correct* information, and how he configured the seemingly corroborating evidence in his argument.

Which brings us to the case of the Shrinking Sun. Since I haven't extensively quoted Hovind before, and his lecture style has its own distinctively bucolic character, let's give "Dr. Dino" the floor to explain matters as he did on the tape:

> The sun is burning. How many knew that already? The sun is burning, OK. Did you know that as the sun burns it is losing five million tons every *second*? It's on quite a weight loss program. The sun is losing five million tons per *second*. As it burns it is shrinking [Hovind made scrunching noises with appropriate hand gestures]—getting smaller. Now I know it oscillates in and out, but the general overall trend is *down*. It's shrinking. Plus it's losing an enormous amount of mass. Now kids, this'll be kind of complicated, so listen carefully. The sun is burning and the sun is shrinking [more squishing sound effects]. So that means it used to be [… an extended pregnant pause …] *bigger*. [Audience laughter.] How many can figure that one out with no help? All right, good. Well now, if the sun is only 6000 years old like the Bible says, that is not a problem. The sun was a few miles bigger, you wouldn't hardly notice. But they want me to believe it is billions and billions of years old. *Ooh*—that would make a problem. See, if we go back a few billion years the sun would be big enough to touch the earth, making life very uncomfortable. And they want me to believe the dinosaurs lived 70 million years ago. I know what happened to 'em. They fried. [More audience laughter.] No, they did *not* live 70 million years ago. That's simply impossible.[292]

Because the sun actually does undergo a net mass loss of around five million tons of hydrogen every second, we have an external calibration supplied by Hovind himself to evaluate his reasoning. It seemed a simple enough calculation: billions of years ago the sun would have had enough extra

mass to inflate its surface out to the earth's orbit. Was that deduction valid? Well, it would depend on knowing what the total mass of the sun is *now*, to see how much "bigger" it would have been at an earlier stage. It was on this point Hovind's math disintegrated. The mass of the sun can be known because of Mr. Newton and his gravitation theory—the solar heft governs the orbits of all the planets. At the moment the sun masses in at roundabout 2×10^{27} tons. Rewind the clock four billion years and the sun would have burned off around 5×10^{23} tons. Which means you get a starting value of 2.0005×10^{27} tons—an absolutely inconsequential addition, amounting to only one-fortieth of a percent of the total mass.[293]

Two questions now arise. First, how could so tiny a mass increment possibly expand the sun almost *ten million times* so that it would fry the earth? And how could Hovind have even made such a claim unless he hadn't performed the calculation to begin with?[294] Given that I have pretensions to an inquiring and feisty mind, in the summer of 1997 I wrote him to find out. And again like Richard Milton, who dug his own *Brontosaurus* hole even deeper without my bidding, Hovind's reply conveyed far more than I had either asked or dare hope for.

First up, there was no defense of his basic calculation. Instead, Hovind supplied me with a completely different piece of information: a 1980 ICR pamphlet by creationist physicist Russell Akridge. This had nothing to do with mass loss from thermonuclear fusion—rather it drew on the quite legitimate work of astrophysicist John Eddy that appeared to show the sun's diameter had shrunk by about 0.1% per century over the history of scientific observation. Although Eddy and his colleagues regarded it as evidence for an oscillating solar surface (which Hovind appears to have obliquely alluded to on the tape), Akridge assumed the rate was constant and extrapolated that back until he had the sun touching the earth's orbit 20 million years ago.[295]

It was then that Hovind commenced some really fancy footwork. He suggested I might have viewed an old set of his tapes, for "I no longer refer to the time when the sun may be touching the earth." Now that piqued my curiosity. The tape dated only from the previous year, so when had this precipitous switch taken place—and why? If the 1996 argument was flawed, shouldn't he have owned up to it in his letter? If it weren't, why then would he have given it up? Hovind offered no clarification (then or later) and jumped to another rock. What was important, he now stressed, was that a change in solar mass by even a small percentage "would upset the fine gravitational balance" and "pull the earth slowly in" to the sun. He offered no calculations for that, either—and upsetting gravity wasn't his original claim, nor had the Akridge piece justified it.[296]

Clearly, Hovind was firmly strapped to his own giddy theoretical merry-go-round. He knew the sun couldn't be old because he was sure the Bible said so, but his "scientific" strategy inspired by this conviction consisted only of grabbing at whatever evidential rings might float within his temporary grasp. We've seen this behavior before—it's standard pseudoscientific equipment. But Hovind obligingly revealed more than that when he didn't think it necessary to address the precise claim that the sun couldn't have been around for billions of years *because* of the mass loss. The illogic here was both evident and serious, yet Hovind pressed on as though such thinking couldn't possibly matter to the intellectual integrity of his case.

With that cavalier attitude we have met the essence of creationist methodology: *willing neither to defend their position, nor abandon it.*

And thus do Kent Hovind and Phillip Johnson cross tracks at last (train wreck optional). Viewed from the analytical basement, there's not a dime's worth of difference between them. We saw how Johnson frolicked around the details of the reptile-mammal transition with no less gymnastic abandon than Hovind does about the Shrinking Sun. The therapsids didn't mean what they appear to because of convergence … or too many cousins … or polyphyleticism … or maybe their reproductive tract. There shall be *some* reason. But in lieu of a good one (or until paleontologists can be persuaded to stop observing transitional features) these inconsequential data may be "accepted" provisionally—though not to the point where they are actually *accepted*. For doesn't the Cambrian Explosion disprove it all? Or better still, the new secret talisman: the *invertebrates*.

We'll ride that latest figure on the Johnson carousel next chapter, but for the moment we're getting dizzy. Which may be what Johnson has in mind all along. Certainly it is less likely for him

to deliver a straight answer to a simple question on matters taxonomical than it is for that Biblical camel (or rope, depending on the translation) to thread a needle's eye.[297]

That the "creationism" of Kent Hovind and Phillip Johnson spin off in different directions is not founded on any fundamental analytical distinction. Both feel equally free to inveigh against fossil evidence in a general way without thinking they needed to be aware of the particulars first. In a phone conversation I had with "Dr. Dino" Hovind (his nickel, fortunately) I asked him to remark on the evident anatomical similarity between Camptosaurids and Iguanodontids, and could practically hear his eyes glaze over in distant Pensacola. Meanwhile, Johnson showed absolutely no curiosity (theistic or naturalistic) about the same subject, even though I had specifically framed my e-mail questions to tease him into inquiring about their possible relationship. Remember, these were separate dinosaur *families*—so if anyone really were successful in demonstrating that they were the same "type," this would actually strengthen the case for *macroevolution* (the Darwinian "connect the dots" game where *everything* is the same "type").[298]

Had either Hovind or Johnson replied, "Oh, I've never heard of them—please do tell me more," that would have shown the spark of natural curiosity that drives the scientific imagination. But that's not the sort of "bottom up" reasoning that infuses the creationist mindset. Theirs is a "top down" battle for the heart and soul, with the intellect tagging along as best it can. Phillip Johnson wants to throttle the atheistic worldview of Richard Dawkins—not to poke holes in David Norman's *Iguanodon* phylogeny.

But that leaves hovering in the ether the philosophical and political issue of what weight is to be given particular Biblical inferences in the sciences and science education. Who gets to pick and choose where Scripture is to be acknowledged? And why only the Bible? Don't the Koran or the Mahabharata get to play? And isn't that Vine Deloria banging at the door?

So it was of some interest to follow Johnson as he took the first exploratory "Steps Toward Theistic Realism" in *Reason in the Balance*:

> If naturalism is true, the scientific naturalists deserve their cultural power, and theologians whose professional mission is to propound knowledge about an imaginary God deserve their lowly status. If theologians hope to win a place in reality, however, they have to stop seeking the approval of naturalists and advance their own theory of knowledge. My intention here is to start the process rather than to finish it, but readers are entitled to expect me to provide a concrete proposal as a basis for further discussion. Here, then, is what I think to be the essential, bedrock position of Christian theism about creation.
>
> The most important statement in Scripture about creation is not contained in Genesis but in the opening verses of the Gospel of John:
>
> > In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God. All things came into being through him, and without him not one thing came into being. (John 1:1-3)
>
> This statement plainly says that creation was by a force that was (and is) intelligent and personal.
>
> The essential, bedrock position of scientific naturalism is the direct opposite of John 1:1-3. Naturalistic evolutionary theory, as part of the grand metaphysical story of science, says that creation was by impersonal and unintelligent forces. The opposition between the biblical and naturalistic stories is fundamental, and neither side can compromise over it. To compromise is surrender.[299]

To which Kent Hovind would no doubt agree. (Evidently the Koran, the Mahabharata, and Deloria *don't* get to play.) Which only leaves us to quibble over the role Genesis is to be allotted in the discussion of *genesis*. And here Johnson gave no clue as to how (or whether) "theistic realism" was going to offer much resistance to the more zany readings of the Bible entertained by Hovind and the Creation Science literalism club.

A particularly meaty specimen (pardon the pun) I have in mind here is the one attached to Genesis 1:30, which suggests to some believers that all humans and animals started out in Eden as strict vegetarians. Only with Adam's sinning did "red of tooth and claw" start to sink in, though there is some difference of opinion among finicky creationists whether full-blown carnivory was known until after the Flood.[300] In any case, there are concrete paleontological applications for this dietary insight, as Ken Ham showed in his 1998 book *The Great Dinosaur Mystery SOLVED!* regarding *Tyrannosaurus rex*:

> With such teeth, evolutionary scientists are quick to see an animal that was a ferocious meat-eater. However, we know that originally *T. rex* was a vegetarian: Genesis 1:30 states, "*And to every beast of the earth, and to every fowl of the air, and to every thing that creepeth upon the earth, wherein there is life, I have given every green herb for meat and it was so*." It's certainly possible that *T. rex* teeth were designed for eating special types of "green herb" such as large melons, gourds, coconuts and large hard seed pods (or even tree and fern branches) to name a few possibilities. It's also conceivable that the Curse might have resulted in changes to their structure, either degenerative or by deliberate design.[301]

Ah, "deliberate design"—what an interesting phrase, so dripping with possibilities. Of course, at this stage a legion of professional comparative anatomists (from creationist Cuvier on down) would be either turning in their graves or personally gnashing their own teeth, for by no stretch of the imagination can the equipment on a tyrannosaur be reconciled with a herbivorous diet.[302] How then do Biblical creationists like Ham manage the trick? With some selective comparative anatomy of their own, Creation Science style:

> However, just because an animal has large, sharp teeth, doesn't mean it was (or is) a meat-eater; it just means it has big sharp teeth. There are many animals today that have sharp teeth but are basically vegetarian, including the Chinese panda. Evolutionists often make the comment that the panda evolved as a meat-eater, so it could get sharp teeth, but which it now uses to mainly eat bamboo. On the other hand, creationists could ague that the panda's teeth are beautifully designed to chew bamboo. In addition, male camels have been described as having teeth that make them look like savage meat-eaters, but camels are strictly vegetarian. Bears have the same sort of teeth structure as a big cat (e.g., lion), but some bears are vegetarian, and others are mainly vegetarian.[303]

But "big sharp teeth" is not quite what distinguishes dietary adaptation. It involves highly diagnostic serration and wear patterns.[304] That was especially true regarding the mammalian omnivores Ham mentioned, a situation going all the way back to the ancestral mammal-like reptile stock. In his footnotes to the paragraph, Ham quoted Michael Benton on the Permian dinocephalian *Estemmenosuchus* that it "had long sharp front teeth, buttony cheek teeth behind, which shows that it ate plants."[305] But it was the *cheek teeth*, not the long front ones, which gave away its herbivory. Camels likewise have a nice battery of plant-adapted teeth behind their front fangs, as you could clearly see on the skull Ham illustrated. As for the omnivorous panda and bears, they are sufficiently distant from the conditions of their carnivore ancestors to have lost their specialized carnassial slicers entirely—duly noted by another of Ham's quoted sources.[306] In contrast, the tyrannosaurs had developed from a long line of *exclusive* carnivores—meaning they had nothing but steak-knife teeth to their bite, set in a head finely adapted for gulping down big hefty chunks of flesh.[307]

Every one of those animals were displaying their evolutionary pedigree right in front of him, only Ham was incapable of seeing it, slapping a creationist designer label on their teeth without skipping a beat. But is this approach any different from Michael Denton or Phillip Johnson sloughing off the anatomy of the therapsids? Even though we don't have living tyrannosaurs to look it, the evidence for predation in the dinosaur world still exists.[308] How that fossil evidence is

evaluated, step by inferential step, is a paleontological process inherently grounded on comparison with contemporary examples, and that brings us flat up against the apparent circumstance that supernatural forces do not appear to intervene in the day-to-day activity of living things. Even Ham spotted that one, pointedly cautioning: "The present food chain and behavior of animals (which was changed after the flood in Genesis 9:2-3) CANNOT be used as a basis for interpreting the Bible—the Bible explains WHY the world is the way it is!"[309]

Such compartmentalization may well serve the needs of Biblical hermeneutics, but it is a recipe for disaster in secular science education. Imagine a student weaned on the "facts" presented by Ham and Hovind, and further armed with the new philosophical "wedge" of Johnson's "theistic realism."[310] A science teacher describing *Tyrannosaurus rex* as a carnivore would be stepping on that student's religious toes no less painfully than were the subject common descent or the naturalistic origin of life. The existence or nonexistence of God would not be the point at issue (except to the student). What would be at stake was the applicability of natural evidence and argument when trying to understand and describe the natural world.

Clearly this requires taking a stand on what "natural" means, doesn't it?

And here Phillip Johnson is right about something: there *is* a profound difference between the Christian creationist worldview and secular scientific naturalism. Modern science in theory and practice contends that *nature is not an artifact*, and strives to understand its workings to the extent that a sound methodology can. However atoms came about and independent of whatever "purpose" there may be invested in them, they nonetheless do their thing on all levels (from radioactive decay to DNA nucleotide substitution) seemingly without getting fiddled with in the process. That is a disconcerting scientific realization that theologians have had to grapple with ever since Newton. Whether or not the planets glide around the sun because God decided there should be gravity, or even sustains their existence from one microsecond to the next, their *apparent* motion nonetheless remains clockwork predictable and therefore "natural" in a way completely unlike any object of intentional design.

And as in the Newtonian heavens, so on the uniformitarian and evolutionary earth.[311]

We see that mountain ranges are not sculpture. Nor are tyrannosaur teeth dentures. And, whether Gish and Johnson like it or not, therapsids are *objectively* chronologically and morphologically intermediate between reptiles and mammals—that is, if "chronology" and "morphology" mean anything at all. How people of religious faith confront the philosophical implications of those statements is up to them—but the "naturalism" behind all three is the same. It's a line of falling dominos that is extremely disturbing to those whose personal deities are believed to have played a more extrovert role in the history of life. But Genesis doesn't discuss therapsids—and neither does St. John. For paleontologists not to pay attention to them because it produces anxiety in some people's theology seems a poor reason to reform the methodology of science.

Yet that is just how Johnson thought to reason through things in *Defeating Darwinism by Opening Minds*:

> When people are taught for years on end that good thinking is naturalistic thinking, and that bringing God into the picture only leads to confusion and error, they have to be pretty dense not to get the point that God must be an illusion. This doesn't necessarily mean that they become atheists, but they are likely to think about God in a naturalistic way, as an idea in the human mind rather than as a reality that nobody can afford to ignore.[312]

But what is it in the *natural world* that we're not supposed to ignore? It's more than Behe's "irreducible complexity." The Creation Science response has been to repair the perceived gap by showing how the Biblical account matched the "true facts of science" perfectly—that's how we get Behemoth and Leviathan identified as sauropods and pliosaurs. The Johnson alternative may be to remove the naturalistic method that insists on putting such claims through a rigorous evidential sieve, but is that solution even remotely workable? The Biblical creationists' wild image of tyrannosaurs gnawing on bark or munching melons in Eden is only the logical outcome of the

general creationist conviction that nature *is* an artifact, allowing in the end for all manner of *unnatural* interpretations to have their say. That's one doctrinal log Johnson's "wedge" seems altogether reluctant to acknowledge, let alone split.[313]

Knowing that Creation Science has their own singularly extensive package deal out there to replace the outmoded evolutionary view, we wonder why the devout would stop with the foggy impressionism of Intelligent Design when they can get the glossy color version, all wrapped up with a Biblically correct bow. One of these days, in the wonderful post-methodological naturalism era, Phillip Johnson's going to have to think about that. For the conception Henry Morris represents is also not interested in compromise or surrender, as *Scientific Creationism* explained:

> But man is perverse and his imaginations are evil. Instead of responding to the remedial purposes of the Curse, he tried to circumvent it and soon became so irretrievably evil that God had to destroy the world with the Flood. Then, instead of gratitude for deliverance from the antediluvian morass of wickedness by the Flood, the survivors soon manifested their own perversity by a new rebellion at Babel. Man has now somehow, in his warped thinking, converted the universal decay principle into an imagined universal evolutionary process and the worldwide testimony in stone concerning the Flood into a contrived record of the history of evolution. The Flood itself he explains away altogether, either as a local flood or a tranquil flood or an allegorical flood (these theories, incidentally, will shortly be evaluated and eliminated as possible options).[314]

Whether or not Johnson knows it, he falls under the options Biblical creationism is out to eliminate.[315] Which suggests if Intelligent Design is really intent on dynamiting methodological naturalism, they'd better take the advice of Margo Channing in *All About Eve*: "Fasten your seatbelts, it's going to be a bumpy night!"

NOTES to Chapter 3

[1] After the summer 1993 premiere of *Jurassic Park*, D. James Kennedy's "Truths That Transform" radio series aimed a "Creation Week" at what moderator Bob Allen characterized as the "subtle propaganda" in the film (dinosaurs living and evolving millions of years ago). Guests like Duane Gish and John Morris (son of Henry) reflected "the importance of examining our assumptions with a Biblical yardstick." To redress the "pernicious evil" of *Jurassic Park*'s popularity among children, Gish's *Dinosaurs by Design* was offered as a gift for contributions of $20 or more (the book retailed for $15.95 in 1998). Further afield in dinosaur show biz, radio evangelist Joseph Chambers decided in 1993 that the insufferable purple theropod Barney came "straight out of the new age and the world of demons," as quoted in Hill & Cheadle (1996, 122). In a similar hyperbolic vein, Morris & Morris (1996a, 207-211) intimate that *Jurassic Park* (and youthful interest in dinosaurs generally) is related to Satan's plan to ensnare the unwary in that false End Time religion wherein they shall "*worship the Dragon!*" In respect of this Creation Science twist on the worst of pop psychology, they specifically mentioned Stephen Jay Gould's childhood fascination for dinosaurs—which makes me wonder how the Morrises would pigeonhole my similar interest. Meanwhile, Ken Ham views dinosaurs as a fine evangelical tool for the new Answers in Genesis museum, Witham (2002, 194).

[2] Gish (1995, 117), citing Romer (1966, 140). The *Saltoposuchus* in Gish (1995, 100) illustrated that small bipedal reptile—carried over at least since Gish (1978, 87), which skipped dinosaurs entirely. More recently, Gish's 1995 version was relied on wholesale by a creationist website (the rather interestingly named intelligentdesign.org/menu/evolution/dinosaurs.htm).

[3] See Raymond R. Rogers, "Ischigualasto Formation," in Currie & Padian (1997, 372-374). The site is part of a very small slice of Triassic time available in the region, as indicated by the stratigraphy chart in Fernando E. Novas, "South American Dinosaurs," in Currie & Padian (1997, 679).

[4] Sereno (1995b) describes the recent dinosaur discoveries in the Ischigualasto. Lambert & The Diagram Group (1990, 112-113) cover the two main herrerasaur families, and Fernando E. Novas, "Herrerasauridae," in Currie & Padian (1997, 303-311) discusses the relationship between *Eoraptor* and the herrerasaurs. See Lambert & The Diagram Group (1990, 85) for the anatomical particulars of *Pisanosaurus*, which is sufficiently fragmentary (known from teeth, bits of backbone, leg and foot) that paleontologists are circumspect about drawing too much from them—which may be contrasted with creationist abandon when it came to *Protoavis*.

[5] See Michael J. Benton, "Origin and Interrelationships of Dinosaurs," in Weishampel *et al*. (1990, 17-18) or Kevin Padian, "Origin of Dinosaurs," in Currie & Padian (1997, 481-484), with the skeleton of *Lagosuchus* illustrated in both. Gish presumably had access to the Benton piece, since he cited the anthology a few pages later, Gish (1995, 122). *Lagosuchus* may be compared to the Late Triassic theropod *Coelophysis*, as well as the later Jurassic forms, *Compsognathus* (remember him?) and *Ornitholestes*, shown in Norman (1985a, 40-41). Indicating just how transitional they were, Paul (1988, 240-244) was undecided whether they should be regarded as protodinosaurs or the most primitive of dinosaurs. Benton also called attention to the anatomical similarities between the lagosuchids and pterosaurs, as did Bakker (1986, 293-295), noting the head, neck, shoulder and ankles. Cf. Monastersky (2001a, 97).

[6] A likely candidate for the encyclopedia Gish referred to would be the aforementioned Weishampel *et al*. (1990). Regarding his museum itinerary, it is interesting to note the British Museum (a.k.a. London Natural History Museum) has attracted its share of antievolutionary visitors, each with their own peculiar take on the exhibits. Schroeder (1997, 31) similarly claimed their displays showed "not a single case in which life underwent a major gradual morphological change." Schroeder (2001, 91) reiterated this position. As the NHM possesses a fine collection of fossil reptiles, including dinosaurs and an *Archaeopteryx* specimen, perhaps he faced the same blurred vision as Richard Milton, whose aberrant perception of the *Diplodocus* gracing their main hall will be discussed later.

[7] Gish (1995, 125-126) cited half a dozen sources for Polar dinosaurs, but the horned dinosaur criticism by Strahler (1987, 428-430) was not specifically acknowledged in either Gish (1993; 1995). Strahler drew partly on humanist philosopher Frederick Edwords (1982c), and Edwords (1982b, 35-39; 1982c, 8-9) noted how Ken Miller had called Gish on his *Triceratops* claims in the 1980s. But while Gish (1993, 23, 27, 123-124, 360-362) did briefly mentioned Edwords, it was not about ceratopsids.

[8] Gish (1995, 119, 122); the text changed subject at that point to stegosaurs. He cited Peter Dodson & Philip J. Currie, "Neoceratopsia," in Weishampel *et al*. (1990, 610) on *Leptoceratops*. The passage from which the quotation was extracted concerned Paul Sereno's views that *Montanoceratops* "is the sister taxon of a monophyletic Ceratopsidae," but that the available evidence is still too fragmentary to establish that for certain. For *Diceratops* and *Sterrholophus* Gish relied on pp. 57 & 181 of the 1972 edition of Donald Glut's *The Dinosaur Dictionary*. As will be seen, Dodson, Glut, Osmólska, and Weishampel are all sources with quite a range of relevant information to supply on the dinosaurs.

[9] See Norman (1985a, 128-129), Lambert & The Diagram Group (1990, 169), or Paul C. Sereno's sections on "Psittacosauridae," in Weishampel *et al*. (1990, 587) and Currie & Padian (1997, 611-613). The 1972 edition of Donald Glut's dinosaur dictionary Gish used was unavailable for comparison, but the revised Glut (1982, 208) reflected the shift in position towards the ceratopsid connection (cemented in 1990 by Sereno's reclassification). An informative illustration in Bakker (1986, 170) compares the skeletal structures and muscle attachments in *Psittacosaurus* and *Protoceratops*.

[10] Gish (1992, 43). As turnabout, it was the protoceratopsids Gish left out of *Dinosaurs by Design*, except to remark in a section on "Dinosaur Family Life" that *Protoceratops* laid eggs, Gish (1992, 18). No illustrations were given of the animal or connections drawn to the ceratopsids. Incidentally, in a long-delayed redress of a bum rap, the "protoceratops" eggs the dinosaur *Oviraptor* was supposed to have been threatening were recently determined to have been their own,

as recounted by James Clark (1995), Fastovsky & Weishampel (1996, 174), or R. Barsbold, "Oviraptorosauria," in Currie & Padian (1997, 507-508).

[11] Gish (1992, 42).

[12] Norman (1985a, 146-151) relates what was known about the group in the 1980s; Teresa Maryanska, "Pachycephalosauria," in Weishampel *et al*. (1990, 573-574), Fastovsky & Weishampel (1996, 151-167), or Hans-Dieter Sues, "Pachycephalosauria," in Currie & Padian (1997, 511-513) reflect the current consensus favoring the ceratopsid connection.

[13] There are so few available deposits that geology has dispensed with the "Middle" and refer to only Early and Late Cretaceous. The chart of main Asiatic Cretaceous sites in Colbert & Morales (1991, 211) shows nine for the Late Cretaceous, but only one for the Early Cretaceous. A map in Dodson (1996, 13) indicates *Psittacosaurus*, the best known of the taxon, comes from exactly four sites in all Asia, two of them adjacent in Mongolia. Lambert & The Diagram Group (1990, 222) show the global distribution of all Mesozoic deposits, which are concentrated primarily in the western United States, and David B. Weishampel, "Dinosaur Distributions," in Weishampel *et al*. (1990, 63-139) provide a comprehensive survey. Fastovsky & Weishampel (1996, 361-363) note the typical fossil dinosaur genera appears to persist for 4-8 million years. Since few deposition horizons afford so fine a resolution in any one area, hunting for dinosaur transitionals is a game of patience, hard work, and considerable geological luck. Because of the durability of their massive skulls the ceratopsids are better represented than were their smaller ancestors. This sparse record has a bearing on the evolution of the psittacosaurid hand, which was reduced by one digit from the basal five (with only three fully functional). Paleontologists being sticklers when it comes to attributing direct ancestry, the known psittacosaurids were not likely to be the *exact* ancestors for the ceratopsians, as noted by Czerkas & Czerkas (1991, 190) or Dodson (1996, 234). Should Gish ever get around to exploring the psittacosaurids more thoroughly, it may therefore be predicted he will invoke the derived hand to selectively bar them from the ceratopsian family photo. Though time may be getting short on this trick: Xu et al. (2002) describe skulls of a basal ceratopsid taxon—whether relevant post-cranial material turns up will depend on how sly a mood the Creator was in back at the Jurassic/Cretaceous boundary.

[14] Gish's oblique description of the protoceratopsids' "bony nasal region" may have been an effort to minimize the Mongolian protoceratopsid *Bagaceratops*, which had a small horn mount on its snout, as well as the more prominent one on *Montanoceratops*. See Lambert & The Diagram Group (1990, 46) for descriptions of *Bagaceratops*, and Glut (1982, 77), Norman (1985a, 131), Peter Dodson & Philip J. Currie, "Neoceratopsia," in Weishampel *et al*. (1990, 595, 598), or Czerkas & Czerkas (1991, 205) for skull illustrations (Dodson & Currie also specifically compare views of *Bagaceratops* with *Triceratops*). Lambert & The Diagram Group (1990, 77-78) describe *Montanoceratops*; Glut (1982, 177) and Peter Dodson & Philip J. Currie, "Neoceratopsia," in Weishampel *et al*. (1990, 595) show the skull (only partially known). Maps in Dodson (1996, 12, 207) indicate *Montanoceratops* and *Bagaceratops* are each known from only single horizons.

[15] Peter Dodson, "Neoceratopsia," in Currie & Padian (1997, 478) has noted the very fragmentary *Turanoceratops* might be an Asiatic ceratopsian. But until better information turns up, the consensus is that the purely Asiatic psittacosaurids were followed by the protoceratopsids, which subsequently radiated into North America where the true ceratopsids developed, Fastovsky & Weishampel (1996, 182). Lessem (1992, 253-254) noted that protoceratopsids (Asian and North American) appear to have frequented fairly arid environments, while the ceratopsids had adapted to a more specialized lush landscape, possibly accounting for their failure to spread back across the land bridge then linking northeast Asia with North America.

[16] See Gish (1992, 28; 1995, 120) for the charging *Triceratops* and illustrations. Ham (1998, 73) decided *Triceratops* didn't have splayed legs, but did not consider the implications that had for ceratopsian phylogeny. See Norman (1985a, 130-131, 136-137, 142-143) for full skeletons of *Psittacosaurus*, *Protoceratops*, and the ceratopsians *Centrosaurus* and *Chasmosaurus*. The smallest known protoceratopsid (the meter-long Chinese *Microceratops*) is also bipedal, Lambert & The Diagram Group (1990, 76, 249). Gee (1999, 104-105) and Lockley (1999, 215-217) comment on the assumptions underlying a galloping *Triceratops*—see also note 212, chapter two.

[17] See Norman (1985a, 128, 134, 140) for temporal distribution of the ceratopsians. Lambert & The Diagram Group (1985, 48) describe *Brachyceratops*; see Glut (1982, 82) for skeletal illustration. *Brachyceratops* also is known from only a single horizon, Dodson (1996, 12). Glut (1982, 80) and Dodson (1996, 197) have noted that it might be a juvenile of several candidate genera, including *Centrosaurus* and the more problematic *Monoclonius*, which may itself represent "a common growth stage for all centrosaurines," as argued by Sampson (1995, 39). Cf. Achenbach (2003, 14-15). All of which reinforces how the ceratopsids tend to grade into one another when it comes to evaluating their skull ornamentation.

[18] For example, Norman (1985a, 139) referred to ten species; Dixon (1988a, 126-137) had fifteen, and showed five *Triceratops* skull variants. Most interestingly for Gish's citation trail, Glut (1982, 250-253) illustrated ten species. The reigning expert in ceratopsian study, Peter Dodson, noted thirteen described species, of which nine were considered adequate for meaningful skull comparison. Dodson (1996, 80-86) made the case for a reduction to only one primary species. Incidentally, Gish's *Diceratops* example was involved in Glut's ten and Dodson's nine as *Triceratops hatcheri*.

[19] The two better-known short-frilled genera to appear next after *Brachyceratops* were the rhino-sized *Styracosaurus* and *Centrosaurus*, both with prominent nose horns, small brow horns or pronounced ridges, and varying frill spikes. The former is known from only one site, with two similar skulls illustrated in Glut (1982, 235). But the latter (which Gish did mention) has been found at several locations, and sports correspondingly more variety, as illustrated in Glut (1982, 90-92) as well as Dodson (1996, 143). One in particular, *Centrosaurus longirostris*, had a shorter nasal horn and more rudimentary frill ornamentation. Maps in Dodson (1996, 12, 93) locate their main fossil sites, and Norman (1985a, 134-137) noted the temporal range and general description for the short-frilled ceratopsians.

[20] Dodson (1996, 85-86). The fenestrae Dodson was referring to were the openings in the skull frill that especially distinguish "short-frilled" types like *Triceratops* from "long-frilled" forms like *Torosaurus*. Fastovsky & Weishampel (1996, 186-189) describe the possible behavioral implications of the frill configurations, involving the tradeoff between threat display and more active horn contact. They suggest the solid frill of *Triceratops* was a derived feature, functioning as a real shield during mating contests with other males.

[21] See Norman (1985a, 138) for background, and Dodson (1996, 176, 194-197) for the new finds. Which ceratopsian the achelousaurs were evolving *from* was not so certain. *Styracosaurus* and *Centrosaurus* were possibilities, or some other as yet unknown centrosaurine.

[22] Gish (1995, 123).

[23] Czerkas & Czerkas (1991, 138-148) nicely cover the issues raised by stegosaur plates. See Norman (1985a, 156) or Fastovsky & Weishampel (1996, 130) for pictures of the prior "best" *Stegosaurus* example, and Kenneth Carpenter, "Cañon City," in Currie & Padian (1997, 92) on the new find. *Stegosaurus* proper is known only from the North American Morrison Formation, as noted by Fastovsky & Weishampel (1996, 115).

[24] Though Gish (1992, 34-35) was aware of the other two reasonably well preserved contemporaries of *Stegosaurus*, one of which showed a mixture of plates and spikes (the African *Kentrosaurus*), the other a row of small plates (the Chinese *Tuojiangosaurus*); neither were mentioned in Gish (1995). See Norman (1985s, 152-153) for their temporal and spatial range. An Asiatic origin for stegosaurs is supported by the earliest examples such as *Huayangosaurus*, but their primitive spike arrangement is again only partially known from the fossils, as indicated by illustrations in Peter M. Galton, "Stegosauria," in Weishampel *et al*. (1990, 436) or Fastovsky & Weishampel (1996, 116).

[25] See Norman (1985a, 158-159), Lambert & The Diagram Group (1990, 163-164), or Fastovsky & Weishampel (1996, 110-111). This may be compared to Gish (1990, 70): "There are no fossils of transitional forms showing spikes gradually developing and no fossils of intermediates showing bony plates gradually coming into being on some previously ordinary reptile. No fossil like the above-mentioned has ever been found, nor will it ever be."

[26] Gish (1995, 23) didn't discuss the nodosaurid branch of the group, though Gish (1992, 36) had stated: "In the 1980s, the findings were all reclassified, so we now have a better understanding of which data belong to each kind," intimating nodosaurs and ankylosaurs might be separate "kinds." The main distinguishing feature between them is that ankylosaurs featured a more heavily armored skull and a bony club at the end of their tails. See Norman (1985a, 160-169), Lambert & The Diagram Group (1990, 167-168), or Fastovsky & Weishampel (1996, 135-149) for the paleontological characters. "The ankylosaurs, stegosaurs, *Scelidosaurus*, and possibly *Scutellosaurus* all appear to fall into a clade termed the Thyreophora," Michael J. Benton, "Origin and Interrelationships of Dinosaurs," in Weishampel *et al*. (1990, 28).

[27] Gish (1995, 124), with similar views expressed in Gish (1990, 71-72). See Paul (1988, 382-383), Lambert & The Diagram Group (1990, 63, 65, 122-123), and Halszka Osmólska, "Ornithomimosauria," in Currie & Padian (1997, 501) for the relevant suspects: the mid-Cretaceous *Harpymimus* (1984) and the Early Cretaceous *Pelecanimimus* (1994).

[28] Gish (1995, 124).

[29] The range of intermediate Late Cretaceous tyrannosaur relatives known by the time Gish was writing would include *Aublysodon* (under ¼ ton), *Alectrosaurus* (about ½ ton), *Alioramus* (¾ ton), and *Daspletosaurus* (3 tons), Lambert & The Diagram Group (1990, 39-40, 45, 56). A comparison of the skeletons of *Ceratosaurus* and *Tyrannosaurus* in Norman (1985a, 64-65, 70-71) reveal how little "transitioning" would be involved, and explains why the two similar forms were lumped together for so long. The shift to the new classification was reflected in Halszka Osmólska, "Theropoda," in Weishampel *et al*. (1990, 182); Fastovsky & Weishampel (1996, 263-279) or John R. Hutchinson & Kevin Padian, "Carnosauria," in Currie & Padian (1997, 94-97) describe the evidence underlying this. Ralph E. Molnar, Sergei M. Kurzanov, and Dong Zhiming, "Carnosauria," in Weishampel *et al*. (1990, 182) noted the intermediate hand of *Tarbosaurus*; the vestigial digit is more clearly illustrated in Norman (1985a, 71). *Tarbosaurus* was an *Allosaurus*-sized form (about 1½ tons) that may have been itself a species of *Tyrannosaurus*, as noted by Paul (1988, 340-343) and Lambert & The Diagram Group (1990, 97). Dingus & Rowe (1998, 215) noted dwarf limbs occurred independently and repeatedly in the theropods (including the avian forms), suggesting a common genetic structure for the process.

[30] Gish (1995, 124-125). Gish (1990, 72) had ventured: "It has been surmised that perhaps the location of his nostrils enabled him to dash out into a lake or stream to escape a hungry meat-eating dinosaur and then raise his head out of the water just enough to breathe." But Lambert & The Diagram Group (1983, 117), Norman (1985a, 90), or Bakker (1986, 124) indicate how obsolete that view was (water pressure at submergence depth would have crushed its lungs), and Gish's subsequent oeuvres have opted for less visible dinosaur surmising.

[31] See John A. Long & Kenneth J. McNamera, "Heterochrony," in Currie & Padian (1997, 313-314). The skull of *Massopondylus* is illustrated in Paul Upchurch, "Prosauropoda," in Currie & Padian (1997, 600) and Peter M. Galton, "Basal Sauropodomorpha—Prosauropoda," in Weishampel *et al*. (1990, 324), showing also a juvenile. *Shunosaurus* is illustrated in J. S. McIntosh, "Sauropoda," in Weishampel *et al*. (1990, 365). Czerkas & Czerkas (1991, 133-135) would reflect common paleontological thinking on sauropod nares when Gish was writing. Apropos the "no cousins" rule, Sereno (1999b, 2140-2142) cautions that the derived extant prosauropods are unlikely to have been the direct ancestors of the sauropods.

[32] Gish (1995, 123). Gish showed a more dated understanding of hadrosaur anatomy in the paragraph before when he stated they "apparently spent considerable time in the water, since they had webbed feet which had hooves but no claws," views carried over from Gish (1990, 70). Doubt about that turn-of-the-century view was expressed by Norman (1985a, 118-120); Bakker (1986, 146-159) settled the issue with a detailed examination of the particular mummified hadrosaur hand that had lead to the misinterpretation. Catherine A. Forster, "Hadrosauridae," in Currie & Padian (1997, 297) reflects the current consensus that they did not have webbed feet.

[33] Norman (1985a, 104-127) covers the range of candidates, with the skeletons of *Hypsilophodon* and *Maiasaura* on pages 106 & 120. Popping up among the world's dinosaurs in Gish (1992, 7) was the Early Cretaceous Australian hypsilophodontid *Leaellynosaura*, but it was not discussed in

the text (this may have been the illustrators' oversight, along with *Plateosaurus*). See Lambert & The Diagram Group (1990, 72) for specifics on *Leaelynosaura*. While Gish (1992, 24-25) listed *Iguanodon* as though it were the only member of its family, Czerkas & Czerkas (1991, 191, 196-202) charted the more complex realities of duck-bill distribution. The flat headed and solid crested hadrosaurs (examples would be *Anatosaurus* and *Maiasaura* respectively) lived in more upland environments and were offshoots of the basal *Iguanodon* form. The hollow crested lambeosaurs (like *Parasaurolophus*) that frequented the hotter Cretaceous lowlands derived from something like the African iguanodontid *Ouranosaurus* (which had the enlarged neural spines and distinctive pelvic configuration typical of the lambeosaurs, along with a more pronounced duck-billed premaxilla). Weishampel (1995) recounted how he and David Norman came independently to understand the development of the hadrosaur jaw system through computer modeling and direct anatomical analysis, and Taquet (1994, 46-47) describes how the change in teeth batteries relate dietary changes occasioned by the spread of angiosperm plants.

[34] Gish (1992, 40).

[35] As diapsid reptiles, dinosaurs lacked sweat glands. Hadrosaurs could have panted to prevent overheating, as modern crocodiles do, except their inherited jaw structure couldn't gape effectively, leading Czerkas & Czerkas (1991, 202) to suggest the air channels performed a cooling role. Besides their visual potential for species recognition, the crests also possessed complex acoustics useful for species-specific bellowing, not unlike the low-frequency calls of modern elephants described by Ben-Ari (1999). These are ideal for predator warning because they won't give away your location (the same principle that allows a stereo subwoofer to be placed anywhere in the room). See McGowan (1991, 73-76, 82) for a discussion of hadrosaur acoustics. Recently computer simulations have been pressed into service to work out the calls various hadrosaur crests might have produced, as noted by Malcolm W. Browne, "Computer Recreates Call of Dinosaur Sound Organ," in Wade (1998a, 37-39).

[36] Gish (1992, 80-83). One of Kent Hovind's lectures (home1.gte.net/dmadh/hovind3.htm) tracks the same points (though identifying Leviathan as *T. rex*!); Sellier & Russell (1994, 230) drew on Morris' 1988 book *The Remarkable Record of Job* to similar effect. The chimerical Ishtar Gate "dragons" resembled an antelope, with a horned head and birdlike hind feet, per Serge Cleuziou, "Babylon: The Gate of the Gods," in Forte & Siliotti (1997, 97). The illustration Gish referred to showed a mounted St. George slaying a rather undersized *Baryonyx*. Like modern tarot artists slavishly repeating anachronisms they don't understand, St. George's 3rd century British mount was equipped with saddle stirrups—a 4th century Asian innovation that didn't reach western Europe until the 8th century, *Past Worlds* (1988, 44). Ham (1998, 29-32) showed a more obviously draconian *Baryonyx* strolling by a *medieval* castle. In his 1993 radio appearance, Gish declared with generous understatement that dinosaurs and people "kept a respectful distance from one another." Asked when dinosaurs died out, he apparently didn't think St. George's *Baryonyx* counted, for he hazarded maybe within a few hundred years after the Flood—using a strict Creation Science Deluge dating that would be c. 2000 BC.

[37] Interestingly, Dawkins (1986, 309-310) alluded to why fire-breathing dragons were adaptively implausible from a Darwinian point of view. By comparison, Gish's grip on zoology has been tenuous, as when he criticized Michael Ruse for offering an "erroneous" example of adaptation: "The white coat color of the polar bear cannot be adaptive, however, since he has no predator. The white coat color thus cannot provide him with any selective value, since failure to detect him against the snowy terrain cannot protect him against a non-existent predator," Gish (1993, 54-55). It apparently did not occur to Gish that a *predator* might itself find some advantage in appearing inconspicuous against a white background when trying to sneak up on a potential dinner. Dawkins (1986, 38-39) duly took the Bishop of Birmingham (a theistic evolutionist) to task for fielding the same invalid polar bear claim.

[38] Surface features varying more than underlying biochemistry, natural defenses tend to circumvent opposing sensory systems by camouflage or feint (moth evasive maneuvers versus bat radar) rather than overt chemical or physical assault (such as tasting awful). Gamlin & Vines (1986, 213-234) survey the interplay between sensory systems and defense; Speed & Ruxton (2002) offer some

theoretical modeling. See Dawkins (1986, 97-99) or Whitfield (1993, 121-123) for brief accounts of the electrical sensitivity of aquatic vertebrates, and Hughes (1999, 201-257) for more detail. Paleontologists being mindful how not all features are reflected skeletally (especially when explaining the limitations of pictorial reconstruction) it was interesting that Gish didn't bring up the matter of whether sauropods had trunks. Land animals with high nostrils like elephants and tapirs do, as noted by Norman (1985b, 7) in his work for young readers, or Lambert & The Diagram Group (1990, 181) for adults. But dinosaurs lacked the substantial *lips* to modify as a trunk in the way mammals have, Bakker (1986, 141-145). See also Stokstad (2001d) on the reevaluation of dinosaur nares by Witmer (2001b).

[39] Chapman (1969, 54, 111-112, 116-117, 284, 443-446). A crash course in beetle phylogeny: the three most ancient superorders have hung on with a few families (four in the Archostemata, known from fossils going back to the Permian period, four in the Myxophaga, and nine in the Adephaga); the more "recently" diversified Polyphaga (which had appeared by the Triassic) covers 149 living families. Most predatory beetles belong to the Adephaga, primarily of the Carabidae family (covering some 1700 species), which is where we find the single genus of bombardier beetles, *Brachinus* (consisting of 40 species). See Richard White (1983, 80-81, 94-95) and Arthur Evans *et al*. (1996, 74-75, 117, 194-195).

[40] Arthur Evans *et al*. (1996, 126). Beetles apply their pygidial glands in many ways. The "water skater" *Stenus* (in the Polyphaga superorder) squirts a chemical that disrupts the surface tension like a detergent to propel itself away from predators, Chapman (1969, 157-158) and Richard White (1983, 113-114). Interestingly, the Carabidae lack a peritrophic membrane that protects cells from damage by the gut contents. While typical of fluid feeding insects, Chapman (1969, 46-48) found its absence in the predaceous Carabidae "surprising." Whether this relates to some underlying genetic switches that may have facilitated the formation of complex secretion systems like those in the bombardier beetles remains to be ascertained.

[41] In a rare instance of owning up to a mistake, Gish (1993, 101-104) noted the Kofahl slip, albeit characterizing it as but a "little hitch" that evolutionists insisted on blowing all out of proportion, so to speak. Yet the fact remained that it had apparently never occurred to Gish (a biochemist) to physically test the reaction—unlike Richard Dawkins (1986, 86-87), who did exactly that to confute the similar claim in Francis Hitching's 1982 antievolution book *The Neck of the Giraffe, or Where Darwin Went Wrong*. Cf. Kofahl (1981) *v*. Weber (1981a,b), and William M. Thwaites, "A Two-Model Creation versus Evolution Course," in Hanson (1986, 98-99) on Gish's beetlemania. Lagging far behind the update curve, Huse (1997, 31-33) used the inaccurate 1976 edition of Gish's *Dinosaurs: Those Terrible Lizards*—while a current creationist nature film touted at CBN.com (December 14, 2000) repeats the explosive beetle scenario.

[42] Gish (1990, 99-100). Gary Parker in Morris & Parker (1987, 85-86) also claimed (without references) any intermediate stage would lead to the proto-bombardier going "boom!"

[43] Milne & Milne (1980, 97). Gish (1990, 97-98) reversed the moderators: "Catalase is an enzyme that causes the extremely rapid conversion of hydrogen peroxide into water and oxygen. The peroxidase enzyme then cause the oxygen to very rapidly oxidize the hydroquinone into another chemical, called quinone, which is a noxious, or irritating chemical."

[44] One scenario would start with a glandular array to squirt nasty tasting quinones at a pursuer. As doing so from the front would mean having to turn around to flee, a posterior location also makes sense. Nothing will blow up if hydroquinones get added to the mix as a further chemical deterrent, and including hydrogen peroxide at that stage would only help generate more quinones, albeit slowly. Introducing catalase beefs up both the production of quinones and generates a bit of heat from any oxidizing of the trace hydrogen, for a warmer puff, and peroxidase would further improve the reaction. From there it is a matter of chemical proportion, as the mixture oxidizes more rapidly for an increasing spurt, and by that time the bombardier could stand its ground and work on aiming. Naturally, a very detailed fossil record would be required to determine to what extent ancient bombardiers possessed a musculature system to eject the contents by physical rather than chemical means, as well as to trace the evolution of any subsequent valved release mechanism triggered by the rising internal pressure.

[45] Dinosaurs have long been a favorite of adventure writers who want their protagonists to be menaced by an especially fearsome monster. The snag being, of course, that the last dinosaur (birds excepted) died out sixty million years before the first humans appeared to wave spears at them, so the trick has been how to converge the two for dramatic purposes. Apart from invoking time travel, ever since Conan Doyle employed the "relic" theory to populate a Venezuelan tepuí with them for *The Lost World*, the temptation has been to hope the next Valley of Gwangi or Kong Island will harbor a few living specimens to provide thrills and chills. Or you can take the simpler *One Million Years B.C./Alley Oop* approach and have early man coexist with the dinosaurs anyway, hang the paleontology. See Lambert & The Diagram Group (1990, 294-301) or Donald F. Glut, "Popular Culture, Literature," in Currie & Padian (1997, 576-578) for surveys of dinosaur themes in entertainment. In depicting life "one million years ago," the 1950s comic book *Tor* may have relied on the same Yale mural as my old dinosaurs, putting oversized versions of the Permian reptiles *Sphenacodon* and *Dimetrodon* in the dinosaur venue along with its decidedly modern-looking caveman hero.

[46] Leviathan may reflect traditions from the primeval sea monster "Lothan" in Phoenician mythology to the Babylonian goddess Tiamat, as well as providing the context for the Jonah story. See Greenspahn (1983, 33-34), Manfred (1987, 206), Michael D. Coogan, "Leviathan," in *Oxford Companion* (1993, 433-434), McKown (1993, 49-50), *The HarperCollins Bible Dictionary* (1996, 602) and Kowalski (2001, 95-111). Ryan & Pitman (1998, 250) relate the Tiamat element to the catastrophic flooding of the Black Sea in the 6th millennium BC. Ellis (1994, 5-6) cautioned that the literal Biblical details were difficult to reconcile with any one animal, though Gehman (1970, 558), *Revell* (1990, 350) and James L. Crenshaw, "Job," in *Oxford Bible* (2001, 353) suggest crocodiles may have inspired some of it. Creationists Paul Taylor (1987, 48) and Ken Ham (1998, 37) peg Leviathan as the extinct Australian pliosaur *Kronosaurus* (a short-necked plesiosaur about the size of a sperm whale) or "something like" it, even though the description fits known Mesozoic marine reptiles no better than living whales. Although Ham noted Leviathan's purported fire breathing (and was so illustrated on p. 38) he skipped any Gishian speculation on the anatomy of its pilot light. Taylor's speculations are currently available online at his Eden Communications website (christiananswers.net). Henry Morris (1972, 32) suggested leviathan was "a marine dinosaur"—an interesting trick, as no aquatic dinosaurs *per se* are presently known to science. Later in the chapter Carl Baugh's similar taxonomical confusion will be explored.

[47] Ham (1998, 39-40) was unusual for quoting the KSV Leviathan account entire. Job 41:1-34 was less a monograph on marine zoology than a reflection of how mighty God was compared to even the most powerful beast (an attitude also seen in Psalms 74:14 & 104:26, where Leviathan is variously destroyed by or is a mere plaything of God). While the KSV may be vivid, the gist of the passage is plainer in the RSV translation: "Can you draw out Leviathan with a fishhook, or press down his tongue with a cord? Can you put a rope in his nose, or pierce his jaw with a hook? Will he make many supplications to you? Will he speak to you soft words? Will he make a covenant with you to take him for your servant for ever? Will you play with him as a bird, or will you put him on leash for your maidens? Will traders bargain over him? Will they divide him up among the merchants? Can you fill his skin with harpoons, or his head with fishing spears? Lay hands on him; think of the battle; you will not do it again! Behold, the hope of man is disappointed; he is laid low even at the sight of him. No one is so fierce that he dares to stir him up. Who then is he that can stand before me? Who has given to me, that I should repay him? Whatever is under the whole heaven is mine. I will not keep silence concerning his limbs, or his mighty strength, or his goodly frame. Who can strip off his outer garment? Who can penetrate his double coat of mail? Who can open the doors of his face? Round about his teeth is terror. His back is made of rows of shields, shut up closely as with a seal. One is so near to another that no air can come between them. They are joined one to another; they clasp each other and cannot be separated. His sneezings flash forth light, and his eyes are like the eyelids of the dawn. Out of his mouth go flaming torches; sparks of fire leap forth. Out of his nostrils comes forth smoke, as from a boiling pot and burning rushes. His breath kindles coals, and a flame comes forth from his mouth. In his neck abides strength, and terror dances before him. The folds of his flesh cleave together, firmly cast upon him and

immovable. His heart is hard as stone, hard as the nether millstone. When he raises himself up the mighty are afraid; at the crashing they are beside themselves. Though the sword reaches him, it does not avail; nor the spear, the dart, or the javelin. He counts iron as straw, and bronze as rotten wood. The arrow cannot make him flee; for him slingshots are turned to stubble. Clubs are counted as stubble; he laughs at the rattle of javelins. His underparts are like sharp potsherds; he spreads himself like a threshing sledge on the mire. He makes the deep boil like a pot; he makes the sea like a pot of ointment. Behind him he leaves a shining wake; one would think the deep to be hoary. Upon earth there is not his like, a creature without fear. He beholds everything that is high; he is king over all the sons of pride."

[48] Taylor (1987, 19). Henry Morris (1972, 32-33) expressed similar views, as had Gish (1990, 68)—repeated in his 1993 appearance on Kennedy's "Truths That Transform." Ham (1998, 59-61) prefers *Brachiosaurus* for his Behemoth.

[49] See Gehman (1970, 100), Manfred (1987, 59), or *The HarperCollins Bible Dictionary* (1996, 112) for the scholarly identification of Behemoth with the hippo. Behemoth as hippo long predated Darwin—being so listed in a 1798 natural history by Thomas Pennant, Ritvo (1997, 53). Michael D. Coogan, "Behemoth," in *Oxford Companion* (1993, 76-77) noted not all the details fit that animal, though, and *Revell* (1990, 84) considered that it might have been a water buffalo; Crenshaw, "Job," in *Oxford Bible* (2001, 353) offered both. Kenneth Miller (1999, 94) opted for the elephant. Michael J. Ryan & Matthew K. Vickaryous, "Diet," in Currie & Padian (1997, 171-172) described sauropod dining habits (grass didn't yet exist in the Mesozoic, by the way). That it was Job again who was responsible for Behemoth ought to have clued Biblical creationists in on the possibility that the description was intended for some other purpose than inclusive taxonomy—Ross (1998, 48) took the position that these animals were "to be taken figuratively." Cf. also Archer (1982, 239-240), Hiers (2001, 83) and Kowalski (2001, 83-84). The RSV translation of Job 40:15-24: "Behold Behemoth, which I made as I made you; he eats grass like an ox. Behold, his strength in his loins, and his power in the muscles of his belly. He makes his tail stiff like a cedar; the sinews of his thighs are knit together. His bones are tubes of bronze, his limbs like bars of iron. He is the first of the works of God; let him who made him bring near his sword! For the mountains yield food for him where all the wild beasts play. Under the lotus plants he lies, in the covert of the reeds and in the marsh. For his shade the lotus trees cover him; the willows of the brook surround him. Behold, if the river is turbulent he is not frightened; he is confident though Jordan rushes against his mouth. Can one take him with hooks, or pierce his nose with a snare?" Job then went on to rhapsodize about the strengths of Leviathan. Incidentally, the KJV version of Job 40:23 reads "Behold, he drinketh up a river, *and* hasteth not: he trusteth that he can draw up Jordan into his mouth." Gish (1990, 68) relied on this translation to suggest "the creature described in Job is so huge he could drink up a river and was not in a hurry." But Diplodocids had heads roughly the same size as that of a horse, which may be compared to the truly gaping maw of a hippo—in any case, neither animal would be literally capable of draining a stream. For a final twist, creationism critic Pennock (1999, 217) noted recent scholarship has related the "tail" that was made stiff by Behemoth to a euphemism for penis, which does give a fresh turn to the text but does not help the sauropod case.

[50] Taylor (1987, 46-47), Gish (1992, 86), and Huse (1997, 63). Recall that Taylor & Gish were specifically targeting children about the "truth" of dinosaurs and the Bible. Sellier & Russell (1994, 239-240) relied on Gish ("professor of natural science and author") for the Japanese tale, but without specific references. Morris & Morris (1996a, 209) and Kent Hovind (at Dr. Dino's website & on Chuck Missler's radio show in August 1999) repeat the plesiosaur myth.

[51] Glen Kuban covered the forensics at Talk.Origins, and YEC Pierre Jerlström & Bev Elliott accept the shark identification (answersingenesis.org/docs/4216cen_m1999.asp). Cf. Ellis (1994, 68-69) and Fairley & Welfare (1998, 78-79). The likelihood that any dinosaurs, plesiosaurs, or even archaic whales still exist is pretty slim, as even enthusiast Mackal (1980) attested. Ironically for YEC cryptozoology, the uniformitarian Lyell was a sea serpent enthusiast, while the anti-Darwinian Owen was adamantly not, Ritvo (1997, 182-186, 265-266n).

[52] Taylor (1987, 36-44), parts of which were subsequently regurgitated by Sellier & Russell (1994, 231). Ham (1998, 137n) appears to allude to the same Arizona petroglyph. See Lambert & the Diagram Group (1983, 161) for the assorted attitudes hadrosaurs are believed to have been capable of, including the "high browsing" stance that comes closest to Taylor's stilted depiction. Norman (1985a, 116-119) shows *Edmontosaurus* in its more typical "low browsing" mode, along with its skeleton. Also like Taylor, Ham (1998, 42-45) decided pterosaurs fit the bat-winged flying snakes mentioned by Herodotus (neither offered references, but these occur in Book II, 75 & Book III, 106 of *The Histories*). Just as the Greek historian had not witnessed the giant gold-mining ants of Persia he also heard tell of, Herodotus saw no living examples flapping about in Arabia, only piles of their purported bones. Whether fossils may have given rise to these tales is difficult to ascertain at this late date, as Mayor (2000, 135-136, 306n) noted. Herodotus placed his Arabian site somewhere due east of the Nile delta city of Buto—a good thousand miles northwest of the prominent frankincense kingdoms at the southern tip of Arabia; see the maps in *Past Worlds* (1988, 137) and Abercrombie (1985, 485). For evidence of living pterosaurs Gish (1992, 16) felt content to cite an 1890 *Tombstone Epitaph* article purporting to disclose the close encounter two Arizona riders had with a reptilian flyer. Concluded Gish: "Those two cowboys may have shot the last living *Quetzalcoatlus* just a little over 100 years ago. It is an unlikely story, but who knows?" Where *is* Charles Fort when you need him? Fort was a rather pompous crank who collected reports of oddities (raining frogs and that sort of thing) earlier in the last century, Gardner (1957, 42-54)—Gish's willingness to rely on so slender a thread here may be compared with the skeptical take of Polidoro (2002, 21). The idea that a 19th century frontier newspaper could simply be sloppy (or succumb to sensationalism for extra circulation) is amply supported by the 1890s "mystery airship" craze recounted in Klass (1974, 302-315), a direct forerunner of the UFO flaps that have cycled through the media to this day.

[53] Dong Zhiming, "Chinese Dinosaurs," in Currie & Padian (1997. 118). By comparison, Taylor (1987, 36) was sure that "The ancient, original 'dragon' legends must have come from memories of dinosaurs"—a view quoted as authoritative by Sellier & Russell (1994, 230). Schroeder (1997, 193) offered probably the most winsome attempt to include dinosaurs in the Bible. Analyzing the terminology used when Moses transformed staffs into snakes in those "anything you can do I can do better" episodes recounted in Exodus 4:3, 7:10, and 7:15, Schroeder decided the singular Hebrew term *taneen* meant "reptiles" generally. That allowed him to translate Genesis 1:21 as "And God created the big reptiles...." And who could ask for bigger reptiles than dinosaurs? QED, dinosaurs are mentioned in the Bible. Not that this is likely to deter fundamentalists enamored of their King James: "And God created great whales…." That leaves the "great sea monsters" of the RSV & NAS the preferable translations for cryptozoology. The NIV & New Living versions opt for "great creatures of the sea," *Today's Parallel Bible* (2000, 2-3). Cf. Greenspahn (1983, 35) on the issue of "sea monster" translation.

[54] Schopf (1999, 282-291), also Lambert & The Diagram Group (1985, 88-89) or Cohn (1996, 90-92). As the fossil bore not even the slightest resemblance to a human skeleton, Scheuchzer's conclusion jump showed how easily Biblical presumptions colored the data before the rigorous standards of comparative anatomy were developed. But then, fossil shark teeth were still being taken for "serpents tongues" in some quarters, Gohau (1990, 58).

[55] Wellnhofer (1991, 20-21). Ham (1998, 120-121) had the sizable cheek to quote this very section of Wellnhofer—but only to surgically extract the dragon legends, bypassing every reference to their likely fossil origin.

[56] Mayor (2000, 15-53), summarized by Dodson (1996, 225-226). Chinese legends of "stony swallows" also appear to have their origin in misinterpreted fossils, Gohau (1990, 22), and fossil footprints have been integrated in the lore of many cultures, William A. S. Sarjeant, "History of Dinosaur Discoveries," in Currie & Padian (1997, 340-341).

[57] In a triumph of hope over data, a Dave Anderson cartoon ("SOME FOSSIL ASSEMBLAGES ARE HARD TO EXPLAIN") in Sunderland (1988, 50) showed a fossilized *T. rex* in pursuit of a human astride a horse. Mesozoic human fossils got fictional play in Christopher Lane's 1999 potboiler *Tonopah* about Melissa Lewis, a dedicated creationist Flood paleontologist (there are so many!)

whose dig unknowingly trespassed on a secret Nevada base. (Murderous government flunkies out to prevent disclosure of a 1950s atomic test mishap filled most of the novel with gratuitous mayhem in a sort of "Green YEC meets Rambo in Area 51" plot.) Morris & Morris (1996b, 264) were only slightly less inventive concerning Novacek *et al.* (1994, 69) on the Gobi Desert Flaming Cliff formation that lacks the *exact* K-T boundary. This is no surprise, as Mongolia is not among the *three* known sites, all in North America (Alberta, Montana and Wyoming), Peter Ward (2000, 132). While frustrating for paleontologists anxious to determine how tightly correlated the mass extinction was with the proposed asteroid splat, the Morrises wrote as though the primitive Tertiary mammals in the upper "T" were being found literally commingled with the earlier "K" fauna. They even scripted a quite imaginary chagrin on the part of the authors: "Evolutionists are embarrassed by this unexpected abundance of both Cretaceous reptiles and Tertiary mammals in the same formation." More recently, Ken Ham's *The Great Dinosaur Mystery SOLVED!* (a glossy cartoon-filled text aimed at ages 13 to adult) bypassed the paleontological defense entirely. Ham (1998, 27): "Because the Bible teaches that the animals we now call dinosaurs were made on the same day as the first two people (Genesis 1:24-31), Christians can authoritatively state that dinosaurs did live with people! This can be declared on the basis of the authority of the Word of God. This is thinking biblically!" … Indeed.

[58] Roland Bird (1939). The American Museum of Natural History displays a small section of the Glen Rose trackways obtained from a later Bird expedition, Norell *et al*. (1995, 181-183).

[59] Numbers (1992, 121). One instance concerned some Carboniferous mystery prints found at several North American sites, Ingalls (1940). Ranging in length from 5-10 inches, the foot had highly splayed toes that didn't look especially human, and appeared to indicate a bipedal gait (though print overlaps can produce that impression depending on circumstances). Lockley (1999, 60-61) surveys major tracks of that period, and the difficulty in interpreting them. Taquet (1994, 66-69) and Lockley (1999, 82-89) describe the case of prints spotted in the early 19th century of a Triassic reptile with a curiously hand-shaped paw that wasn't explained until the 1960s when an odd thecodont turned up to fit them. The purely geological processes responsible for shoe-shaped features have been discussed by Roy Gallant (1975, 177-179), Robert E. Sloan, "The Association of 'Human' and Fossil Footprints," in Zetterberg (1983, 354-357), and Strahler (1987, 459-462). These "prints" show none of the characteristic pressure patterns of a human foot, and are often found in offshore marine environments—rather "a strange habitat for prehistoric man," as University of Utah geologist Richard Robison wryly remarked of one purported Cambrian "sandal," Sloan in Zetterberg (1983, 356).

[60] As recently as 1996 the Burdick print has shown up in NBC's "The Mysterious Origin of Man," as well as in a videotape by "Dr. Dino" Kent Hovind (along with several other alleged "man track" castings). While Hovind advised his audience that he knew all about the controversy concerning the prints, he didn't feel cause to share much of this information with his rapt listeners (nor does it surface at his website, drdino.com). The same holds true for Carl Baugh's Creation Evidence Museum website (creationevidence.org), where one may see photos of what is purported to be a "man track" *in situ*. Numbers (1992, 202-203, 265-267) recounted the impact Burdick's 1950s research on the Paluxy tracks had on the budding Flood Geology of Whitcomb & Morris (1961), with Burdick all too willing and able to supply evidence for their doctrine, even as the doubts of other creationists mounted. Numbers (1992, 267) concluded: "For a decade and a half after the founding of the CRS no one contributed more than the eccentric Burdick to furthering this agenda. Unfortunately for the reputation of creationism, no one among the leadership was so lacking in credentials, critical thinking, and caution." Christian apologist Gleason Archer (1982, 63-64) was enthusiastic about the Glen Rose tracks. Ironically, Toumey (1994, 137-138) noted some of the most "merciless" criticism of the Creation Research Society Glen Rose position came from the Seventh-day Adventist creationist organization, the Geoscience Research Institute—thus completing the short circuit begun when Henry Morris hijacked the Adventist Flood Geology of White and Price.

[61] See Godfrey (1981; 1985) re Walter Coombs (1980), Weber (1981c), Zuidema (1981, 4-5), Cole *et al.* (1985b), Hastings (1985), Kuban (1986), Steven Schafersman, "Paluxy Footprints," in

Frazier (1986, 319-323), Strahler (1987, 462-470), Lockley (1999, 181-185), Pennock (1999, 216-221) and Kossy (2001, 184-189). Kitcher (1982, 121-122), McGowan (1984, 107-109), Ecker (1990, 68-69), Tiffin (1994, 113-114) and Eldredge (1982, 131; 2000, 129) are briefer. Cf. the Talk Origins coverage of biologist Glen Kuban and science teacher Ron Hastings with the "refutation" of Kuban by the YEC website omniology.com, confidently recommended by Kent Hovind contra criticism by answersingenesis.org/docs2002/1011hovind.asp ("Maintaining Creationist Integrity"). One genuine Glen Rose "mystery" is whether the theropod preserved there 100 mya (likely *Acrocanthosaurus*, an *Allosaurus* relative) actively stalked its sauropod prey (probably *Pleurocoelus*). Thomas & Farlow (1997) think so, but Lockley (1999, 176-181) and Chiappe & Dingus (2001, 162-165) are more skeptical.

[62] Wendell Bird (1989, Vol. 2, 128), Ratzsch (1996, 81, 174), and Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 59) represent the Glen Rose tracks as showing Creation Science willingness to appreciate new information—not as a sign of how a pervasive lack of evidence has had no effect on their fundamental position. Cf. Douglas Futuyma in Bennetta (1987, 37) and Alters & Alters (2001, 94-97).

[63] Answers in Genesis puts Paluxy on their 2002 "don't use" list; Paul Taylor (1995) & Morris & Morris (1996a, 209-210; 1996b, 120-122) leave it out—though the 1996 print of Morris (1985, 122-123) still anachronistically supports Paluxy. Cf. John Morris' Impact No. 151 backspin (January 1986, at icr.org/pubs/imp/imp-151.htm) with Schadewald (1986, 6-9) & Hastings (1986; 1987). While the 1982 *What Is Creation Science?* quoted by Lloyd Bailey (1993, 25) extolled Glen Rose, the Morris & Parker (1987, 166) 1997 ed. settled for: "Footprints of man and dinosaurs together also represent 'misplaced fossils.'" Huse (1997, 62) invoked Wysong to claim such prints "have been carefully studied and verified by reliable paleontologists and cannot be dismissed as frauds." Lane's *Tonopah* novel also waves Paluxy (p. 24). Meanwhile, OEC Hayward (1985, 149-151) and Ross (1994, 114-115) freely dismiss them as spurious.

[64] The standard Biblical date for the Flood was determined by counting life spans forward from the creation of Adam, a period of 1656 years according to Whitcomb & Morris (1961, 26) or Henry Morris (1985, 247), with 368 years from the Flood to Abraham. This is the interpretation favored by doctrinaire Flood advocates, including Huse (1997, 91) and Kent Hovind, though Whitcomb & Morris (1961, 478, 479) mentioned a few alternatives, from the "strict-chronology" dating of 2459 BC, to the looser sequence allowing up to 5000 years between the Flood and Abraham. See also Morris & Morris (1996a, 70-71). The Deluge itself is held by most believers to have taken place over only one year, while an assortment of geological upheavals (mountain ranges and continental shifts) are permitted to occur during the few centuries after.

[65] James Burke (1985, 244-255). Cf. Doyle *et al*. (1994, 20-22) on Siccar Point and how James Hutton (1726-1797) and John Playfair (1742-1819) interpreted it. Though doubts about the strict reality of the Flood were being voiced by the 17th century, fear of religious censure considerably dampened free expression (Edmund Halley buried his own tentative forays here deep in the Royal Society archives). Cf. Stark (2003, 163, 198-199) on how atypical Halley's skepticism (if not outright atheism) was in the cloud of Christian scientists. By the time Hutton's geological "revolution" came along the bloodier French one was underway. That analogous disruption of the *status quo* caused the quite pious and conservative Hutton to get it from both religious and political quarters, Cohn (1996, 100-102). During the 19th century Cuvier and others began to think in terms of hundreds of thousands, and then millions of years, though William Buckland's "friend William Conybeare set a record by estimating the age of the earth at 'quadrillions of years,'" Gohau (1990, 171).

[66] Henry Morris (1985, x, 92, 254) and Huse (1997, 53). Similar glancing references may be found in Morris (1963, 48, 60; 1975, 55-56), Morris & Parker (1987, 243), Gish (1978, 54; 1993, 303), and Morris & Morris (1996a, 75; 1996b, 20-21, 259-261, 297). By comparison, Morris (1985, 221-255) and Morris & Morris (1996a, 35-64) criticized at hairsplitting length the rival Day-Age and Gap theories—with Huse (1997, 76-77) duly referring his own readers to Morris' solo account. Bert Thompson (1995, 125-218) is similar. In the 1996 video "Fossil Evidence of Creation" Australian creationist geologist Andrew Snelling attributed the geological system to

evolutionary thinking, mentioning only Lyell and Darwin on the fly. A singularly rambling rejoinder to the "circular reasoning" argument (that fossils are dated by rocks in turn dated by the fossils) was given by way of "balance" courtesy of paleontologist Ken Carpenter. Apparently elicited while Carpenter was trying to work on cleaning a fossil sample, his attention clearly seemed to be somewhere else. This splendid example of what editing can do for an apologetic cause has been shown on the Trinity Broadcast Network as recently as January 1, 2000. See the Biblical Creation Society (pages.org/bcs/bcs100html) for a rare (though still equivocal) attempt to deal with the geology of Siccar Point from the YEC perspective.

[67] Henry Morris (1963, 58). While absent from the laundered secular version, the full religious edition of Henry Morris (1985, 251) still embraces it: "If the Bible is the Word of God—and it is—and if Jesus Christ is the infallible and omniscient Creator—and He is—then it must be firmly believed that the world and all things in it were created in six natural days and that the long geological ages of evolutionary history never really took place at all." This view is plainly reflected in the list of "*Contradictions between Genesis and the Geological Ages*" in Morris (1985, 227-228), Morris & Morris (1996a, 47), Bert Thompson (1995, 213-214, 230-234), or Huse (1997, 164-165), where fruit trees had to exist before fishes, and birds before insects, on Biblical grounds alone. Strahler (1987, 357) noted the irony of 20th century Biblical creationists being forced by the necessity of their antievolutionism to repudiate the entire legacy of classical biostratigraphy so carefully constructed by 18th and 19th century Biblical creationists!

[68] Henry Morris (1963, 65-66). In his 1993 "Creation Week" radio stint, Gish dismissed the opinions of Hutton and Lyell as "preaching" without mentioning their reasoning or evidence, and Gish (1995, 49) portentously ranked uniformitarians among the "last day scoffers" prophesied by 2 Peter 3:3-6. Assuming, of course, that St. Peter was the author of that epistle, a point seriously disputed by Biblical scholars, Robin Lane Fox (1992, 133-136). Although evolutionary thinkers like Darwin were happy to have an older earth, the recognition of the great age of the planet had nothing to do with evolutionary assumptions. See Gohau (1990, 111-185), Cohn (1996, 47-123) and Nicholas A. Rupke, "Geology and Paleontology," in Ferngren (2002, 179-194) on the development of modern geological thinking concurrent with the gradual dissipation of belief in a literal Flood. Futuyma (1982, 37-38) and Kitcher (1982, 125-126) both noted the "diluvian theory" had been abandoned by prominent creationist geologists like Adam Sedgwick years before Darwin sailed on the *Beagle*—see Schadewald (1983) for further context. Gish (1993, 225) ingenuously responded apropos Kitcher: "It is clear from reading this portion, however, that it is not *creation* that Sedgewick [*sic*] is disavowing, but his previously held position concerning *catastrophism*, which he now believed to be incorrect." Incidentally, while rare misspellings of Sedgwick's name do occur, as in Ward & Brownlee (2000, 128-130), Gish managed to do so even in his direct quote from Kitcher.

[69] A footnote in Henry Morris (1963, 74) demurred: "The most serious of these difficulties are dealt with in considerable detail in *The Genesis Flood* (by John C. Whitcomb and Henry M. Morris, 331 ff.), and shown to be fully capable of resolution and harmony with Biblical creationism and catastrophism." But if so capable of resolution, why then were they difficulties? Morris (1972, 26) progressed to: "Although there are still many unsolved geological problems in connection with this Biblical interpretation of the fossils, these problems are not nearly so difficult to interpret as those confronting the evolutionary geologist. Many creationist scientists today are actively doing research on these problems and the scientific basis of so-called 'flood geology' is becoming stronger all the time." No further redaction of Flood Geology inadequacy clouded Morris (1985), Morris & Parker (1987), or Morris & Morris (1996a,b,c).

[70] Cf. the short shrift given igneous rocks by Henry Morris (1985, 101) with Coffin & Eldholm (1993)—or Jon Erickson (1996) on marine geology and Sieh & LeVay (1998) on earthquakes and volcanism. Lambert & The Diagram Group (1988, 56-63) review plate theory, and Strahler (1987, 200-214) critiques the Creation Science position. New conceptions supersede traditional creationist canards, like the formation of coal and oil in Morris (1985, 107-110). Coal is now seen as forming in deltaic swamps (often related to ice age sea level fluctuations) and not in "peat bogs," Strahler (1987, 218-221, 235-238) or Emiliani (1992, 345-349). Iconoclast Gold (1999, 37-123)

presses his case for an inorganic (but still non-catastrophic) origin for natural gas, petroleum, and black coal (excluding peat and lignite)—though Robert Ehrlich (2001, 122-145) is skeptical. Although Hayward (1985, 153) cited a 1980 geological symposium reporting the contrary, Morris (1985, 104) still quoted a 1957 text to affirm that "no dolomite sediments are being produced at all." Likewise, Morris (1985, 105) and Paul Taylor (1995, 45, 113) consider Precambrian chert beds inexplicable—meanwhile, it has been recognized that oceanic silica precipitated differently before the appearance of siliceous sponges, radiolaria, and diatoms, Strahler (1987, 225) or Emiliani (1992, 320-321). See also "More Errors on True.Origin: J. Sarfati's Support of Flood Geology" (at onthenet.com.au/~stear/henke_refutes_sarfati.htm) by geologist Kevin R. Henke. Not that Creation Scientists aren't *busy*. Gary Parker extolled the work of creationist geologist Steven Austin on coal deposits: "His model, still in the developmental stage, already explains many features of coal that the swamp model cannot explain. Even more importantly, his theory—a real scientific breakthrough—is the first ever to be used to *predict* the location and quality of coal." Yet when Taylor (1995, 45, 101) and Morris & Morris (1996b, 255-268) touched on fossil fuels nearly a decade later, Austin's "scientific breakthrough" was nowhere to be found (more of Austin's views will be explored shortly). Cf. Zuidema (1981, 3-4) on YEC expectations on oil deposits. Parker also alluded to Harold Slusher of the ICR, delving into "magma cooling rates, break up times for star clusters, and a dozen other projects," Morris & Parker (1987, 170, 175). Robert Schadewald, "Creationist Pseudoscience," in Frazier (1986, 314-315) and Numbers (1992, 232, 288, 421n) noted Slusher's padded academic credentials, while Hayward (1985, 141-142) commented on the meteoric dust myth offered in Slusher's 1980 book *Age of the Cosmos*.

[71] Henry Morris (1985, 98-99), citing Colbert's 1965 *The Age of Reptiles* (p. 169) for the Alberta example, and his 1968 *Men and Dinosaurs* (pp. 141, 151 & 58) for the remainder.

[72] See Lambert & The Diagram Group (1990, 53) on *Coelophysis*, and Norell *et al*. (1995, 107-109), Benton (1996, 74-75), or Clive Coy, "Ghost Ranch," in Currie & Padian (1997, 277) on the formation. For comparison, one tightly packed mass of sauropod bones in Wyoming (the sort of jumbled deposit a catastrophist would home in on) was not much larger: 14 x 20 meters—and the 4000 bones involved only around 20 animals. See Brent H. Breithaupt, "Howe Quarry," in Currie & Padian (1997, 355), as well as the excellent color photograph of part of the site in Norell *et al*. (1995, 86).

[73] Norell *et al*. (1995, 109): "a few years ago tens of thousands of caribou drowned while trying to cross a flood-swollen river in northern Canada. Along this river the bloated, decomposing bodies were stacked 3 meters high. Similar occurrences happen each year at river crossings during the annual migration of east African antelopes." See also Weber (1980b, 10-13).

[74] Flood Geology has to pointedly ignore the geological subdiscipline of *taphonomy* that studies the forensics of fossil preservation. See Simpson (1983, 14-26) or Behrensmeyer (1984) on its general principles, Anthony R. Fiorillo, "Taphonomy," in Currie & Padian (1997, 713-716) for a dinosaur application, Wagner (2000b) at the genetic level, and Carpenter *et al*. (2003) on what some fossil fish tell about Late Cretaceous climate. Laurie Godfrey, "Creationism and Gaps in the Fossil Record," in Godfrey (1983, 195) noted that taphonomists "can recognize the telltale signs of postmortem gnawing, of trampling, of slow or rapid water transport, of oxidizing or reducing depositional environments, of physical and chemical weathering, of postdepositional deformation, and so on. They can tell you why no shoulder blades, vertebrae, hand bones, and foot bones may be represented in a deposit loaded with skulls, jaws, and occasional long bones of fossil vertebrates." Gish (1993) bypassed taphonomy in his rejoinder to Godfrey. Henry Morris (1963, 49) is wonderfully obtuse: "But in what way do fossils of dead animals provide evidence for evolution? Since they were deposited in most cases prior to human historical observations and records, it is obviously impossible to know for certain just how and when they lived and were buried." With straight face, Morris & Morris (1996b, 263) quoted Behrensmeyer (1984, 560, 561) about how rapid preservation needs to be to protect fossils, as though this meant the more intensive catastrophic conditions mandated by Flood Geology.

[75] For tidy summaries of sedimentary basics, see Lambert & The Diagram Group (1988, 74-83) or Palmer (1999, 172-173), and Doyle *et al*. (1994) for examples of modern stratigraphic principles described and applied in specific instances. Cf. Wing (2001, 50).

[76] Strahler (1987, 289-292) explained how such simulation experiments clarified the mechanisms for steep "incised meander" canyons, the result of a combination of slope, elevation shifts on the water course, and the type of sediments being carried. Since increased water flow was involved, creationist geologist Austin (1994, 98-99) cited the same sources as though they supported the sort of catastrophe he had in mind (the rapid draining of temporary lakes formed in the Flood). He actually undermined his own argument by further citing John Allen *et al*. (1986, 68) on the incised meander at the Palouse Falls, formed during the genuinely catastrophic drainage from glacial Lake Missoula. That intense surge sculpted a fairly short sheer-walled W-shaped canyon significantly different from the extended layer cake "gooseneck" type being discussed. The Palouse River canyon walls at that point also feature distinctive notches at the top carved by whirlpool action, as indicated in Mueller & Mueller (1997, 96-97).

[77] See Brent H. Briethaupt, "Como Bluff," and David A. Eberth, "Edmonton Group," in Currie & Padian (1997, 135-137, 199-203). Bakker (1986, 105-116) also presents a vivid description of dinosaur taphonomy at Como Bluff.

[78] Henry Morris (1985, 118-120) ingenuously offered fourteen "obvious predictions" of the Flood theory concerning fossil distribution. Essentially a restatement of Henry Morris (1963, 72-74), it was a valiant attempt to somehow "predict" what was actually observed. But the idea that Flood sediments would naturally tend to bury animals so quickly that *Lagerstätten* ought to be the norm did not occur to him. To account for the early marine fauna Morris arbitrarily decided invertebrates lived on the sea bottom below the fishes (points 4 & 5)—which should be news to the crabs, molluscs and cephalopods seen in living marine ecosystems. That animals were sorted by their hydrodynamic properties (point 9) was a complete misfire since the fossil record supports no such thing (where dinosaurs large and small can show up beside diminutive mammals and even tinier pollen grains). To explain the absence of human artifacts Morris defined the Flood slurry as so thin that "heavier metallic" objects would conveniently sink out of sight (point 13)—as though massive sauropod femurs or *Triceratops* skulls wouldn't follow them down. How Morris thought this "misplaced concreteness" would explain what happened to bone hairpins and utensils, or clay pots and beakers, remains to be seen. McGowan (1984, 58-66) went through Morris' points one by one, offering many confuting examples from his own experience—which Gish (1993) did not discuss. Morris & Morris (1996b, 306-307) continue voicing the idea of "ecological burial zones," though even more abstractly than in the earlier versions.

[79] Norman (1985a, 32). A map of the Bernissart formation showed two main deposition clusters, suggesting a shift in prevailing current at the site. Even Strahler (1987, 380) was behind the curve on this one, relying on Colbert's presentation of the ravine interpretation. Taquet (1994, 37-41) discusses the site in relation to more recent findings.

[80] Milton (1997, 94) offered Morris' four dinosaur examples in the same order, citing only the Colbert sources (though not with page numbers). As Morris' *Scientific Creationism* was in his bibliography, Milton likely obtained them from there secondarily. Happy enough to have *Archaeopteryx* as a non-bird, Milton (1997, 106) quoted Norman (1985a, 193) on the I-II-III versus II-III-IV digit problem.

[81] Milton (1997, 269): "Let me make it unambiguously clear that I am not a creationist, nor do I have any religious beliefs of any kind. I am a professional writer and journalist who specializes in writing about science and technology and who writes about matters that I believe are of public interest." The problem comes in trying to figure out what Milton does believe, unambiguously or otherwise. Milton (1997, 19) apparently thinks the earth is not many millions of years old, but whether as young as 100,000 or even 10,000 is impossible to determine from the text. He regularly appealed to Young Earth creationist Melvin Cook on matters from radioactive dating to continental drift, Milton (1997, 32-33, 42-45, 62-64). See Strahler (1987, 157-158) or Stephen G. Brush, "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 65) on some of Cook's technical mistakes. That Milton thought Cook's 1960s calculations

on the supposed impossibility of crust convection (conducted before most of the evidence for seafloor spreading was amassed) could even be relevant after thirty years of continued geological research said a lot right there. As for evolution, Milton hinted at one point that quantum theory might offer the key to a "non-Darwinian" replacement for the mechanistic straw man he'd been attacking through the book, only to ridicule later on "half-baked speculations about aliens and quantum mechanics" he never specified, Milton (1997, 230-233, 274). Were it not for Phillip Johnson's already extensive fogbank in this area, Milton would warrant top honors for the artful concealment of their own position (from others, certainly, and perhaps even from themselves).

[82] Milton (1997, 79). Apropos the precision use of Lewis Carroll metaphors, Ankerberg & Weldon (1998, 309): "In conclusion, the alleged evidences for evolution may properly be considered at home in *Alice in Wonderland*. In that fantasy world, as the Red Queen said, 'six impossible things can be believed before breakfast.'" Likewise, on whether the human brain ultimately "traced back to nothing but a mixture of hydrogen and helium gases plus gravitational energy," Gish (1995, 199-200): "As the Red Queen in Alice in Wonderland stated, if one practices hard enough you can believe six impossible things before breakfast." The *Red* Queen is it—and in *Alice in Wonderland*? Critic of creationism Hyers (1983, 3) also erred on "the Queen in *Alice in Wonderland*" believing "three impossible things before breakfast." Incidentally, Carroll tended toward a belief in theistic evolution, Gardner (2000c, 169-170).

[83] Milton (1997, 214) alluded to a "200-foot brontosaurus." An e-mail aimed at Milton (via the British *Mensa* magazine he edits) determined this observation was based on a "182-foot" (60 meter) "Brontosaurus" in the London Natural History Museum. But a check of the museum listings in Lambert & The Diagram Group (1983, 244) indicated they actually had a cast of the Carnegie Museum's famed *Diplodocus* (as does the Smithsonian)—a lighter but longer 80-foot sauropod cousin of *Brontosaurus/Apatosaurus*. Further e-mail to the NHM paleontology department took all of 24 hours to confirm they did not in fact have Milton's monstrosity. As the NHM's Simone Wells dryly informed me, such a specimen wouldn't even fit in the main gallery (which barely accommodates their *Diplodocus* as it is); see Gardom & Milner (1993, 24) or the 2002 *A&E* version of Conan Doyle's *The Lost World* for views of the display *in situ*. All this suggested (i) Milton likely slipped an extra digit (or confused English for metric) somewhere in his notes. (ii) He knew so little about sauropod dimensions the measurement didn't strike him as discordant as a status-conscious neighbor bragging about their new "50-foot" Lamborghini. And (iii) even though positively prompted by my skepticism, Milton never thought to fact check himself before glibly repeating the mistake.

[84] An *Iguanodon* is about nine meters long, but again corpses would tend to be found on their side, where only about a meter would be required to bury a complete one. This might not have appeared obvious to Milton (1997, 84) when he recounted their measurements, because dinosaur dictionaries and encyclopedias don't customarily give the *width* of these animals. But this was easy enough to determine with the many scale replicas available—such as the collection from the London Natural History Museum.

[85] Milton (1997, 23). "Figure I" referred to a geological chart on page 69, which listed only the dates and sediment thickness, not the annual rate per period. Running Milton's numbers through the mill generated a less uniform spread when not rounded to a single decimal. For the Palaeozoic: Cambrian (.17), Ordovician (.19), Silurian (.26), Devonian (.23), Carboniferous (.22), and Permian (.12). The Mesozoic: Triassic (.20), Jurassic (.24), and Cretaceous (.21). And the Cenozoic epochs: Paleocene (.33), Eocene (.57), Oligocene (.53), Miocene (.58), and (if taken as beginning a million years ago) Pliocene (.42). With the Silurian value over twice the Permian and the "slightly" higher Cenozoic ones running close to triple his own average, Milton offered a measure of his command of numerical scruples.

[86] Milton (1997, 70) got the *idea* of erosion OK: "The study and interpretation of this sequence of sediments (the science of stratigraphy) is complicated by the fact that some of the beds have been laid down, only to be eroded again, giving rise to gaps in the sequence." But Native American creationist Deloria (1995, 40) had a far looser grip: "We are told that dinosaurs lived 65 million years ago, and yet from Roy Chapman Andrews forward our scientists continue to find the dinosaur

skeletons on top of the ground or very near the surface. So 65 million years of sediment apparently was insufficient to bury those monsters from our sight." Deloria might try tunneling in the Morrison Formation in Utah sometime, after which he might better appreciate why paleontologists tend to dig at the sections that have eroded surface exposures.

[87] Milton (1997, 81).

[88] Milton (1997, 84). Milton was evidently envisaging the entire Bernissart being deposited in one go, though even then it wouldn't quite be *millions* of times his rate, but at most 200,000. So Milton had exaggerated by about an order of magnitude.

[89] For comparison, Doyle & Lowry (1996, 340) used a rough value of 1.7 mm per year (actually "17 metres per 10 000 years") for one of their hypothetical examples—an order of magnitude off of Milton's value. This consistency extended even to an offhand observation about the lens defect in the Hubble telescope being "more than a centimeter out—that it was outside the range that anyone was mentally prepared to check on. Had it been a millionth of a meter out, it would have been spotted at once," Milton (1997, 50). The mirror had in fact been ground 2 microns too flat at the edges (1/50 the width of a human hair) because a laser used to position a "null test" lens had reflected off a paint chip, Fischer & Duerbeck (1998, 27). That resulted in the misalignment of the calibration lens by 1.3 mm—again roughly an order of magnitude shy of "more than a centimeter."

[90] The association of animal remains with fossil humans is well illustrated in *Past Worlds* (1988, 56-66); Patrizia Anconetani & Carlo Peretto, "Studying the Animal Bones from Isernia La Pineta," in Forte & Siliotti (1997, 104) describe the techniques employed to evaluate the source and nature of animal remains at prehistoric human sites. Unfamiliarity with the realities of fossilization show up as recently as Ham (1998, 15-17, 107-110), who took the existence of things like unfossilized dinosaur bones as proof they weren't millions of years old. But fossilization is a far more complex process than simple mineral infusion, as noted by Hervé Bocherens, "Chemical Composition of Dinosaur Fossils," in Currie & Padian (1997, 111-117). Clive Trueman, "Permineralization" in Currie & Padian (1997, 540-541) pointed out that "changes to the apatite lattice are the principle chemical differences between fresh and fossil bones, actual replacement of bone material being quite rare." Ham (1998, 145-146, 148-151) cited several articles from Currie & Padian, but not these relevant to the point at issue.

[91] McGowan (1984, 91-93). Hayward (1985, 153, 221n) also noted fossil formation is observable today. The Ontario lake and deep-sea cores were discussed by McGowan (1984, 80-82) in relation to the claim in Henry Morris (1985, 99) that "The sediments at the bottom of the ocean are still soft sediments, not solid rock." McGowan noted the *Glomar Challenger* showed the surface ooze grew progressive chalkier as the depth increased until it was found as hardened sediment—another of McGowan's many criticisms overlooked by Gish (1993). McGowan's New Zealand experience may also be compared with the parlor spelunking of Huse (1997, 91-92): "There are caves, fissures, and mass burial sites throughout the world that are literally packed with masses of fossils; often the fossils of these various animals come from widely separated and differing climatic zones, only to be thrown together in disorderly masses. Such phenomena can be satisfactorily explained only in terms of a worldwide aqueous cataclysm." Or with Milton (1997, 78): "Indeed there are bones and shells of millions of creatures available on land and sea. But nowhere are these becoming slowly buried in sediments and lithified. They are simply being eroded by wind, tide, weather, and predators."

[92] In case you were wondering: the molecular bonds twist when water cools, forcing the array apart, and bumblebee wings generate sustained low-pressure vortices that provide added lift. Only in recent years have the tools of computer modeling advanced to where the water molecule problem was susceptible to resolution. The wing matter required models and slow-motion filming to pin down, and the general principles learned there turned out to apply more generally to bird, insect and fish motion, Dickinson (2001; 2003) and Hu *et al.* (2003). Which raises a deeper philosophical question: should the naturalistic assumption that these phenomena were not inherently magical have been rejected *a priori* because they were inadequately "explained" by science up until then? As we'll see, such issues circulate around the "theistic realism" Phillip Johnson proposes to inject into contemporary scientific thinking as an antievolutionary vaccine.

[93] Numbers (1992, 95-96) pointed out such doubts had been dogging Flood Geology from the start, with much critical sighing coming from within the religious community itself.

[94] Henry Morris (1985, 102-103). Their one footnote (to sentence one) declared that "Some sandstones may have formed from windblown sand, rather than water-transported sand, although this is doubtful. If so, however, the provision of the needed cement on any uniformitarian basis becomes an even greater mystery." No bigger a mystery than Cynthia Giles and the tarot, since Morris had to deny the existence of dune sandstone because their preservation would be especially hard to account for in the Flood. Weber (1980a, 25-27) or Strahler (1987, 217-218) may be compared to the YEC Austin (1994, 29-36) on the fossil dune problem, but a juicy slice of obtuse Flood Geology reporting concerns Morris & Morris (1996b, 264-265) on the Late Cretaceous "Flaming Cliffs" in the Gobi Desert. Blithely oblivious to the implications of what they were saying, the Morrises cited Novacek *et al*. (1994) on the "rapid" burial of these fauna, then frosted the cake by referring to dinosaur tracks being found in "desert dunes" and "interdune" environments. The incongruity of dune prints and sandstorms being preserved during a single obliterating global *flood* obviously did not occur to them. See Lessem (1992, 248-251) or Tom Jerzykiewicz, "Djadokhta Formation," in Currie & Padian (1997, 188-189) on how this Mongolian site could only be accounted for by arid conditions prevailing over a hundred thousand years; cf. Preusser *et al*. (2002) on 160,000 years of Arabian dunes. Occasional rains in turn allow dunes to flow like cement, as explained by Dingus & Loope (2000). See Doyle *et al*. (1994, 88-89, 126-127) on how dunes are evaluated in a stratigraphic column, and Loope *et al*. (2001) apropos a Jurassic site in Utah. Emiliani (1992, 324-325, 332-333) noted such Jurassic sand dunes and ones only 120,000 ybp in the process of lithification.

[95] Morris & Morris (1996b, 307-308) repeat the cement analogy without any exploration of how plausible the Flood Geology version is. Of interest here is work the Morrises didn't cite: the 1980s lamination experiments of French sedimentologist Guy Berthault, which suggested some striated features might form quickly. Berthault's "Experiments on Stratification" (reprinted by the ICR Acts & Facts, "Vol. 20 No. 10 Oct. 2000 Online Issue No. 2") was presented at the 1994 International Conference on Creationism, and his "Genesis and Historical Geology" at the 1998 meeting (alongside Steven Austin's "Grand Canyon: Monument to Catastrophe"). Interestingly, Austin (1994, 38) put more qualifications to Berthault's work than the sweeping exuberance of Milton (1997, 78), who considered this research the "death knell of the idea that the existence of thousands of meters of sediments is by itself evidence for a great age of the Earth." Neither explained how such laminations would get to be *rock*, however—while mainstream geologists have been plugging away at these problems with some success. Limestone was first synthesized in 1805, while the tougher granites required 20th century technology to simulate the extreme temperatures and pressures responsible for their formation at depth, Gohau (1990, 121).

[96] Morris & Parker (1987, 172-173). Other creationists have been more vocal about the Mississippi delta. In his 1996 video Kent Hovind declared the earth couldn't be even hundreds of millions of years old because the river would have filled in the Gulf of Mexico by now—as though geologists were claiming the Mississippi were primeval or that erosion played no part in removing prior deltas. Relying on Wysong again, Huse (1997, 68) insisted the delta had to have formed over only the last 4000 years—see Strahler (1987, 286-289) for an examination of Wysong's misunderstandings about delta sedimentation. The Mississippi has been emptying into the Gulf of Mexico for the last 60,000 years, but the earlier deposition occurred farther out owing to the lower sea level during the late Pleistocene ice age. The delta positions since around 3300 BC have been quite precisely mapped, as noted by Strahler or Emiliani (1992, 308-309).

[97] Eldredge (1982, 109): "geologists agree with Parker that such widespread geological formations as the St. Peter Sandstone, which blankets much of the interior of the North American continent, bespeaks of widespread flooding." Indeed: the region was covered by a series of shallow seas during the Ordovician, Lambert & The Diagram Group (1985, 206; 1988, 193)—this is the period in which Gary Parker's "Cambrian" fauna were living. For a specifically Colorado chunk of Ordovician seafloor, see Palmer (1999, 70-71). While river erosion has exposed some Ordovician strata, chiefly the Manitou limestone and Harding sandstone, the Cretaceous Dakota Formation

dominates eastern Colorado, Chronic (1980, 94, 129, 143, 164-167). Bits of the St. Peter Sandstone are exposed farther east, such as southeastern Wisconsin or the stretch visible in Mattheissen State Park in Illinois.

[98] Kenneth Carpenter, "Morrison Formation," in Currie & Padian (1997, 451). See Benton (1996, 100-103) for a quick overview, David A. Thomas (1998) on how the Morrison fails to support Creation Science claims, and James I. Kirkland, "Fruita Paleontological Area," in Currie & Padian (1997, 254-255) for a more detailed analysis of the Colorado end.

[99] See Weber (1980a; 1980b, 19-20). Ironically, critics from Strahler (1987, 373-379) to Wise (1998)—available in expanded online version at csun.edu/~vcgeo005/wise.htm)—have thought more on Flood deposition than have Creation Scientists. The YEC belief in arbitrary hydraulic sorting prompted Robert J. Schadewald, "Six 'Flood' Arguments Creationists Can't Answer," in Zetterberg (1983, 452) to observe: "Indeed, one wonders how Henry Morris, a hydraulic engineer, could ever have offered it with a straight face." Besides the obvious (small trilobites not regularly sorted from larger ones), the range of contrary paleontology Flood Geology has to junk is daunting. E.g. delicate trace fossils (burrows and feeding tunnels) described by Doyle & Lowry (1996, 305-313), whole dinosaurian paleoenvironments in Lessem (1996) or Zhou *et al.* (2003), or dietary clues in fossilized dung (coprolites) noted by Kenneth Miller (1999, 62). As for the tardy arrival of flowering plants only in Cretaceous strata, Schadewald in Zetterberg (1983, 451) wryly observed that "A scenario with magnolias (a primitive plant) heading for the hills, only to be overwhelmed along with early mammals, is unconvincing."

[100] Like fossils caught at the meandering river curve, sometimes all the silliness parks in one spot. At the website promoting the program "The Mysterious Origins of Man" (still available at this writing at bcvideo.com/bcvideo) the "Alley Oop" view of dinosaurs as contemporaries of man and the Mayan-Egyptian pyramid connection are able to mingle freely. Likewise the popular Oklahoma City-based "Southwest Radio Church" presents a dazzling mix of apocalyptic opinions held by David Webber (whose svelte radio manner reminds me of Pat Robertson) and his occasional co-author, the more folksy Noah Hutchings. See Boyer (1992, 267-270, 282-288) and John Williams (2001, 32-33, 143, 180-181) for some of their End Time obsessions. Hutchings' own "Watchman on the Wall" program sports guests from Carl Baugh on vapor canopy dynamics to I. D. E. Thomas explaining his amazingly comprehensive UFO cosmology (Hutchings is himself a committed ufologist due to his having seen several in the 1930s). In December 1993 Thomas was on hand to promote his book *The Omega Conspiracy*: fallen angels who built the Great Pyramids and provoked God's judgment in the Flood were now flying around in UFOs and causing trouble in the Bermuda Triangle as the time of the Antichrist neared.

[101] Citing Whitcomb & Morris (1961, 35-36, 39), Henry Morris (1963, 62-63) freely imparted a catastrophic spin to what was only a conventional stream flooding. Besides major volcanic eruptions and asteroid impacts, Doyle *et al*. (1994, 11) reflect how "catastrophism" applies to contemporary geology, apropos a tidal wave that struck the east coast of Scotland around 5000 BC. Ham (1998, 135) latched onto the "catastrophe" Czerkas & Czerkas (1991, 150-151) described concerning the Morrison Formation bone beds in Utah (including Dinosaur National Monument). Chiappe & Dingus (2001) may be expected to suffer a similar fate, re the floodplain "catastrophe" that preserved some Cretaceous Patagonian dinosaur eggs. This spirit of "grab what you can" guided a lengthy segment with the late Eugene Shoemaker (co-discoverer of the comet that slammed into Jupiter in the early 1990s) in the "Fossil Evidence of Creation" videotape. The narrator gently acknowledged up front that Shoemaker did not buy into Young Earth geology … then left the tape to quote the astronomer at length on how "uniformitarianism" needed revision in light of such catastrophic activities. Nothing in Shoemaker's remarks supported any revision of geological dating, of course. Which meant the only apologetic purpose to be served by quoting him was psychological: to leave as the last word the general impression that there was something amiss with "uniformitarianism," and plug ahead as though that could only be what Creation Science had in mind.

[102] Gould (1980, 194-203) summarized how the Spokane Flood has become as much a part of the "uniformitarian" tool kit of modern geology as river sedimentation. Vitaliano (1973, 145-147) was

an early references to the catastrophic Missoula drainage; exhaustive recent coverage may be found in John Allen *et al*. (1986) and Mueller & Muller (1997), with more introductory treatments in Alt & Hydman (1984, 171-176. 184-189), Mason (1997, 107-118), Jon Erickson (2000, 218-220) or and Hill Williams (2002, 117-134). Palmer (1999, 158-159) has a dandy bird's-eye view of the ice sheet and glacial lakes as they would have appeared 13,000 ybp.

[103] Chittick (1984, 216-217) was particularly enthusiastic, deciding the Spokane event "clearly points to the catastrophe of Noah's flood." Gary Parker in Morris & Parker (1987, 173-174) was more circumspect, noting only its erosional power. Over in Native American creationism, Deloria (1995, 213-221) recounted the story favorably, but rejected the idea of multiple events (however supported they were by the geological data) solely because it conflicted with the Indian legends of there being only one flooding.

[104] While Austin (1995, 4, 95-97, 104, 106) hit on the Spokane Flood as a model for rapid erosion, he omitted such details as that the waters tore along at up to 75 feet per second, John Allen *et al*. (1988, 98). Austin (1994, 34-35) had set a ceiling rate of 5 fps on the "high velocity" flow he proposes for the Coconino Sandstone dunes. Austin (1994, 31-32) also relied on Leonard Brand (a creationist biologist at Loma Linda University) for the claim that tracks of a Permian protomammal preserved there were made underwater. The criticism of Brand in Lockley (1999, 68-71) characterized the Flood theory of the Coconino dunes as "geologically naïve and disingenuous." Interestingly, the Grand Canyon itself wasn't even depicted at full strength—no panoramic photographs of isolated mesas weathered over vast ages marching to the horizon, as seen in Redfern (1980, 26-27, 36-37, 70-72, 82-83, 174-177). Of particular interest would be the Granite Gorge, shown by Redfern (1980, 80-81) as it may have looked 1.7 billion years ago, before the Alpine mountain peaks had eroded to their present condition. All that may be contrasted with the wimpy canyon shots in Austin (1994, viii, 79), or the graphic representations showing only a single narrow wiggling trench, Austin (1994, 1, 11, 15-16, 89, 94). Ironically, the photo used in Gish (1992, 14) for a section summarily accepting Austin's post-Flood lake drainage theory managed to capture the sweep of the formation much better (Gish may have been no more aware of the implications of this than he was of the illustration of *Plateosaurus*).

[105] Bretz spotted the general cause of the Columbia River features as early as 1919, but the source mechanism didn't become clear until the existence of Lake Missoula was pinned down in the late 1920s. As with the continental drift ideas of Alfred Wegener and Alexander Du Toit floating at the same time, the geological establishment was very dubious of the flood theory, though those who looked at the evidence firsthand accepted it quite readily. It was probably no coincidence that the "Bretz Flood" (as John Allen *et al*. would prefer it to be known) gained wide currency during the 1960s, when seafloor spreading was discovered and impact theories began to be taken more seriously, such as Gallant (1964). See Hallam (1975), Gohau (1990, 187-216) or Hellman (1998, 141-158) on the history of drift theory and its geological acceptance, and James Burke (1985, 328-331) or Palmer (1999, 169) for the short of it. A similar stew of science and psychology flavors the debates over primeval asteroid impacts and Snowball Earth, William Glen, "How Science Works in the Mass-Extinction Debates," in Glen (1994, 46-85) and Gabrielle Walker (2003a).

[106] Though the formations were mentioned all through Austin's book, nothing was said about their special beveled stratigraphy. "A Flood model which would account for the Great Unconformity, Tapeats Sandstone, Bright Angel Shale, and Muav Limestone," shown in Austin (1994, 69), suggested a parallel deposition sequence in direct conflict with the tilted reality. Since Austin (1994, 23-24) accepted in a theoretical sense that tilting of existing deposits had to occur afterward, he clearly failed to apply his own principles whenever it lead to conclusions inconsistent with the Flood model. Redfern (1980) and Hamblin & Hamblin (1997) cover the geology of the canyon, with Strahler (1987, 300-308) on its Creation Science aspects (the Cambrian faunal zone case occurred near the end of Strahler's account). Lambert & The Diagram Group (1988, 173) show how migrating shorelines are reflected in an overall stratigraphic sequence. Another good case of fossil tipping is the tangle of sauropod bones exposed on the cliff face at Dinosaur National Monument, pictured in Norman (1985a, 84-85).

[107] Ankerberg & Weldon (1998, 301). Their endnote on page 385 cited "Emmitt [a typo, as the main text referred to "Emmett"] L. Williams, Book Reviews, *Creation Research Society Quarterly*, Dec. 1994, p. 160)." Back in a "Note to the Reader," Ankerberg & Weldon (1998, 8) defended their "unavoidable" use of secondary citation. "However, 1) when used, only reliable secondary sources were cited; 2) these almost always contained the primary reference which is listed first for the reader's convenience; 3) most secondary references are *not* creationists' citations of evolutionists; and 4) the quality of an argument/content, not its secondary nature, was our primary concern. Of course, it is always possible that a secondary reference has inadvertently misrepresented the original text. We would appreciate being informed of any instance where this occurs." The idea that their secondary conduits might have *advertently* misrepresented the material (either through stupidity or design) evidently did not occur to them. Moving around the creationist merry-go-round, John Morris recommends Austin's book at the ICR website, while Gish (1995, 51) cited Austin among many recent discussions "of the catastrophist interpretation of historical geology." These turned out to be parade of Young Earth creationism—ranging from G. M. Price's 1926 chestnut, through the obligatory Whitcomb & Morris to three books by Henry Morris and one by his son John, and even a page from Clifford Burdick referenced from a creationist anthology. Paul Taylor (1995, 46-47, 112) is similar. But since Austin's book on the Grand Canyon objectively failed to make its case, these examples measure only the ideological congeniality of the material within the seductive confines of a pseudoscientific buddy system.

[108] Interbedded volcanic ash helped date late Ediacaran biota, Grotzinger *et al.* (1995)—see Kerr (1995b) for the evolutionary implications. Without realizing the implications, a footnote in Ham (1998, 97) citing Norell *et al*. (1995, 17) blithely noted how ash separates strata of the aforementioned Triassic Ischigualasto Formation. Extensive Cretaceous mountain building provides further examples, such as Montana's Elkhorn Mountain eruptions, Raymond R. Rogers, "Two Medicine Formation," in Currie & Padian (1997, 760-765). A herd of maiasaurs (relatives of *Iguanodon*, per note 33 above) was buried in a deadly ash/mudflow combo familiar from the Mt. St. Helens case, Czerkas & Czerkas (1991, 203-204). More recently, much of the United States was blanketed with the distinctively traceable ash falls of the enormous Long Valley eruption in central California 700,000 years ago, as well as the two major Yellowstone eruptions 620,000 and 2 million years ago, Sieh & LaVey (1998, 143-144). Hayward (1985, 128-130) criticized Whitcomb & Morris (1961, 189) for attributing the Yellowstone example (upright stumps buried in repeated ash falls) to intermittent flooding. But water not only didn't account for the features—it couldn't, as there was no sign of alluvial sedimentation (just ash). Henry Morris (1985) and Morris & Parker (1987) subsequently skipped the Yellowstone excursion. Cf. Wise (1998, 170). Just to complete a geological circle, ash from an eruption of Mt. St. Helens around 15,000 years ago is interbedded in the early deposits of the Spokane Flood.

[109] Historical accuracy is ever the bane of ideologues. From benign silliness like the people who think anybody but the Bard of Avon wrote Shakespeare's plays, through contemporary myths like the Roswell aliens resonating in a climate of "X-Files" conspiracy, to viler extremities like the Holocaust deniers, sloppy historical thinking is an "equal opportunity" affliction. Abruzzi (1999) described the broad "politically correct" fallout from the fictitious "Man Belongs to the Earth" speech attributed to Chief Seattle. An example I had a chance to follow firsthand concerned Taylor Caldwell's 1960s novel *Captains and the Kings*. An unintentionally hilarious work riddled with historical anachronism and melodramatic rightwing cabals, at one point her protagonist was shown New York's Fifth Avenue during the Civil War, where "the true rulers of America" lived: the Astors, Vanderbilts, and Goulds. Only the Vanderbilts didn't live on Fifth Avenue then (the kids moved there in the 1880s), Jay Gould hadn't yet made his millions, and none of the three families ever steered the political fortunes of America. Gould, in fact, was the "kiss of death" for James Blaine when he tried playing presidential kingmaker for the Republican candidate in the 1880s, Klein (1986, 335-337). After Caldwell's book was made into a quite entertaining NBC miniseries in the early 1970s, the John Birch Society picked up on the publicity to conduct a recruiting drive on my college campus, handing out bales of free copies of Gary Allen's *None Dare Call It Conspiracy* (an even more distilled piece of paranoia Caldwell relied on and had recommended for

further reading). Allen's book still circulates along the nether fringes of the apocalyptic religious right, such as Watcher Ministries in Montana (at crossfields.com) where UFOs and Martian faces rub shoulders with the New World Order as signs of the impending End. Or hiddenmysteries.com, a book retailer which runs the gamut from leftist Noam Chomsky to an assortment of Lost Civilization advocates like Michael Cremo and Graham Hancock (cf. note 400, chapter five). Caldwell's own paranormal beliefs were recounted with painfully straight face by Stearn (1974). Illusions about history do indeed have their consequences, as will be seen again later in the conservative creationist spin on history.

[110] Disposing of the evolutionary side of horses has been a murky enterprise for Creation Science because an improving fossil record kept adding side branches, outdating the often simplified descent charts in books and museums. Add critical commentary from within the evolutionary club, such as Kerkut (1960, 144-149), and antievolutionists unfamiliar with the paleontology supposed confusion reigned (see note 39, chapter one). Yet the major stages in horse evolution have hardly budged, as indicated by the treatments in Simpson (1961a, 229-267; 1983, 192-196), Strahler (1987, 443-447), Colbert & Morales (1991, 343-362), Christine Janis, "Victors by Default," in Gould (1993, 198-200), or Tudge (1996, 150-153). A marginal note concerning Simpson (1961a, 235-237) drawing on a 1948 paper on horse skull endocasts by Tilly Edinger that suggested *Hyracotherium* (then called *Eohippus*, "Dawn Horse") had a comparatively primitive mammal brain, more like its condylarth ancestors. That observation turned out to be ironically all too true, as a 1960s reappraisal by Leonard Radinsky suggested Edinger had mistakenly used an Eocene condylarth for her "Eohippus" sample. Additional *Hyracotherium* fossils revealed brains of considerably greater sophistication, more on a par with the descendent *Mesohippus* (see the account in the December 1993 "Florida Fossil Horse Newsletter" of the Florida Museum of Natural History at flmnh.ufl.edu/ponyexpress/pony2_4/Pe24.htm).

Gish (1993, 129-131) claimed horse evolution is now "rarely brought up by evolutionists in public debate, and almost fails to appear at all in the more prominent anti-creationist books." While citing five accounts that didn't, including Kitcher (1982), Zetterberg (1983) & Godfrey (1983), Gish tactfully avoided McGowan (1984, 142-148) which noted horse embryos briefly develop the buds for the shortened side toes their ancestors had. Gish targeted only Futuyma (1982, 85-94) for close criticism. To dismiss the condylarth *Phenacodus* as a horse ancestor he had to trawl for quotes all the way back to Simpson (1944, 106)—listed as p. 105 in Gish's note—as though paleontology had stood still since D-Day. Or as though Simpson had not written anything on the subject in the decades since, such as Simpson (1961). Gish (1995, 189) nudged slightly forward when similarly mining Simpson (1953, 259). Meanwhile, Rich *et al*. (1996, 564-565) summed up the contemporary view that *Phenacodus* "is almost exactly what one would predict for the ancestor of the horses and other perissodactyls before the unique structure of the ankle of the hind foot evolved."

Gish then repeated the "embarrassing" assertion that single-toed horses couldn't have evolved because the South American ungulates, the camel-like litopterns, had supposedly done the reverse, going from single toe to three. Only neither Futuyma nor any other evolutionist had said they had, and Gish did not address the telling criticisms Strahler (1987, 445-447) leveled at that very point (the "three-toed" ones had descended from "three-toed" ancestors). Moreover, the misleading text Strahler quoted remains in Gish (1995, 191-192). Finally, a true creationist gem: Gish (1995, 194) tried to disprove horse evolution by pointing to the ancestral transitional genus *Dinohippus* which had both single-toed varieties and ones retaining the shortened flanking toes—"Gish's Law" in kamikaze dive mode! Sarfati (1999) offered similarly tight glossing of Tucker *et al.* (1998) and Morell (1999a) re MacFadden *et al.* (1999) on dental genetics and horse tooth evolution respectively. Cf. Janis *et al.* (2000) on the broader evolutionary context of what was going on here.

[111] Kitcher (1982, 131) voiced similar criticism, which Gish (1993) characteristically did not discuss in his riposte. Interestingly, an illustration by Earl & Bonnie Snellenberger for Gish (1990, 38) showed a marine ensemble that included modern forms like whales and hammerhead sharks, along with extinct plesiosaurs, ichthyosaurs, and trilobites. The chapter (on "Life in the Sea—The

Creation of Fishes, Whales, and Many Other Things") did not specifically allude to the arrangement, either to affirm or disavow its anachronism.

[112] Although the "ecological zone" idea goes back to Harold W. Clark in the late 1930s, Numbers (1992, 124-125), modern Flood Geology has made little progress in sorting out the staggeringly extensive marine and terrestrial record. Morris & Parker (1987, 163-170) sufficed with a generalized antediluvian landscape stringing the fauna from the geological periods along a spiral as though this sort of thing occurred in actual strata. Gary Parker did decide that trilobites and dinosaurs resided in distinct zones (as safe a bet as saying sharks and zebras live apart). The chapter on fossils assembled by Walter R. Barnhart, Marcia L. Folsom and Kurt P. Wise for Austin (1994, 133-150) illustrated faunal zones with the same Ordovician seafloor samples depicted in Morris & Parker (1987, 127). On his own, Kurt Wise, "The Origin of Life's Major Groups," in Moreland (1994a, 226) declared that a global flood "which gradually overcame first the sea and then the land, actually explains the primary order of major groups in the fossil record (sea to land) better than macroevolutionary theory." But all he had to offer was a lame footnote to another of his unpublished papers. This circumspection is hardly surprising, given things like the 500 mile cross section of Late Cretaceous strata running from western Montana to central North Dakota shown in Rich *et al*. (1996, 28). Even were it possible to contrive some patchwork of contemporary "ecological zones" to account for this multimillion-year layer cake of interlaced marine and terrestrial sediments, there would still be the interbedded volcanic ashes and tuffs at the western end to poke an inconsiderate thumb in the Creation Science eye. One of twenty-four basins around the world where strata of all geologic ages are present, an exhaustive examination of the North Dakota example may be found at isource.net/~grmorton/dmd.htm, the website of geophysicist (and former Young Earth creationist) Glenn R. Morton.

[113] See John Allen *et al*. (1986, 200) for energy values of geological events like the Spokane Flood, the Santorini (Thera) eruption, and meteoric impact. Physical evidence for such events are also plentiful, putting the vagaries of Creation Science in even sharper contrast. For example, massive submarine landslides have been identified from an eruption in the Hawaiian chain 100,000 years ago, with one from Oahu extending a hundred miles onto the seabed, Sieh & LeVay (1998, 265-266).

[114] The connection between earthquakes and seafloor spreading along the "Ring of Fire" was recognized the moment they were plotted on a map together, from Matthews (1973, 10-11) all the way to Palmer (1999, 178). The quarter century between Matthews and Palmer has seen a complete transformation in theories of mountain formation and volcanism. Yet Gish (1995, 49) still insists: "Neither has the uniformitarian concept been sufficient to explain mountain building nor the formation of such vast lava beds as the Columbia Plateau in the northwest United States, a lava bed several thousand feet thick covering 200,000 square miles." Huse (1997, 78) cited an earlier edition of Gish for this same information. Cf. Gish (1978, 58). Similarly Milton (1997, 90): "In North America an area of 200,000 square miles in Idaho, Washington State, and Oregon, known as the Columbia Plateau, is covered by lava to a depth as great as 5,000 feet (almost 1 mile). Uniformitarianism could never account for such beds. This quantity of lava exceeds by many orders of magnitude [!!!] all the lava flows from all the world's currently active volcanoes." Neither Gish nor Milton offered any citations, but it may have been Velikovsky (1955, 89), who also used the 200,000 figure. All of which is extremely interesting, because the Columbia Basalt actually covers less than a third of that area, about 63,000 square miles. The eruptions disgorged 42,000 cubic miles of lava from a dike system from 17-13 mya (though some flows continued to spurt until 6 million years ago), Mueller & Mueller (1997, 30-39) and Hill Williams (2002, 93-106). While some of the largest individual eruptions involved 500 cubic miles of lava, the average per flow was around 130 cubic miles. To put this in perspective, the minor Hawaiian volcano Pu'u O'o erupted 1/50 cubic mile of lava over just a three year period in the 1980s, meaning 500 cubic miles would require only around 7500 years. Keep that up for 5 million years and you get Mauna Loa (very much an active volcano), which comprises 18,000-24,000 cubic miles of lava all on its own, Sieh & LaVey (1998, 192, 248, 257) and Jon Erickson (2000, 82). Cf. also Dvorak *et al*. (1992) on the magma dynamics of Kilauea.

[115] A variety of geological forces (including plain old erosion) have contributed to the Waterton-Glacier landscape. See Alt & Hydman (1973, 234-235) and Strahler (1987, 391-392), as well as the online commentary at glenn.morton.btinternet.co.uk/othrust.htm and by Joel Hanes & John G. Solum at Talk.Origins. The Alps (formed by plate collision) suggest how complex things can get: upper layers of severely crumpled rock eroded away until only fragments remain seemingly in the "wrong" geological sequence—such as the Beausset klippe, Gohau (1990, 183). Henry Morris (1972, 22-23) exaggerated the Lewis Overthrust specifics, such as claiming that the deposit was six *miles* thick when it was actually some several thousand feet—inaccuracies repeated by Huse (1997, 61-62), citing a later work by Whitcomb, suggesting the source of the problem. (Had any of them stopped to think about it, were the overthrust that thick it would place the Lewis range among the world's tallest mountains.) Morris also claimed the block moved fifty miles, though the farthest appears to have been more like thirty, which could have been accomplished over ten million years by an average creep of 0.5 cm (1/5 inch) a year. That may be related to measurements taken over a ten year period indicating the mid-ocean rift has been pushing the entire Atlantic Ocean apart thirty times faster than that (15 cm/year, about six inches), Doyle *et al*. (1994, 103). Even averaged over a longer timeframe (the 780,000 years since the last geomagnetic reversal) the Atlantic has still widened by 1.8 cm/year, quite modest by plate movement standards, Sieh & LeVay (1998, 12-17).

[116] Creation Scientists employ the Lewis Overthrust to challenge the idea that Precambrian strata are actually older than Cretaceous, instead contending they formed simultaneously. Numbers (1992, 80, 216-219) noted the long-running role it has played in Flood Geology ever since George McCready Price had his epiphany on it at the turn of the 20th century, passing through Walter Lammerts to John Whitcomb and Henry Morris. It has got comparatively less press lately, with Henry Morris (1985, 120-121) referring the reader back to *The Genesis Flood* for discussion. Morris begged off giving a detailed analysis of the reasons why he thought overthrusting in general was "mechanically impossible," while Morris & Parker (1987, 234-235) and Morris & Morris (1996b, 302-306) devoted most of their space to flailing a dead horse (the obsolete "pore-water pressure" theory of overthrusting). Weber (1980b, 21-23) and Hayward (1985, 155-156) briefly criticized *The Genesis Flood* version of overthrusting, while Strahler (1987, 387-394) went into more detail. In this department, Gish (1993) did not respond to the account in Eldredge (1982, 106-108), since reprised in Eldredge (2000, 111-113).

[117] Gohau (1990, 64-82) captures the flavor of this process with the field observations of figures like Nicolas Steno in the 17th century. Sieh & LaVey (1998, 164-179) describe the pioneering 1870s fieldwork of Grove Karl Gilbert in the Basin and Range province around Nevada and Utah, and how later seismologists built on that foundation. A dandy contemporary illustration would be the painstaking reconstruction of the entire geological history of the British Isles in Doyle *et al*. (1994, 177-222).

[118] The Creation Science tendency to pigeonhole evidence was illustrated by the Cambrian faunal tilting example. Arthur Strahler had relied on a 1945 Carnegie Institution publication by Edwin D. McKee, *Cambrian History of the Grand Canyon Region* (Pub. 563, Part I). While this source did not appear in Austin's section of the book, it was used by Barnhart, Folsom and Wise to argue (rather irrelevantly) for the absence of Cambrian sponges in the canyon, Austin (1994, 141).

[119] Colbert & Morales (1991, 211-212) list the main vertebrate-bearing Mesozoic deposits. In North America there are none for the entire middle of the Triassic, representing about 10 million years not available for inspection; only six major sites cover Asia for the entire Triassic. And so it goes region after region with predictable results, such as Christine Janis, "Victors by Default" in Gould (1993, 174) pointing out the dearth of Triassic sites when trying to work out the early evolutionary history of the monotreme mammals. See Fastovsky & Weishampel (1996, 361, 364, 367, 369, 370-372, 375, 379) for the dinosaur case.

[120] Spencer G. Lucas, "Marine Reptiles and Mesozoic Biochronology," in Callaway & Nicholls (1997, 427). Michael Benton, "Four Feet on the Ground," in Gould (1993, 112) similarly noted that "nowhere in the world do ocean crusts predate the mid-Jurassic." Even so, new transitional blips do turn up to fill in the picture now and then. Robert L. Carroll, "Mesozoic Marine Reptiles as Models of Long-Term, Large-Scale Evolutionary Phenomena," in Callaway & Nicholls (1997,

475-477) mentioned that "The mid-Cretaceous aigialosaurs are almost ideal intermediates between primitive anguimorph lizards and the earliest mosasaurs." As the known aigialosaurs are contemporary to mosasaurs, however, it can be expected Gish will invoke the "no cousins" rule to reject the connection should he ever get around to them.

[121] Gish (1995, 100-109) covered pterosaurs, plesiosaurs, and ichthyosaurs—placing the plesiosaurs in the Jurassic and Cretaceous, evidently unaware the earliest ones date from the Triassic. Equally muddled was physicist Schroeder (1997, 30-31), who thought ichthyosaurs first appeared "fully developed" in the Jurassic (missing the mark by about forty million years). Early ichthyosaurs retained socketed reptilian teeth, while descendants increased the number of bones in their paddling fins and the tail bent down to accommodate an upper fluke, McGowan (1991, 232-235), Chris McGowan, "A Transitional Ichthyosaur Fauna," and Olivier Rieppel, "Introduction," in Callaway & Nicholls (1997, 61-78, 107-119). Ichthyosaur evolution has recently been clarified by excellent Japanese finds of Early Triassic lizard-like intermediates (one took *fifteen years* to clean from its matrix), Motani *et al.* (1996) and Motani (2000).

[122] For example, the first pterosaurs to appear are three quite small isolated species in the Late Triassic, making their preservation a long shot on those grounds alone. But the Jurassic Solnhofen *Lagerstätte* suggests the variety of what escaped the fossil record: five widely varying species of *Rhamphorhynchus* turned up there, along with four of *Pterodactylus*. See Wellnhofer (1991, 40-45, 60-64, 85-86); Palmer (1999, 104-105) illustrates many of the fauna found at the "Solenhofen lagoon." Because the record is otherwise so patchy evolutionists like Wellnhofer are prudent about drawing relationships, as was Kevin Padian, "Pterosauromorpha," in Currie & Padian (1997, 617-618) and the view reflected in Monastersky (2001).

[123] Marine paleontologist McGowan (1984, 158-160) had brought up the nothosaurs, which Strahler (1987, 430-433) duly picked up on. Although no mention was made of either of those criticisms, Gish (1995, 107) felt obliged to dispose of the nothosaurs anyway, which he did via an authority quote extracted (with two ellipses) from Robert Carroll's 1988 *Vertebrate Paleontology and Evolution* recounting some of the nothosaurs' specializations. That Carroll does not regard nothosaurs as *unrelated* to plesiosaurs is indicated in his latest writings, such as Robert L. Carroll, "Mesozoic Marine Reptiles as Models of Long-Term, Large-Scale Evolutionary Phenomena," in Callaway & Nicholls (1997, 468-473), where the sparse fossil representation of nothosaurs was discussed. Over on the Intelligent Design side, Denton (1985, 167, 169) also sideswiped ichthyosaurs and plesiosaurs (overlooking the intermediate nothosaurs entirely) without providing a geological context.

[124] The section on turtles in Strahler (1987, 434-437) indicates the earlier incarnations of Gish's book did not discuss them, thus putting them in the "research on the fly" bin. Wendell Bird (1989, Vol. 1, 216) drew on *Encyclopedia Britannica* for the information that "The origin of turtles is abrupt with a 'lack of early fossils,'" without pondering the geological context.

[125] Gish (1995, 114-115), citing Lee (1993; 1994). Gish's reference to the "inversion of rib cage and girdles" may be an allusion to the anatomically misleading creationist argument about how the shoulder blades of turtles lie inexplicably inside the rib cage, as noted by Strahler, drawing on Petto (1982). The embryological and anatomical shifts involved in turtle shoulders and pelvises are described by Lee (1993, 1719-1720; 1996)—cf. Loredo *et al.* (2001) on the developmental biology of turtle shells. Whether Gish further sought to imply that turtles were small, *agile* reptiles (as opposed to the "large, clumsy" pareiasaurs) is open to speculation.

[126] Lee (1994, 65). The acromion process evolved independently in the therapsids, where it performed a similar function. With the earliest turtles being terrestrial, the adaptive features of the shell could be explained as extensions of the pareiasaurs' body plating. Though Rieppel & Reisz (1999) disagree, favoring an aquatic origin for turtles (and offering cladistic support for turtles being diapsids rather than anapsids). Lee (1997) and Platz & Conlon (1997) debate the pros and cons of the diapsid grouping, which has garnered some genetic support in recent years, such as Zardoya & Meyer (1998) and Rieppel (1999) re Hedges & Poling (1999). Cf. also the skeptical Mindell *et al.* (1999, 149-150). Several notes of caution are in order: one doesn't have pareiasaur DNA or developmental biology to inspect for comparison, and molecular mutation rates can vary in

rate and impact. Coding for the amino acids that govern three-dimensional protein folding are the most revealing, for example, Balter (1997, 1034), but reversals at a given nucleotide locus can distort cladograms based on only a few variables, as Strauss (1999a) pointed out about the mitochondrial "clock."

[127] See Liem (1988) on the lung and swim bladder; cf. Gould (2002a, 107-108). Rich *et al*. (1996, 366-367) and Lambert & The Diagram Group (1985, 84-85) illustrate fossil teleosts and general evolutionary trends—hampered as usual by an inadequate fossil record for the plethora of living forms (everything from sea horses to goldfish), Stahl (1985, 167-169). Cf. Málaga-Trillo & Meyer (2001) and Merritt & Quattro (2001) on some revealing teleost gene duplications.

[128] Gish (1995, 76-80); cf. Gish (1978, 66-70). The five fish classes, in rough order of appearance: the primitive jawless Agnatha (which include the living lampreys), the extinct armor-headed Placodermi, the Acanthodii (variously called "spiny sharks" or "spiny fishes"), the Osteichthyes (the "bony fishes" that include the teleosts), and Chondrichthyes (true sharks and rays). See Gamlin & Vines (1986, 95-98) or Geoffrey Waller, "Evolution of the Vertebrates," in Waller (1996, 293-299) for useful overviews of the basic fish anatomy and their evolutionary relationships, and Lambert & The Diagram Group (1985, 74-87) for more fossil examples. As Stahl (1985, 50-193) exhaustively explored the many lose ends in fish phylogeny, her account is particularly useful in assessing what data creationists had at their disposal in making their case.

[129] Gish (1995, 81). Similar characterizations of fish origins may be found in Henry Morris (1985, 82) and Wendell Bird (1989, Vol. 1, 213-214).

[130] Stahl (1985, 120-121) showed some examples from the Triassic (a coelacanth and the skull of a ray-finned fish). Lambert & The Diagram Group (1985, 78) on the "spiny fishes" (class Acanthodii): "Most are crushed flat in shale slabs. Early fossil are just spines and scales." Or the sharks: "Many are just teeth, fin spines, or tooth-like denticles from skin. The soft skeletons have mostly rotted," Lambert & The Diagram Group (1985, 78), with similar views in Stahl (1985, 176-177). The spotty nature of fish preservation is perfectly illustrated by the coelacanth, a quite large form which managed to get along for 65 million years since the Cretaceous without leaving a single fossil trace (the reason why it was thought to be extinct), Stahl (1985, 145-146, 213-221). Gish (1987, 75) suggested the absence of coelacanth fossils invalidated the fossil record, but Gish (1995, 84-85) sounded more like Johnson (1991, 74-75), Huse (1997, 88) or Milton (1997, 255-257) in hurrying to dismiss that "living fossil" as having been related to the ancestral stock of amphibians. Cf. Ellis (2001b, 90-96) on coelacanth diversity.

[131] Stahl (1985, 24) remarked that the Old Red Sandstone (part of the Orcadian lake system in Britain) was "one of the few formations in which the passage from late Silurian to early and middle Devonian sediments is recorded without major gaps occasioned by erosion." See Michael Benton, "The Rise of the Fishes," in Gould (1993, 75-77) on Orcadian taphonomy, and why it is such a treasure trove of well-preserved dead fish. Lambert & The Diagram Group (1985, 78) noted the "Late Devonian Cleveland shales preserve fine specimens of early sharks along Lake Erie's southern shore." Colbert & Morales (1991, 76) list few relevant Ordovician and Silurian deposits, with the situation improving with the Devonian (when the fish classes duly show up "fully formed"). Simpson (1983, 85) charts the ups and downs of the fish classes.

[132] Gish (1995, 79-80) alluded to Gish (1978) and *Evolution: The Challenge of the Fossil Record* (1985), with quotations from Strahler (1987, 316, 408). It is also not quite true that *no* intermediates have been found in fish history, as an attentive reading of Stahl revealed. The progression of fish forms is more apparent when you look at their physical representations instead of distilling the subject to abstract authority quotes as creationists do. Although their internal anatomy is presently unknown, the appearance of early agnathan anapsids show relationship to the later ostracoderms, and that group is reasonably linked to the modern cyclostomes (hagfish and lampreys), Stahl (1985, 30, 45-48). See Martini (1998) on the latest view of the otherwise neglected hagfish. The evolution of fin structure within classes has been actively studied, as Stahl indicated for the Placodermi and Acanthodii—with those latter having features further connecting them to the other two fish classes, the sharks and osteichthyian ray fins, Stahl (1985, 78-79, 90-92, 111-113). More recently, a 400 mya link between the osteichthyans and non-osteichthyan fishes

has turned up, Ellis (2001b, 96-97) re Ahlberg (1999) on Zhu *et al.* (1999). Deeper into the embryological side, Stahl (1985, 93-94) noted the origin of the vertebrate jaw from fish gill arches (encounter apropos to the reptile-mammal transition), and neatly illustrated by Norman (1994, 72), and Henry Cooper (1996, 36) stressed the escalating sequence of homeobox genes (one set in primitive chordates, multiple copies in hagfish and lampreys, and four in jawed fishes). Recent work here includes Martin Cohn (2002) and Chiu *et al.* (2002) on Hox expression in lampreys and gnathostomes, and Stokstad (2003b) & Burrow (2003) re Meredith Smith & Johanson (2003a,b) on placoderm dental evolution.

[133] Another trail concerns Laurie R. Godfrey, "Creationism and Gaps in the Fossil Record," in Godfrey (1983, 201-202) criticizing Gish for overlooking basic works on angiosperm origins by Charles Beck and Norman Hughes. Thus prodded, Gish (1993, 85-87) mined several authority quotes on the mysteries of angiosperm evolution—reprised in Gish (1995, 337) and secondarily by Ankerberg & Weldon (1998, 215). Gish did *not* mention the important Early Cretaceous discoveries noted by Godfrey (surprising pre-punk eek paleobotanists not expecting adaptive radiations to occur in "only" a few million years). Although quoting Beck on the perceptual change, Gish (1993, 87) sidestepped whether the new finds rendered his fresher quotes moot (the 1976 paper by James Doyle and Leo Hickey cited by Godfrey appeared just as Beck and Hughes were published). On this point, Johnson (1991, 179) tried to have his cake and eat it: "Laurie Godfrey writes that paleobotanists have recently identified fossil pollens and leaves as 'members of a primary adaptive radiation of angiosperms,' in *Scientists Confront Creationism*, p. 201. I wish that paleobotanists would do for the plant evidence what I have tried to do for vertebrates [!], and test the common ancestry hypothesis by the plant fossil record. I suspect that the results would be embarrassing to Darwinists. Creationist sources frequently quote the remark of Cambridge University botanist E. Corner on the subject," which Johnson repeated himself, as though this 1961 quote invalidated subsequent evidence (see also note 140 below on Gish and Miller). Like insects (notes 90-93, chapter two), sorting out the angiosperm radiation is made harder because it didn't happen all at once (the earliest forms even lacked petals), Crepet (1998), Friedman & Floyd (2001) and Klesius (2002). Cf. Gamlin & Vines (1986, 59-66), David L. Mulcahy, "Rise of the Angiosperms," in Eldredge (1987, 21-26), Michael Benton, "Dinosaur Summer," in Gould (1993, 152-157), Rich *et al.* (1996, 534-541), James F. Basinger, "Mesozoic Floras," in Currie & Padian (1997, 422-433), Ayala *et al.* (2000) re Dilcher (2000), and Zanis *et al.* (2002). Genetics suggest a pre-Cretaceous origin, Li (1997, 164-167), while an odd primitive Chinese angiosperm hints at an Asiatic herbaceous source, Sun *et al.* (1998; 2002) and Stokstad (2002b). However, its Late Jurassic dating is problematic, Swisher *et al.* (1999) and Barrett (2000); Palmer (1999, 136-137) treats it as Cretaceous. See Krizek & Meyerowitz (1996), Doebley & Lukens (1998), Alvarez-Buylla *et al.* (2000), Lawton-Rauh *et al.* (2000), Crepet (2000) on Barkman *et al.* (2000), Coen (2002), Davies *et al.* (2004) and Nam *et al.* (2004) on angiosperm developmental genetics (such as the MADS-box and *cyc* genes). For comparison, Zhou & Zheng (2003) discuss a Cretaceous gingko intermediate, and Nishiyama *et al.* (2003) explore the implication moss genes have for land plant evolution. Parenthetically, Futuyma (1982, 46) noted a plant tidbit overlooked by Gish and Johnson: poinsettia have bright red leaves to attract pollinators instead of petals because their group had lost petals—like bee stingers, adaptations depend on what is *available*.

[134] Strahler (1987, 316). Strahler's reference to the Ordovician indicates he was thinking in terms of the first appearance of the agnathans at that time, and didn't explore the geological context of the subsequent radiation of the more advanced fish in the Silurian and Devonian. A similar focus on the better represented patches of the fossil record likely explains the absence of fish evolution as a hot topic among the other critics of creationism singled out by Gish (1993, 128-129, 236-237), such as Kitcher (1982), Godfrey (1983), and Zetterberg (1983). Gish (1993, 128) did note: "Futuyma (Ref. 29, p. 74) and Eldredge (Ref. 17, p. 49) each briefly mention fishes, but neither mentions a single word about the huge gap between fishes and invertebrates nor attempts to give any explanation whatsoever as to why each major group of fishes appears fully formed at the start." The fish-invertebrate connection was consistently expressed in Gish (1993, 115, 236), but only later did we learn what sort of invertebrate he had in mind. Gish (1993, 299): "if some invertebrates,

such as trilobites, had evolved into fish, the transitional forms would be easily recognized as transitional whether taxonomists chose to place them in the Class Trilobita or in the Class Pisces." Gish (1990, 45) had gone even further for the kids: "Evolutionists can't agree as to whether a worm, or a sea urchin, or a sponge evolved into a fish—and not one single fossil intermediate between an invertebrate and a fish has ever been found!" He cited no paleontologist arguing fish developed from any derived *arthropod*, let alone sea urchins or sponges. Whether this represented an intentional straw man or reflected Gish's own tenuous grasp of comparative anatomy is difficult to say—but recall his tendentious dismissal of the very real Cambrian chordate *Pikaia* (Gish's only other mention of Strahler).

[135] Cf. Strahler (1987, 408-412) and McGowan (1984, 150-158) with Gish (1995, 83-92). The two orders Dipnoi (lungfish) and crossopterygians (coelacanths and their extinct rhipidistian relatives, such as *Eusthenopteron*) in the subclass Sarcopterygii share with basal amphibians (like *Ichthyostega* and *Acanthostega*) bony limbs, specialized vertebrae, and a two-part cranium with internal nares and unique teeth. Radinsky (1987, 78-81) compared the structural layout of *Eusthenopteron* with early amphibians, noting how relevant muscle transformations were traceable in the fossils. See also Lambert & The Diagram Group (1985, 86-87, 90-93), Colbert & Morales (1991, 64-69), Michael Benton, "The Rise of the Fishes," in Gould (1993, 79-83), Ahlberg *et al.* (1996), Rich *et al*. (1996, 367-371) or Samantha Weinberg (2000, 98-102, 195-203).

Unlike the external gills of modern amphibians, the earliest had internal fishlike gills, Coates & Clack (1991), prompting Miller (1999, 40): "*The first amphibians looked more like fish than any amphibian species that would follow them in the next 380 million years*." While Gish (1995) excised confused bits in Gish (1978, 76-77) on early amphibian anatomy that McGowan and Strahler criticized, Gish (1995, 87) shanghaied Forey (1988, 729) to try a fastball: "Evolutionists point to the presence of the fish-like tail fin as evidence that *Ichthyostega* is a descendant of rhipidistian fish, but as Forey points out, such ideas are flawed because fish-like tails are characteristic of the general group of vertebrates with jaws (Gnathostomata)." While a fishy tail couldn't be a simple derived rhipidistian feature, it was a flight of Aristotelian humor indeed for Gish to suggest early amphibians couldn't have evolved from any fish line because their tails were too generally fish-like.

As with polar dinosaurs, Gish intimated the evolutionary apple cart was somehow upset by recent finds suggesting early amphibians were able to walk reasonably well. Cf. Lebedev (1997), John Noble Wilford, "Early Amphibian Fossil Hints of a Trip Ashore Earlier Than Thought," in Wade (1998a, 111-114), Daeschler & Shubin (1998), Gee (1999, 46-66) or Ellis (2001b, 130-138), with Westenberg (1999) or Palmer (1999, 78-79) for a few handy visuals. Zimmer (1998, 28-107; 2001g, 131-134) chronicles how the development of vertebrate limbs was implied by the fossil evolutionary sequence and later confirmed genetically. Hox is involved, with finger duplication due to alanine repeats in the *Hoxd-13* gene. See Goodwin (1994, 147-161), Sordino *et al.* (1995), Averof & Patel (1997), Kondo *et al.* (1997), Shubin *et al.* (1995; 1997), Gibson-Brown *et al.* (1998), Schwartz (1999, 339-345), Laurin *et al.* (2000), Ruvinsky & Gibson-Brown (2000), Tudge (2000, 389-397), Wagner & Chiu (2001) and Capdevila & Belmonte (2002). Incidentally, the Hox of living coelacanths are more like those of mammals than ray-finned fish, Koh *et al.* (2003). Cf. Venkatesh *et al*. (1999; 2001) re Rasmussen & Arnason (1999) and Zardoya & Meyer (2000) on fish phylogeny, and Wellick & Capecchi (2003) on mammalian skeletal patterning.

[136] Joel Cracraft, "Systematics, Comparative Biology, and the Case against Creationism," in Godfrey (1983, 179-180). Cracraft was citing the 1972 6th volume of *Evolutionary Biology* (edited by T. Dobzhansky, M. K. Heck, and W. C. Steere), Leigh Van Valen's 1973 review of it in *Science* (180:488), and Gish's 1979 quotation from *Evolution: The Fossils Say No!* The Van Valen quotation is still to be found in Gish (1995, 339).

[137] Gish (1993, 324). The exhaustive list of Cracraft's alleged methodological defects: "Cracraft is extremely arrogant, heaping scorn and derision on creation scientists and their science, accusing creation scientists of misquoting, of quoting out of context, of employing distortions, of holding childish myths, of being religious zealots, of lacking in competence, of being extremists, of implying

innuendos, and of being guilty of outright deception," Gish (1993, 306). Some examples of which may be spotted in the Cracraft quotations to follow.

[138] Assessing Gish's aptitude in responding to criticism depended on inspecting his primary source material. Fortunately I had directly available most of the critical titles listed by Gish (1993, 443-444): Eldredge (1982), Futuyma (1982), Kitcher (1982), Godfrey (1983), David Wilson (1983), Zetterberg (1983), McGowan (1984), Montague (1984), and Hanson (1986). The two salient ones were the Godfrey anthology, which Gish (1993, 251-366) devoted about a quarter of the book to defusing, and McGowan's solo effort, whose primary arguments weren't mentioned at all. The other critical works on Gish's list were: Dorothy Nelkin's *Science Textbook Controversies and the Politics of Equal Time* (1977), Flo Conway and Jim Siegelman's *Holy Terror* (1982), Michael Ruse's *Darwinism Defended* (1982), and D. R. Selkirk & F. J. Burrows' *Confronting Creationism: Defending Darwin* (1987). None of these latter volumes managed to graduate to a chapter topic in Gish's analysis.

[139] For this reason Gish's forays into who misquoted whom about what are guaranteed to glaze the eyeballs over. E.g., whether evolutionist Richard Goldschmidt believed half a century ago that the first bird hatched literally from a reptile's egg or only used this as a metaphor, and to what extent later evolutionists like Gould entertained the idea themselves. Contrast the eggbeater version of Gish (1993, 75-76, 138-145) with Gould (2002a, 451-466)—or Dennett (1995, 282-299), certainly no Gould partisan. Cf. Dietrich (2000) for some technical perspective, and Massimo Pigliucci's comments on "Micro/Macro Evolution" at fp.bio.utk.edu/skeptic. Then there was Gish (1993, 77-79; 1995, 350-351) authority quoting David Raup on the supposed absence of transitional sequences, and thus denying Kitcher (1982, 115) accusing Gish of misrepresenting Raup. This argument cropped up again with Raup himself, on "The Geological and Paleontological Arguments of Creationism," in Godfrey (1983, 156). There Raup duly explained the obvious: that transitional forms exist, but not as the smooth baby-step sequences Darwin imagined, and cited *Archaeopteryx* as an example of where taxonomists had to arbitrarily classify it as either a "bird" or "reptile." Gish (1993, 298) obdurately responded "that research during the past few years on major anatomical features of *Archaeopteryx* has established, in every instance, that these features are bird-like rather than reptile-like, and that its status as a transitional form is becoming more and more dubious with the passage of time." Round and round creationism goes, and where it stops we already know. Off the ICR reservation, Phillip Johnson (1991, 170-171) thought Raup's 1983 explanation for the persistence of fossil gaps "hints at a certain lack of conviction." Old Earth "progressive creationist" Robert C. Newman, "Conclusion," in Moreland & Reynolds (1999, 154) stuck to the more dated Raup material, citing the 1979 remarks along with similar observations about the lack of *gradual* intermediates made by Stephen Jay Gould and Steven Stanley from the same period. Newman was able to reference creation-oriented publications from the 1980s and 1990s, however.

[140] Kenneth Miller (1982, 9), reprinted in Zetterberg (1983, 258), on the 1981 Gish-Doolittle creationism debate sponsored by Jerry Falwell. The 1961 statement by botanist E. J. H. Corner characterizing plant origins as being as mysterious as special creation has been variously used by Gish (1978, 154; 1990, 36; 1995, 336), Henry Morris (1985, 86-87), Gary Parker in Morris & Parker (1987, 135), Wendell Bird (1989, Vol. 1, 233-234) and Paul Taylor (1995, 106). Gish (1993, 82-84, 89-91) ultimately quoted Corner's original text at length and made the most of Miller's having slipped in "higher" as a synonym for angiosperms. Gish did not call attention to how quickly Miller had acknowledged and corrected the gaff, re Miller's exchange with Robert Kofahl in the Summer 1982 issue of *Creation/Evolution* (pp. 40-43), available online at ncseweb.org (cf. note 41 above, where Gish cut Kofahl just such slack on the bombardier beetle in that same *Creation/Evolution* venue). Meanwhile, we still have Gish's uncorrected Creation Science shibboleths about Behemoth, *Archaeopteryx* or *Protoavis*. The scholarly situation was more ambiguous with Gish (1993, 80-82) on Laurie R. Godfrey, "Creationism and Gaps in the Fossil Record," in Godfrey (1983, 202). All she had done was remark that the Corner quote was the only spot where angiosperms had come up in Gish's book. Since Gish hadn't specifically used the term "angiosperm," Gish had barely half a point there.

[141] See Bauer (1984) on the apoplectic early scientific reactions to Velikovsky's theories, as well as a penetrating autopsy showing exactly where he went wrong—cf. also Plait (2002, 174-186). This may be contrasted with the "misunderstood genius" version of Velikovsky partisans such as De Grazia, *et al*. (1966) and Ransom (1976). For those unfamiliar with the episode, Velikovsky (1950) correlated a host of catastrophic legends to the close approach of the planet Venus, which he believed was recently ejected from Jupiter and was described by ancient observers as a comet. Although best known for his neo-catastrophism, except for Velikovsky (1955) the rest of his work was historical—Velikovsky (1960) even ventured an intriguing identification of the legendary Oedipus with the Pharaoh Akhnaton. But the focus of Velikovsky (1952; 1977; 1978) was on resolving the incredible chronological headache occasioned when he took the much older *Admonitions of Ipuwer* as an Egyptian eyewitness to the cometary cataclysm going on during the Exodus. The Ipuwer Papyrus just as likely reflects the Egyptian fear of chaotic conditions, as noted by Cohn (1993, 19-20), but if it was to be shifted to 1500 BC (the traditional Exodus dating Velikovsky used) it meant pulling the Middle Kingdom forward by centuries. That in turn meant removing blocks of later pharaohs as duplications to keep things from spilling over at the other end (the problem would have been even worse using the more conventional scholarly opinion of Ramses II as the Pharaoh of Exodus around 1200 BC). For the curious, Hitching (1978, 170) managed a tidy summary of Velikovsky's revisionist framework. Recently Rohl (1995) proposed his own controversial exorcism of pharaonic ghosts, relating Egyptian and Biblical historical figures on a non-catastrophic basis. Finally, just to add some spice, there's the 1628 BC dating of the Thera eruption to contend with. While that may have been responsible for the Exodus backdrop, it does appear to correlate to the change in Minoan status observed during the reigns of Hatshepsut and her son Thutmose III, as effectively argued by Pellegrino (1991). But that requires sliding the New Kingdom 18th Dynasty back the other direction, 150 years earlier than accepted. "Ages in Chaos," indeed!

[142] Kitcher (1982, 120).

[143] Gish (1993, 209, 210). Besides this and the Cracraft example above, Gish (1993, 275, 295, 334, 343, 357) dispensed a range of pejoratives, though as with the definition of "kind" it's not entirely clear by what standards he bestowed them. So biologist Thomas Jukes was "a virulent anticreationist," as was geologist Steven Schafersman, while anthropologist Loring Brace was "a bitter opponent of creation science," and science writer Robert Schadewald "a bitter anticreationist." Stephen Jay Gould was singled out for his "arrogant reference to creation scientists as 'yahoos.'" Only paleontologist David Raup warranted positive stroking, for conceding (according to Gish) "that creation scientists do use acceptable scientific methods (though sometimes poorly, in his opinion)." Actually Raup wasn't quite that conciliatory. "In my view, a few of the arguments used by the creationists are 'scientific' in the sense that they use the basic methods of testing hypotheses normally considered to be scientific. This does not mean, of course, that the conclusions are correct. Bad science may be difficult to distinguish *methodologically* from good science," David M. Raup, "The Geological and Paleontological Arguments of Creationism," in Godfrey (1983, 159). As Raup at no point openly accused Creation Scientists of practicing *good* science, Gish may eventually think better of having declared that Raup "approaches the creation/evolution controversy calmly and objectively."

[144] Gish (1993, 252) similarly fumed over Richard C. Lewontin, "Introduction," in Godfrey (1983, xxiii) stating that "The facts of evolution are clear and are not disputed by any serious scientific worker." Gish rejoined, "That statement is as inaccurate as it is arrogant. There are literally thousands of serious scientific workers who reject the 'facts' of evolution and who believe that creation is far more credible." Gish clearly considered his own Creation Science community as an exemplar of this, but did include Michael Denton in the club. Although Lewontin had been speaking of "evolution" in its broadest sense, which included the physical development of the earth and universe over billions of years, Gish did not deal with that aspect. Instead, Gish (1993, 253) took issue with the history of early 20th century creationism: "Lewontin declares that these rural Southerners perceived themselves, correctly, as being under control of the rich northern and eastern bankers and entrepreneurs. As a result, we are told, many flocked to populism and socialism, and

there was an accent on revivalist, fundamentalist religion. Consequently, Lewontin says, evolution was hardly mentioned in textbooks. It, no doubt, greatly pleases Lewontin, a Marxist, to relieve what he perceives to be the great and considerably successful class struggle of more than a century ago. But to portray the creation/evolution controversy as a struggle between rural Southerners and the rich, well-educated, elite Northern and Eastern classes, is totally inaccurate." Lewontin's politics aside, his point related to the *quality* of science education: "Evolution, for example, was barely mentioned in school textbooks; as late as 1954, my children, in Raleigh, North Carolina, read that 'God made the flowers out of sunshine,'" Godfrey (1983, xxv). This too Gish did not discuss.

[145] Gish (1993, 210-211).

[146] Gish has left the defense of Flood Geology to others, Numbers (1992, 225-226). Overlooked criticism may start with McGowan (1984, 57-67) and Kenneth B. Miller, "Scientific Creationism versus Evolution: The Mislabeled Debate," in Montague (1984, 39-54) on the inadequacies of Young Earth stratigraphy and paleontology. John A. Moore, "On Giving Equal Time to the Teaching of Evolution and Creation," in Zetterberg (1983, 443-444) questioned what plants were taken aboard Noah's Ark, how they were dispersed afterward, as well as whether freshwater or marine fish needed storage (depending on how dilute the saline oceans became). Moore surfaced in Gish (1993, 96) only apropos "the false and slanderous charge" by an anonymous 1972 article in the Biological Sciences Curriculum Study newsletter that some creationists had deliberately confused him with creationist John N. Moore. (As with the Corner quote, the validity of Gish's point depended on inspecting the original text, but this time no quotations were provided; the allegation of "misquotation" from Cracraft above indicated Gish's umbrage could fire on a hair trigger.) Gish also skipped the reprise of Robert J. Schadewald (1982) in Zetterberg (1983, 448-453). Gish (1993, 98, 357-359) brought up Schadewald about an instance of molecular evolution (to be discussed later in relation to creationist education) and concerning the piece previously noted comparing Creation Scientists to Flat Earthers. In the Zetterberg article Schadewald observed how crowded the antediluvian ecosystem would have been had everything in the geologic column been alive at once. He reported that Gish responded to this in a 1980 radio debate by claiming there are 100 billion billion herring in the sea today—which Schadewald calculated as translating into two per cubic foot throughout the earth's oceans. "I concluded (a) that all of the herring are red, and (b) that they were created *ex nihilo* by Duane Gish on the evening of October 21st, 1980," Schadewald in Zetterberg (1983, 449). For a quick survey of Creation Science's Ark beliefs and criticisms, see Ecker (1990, 28-30).

[147] Concluding his critique of Futuyma's treatment of horse evolution, Gish (1993, 132): "we have already allowed ourselves to fall into the trap of engaging evolutionists in a debate concerning alleged transitional forms—an exercise totally unnecessary, and part of their smokescreen designed to cover up the complete failure to find ancestors for the invertebrates and the vertebrates (fishes). Therefore, rather than devoting space here to a point-by-point refutation of the claims by evolutionists concerning these alleged transitional forms, the reader is referred to the discussions found in the creationist books and the non-creationist anti-Darwinist books referred to early in this chapter." Those sources included Gish's own *Evolution: Challenge of the Fossil Record*, reincarnated as Gish (1995), such peripheral works as Rifkin & Perlas (1983) and *Evolution from Space* by Fred Hoyle and Chandra Wickramasinghe, as well as Denton (1985)—which one may recall accepted horses as an example of *microevolution*. Later on, regarding Kitcher (1982, 108-114), who specified a variety of fossil transitions (including the crossopterygian skull and the therapsid jaw), Gish (1993, 224) again directed the reader to *Evolution: The Challenge of the Fossil Record*. When it came to responding to astronomer George O. Abell, "The Ages of the Earth and the Universe," and physicist Stephen G. Brush, "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 33-84), Gish (1993, 260) didn't press even as far as Gish (1978, 59). He begged off without recommending any particular titles to stand as exemplars of Young Earth opinion, though Gish (1995, 50) later fielded references for some of those who have "exposed weaknesses and fallacies in radiometric dating methods." These consisted of Whitcomb & Morris (1961), Harold Slusher's 1981 *Critique of Radiometric Dating Methods*, Melvin Cook's 1966 *Prehistory and Earth Models*, and two 1970 CRS articles by Cook

and another creationist cipher, S. P. Clementson (who has laid even less of a citation trail than Cook).

[148] Gish (1993, 329).

[149] Joel Cracraft, "Systematics, Comparative Biology, and the Case against Creationism," in Godfrey (1983, 183-184); the brackets were in the original. The first paragraph references were to the 1974 edition of Henry Morris (1985), Morris' 1977 *The Scientific Case for Creation*, Wysong's 1976 *The Creation-Evolution Controversy*, and the 1979 incarnation of Gish (1995). The fifth paragraph citations were to: Norman I. Platnick & Gareth J. Nelson, "A method of analysis for historical biogeography," in *Systemic Zoology* 27:1-16 (1978); Nelson & Platnick, "A vicariance approach to historical biogeography," in *Bioscience* 30: 339-43 (1980); Nelson & Platnick's 1981 *Systematics and Biogeography*; Cracraft, "Biogeographic patterns of terrestrial vertebrates in the southwest Pacific," in *Palaeogeography, Palaeoclimatology, Paleoecology* 31:353-69 (1980); and Nelson & Donn E. Rosen's 1981 *Vicariance Biogeography: A Critique*. The final source was "G. F. Howe. 1979. Biogeography from a creationist perspective. 1: taxonomy, geography, and plate tectonics in relation to created kinds of angiosperms. *Creation Science Research Society Quarterly* 16:38-43." With ironic tongue planted firmly in cheek, Gareth Nelson (of the American Museum of Natural History) provided a preface to Wendell Bird (1989, Vol. 1, xii), dryly noting biogeography was "a topic inexplicably missing from his argument."

[150] In the course of his anemic remarks on the inadequacies of Scientific Creationism, Ratzsch (1996, 154) offered that, "other than Scripture, to which creation science does not appeal, there are no direct observational data of the flood itself." Ratzsch was speaking of eyewitness accounts, rather than inference from present evidence, but this accurately described the root of Creation Science's logical quandary. Another indication of the amorphous character of recent Biblical creationism would be the astonishingly weak-kneed "defense" of the field given by Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 41-75). Rather than burden the reader with supporting information, the Flood gained plausibility in their eyes (p. 49) through the gymnastic deduction that it was less difficult to accept than the resurrection of Jesus (which they were certain took place). Besides, belief in the Young Earth was "intellectually interesting" (p. 50)—an esthetic judgment that no doubt could also be made for extraterrestrial intervention theories or Edgar Cayce's Atlantis.

[151] Gish (1993, 327-329); brackets in original text.

[152] Strahler (1987, 365-366) and Ecker (1990, 42-43) have also taken Whitcomb and Morris to task on these topics.

[153] Although Velikovsky would seem a ready ally for Biblical catastrophism (even supplying a physical explanation for the Exodus), he never defended the theological subtext that any of this was God's doing, so Creation Scientists have kept their distance from Velikovsky, as indicated by DeYoung (1989, 48-49). Henry Morris (1963, 64) briefly alluded to Velikovsky as part of "the recent revival of interest in catastrophism," as did Sunderland (1988, 126-127), while Henry Morris (1972, 67) mentioned him concerning legendary accounts of divine warfare. Velikovsky emerges as a victim of "suppression" under the topic "Scientific Lack of Integrity by Many Evolutionists" in Wendell Bird (1989, Vol. 2, 135, 489). But sidle over to the loonier fringe and Velikovsky's popularity escalates: from Flindt & Binder (1974, 15-16) to the rambling Bible lectures of Idaho apocalyptic Chuck Missler (along with satanic UFOs and Great Pyramid codes). Yet Velikovsky also intersects the decidedly anti-Christian worldview of Vine Deloria (1973, 48): "There appears to be no doubt that Velikovsky has been vindicated and that we are on the verge of an incredible reordering of our conception of both the world and history." A quarter century later this enthusiasm had dimmed slightly: "A sufficient literature has evolved since then to argue the case for Velikovsky," Deloria (1995, 46). His sole example of Velikovskian prescience was the scorching temperature of Venus (which Deloria mistakenly placed at "800° C"—it should read Fahrenheit), dismissing as "ad hoc" the runaway greenhouse mechanism that reasonably accounts for it. Pulling things full circle, Deloria (1995, 93) also felt Patten's ice collapse theory in *The Biblical Flood and the Ice Epoch* "makes a lot of sense." Regarding evolution, Velikovsky was always exceedingly vague, hinting at some sort of catastrophic process triggered by massive mutations but never going

into any detail in his published oeuvres. For that reason it was reassuring to find Richard Milton (1997, 87-94) drawing on Velikovsky, since Milton's own anti-Darwinian neo-catastrophism is comparably foggy.

[154] When I first read *Worlds in Collision*, fresh out of high school, I was quite impressed by it (compared to von Däniken's *Chariots of the Gods?* or Hal Lindsey's *The Late Great Planet Earth* which I ran into around the same time). The Indian ice age claim in Velikovsky (1950, 91) was one of his most telling bits for me, and when in college I discovered all the critical fuss about him I actually spawned a (very) small "where there's smoke" bunch on campus. I also practiced the lazy secondary citation indulged in by Ankerberg & Weldon or Wendell Bird (which is why I can recognize it so easily). Except in my case a solid dose of college methods courses drummed that wickedness out of me, and by the mid-1970s I had taken the further fateful step of reading sources for knowledge rather than ammunition. Velikovsky fell apart for me at the 1974 meeting of the American Association for the Advancement of Science (AAAS) in San Francisco, where a special session was devoted to him. Carl Sagan was among the host of critics who hoped to dispose of the heretic once and for all—their papers were later compiled in Goldsmith (1977), though without any of the pro-Velikovsky pieces. But it wasn't anything Sagan or the other critics had to say about Velikovsky that turned the tide. It was a solitary question asked of Velikovsky afterward, about continental drift, that did it. It wasn't even a critical one—as I recall, the gentleman asking it was favorable to his views. But Velikovsky's reply was so defensively cursory and dismissive that I sensed at once *Earth in Upheaval* catastrophism was never going to get anywhere, stuck forever where it was in Velikovsky (1955, 115-119). Cf. David Morrison, "Killer-Comets, Pseudocosmogony, and Little Green Men," in Kurtz (2001, 163-165). A similar fate befell the fascinating pole-flipping speculations of Charles Hapgood. Besides Hapgood & Campbell (1958) and Hapgood (1970) on that subject, Hapgood (1966) was also the precursor to a revival of "lost advanced civilizations" lore that continues to nip at the heels of conventional archaeology in much the same way as catastrophism assails uniformitarian geology. Like Velikovsky's ideas, Hapgood's views on ancient sea voyages are alive and well in certain circles, which we'll encounter in the chapter on human evolution.

[155] By citing nothing on this point Gish didn't get even as far as Milton (1997, 62), who at least put forward the views of creationist Melvin Cook who tried to dispose of continental drift back in the mid-1960s (theoretical objections quickly rendered obsolete by subsequent oceanic exploration). Deloria (1995, 39-40) waded in here with exactly as much expertise as he showed with dinosaur deposits: "Inconsistencies abound, but we are so brainwashed by science that we do not even ask the relatively simple questions about ordinary things. We have shifting continents attached to sliding gigantic 'plates' and we also have continents rising and falling to allow for the deposition of limestone and marine sediments. Exactly how both processes can occur at once is not clear, and it is only our trained belief that an infinite amount of time has passed that allows both processes to be held as literal truths." Morris & Morris (1996b, 269-273) continue to hold the ICR line against continental drift, relying on early 1980s comments to dispose of 1990s geophysics. By contrast, Vitaliano (1973, 230) noted the shift between the 1954 edition of De Camp's *Lost Continents*, where Wegener's theory was put on the "very doubtful" list, and the 1970 revision in which continental drift was now accepted as a geological reality, De Camp (1970, 162).

[156] Kitcher (1982, 140-142) specifically highlighted the problems the Australian marsupials posed for the Flood scenario (sluggish koalas somehow beating out swift placentals to settle the continent before the hypothetical land bridges closed off post-Flood). Gish (1993, 225) slid past those remarks during a cursory dismissal of another point: "Kitcher makes a feeble attempt to refute the evidence for creation based on purpose and design, in a section entitled, 'To each according to his need' (pp. 135-143). Kitcher claims that recent discoveries of biochemical similarities among organisms represent 'a striking new success for evolutionary theory' (p. 136). This claim is powerfully refuted by molecular biologist Michael Denton." Ratzsch (1996, 99-100) was more overtly obtuse, sloughing off Kitcher's slow traveling marsupials as merely a misreading of Flood theory, which required only created "kinds" aboard the Ark and not every species. Thus Ratzsch sidestepped Kitcher's main point about why *particular* animals made it to Australia, and the

preposterous amount of diversification that would have been required afterward if they had started out as a limited repertoire of "kinds." Because Biblical creationists have been far from zealous about specifying Noah's passenger list, such nebulous invocations constituted not an "explanation" but an *excuse*.

[157] Stahl (1985, 151-152, 173-174) is an interesting transitional example, undergoing revision just as the new perspective was settling in. Cf. Futuyma (1982, 51-53) on lungfish and cichlid distribution, or Kumazawa & Nishida (2000) on the freshwater arowana. Fish and crocodile fossils have been found in Brazil and Africa because the basin where they once lived was split in half during the Cretaceous, Taquet (1994, 89-90). Or the North American trilobites stranded on a slice of Scotland that marked the closing of a Paleozoic sea, Doyle & Lowry (1996, 61). Simpson (1983, 98) noted how improved fossil collection and analysis (William Diller Matthew showed how animals like tapirs once had far larger ranges and so didn't require beeline connections between their now isolated habitats) deflated "what might be called a land-bridge rush" in vertebrate paleontology from 1895 to 1915. Cf. Davis *et al.* (2002) on "disjunctions" in angiosperm biogeography and Ashworth & Thompson (2003) on fossil Antarctic flies.

[158] Gish (1992, 77) referred to Antarctic dinosaurs—his remarks on polar dinosaurs from *Evolution: The Fossils STILL Say NO!* were recounted in note 65 of chapter one. Morris & Morris (1996b, 308-310) summarily attribute "The Anomalous Climates of the Ancient World" to their catchall vapor canopy—all blissfully divorced from any anchoring data. For a concise current overview of how continental distribution affects climate, see Doyle *et al*. (1994, 145-157). Factors include mountain uplifts, the formation of supercontinent roadblocks to wind and oceanic circulation, and the Milankovitch cycles (the wobbling of the earth's axis and orbital eccentricity that combine to oscillate prevailing conditions). Working off a new study of Arctic fauna by Tarduno *et al.* (1998), Huber (1998) noted how climatologists have used such information to refine their models (particularly when it comes to enhanced carbon dioxide levels occasioned by Late Cretaceous volcanism). See also Alley & Bender (1998) or Alley (2000).

[159] Kitcher (1982, 51-52).

[160] Gish (1993, 213-215). There were two citations. The first was to Romer (1966, 211, 381) for the Pleistocene and Miocene fossil records of tenrecs and company. The second was "A. F. Shull, *Evolution*, McGraw Hill Book Co., New York, 1951, p. 70 (as quoted by J. C. Whitcomb and H. M. Morris, *The Genesis Flood*, Presbyterian and Reformed Publishing Co., Philadelphia, 1961, p. 85)."

[161] It was especially ironic of Gish to bring up the Seychelles in a context where continental drift applied. The Seychelles are a surface protrusion of the Saya de Malha Bank of volcanic deposits—which happen to be the *other half* of the Deccan Traps of India, formed just as the Indian plate passed over the Reunion Island hot spot just east of the present position of Madagascar. See Dingus & Rowe (1998, 35) or Sieh & LeVay (1998, 187-188) for recent discussions. More typical hot spot traces are chains of volcanic islands, such as those charted by Jon Erickson (1996, 100-104) and Courtillot (1999, 73-87). The Hawaiian plume has left a trail of now-submerged (and progressively older) seamounts running northwest past Midway all the way to the Kuril Trench off Kamchatka, Matthews (1973, 28-29), Strahler (1987, 209), Sieh & LeVay (1998, 248) or Hill Williams (2002, 71). Creation Scientists of course would quibble with the radiometric methods used to date them precisely, but even without that the overall pattern is clear enough. Tiffin (1994, 47-49) surveys some of the odder views Biblical creationists have about seamounts.

[162] Ronald Nowak (1991, Vol. 1, xxi-xlv). Madagascar has its share of well-traveled rodents (though all their genera are endemic); likewise the one pygmy musk shrew genus ranges to Asia, but is also found in Africa. Madagascar's own chameleons have also got around, Rieppel (2002) re Raxworthy *et al.* (2002). For biogeographical perspective: Springer *et al.* (1999), Hedges (2001) re van Dijk *et al.* (2001), Gore (2003), Yang *et al.* (2003) and Yoder *et al.* (2003).

[163] Sampson *et al*. (1997, 27) and Flynn & Wyss (2002, 57) noted the geological background while describing their respective fieldwork on the island. Interestingly, in 1993 (just as *Creation Scientists Answer Their Critics* came out) Cretaceous mammal teeth were recovered for the first time there, similar to South American forms (suggesting a wide spread of Mesozoic insectivores).

See Flynn *et al.* (1999), Flynn (2000), Krause (2000; 2001) and Wong (2002b) on recent Malagasy fossil finds, Jolly (1988, 140-141) or Dunbar & Barrett (2000, 82-98) on lemurs (living and extinct), and Pastorini *et al.* (2003) on the genetic side. Though sizable, the Madagascar gap is tiny compared to the NE USA, where almost the entire 150 my of the Mesozoic has been lost to erosion, Malcolm W. Browne, "Reconstructing a Galloping Crocodile After a Mere 200 Million Years," in Wade (1998a, 131). Determining what migrated from where and when depends on getting all the factors straight, since new data can significantly change the perspective. For example, in discussing Madagascar's split from Africa, Whitfield (1993, 173) worked in terms of this happening about 170 mya—but by Sampson *et al*. the move had been pressed forward 10-20 million years. Both India and Antarctica were nearby well into the Cretaceous, likely attended by peripheral islands subsequently lost to subduction—cf. Cracraft (2001, 72). Tudge (1996, 50) is also relevant: "We do not know what India's island creatures were like, however, or how they might have turned out, because its surface was obliterated around 60 million years ago by the Deccan volcanoes, the biggest known on earth." So working out what *really* went on so long ago requires much of the patience and tenacity of crime solving.

[164] See Ronald Nowak (1991, Vol. 1, 126-128, 140-141) for the tenrec and mole examples, and Stanhope *et al.* (1998) on their further genetic relationships. The issue of animal survival is, of course, a matter of competition within an ecological niche. Regarding Madagascar, Gamlin & Vines (1986, 124): "Lying close to the African mainland in the Cretaceous, Madagascar moved away to an insular existence during the Paleocene. It took with it archaic primates which gave rise to the lemurs, mouse lemurs, indris and aye-aye. Elsewhere in the world, most of these early primates died out in the face of competition from the more intelligent and adaptable monkeys. The only primitive primates to survive outside Madagascar are the lorises and tarsiers—small, specialized, nocturnal animals that inhabit the forests of Africa and Asia."

[165] See Ronald Nowak (1991, Vol. 1, 400-402) on primate taxonomy at the time of Gish (1993)—and Martin (2003) re Seiffert *et al.* (2003) on some recent relevant fossil finds in Egypt.

[166] That arbitrary (and wrong) geological hypothesis inspired the tedious theosophical speculations of Helena Blavatsky on the "Lost Continent of Lemuria"—in its turn relegated to the boondocks during the 1930s by James Churchward's murky chronicles of the equally imaginary "Mu" supposedly straddling the Pacific. See de Camp (1970, 47-75) for droll coverage of this obscure subset of Atlantis lore, as well as the biogeographical origins for the Lemurian land bridge theory in the 1870s.

[167] Kitcher (1982, 51). Directly after the paragraph Gish cited, Kitcher (1982, 52) outlined a series of independent checks for the evolutionary model. There would be the ability of the tenrec ancestors to cross the originally narrow gap between Madagascar and Africa, the competitive utility of the various adaptive specializations appearing as the tenrecs proliferated, and finally the physical relationship of the tenrecs (testable via their comparative anatomy and biochemistry). Which made the conclusion of Gish's chapter more than usually oblique: "What impressed me most, after going through Kitcher's book the second time, was the lack of substance in his arguments. His supposed employment of problem-solving strategies to generate Darwinian historical narratives is nothing but empty rhetoric. He resorts, again and again, to special pleading. He rests safe in his delusion that all objections to Darwinism, even when coming from competent biologists and other scientists, is muddled thinking or fanatic fundamentalism. It is Kitcher who is guilty of abusing science, not the creation scientists," Gish (1993, 227). Incidentally, Gish's "competent biologists" consisted specifically of Michael Denton.

[168] Something as seemingly mundane as river junctures turns out to pose sizable difficulties for catastrophism, as John Playfair spotted way back in the early 19th century. John Allen *et al*. (1986, 23) noted that "Playfair's Law" in geology recognizes his clever observation that rivers almost always merge at the same level, not as one river pouring into the other at a waterfall. This is because there has been an enormous amount of time for them to erode to evenness. Had anything like massive catastrophic transformations been the norm (during the Flood or otherwise) the drainage patterns would have been so altered that waterfall overflows would be the rule, not the scenic tourist attraction exception.

[169] Down in the trenches, Helen Fryman of the Christian Apologetics & Research Ministry (carm.org) blithely offers the frisky post-Flood speciation approach among the "good information" they supply contra evolution and "cults" like Mormonism. Meanwhile, Ross (1998, 92): "Ironically, creation scientists (quietly) propose an efficiency of natural biological evolution greater than even the most optimistic Darwinist would dare suggest."

[170] Kitcher (1982, 140) relevantly noted: "Why only one Ark? Why Ararat? (Why not New Jersey?) Of course, we know the answers to these questions. But what *scientific* evidence is there for supposing that there was just one vehicle for preserving land animals during the Deluge and that the subsequent radiation began from Mount Ararat? Creationists tie their hands behind their back when they approach problems of biogeography with such gratuitous assumptions."

[171] Henry Morris (1985, 207-215) explains the Creation Science view. The colliding YEC/OEC interpretations of Genesis and a global Flood are inconclusively arrayed in Youngblood (1986)—and largely evaded by OEC physicists Hayward (1985, 179-181, 185-187) or Ross (1994, 111; 1998, 142-144). Cf. Hyers (1983) & Greenspahn (1983). The New Testament is involved, as Jesus treated the Flood as a genuine event in Matthew 24:37-39 & Luke 17:26-27, as did 1 Peter 3:20. There is also the "misplaced concreteness" of Genesis 6:6-7: "And it repented the Lord that he had made man on the earth, and it grieved him at his heart. And the Lord said, I will destroy man whom I have created from the face of the earth; both man, and beast, and the creeping thing, and the fowls of the air; for it repenteth me that I have made them." Here is the curious image of a deity believed to be omniscient through all time and space *changing his mind* on the basis of temporal events—would these not have been foreseen from the start?

[172] For reasons why population size matters for animal survival, see Robert Moore (1983a, 6-8, 14-15) on the compounding absurdities of Flood scenarios and Tudge (1996, 102-105) for the more general world of zoology.

[173] Strahler (1987, 450-454) remarked on the general absence of extinction as a Creation Science topic—the term didn't even surface as an index item in Whitcomb & Morris' *The Genesis Flood* or Gish's *Evolution*. That remains true in his revised version—though Gish (1995, 128) did saunter by the subject in the text when he dismissed any catastrophic explanation for dinosaur extinction (other than the allowed Flood) as "unrealistic" because not everything departed. Gish did observe that "the struggle to repopulate a drastically restructured earth with a totally different climate following a worldwide flood would have have [*sic*] resulted in failure for many creatures, while others succeeded. The dinosaurs apparently were among the losers." Gary Parker was more explicit in Morris & Parker (1987, 174-175), equating extinction = dinosaur = reptile = big as "giant forms seem to have been particularly hard hit by extinction." There is a grain of truth there, but Parker pressed that into the more questionable assertion that "it's the cold-blooded, those less likely to adapt to climate extremes like we have today, that have been most strongly devastated by extinction." Why this would account for the survival of the Komodo dragon and garter snakes, but not *Dimetrodon* and *Probainognathus* remains to be seen. For comparison, how paleontologists approach the subject of dinosaur extinction, especially the matter of the selectivity of the K-T event, may be seen with Michael Benton, "Dinosaur Summer," in Gould (1993, 100-110), Fastovsky & Weishampel (1996, 400-427), or Dingus & Rowe (1998, 82-90).

[174] Scientific efforts to investigate the pace of mutation within naturally varying populations have generated a whole field of genetics, "molecular evolution," which Mark Ridley (1997, 78) noted "has grown into one of the richest—perhaps the richest—field in modern evolutionary research." Li (1997) provides a thorough survey of the present state of the art.

[175] Paul Taylor (1987, 31).

[176] Gish (1992, 78). Henry Morris (1985, 182-196) discussed the origin of human racial variation and civilization only in very broad terms, and not in relation to the specific Egyptian example. Gish (1990, 92) presented the same basic Creation Science position for children. Lubenow (1992, 146-149) veered off in another direction, arguing that post-Flood humans suffered from a variety of illnesses due to the Ice Age brought on by the Flood—and that these benighted folk ended up mislabeled as *Homo erectus* and Neanderthal. The many-faced Hydra of the creationist version of human history will be explored more fully in chapter five.

[177] Henry Morris (1985, 167-169) asserted that at the present 2 percent rate "it would take only about 1,100 years to attain the present world population. If man has been on earth a million years or more, untold trillions of men and women must have lived and died on earth. Where are their bones?" This view is repeated in Morris & Parker (1987, 15-16), Morris & Morris (1996b, 317; 1996c, 146-148), Paul Taylor (1995, 16-17), along with Kent Hovind in a 1996 video lecture. Cohane (1977, 56) used the same population growth argument to conclusion jump in the opposite direction: that humans came from outer space only in the last 20,000 years.

[178] Fagan (1999, 79, 266n) noted current estimates put hunter-gatherer population growth at a snail's pace of 0.0015 percent annually (for a world population of somewhere around 8.5 million in 13,000 BC) until the advent of agriculture around 9000 BC, when it rose to 0.1 percent. The rate climbed to 0.6 percent in the 19th century, and then to 2.0 percent in the 20th century.

[179] Ecker (1990, 178-179).

[180] Milne (1983, 3-4) and Monroe (1986), drawn on variously by Robert Schadewald, "Creationist Pseudoscience," in Frazier (1986, 308-309), Strahler (1987, 367-369) and Pennock (1999, 224-226). There are two demographic bottlenecks that YEC believers have to contend with: Adam's initial progeny, and a second when only Noah's family survive the Flood. Hayward (1985, 136) noted Morris' 0.5 percent growth rate would have the world population at the time of Christ only 250,000 (the city of Rome alone had more than that, with the empire somewhere around a hundred million); cf. Zimmer (2001g, 323-324). Morris & Morris (1996b, 317-320) remain well behind the scholarly curve here, paying no attention to such critics as Strahler or Hayward. Ross (1998, 103) briefly touched on exponential population growth rates, though only in relation to how profligate the generations after Adam would be if their longevity were taken at face value and children were produced regularly for eight or nine hundred years. Ironically, the same "coalescence theory" that comes into play concerning the genetic Eve idea (that present mitochondrial DNA points back to a *single* female ancestor about a hundred thousand years ago) applies here too. Current allele diversity requires many "Eves"—which in turn means the human population in which those ancestors would have lived is unlikely to have ever dropped below ten to a hundred thousand at any time in the last million years, Ayala (1994), Avise (1998, 38-40) or Paul Ehrlich (2000, 99-100).

[181] Lehner (1997) comprehensively covers the whole span of pyramid building. Several centuries of development lead from the basic mastaba tomb up to the first giant step pyramid of Djoser in the 3rd dynasty, built around 2600 BC. Current chronology would put the Creation Science Flood towards the end of the 5th dynasty, by which time the pyramid fad had settled into a more modest phase that continued all the way to the 13th dynasty (c. 1750 BC).

[182] Vitaliano (1973, 150-177) is still a landmark work in this field, describing the relevant cultures with flood traditions, and the extent to which they relate to the Scriptural one (chiefly through cross-cultural feedback). There was no intimation of this when Henry Morris (1972, 98) concisely put "Worldwide distribution of flood traditions" on his list of "NON-BIBLICAL ARGUMENTS FOR WORLDWIDE FLOOD." Gish (1992, 74-75) supplied a few details for the pliable young mind (along with that flame-throwing *Parasaurolophus*). Although claiming there existed "more than 270 flood stories and historic records in many parts of the world," Gish described only four (from Hawaii, China, the Toltecs, and Babylonia)—all briefly and none with sources. Stiebing (1984, 17) noted the Hawaiian tale was recorded long after the arrival of Christian missionaries. The Chinese "Fuhi" story also sounds suspiciously like a rehash of Noah, and isn't supported by the flood legends recounted by Vitaliano (1973, 163). The Toltec tale is related to Mesoamerican creation myths, which were embellished post-Conquest as noted by Vitaliano (1973, 175-177). The Babylonian story will be discussed shortly.

[183] There are two interesting "mysteries" concerning the star Sirius that bear on the issue of traditional beliefs and how to interpret them. One concerns the Dogon people of Africa who appeared to be aware of the existence of two invisible stellar companions for Sirius. This is fine for the dwarf star Sirius B, which actually does exist, but there is no Sirius C. The Dogon may indeed have obtained some of their knowledge from contact with a scientifically advanced culture, but probably not the extraterrestrials from Sirius itself that Temple (1976) suggested. Traveling Jesuit missionaries in the 1920s were a more likely source, influencing the local tradition in a way well

documented in similar instances. See Sagan (1979, 75-79), Kenneth Brecher, "Sirius Enigmas," in Brecher & Feirtag (1979, 106-114), or Ortiz de Montellano (1996). Because the ancients listed Sirius as a *red* star rather than a blue-white one, DeYoung (1989, 64) took that as proving the companion dwarf had been a red giant within historical times, and so invalidated the whole modern conception of stellar evolution. But as noted by Brecher in Brecher & Freitag (1979, 95-98), the early references may have been to *brightness* rather than color (a 700 BC Babylonian account refers to Sirius as shining like copper). It is further known that classical copyists tended to bow to authority—Aristotle got the number of teeth in a horse wrong, and no one ever bothered to check up on him or contradict him if they had. Some of the "red" Sirius remarks also turn out to be from later Romans like Cicero, Horace, and Seneca, politicians and poets not primarily known for their scientific acumen. In the 2nd century AD Ptolemy included Sirius among the red stars Aldebaran, Betelgeuse, Arcturus, Antares, and Pollux. Besides establishing the faulty ground rules for today's "tropical" format of astrology, Ptolemy has been suspected of fudging some of his numbers, though Kohn (1986, 35-36) gives him the benefit of the doubt. Not until around AD 980 did Arab astronomers start trusting their own eyes more than written authority and remove Sirius from the red star category.

[184] Vitaliano (1973, 156-159, 218-251). Though as the Deucalion tale does involve rain and punishment (by Zeus), Luce (1969, 118-121) considered that less directly related to Cycladic tidal waves from Thera than the many other Greek sea wave stories he recounted. Much as with creationism, "Atlantis" has also been buried under a mountain of obfuscating literature and an often overly literal interpretation of Plato's account (Atlantis existing beyond the Pillars of Hercules and disappearing 9000 years before the Greek statesman Solon). Thus Hitching (1978, 136-140) rejected the Thera/Atlantis connection because he wanted to retain the Edgar Cayce-class Atlantic identification—while critics from Lionel Casson, "Where Did Homer's Heroes Come From?" in Joseph Thorndike (1977, 78-80) and Cazeau & Scott (1979, 197-199) to Christopher (2002a) dismiss the Thera/Atlantis idea rather out of hand. But the eruption of Thera indisputably occurred and when taken in conjunction with the decline of Minoan fortunes thereafter reasonably fits the descriptions Plato claimed to have obtained very secondhand from Egyptian sources (which he then embroidered with his own pet theories about the "ideal state"). Both the date and location could easily have been mistranslated anywhere along the trail—the Minoan symbols for 1000 and 10,000 were very similar, for example. Also a confusion of only one letter in the Greek for "larger than" (*mezon*) and "between" (*meson*) would change the meaning of Atlantis being "larger than" Libya and Asia, as Luce (1969, 32) pointed out. Early presentations of the Thera/Atlantis theory (including the attendant controversy of its possible relationship to the timing of the Biblical Exodus) run from the popularly oriented Galanopoulos & Bacon (1969) and Mavor (1969) to the more scholarly Luce (1969)—Pellegrino (1991) effectively summarizes the case in light of recent archaeology. For an interesting contrast (and parallel), Keys (1999) argues that a major volcanic eruption near Krakatoa in the 6th century AD triggered climate fluctuations sufficient to disrupt cultures around the world.

[185] Whitcomb & Morris (1961, 489) had allowed for an earlier dating of the Flood, which Hayward (1985, 187) remarked on as their effort to circumvent the Egyptian chronology problem. More recently, Henry Morris (1985, 131) mentioned Egyptian chronology only in a section on the vagaries of dating rocks: "The beginning of written records, with anything approaching a verifiable chronology, dates from about the first dynasty in Egypt, (between 2200 and 3500 B.C.)." As the kings of the 1st dynasty haven't moved around much from their current position at 2920-2770 BC, Lehner (1997, 8), Morris' curiously liberal timeframe was comparable to pegging the Civil War at "between 1842 and 1885." Morris in Morris & Parker (1987, 14) and Morris & Morris (1996b, 314) subsequently quoted Colin Renfrew for a more accurate 3000 BC date for the First Dynasty, though still without appreciating its implication for Flood chronology.

[186] In this area, Lloyd Bailey (1993, 75-80) studied the "table of nations" of Genesis 10, indicating how it related more to mythology and wordplay (*Adam* means "earth creature," *Eve* derives from "life-giver," and so on) than to any objective peopling of the planet.

[187] While creationists are often vague on dates, Whitcomb & Morris (1961, 478) pegged Babel to 2358-2119 BC—while Old Earth Ross (1998, 181) insisted, "The scattering of peoples following the Tower of Babel debacle probably took place between thirty thousand and eleven thousand years ago." Ross offered no more reasons for this than for his claim that "Noah and his sons likely lived twenty to thirty thousand years ago." Cf. Strahler (1987, 494-495). For contrast, liberal theologian Kowalski (2001, 114-115) dressed Babel in ecological chic (as reflecting the dire effects of Sumerian deforestation). But Ecker (1990, 35) noted all this rested "on a bad Hebrew pun" between *balal* ("to confuse") with *Babel* (the Hebrew name for the city comes from the Akkadian *Bab-ilani*, "gate of God"). Like the sudden non-omniscience of God preceding the Flood, if taken as other than a linguistic origin myth the story presents its own peculiarities. Having figured out how to fire brick, we are told mankind felt on a roll and decided to "make us a name" by building their celebrated tower to heaven. Which immodesty prompted Genesis 11:6-7: "And the Lord said, Behold, the people *is* one, and they have all one language; and this they begin to do: and now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and there confound their language, that they may not understand one another's speech." Are we then to believe the creator of vast nebulae, whose omnipotence embraced the universe itself, felt *threatened* by the ability of mortals to construct brick ziggurats? Whether as a divine inferiority complex or as incipient paranoia, if the purpose of confounding human language was to keep us from doing that sort of thing, this was another evident policy failure. For humanity managed to overcome their communication handicap without much of a sweat, and subsequently progressed to far grander delinquencies like skyscrapers and space travel, not to mention thermonuclear weapons and genetic engineering.

[188] Characteristically, Richard Milton missed this connection too. Based on the fossils sandwiching the Como Bluff deposits, Robert Bakker roughly estimated the time spanned as about 10 million years. To which Milton (1997, 29) naively protested: "Yet we are given the confident assertion concerning the number of dinosaur generations and the number of years to which this sequence is equivalent, with no solid physical basis. No other scientific discipline would be permitted to consider such procedures, but when paleontologists date rocks by means of fossils, they do so with the authority of Charles Darwin himself." But replace "fossils" with "pottery fragments" and that's exactly what archaeologists have been doing since long before Darwin came on the scene (adding radiometric dating as a useful adjunct to their discipline). The principle even applies to the presence of pop-top beer cans in garbage dump stratigraphy, as Kenneth Miller (1999, 28-31) dryly noted.

[189] Besides the chasm separating the known histories of Native American cultures and the hypothetical kingdoms recounted in the Book of Mormon, European seed crops, farm animals, advanced metallurgy, and wheeled vehicles were unknown in the New World until introduced after Columbus. Relevant anachronistic texts from the Book of Mormon: 1 Nephi 18:24-25 (the emigrants planting seed crops brought with them from Jerusalem, and the cattle, oxen, asses and horses they found in the forests); 2 Nephi 5:15 (the working of iron and steel); and Alma 18:9 (horses being used for chariots). While Mormon convert Coke Newell (2000) avoided all such oddities in his guided tour of church doctrine, the critical Abanes (2002, 74-75, 514n) pointedly did not. Incidentally, von Däniken (1984, 1-31) schizophrenically doubted the veracity of the Book of Mormon while still extracting its mythology for his own purposes.

[190] Random examples run from Sarton (1959, Vol. 1, 103), correlating the Swiss lake cultures to the dynasties of Egypt, Babylonia, and the Aegean, to Wernick (1973, 32), relating the European megalith builders to their Near Eastern contemporaries. Hot off the unacceptable presses: Fagan (1999, 99-117) linking the fall of the Old Kingdom in Egypt to drought conditions established by the latest climatological research. Rejecting the antiquity of other cultures would only put historical scholarship back where it was a quarter of a millennium ago, among the public, scholars, and scientists who accepted as authoritative Bishop Ussher's 4004 BC dating of the earth calculated in the 1650s. Cohn (1996, 96) remarked: "In a book review for 1730, for instance, all chronologies which suggested that Chinese civilization was older than that were summarily rejected. 'Such Chimeras', wrote the critic, 'deserve not the Pain of refuting. They are equally

repugnant to good Sense, the Rules of Criticism, and to Religion.'" Henry Morris (1985, 194) may have felt free to note the oldest confirmed date for China was 2250 BC because it fell after the Flood (he did not explain how the distinctively Chinese culture could have originated in less than a century). For a survey of the long archaeological trail predating the rise of Chinese civilization available at the time Morris was writing, see Chang (1981). The Babel scenario also requires the abandonment of modern linguistic scholarship like Renfrew (1994) or McWhorter (2001). One language has especially mutated from its structurally different ancestors: English. Norse raiders settling in Britain found the prior immigrant rush, the Anglo-Saxons, spoke a language with a related vocabulary but operating under completely incompatible grammar. The outcome was to drop the confusing inflections entirely—which is why Chaucer is practically incomprehensible to a contemporary "English-speaking" listener. The conceptual similarity between animal evolution and language development was ingeniously argued by Pennock (1999, 117-179). Along the way Pennock criticized the creationist interpretation of John W. Oller Jr. & John L. Omdahl, "Origin of the Human Language Capacity: In Whose Image?" in Moreland (1994a, 235-269), which held that our ability to understand abstractions like God or morality proved language was a divine gift (more on that notion in chapter five).

[191] John H. Marks, "The Book of Moses," in *Interpreter's* (1971, 1-9) catalogs the Biblical passages by source; G. I. Davies, "Introduction to the Pentateuch," in *Oxford Bible* (2001, 12-38) surveys the exegetical issues. See also: Asimov (1981), Spong (1991, 43-55), Lane Fox (1992, 58-59, 177-181), Armstrong (1993, 12-17, 62-65) or Hiers (2001, 14-16, 37-39). Closer to the creationism issue: John A. Moore, "Creationism" & "On Giving Equal Time to the Teaching of Evolution and Creation," and N. Patrick Murray & Neal D. Buffaloe, "Creationism and Evolution: The Real Issues," in Zetterberg (1983, 129, 438-441, 460), Paul Hollenbach, "Creation Belief in the Bible and Religions," in David Wilson (1983, 138-147), James W. Skehan, "The Age of the Earth, of Life, and of Mankind: Geology and Biblical Theology versus Creationism," in Hanson (1986, 21-27), Ecker (1990, 19, 55) and McKown (1993, 46-51, 61, 84).

Not all Biblical resources so forthcoming as Marks, though. In the *Oxford Companion* (1993, 140-141, 231-232), while J. R. Porter briefly mentioned the J/P issue on "Creation," Alan Millard did not re "The Flood." Likewise the entry on "creation" in *Revell* (1990, 151-152) or *New Bible* (1994, 65-67) on Genesis. Among creationists, while Bert Thompson (1995, 103-112) directly rejected the J/P idea, Henry Morris (1985, 250-255), Paul Taylor (1987) and Morris & Morris (1996a, 65-72) skipped it, as did OEC Hayward (1985, 161-178) and Schroeder (1997, 60-71) on the days of creation. Robert Faid (whose apocalyptic Biblical numerology will be explored later) deserves points for bravado. "There are few Bible scholars who dispute that Moses wrote the Book of Genesis, although there is no mention in Genesis of the actual author, nor any references to Moses receiving a revelation from God about what the book contains," Faid (1993, 11). As will be seen in chapter six, "Historical Criticism" upsets Biblical traditionalists as much as naturalistic evolution does, and both inerrancy and Darwinism are subjected to the same distinctive methodological toolkit.

[192] Physiology professor Robert Root-Bernstein (quoted re note 32, chapter one) found about 10% of his students believe men and women differ in this way, Pennock (1999, 369-370, 372). The standard equipment for both sexes is 12 ribs—though individuals vary, including Root-Bernstein's own mother (13) and the Bronze Age Alpine "Ice Man" (11). Vern S. Poythress, "Response to Howard J. Van Till," and Howard J. Van Till, "Conclusion," in Moreland & Reynolds (1999, 236-237, 242-243) reflect the literal versus poetic interpretation of Genesis 2:21-22. Ross (1998, 75) invoked mistranslation to assert that, "While Adam slept, God removed a portion, something like a biopsy, from Adam's side and used that tissue in constructing Eve." Walter Bradley, "Why I Believe the Bible Is Scientifically Reliable," in Geisler & Hoffman (2001, 175) cribbed Ross. But as God presumably knew Adam's constituency down to the last DNA nucleotide (and could thus have created any modified version for Eve directly) this surgical "misplaced concreteness" hardly seemed an improvement on the Poythress/Van Till squabble. Ross decided also that I Corinthians 11:11-12 "sheds some light on why God may have chosen to construct Eve from Adam's tissue sample: In the Lord … woman is not independent of man, nor is man independent of woman. For

as woman came from man, so also man is born of woman" (Ross' ellipsis). The full KJV is more opaque: "Nevertheless neither is the man without the woman, neither the woman without the man, in the Lord. For as the woman *is* of the man, even so *is* the man also by the woman; but all things of God." This is a long way from a treatise on divine cloning. But then Ross showed considerable agility and imagination in getting the Biblical "frame of reference" to come out right—such as Ross (1998, 69-70) arguing that the creation account in Genesis 2 dealt with "humanity's major responsibilities" and thus wasn't in conflict with the cosmologically and paleontologically quirky sequence of Genesis 1.

[193] Cohn (1993, 45-51) summarizes the late second millennium BC *Enuma elish* tales, which recounts the exploits of the new top god Marduk (including a battle with the primeval goddess and chaos monster Tiamat which carries overtones of Leviathan). Cf. Marcus (2000, 154-178) on the Babylonian Captivity, which appears to be less pervasive than formerly thought.

[194] The Day 4 goof was a perfectly understandable one at the time: as dawn precedes the sunrise due to atmospheric scattering, the connection between daylight and the big ball of fire in the sky could easily be missed. But the creator of the universe would presumably have known the correct arrangement, and this business of what God was up to on Day 4 has plagued the literal Biblical imagination ever since. While YEC accepts the Genesis sequence, hang the stellar cosmology, the OEC temptation is to claim the heavenly bodies only became *visible* then (such as by the removal of an obscuring cloud). But with no one around to see this but God, we have here a particularly silly case of "misplaced concreteness." With unintended irony, Henry Morris (1985, 238) castigated such "strained renderings" of Scripture. Referring to theologian Robert C. Newman, "Progressive Creationism," in Moreland & Reynolds (1999, 108), Vern S. Poythress, "Response to Robert C. Newman," in Moreland & Reynolds (1999, 150) also cautioned that "Genesis 1:16 says that God 'made' the lights, not that he caused to appear already-existing heavenly bodies, as Newman states."

Schroeder (1997, 67), Ross (1998, 42-45) and Walter Bradley, "Why I Believe the Bible Is Scientifically Reliable," in Geisler & Hoffman (2001, 172-173) variously play this cosmological shell game. Schroeder was particularly concrete on his scheduling, aligning the creation days to a logarithmic scale starting at the Big Bang, which required positioning the atmospheric clearing to 1.75 billion years ago. Unfortunately the atmosphere became transparent to visible light as early as 4.2 bya, Hartmann & Miller (1991, 69)—which would fall during Schroeder's Day 2 events. Schroeder (1997, 69, 94) skipped around birds not appearing anytime during the fifth day (ending in Schroeder's scheme 250 mya) by deciding the *oaf* of Genesis 1:20-21 referred to "winged (insect) life." By the way, Michael Behe enthused on the dust jacket that "Schroeder vindicates the fruits of sophisticated biblical scholarship with the tools of modern science."

Another entrant in the Rationalizing Day Four competition is Barr (2003, 45): "Once, it was a common argument against the literal interpretations of Genesis that light was created on the 'first Day,' while the sun and stars were not made until later, on the 'fourth Day.' It now appears that the biblical chronology was quite right in this respect." Barr did not venture whether Genesis was also "quite right in this respect" when it came to the *earth* being created before the sun, or the moon arriving along with the sun and stars on Day Four.

[195] Ecker (1990, 55) remarked on how Morris (1985, 205-206) resolved the conflict from the Creation Science perspective by deciding the "P" creation story in Genesis 1 was written by God, Adam wrote the second "J" account of Genesis 2, and Moses did the editorial work. Faid (1993, 12-23) drew on the P. J. Wiseman's 1985 book, *Ancient Records and the Structure of Genesis*, for 11 written tablets Moses relied on for his editing job. Ross (1998, 59-62, 81-86) didn't get quite that far, touching on "higher criticism" only in terms of its early 18th century intellectual roots and not discussing the J/P problem specifically. Ross relegated the *Enuma Elish* parallels to but a distortion of the original Genesis facts, subsequently corrected by God himself during his editing sessions with Moses (as recounted in Exodus 19:3-25 & 24:9-18). Morris & Morris (1996c, 50-51) likewise regard Babylonian cosmology as a corruption of Genesis, further compromised by the taint of "evolutionary" doctrines of natural change inspired by Satan. Judging from these examples,

historical scholarship is in for a bumpy ride should ever the creationist version of Mesopotamian mythology gain pedagogical currency.

[196] Stiebing (1984, 13-15) compares "J" versus "P" Flood texts. Incidentally, otherwise scrupulous Flood believers appear not to take the "on the very same day" part of Genesis 7:11-14 too literally. Tiffin (1994, 92) calculated why: the 35,000 animals Whitcomb & Morris allowed on board would require loading at least one every two seconds—with insects you have twelve per second. Critic Robert Moore (1983a, 21) was even less generous by including fossil fauna.

[197] Gish (1992, 75).

[198] Cohn (1996, 1-18) neatly covers the Genesis Flood story and its varied Mesopotamian antecedents. Stiebing (1984, 16) remarks on the Ebla find.

[199] Cohn (1996, 18). Parenthetically, the Babylonian scribes were more than secretarial assistants. Like their Egyptian counterparts, in an illiterate society the ability to write was a skill to be carefully guarded. They reflected their heightened status by modifying the *Enuma elish* cosmology, giving the new top deity Marduk a vital sidekick, Nabu—a god for scribes.

[200] An example of intense social pressure affecting a religion is the "Ghost Dance" movement of 1890, where plains Indians threatened by the expansionist United States abruptly incorporated elements of Messianic Christianity, Dee Brown (1971, 406-412). Their conviction that garments could be rendered bulletproof by faith was tragically disproved during the bloody military repression that followed, Viola (1990, 190-200, 214, 217-218). Shermer (2000, 174-190) relates the phenomenon to other eschatological beliefs, such as Louis Farrakhan's UFO "Mother Plane."

[201] See Cohn (1996, 23-31) on the practice of medieval exegesis known as "typology" and how it interpreted Noah and the Flood in that manner. Cf. Zagorin (2003, 201-203) on the typological reasoning underlying Roger Williams' advocacy of religious tolerance. Harding (2000, 229-230) notes the spirit of typological thinking remains alive and well among born-again Christians. An example on the quirky creationist side would be Faid (1993, 17): "Theologians have found the Flood and the salvation of the human race a *type* or *foreshadow* of the redemption of mankind which would be brought about later in history by Jesus Christ."

[202] Vitaliano (1973, 154) and Cohn (1996, 1). Lane Fox (1992, 217-219) and Ryan & Pitman (1998, 52-55) recount Woolley's discovery of the flood layer at Ur, which turned out to be less spectacular than first thought; see also David MacDonald (1988) and Tudge (1996, 274-276). Keller (1956, 25-43) and Schroeder (1997, 205-206) accept the local Mesopotamian flood theory of the Deluge.

[203] See Ryan & Pitman (1998, 73-92) for a fine treatment of the discovery of the Mediterranean dry-up, and the many scientific parties involved in reasoning through the evidence. Given the ludicrous implausibility of Flood Geology, Morris & Morris (1996b, 266) ironically disparaged the Mediterranean desiccation as a "fantastic theory."

[204] Under the "A for effort" category: Glenn Morton (1997) boldly hoped a very ancient *Homo* (related in chapter five per Oxnard & Zuckerman) might have experienced the Mediterranean refilling as *the* Flood. See Matthews (1973, 20-21) for a dandy panorama of the Falls.

[205] Ryan & Pitman (1998, 101-161).

[206] Ryan & Pitman (1998, 185-187). The Younger Dryas was apparently triggered 12,000 years ago by fresh water dumped from glacial Lake Agassiz down the St. Lawrence River into the Atlantic—a change in salinity that interrupted the saltwater "Great Ocean Conveyor Belt" involved in global thermal equilibrium, Alley (2000, 110-118, 161-162). Mithen (1996, 219-222) and Fagan (1999, 82-86) describe its effects on the Euphrates hamlet of Abu Hureyra.

[207] Hudson Bay glacial flooding appears responsible for the 6200 BC cooling, Alley (2000, 162). *Past Worlds* (1988, 87) shows the geography of the early groups discussed by Ryan & Pitman. Cf. Zilhão (2001) on a maritime colonization of the western Mediterranean c. 5400 BC.

[208] Stiebing (1984, 22-23).

[209] The absence of flood myths among the peoples proposed to have dispersed from the shores of the New Euxine Lake (especially those landing in semi-arid Central Asia) might suggest the proto-Sumerians experienced the disaster differently from their presumed neighbors. If they lived nearer the Bosporus escarpment, for example, the horrible "flood weapon" would have had an impact

unlike that for someone living at the far northern shore, where they would have noticed only the water lapping higher each day in the yard. The Sumerians' later extensive use of irrigation (a necessity on the searing Tigris-Euphrates plain due to the lack of reliable rains) may also reflect a tradition of water management. If so, their ancestors may have been more reluctant to abandon their "sweat equity" to the waves than those able to just pack up and flee. One curious detail from *Gilgamesh* lends support to a continuing link between the Mesopotamian flood tradition and the realities of the Black Sea: the "stone things" Gilgamesh used to cross the "waters of death" to reach Utnapishtim. Scholars have long puzzled over what this might refer to, tending toward a mythical or talismanic interpretation. But Ryan & Pitman (1998, 242-244) noted boatmen lower stones in a basket or net to hitch a ride on the deep crosscurrents pouring in from the Mediterranean (a procedure illustrated in the BBC "Horizon" show) to cross the highly anoxic Black Sea—indeed, ecologically a "sea of death."

[210] Prior to the flood theory of Ryan & Pitman (1998, 250-251), Vitaliano (1973, 247-248) remarked that the Samothrace tale may have been simply a mythical explanation for the formation of the Bosporus and Dardanelles—though noting that Luce (1969, 121) connected the inundation element to the Santorini eruption. If some seafaring contingent of the Black Sea diaspora did get as far as Samothrace, there would be no reason why the Thera tsunami couldn't have got mixed into the tradition. Of course, there's also the much slimmer possibility that the legendary trail had been piling up for longer than realized, with the Black Sea flow into the Mediterranean after 12,500 BC somehow being preserved. While this would be the sort of datum to make Graham Hancock smile (as will be explored in chapter five concerning his argument for a global seafaring culture setting up megalithic markers around 10,500 BC), I find that long a time frame difficult to swallow. A more realistic example of how long information may be carried in a pre-literate society concerns the Anatolian settlement of Çatal Hüyük (at the foot of the Taurus Mountains in southern Turkey). Nine thousand years ago a muralist there illustrated an eruption of the volcano Hasan Dag, about 80 miles to the east. But the last activity there apparently took place a thousand years earlier, Ryan & Pitman (1998, 180-181). The mural is illustrated in *Past Worlds* (1988, 83) and related to the obsidian trade by Alberto Siliotti, "Çatal Hüyük: The Origins of the City," in Forte & Siliotti (1997, 72).

[211] The progress of the Black Sea scenario may be seen by Kerr (1998b; 2000b), Morrison & Morrison (1999) and Eldredge (2000, 201n), as well as the exploratory expedition undertaken by *Titanic* discoverer Robert Ballard (2001). Much as Ian Wilson (2) (1999, 20-22) has, it may be expected Old Earth creationists will welcome such discoveries; e.g. Robert C. Newman, "Progressive Creationism," in Moreland & Reynolds (1999, 112), who listed the Black Sea as a possible localized Flood site. Such a downsized "materialist" deluge does not impress purists like the YEC Bible-Science Association though (April 2001 "Creation-Evolution Headlines" at creationsafaris.com/crev04.htm). Nor did Graham Hancock (2002, 24-49) include even a whiff of Ryan & Pitman in his coastal flooding interpretation of Mesopotamian flood lore.

[212] Ryan & Pitman (1998, 193-195).

[213] Robert Moore (1981), Stiebing (1984, 24-27) and Toumey (1997) chronicle Ark hunting through the years, including efforts by astronaut James Irwin. The Bible Archaeology Search & Exploration Institute remains optimistic though, Cornuke & Halbrook (2001). Due to political realities (including Kurdish separatism) regional authorities have not welcomed Arkologists, despite their sincerity. Toumey (1997,17): "Perhaps the ultimate irony of the expedition to Ararat is that while the ark seekers mean to demonstrate that the Bible is neither myth nor superstition, they associate it instead with rumor and illogic. Genesis deserves better."

[214] The authority for flood mythology in "The Incredible Discovery of Noah's Ark" was "Dr." Charles Berlitz, who claimed a story nearly identical to the Biblical account was known from *ancient Egypt*. Cornuke & Halbrook (2001, 4, 221n) similarly trust Berlitz on New World tales. Alarm bells should also have rung over a supposed 1917 Russian expedition to Ararat—a confabulation inspired by a 1933 April Fool's story, Robert Moore (1981, 8). The CBS show quoted a publishing house editor's account of an author's interview with Anastasia claimant Anna Anderson, who agreeably confirmed having seen reports on it while in the retinue of her father the

Czar. All of which depended, of course, on Anderson actually being Anastasia. Unfortunately, as covered in a PBS NOVA program a few years later, mitochondrial DNA tests established Anderson wasn't a Romanov. She was in fact the very Polish refugee a skeptic had claimed she was back in the 1920s—clinched when the research team tracked down one of her living relatives and matched the mtDNA with him. Not surprisingly, Anderson defenders (including those who had been looking forward to the test) promptly disavowed the negative results. See Sykes (2001, 63-78) for further details.

[215] "Dr." Carl Baugh's many degrees are apparently self-inflicted. Eve & Harrold (1991, 129) noted his anthropology doctorate emanated from an unaccredited Bible college in Irvine, Texas. His MA in archaeology and philosophy doctorate stemmed from the "Pacific College of Graduate Studies (Missouri Center)" branch of "Pacific International University"—an unaccredited Australian correspondence school founded by (drum roll, please, with concluding cymbal) Baugh's associate Clifford Wilson. Glen Kuban explored Baugh's murky collegiate background at his Talk.Origins Archive website. The full text of Baugh's jejune 1989 "doctoral dissertation" ("Academic Justification for Voluntary Inclusion of Scientific Creation in Public Classroom Curricula, Supported by Evidence that Man and dinosaurs were Contemporary") is proudly on display at his Creation Evidence Museum website. Diploma mills have also serviced Baugh acolyte "Dr." Kent Hovind, as noted by Brett Vickers at his Talk.Origins piece on creationist academic credentials (talkorigins.org/faqs/credentials.html). The degrees of notable Scientific Creationists (Henry & John Morris, Duane Gish, Steve Austin, Kurt Wise, etc.) are authentic, however—it's the quality of their post-doctoral reasoning that is contentious. Cf. Pine (1983). Gauzy doctorates also appear to decorate many prophecy authors, Boyer (1992, 310-311).

[216] A 1993 article by Jim Lippard in *Skeptic* magazine (Vol. 2, No. 3) covered the Jammal episode in detail, and is currently available online at the Talk.Origins Archive.

[217] This too had its paperback analog. Relative to dinosaurs being contemporary with humans, Sellier & Russell (1994, 225-247) presented the Creation Science position whole cloth. The sources were a familiar gallery: Donald Chittick, Duane Gish, Henry Morris, Paul S. Taylor, "Dr." Carl Baugh, and so on. Even for so trivial a datum as the origin of the word "dinosaur," a 1990 creationist book by Ken Ham *et al*. was cited rather than a real paleontologist, indicating how ingrained the tendency is among the pseudoscientific to keep to a very narrow rut of allowable source material.

[218] Sun International never thought to have the wood tested, though that is not always a deciding factor when it comes to items of religious significance—as the continuing fuss over the medieval Shroud of Turin indicates, Lane Fox (1992, 250-251) and Nickell (1987; 1998; 2001b; 2001c, 150-156). Nickell's 2001b article is also reprised in Kurtz *et al.* (2003, 265-274). For many centuries Christian pilgrims have been interested in Ararat because of its supposed Noachian provenance, and pieces of shrines and lean-tos may have been taken for pieces of the Ark. Wood fragments initially dated to 3000 BC by a Spanish laboratory (based on physical appearance and cell modifications) were eventually subjected to five independent radiocarbon tests which placed them around the 8th century AD, Stiebing (1984, 26-27).

[219] YEC John Woodmorappe (the nom de plume of Jan Peczkis) proposed to account for the niggling details in his 1996 book *Noah's Ark: a Feasibility Study* (unfortunately out of print at this writing). Glenn Morton's review of it (calvin.edu/archive/evolution/199607/0167.htlm) may be compared with Woodmorappe's "refutation" (at rae.org/pagesix.htm). Interestingly, Woodmorappe started off by declaring that "Morton is attacking the very Word of God" and quoted Martin Luther fulminating about similar "criminal monsters" who attacked Scripture. Whether such umbrage falls under the same category as Luther's considerable anti-Semitism, as noted by Hill & Cheadle (1996, 20) or Walters (2001, 55-61), is debatable—but it does suggest how ill-prepared Woodmorappe is to allow his Noachian conclusions to be tempered by evidence. More on Woodmorappe/Peczkis in the last chapter.

[220] Genesis is as imprecise about "gopher wood" as it is about Behemoth and Leviathan. The term was used in the Bible only that once—but if related to the Hebrew *kopher*, Akkadian *kupru*, and Arabic *kufr* (pitch), it suggests something in the pine family, possibly cypress, Gehman (1970, 339)

and *Revell* (1990, 252). Gish (1992, 71): "gopher wood (cypress)." The discussion of the Ark in *Revell* (1990, 52) added a cargo proviso reflecting Creation Science speculations: "Assuming that the animals hibernated, the ark could easily have accommodated as many as 35,000 different vertebrate 'kinds' along with Noah and his family. *See also* Cubit; Kind." Unfortunately, there turned out to be no listing for "kind" in *Revell* to explain their stance on that fascinating topic.

[221] Robert Moore (1983a, 3-5, 15, 32) and Tiffin (1994, 85-86). Cf. the exchange by Elmendorf (1983) and Moore (1983b). Landström (1969, 172-173) illustrates the 325-ft clipper *Great Republic* (launched 1853) and Labaree *et al*. (1998, 370) the 329-ft coal schooner *Wyoming* (1909), both economical vessels that enjoyed long careers, though restricted to coastal hauls. The largest wooden ship may have been the 444-ft long (180-ft beam) "treasure junk" used on the exploratory voyages of Chinese grand eunuch Zheng He (AD 1405-1433), Needham (1971, 533, 560), Boorstin (1983, 190) and a 2001 *NOVA* episode. Its watertight compartments could reportedly be flooded to hold fish—which may have soft-pedaled a necessity, if the extravagant ship *leaked*. Casson (1971) surveys shipbuilding in the ancient world (Egyptian reed boats with sails, oarsmen and cabins are known from 3200 BC; seagoing wooden planked craft by 2450 BC)—but no bulk cargo craft on the mythic scale of Noah or Utnapishtim. *Revell* (1990, 53) affirmed the Ark's stability at sea without detail. Gish (1992, 72) said "there must have been great tidal waves during this time. In God's design, the Ark was planned for stability, not for going great distances. All the Ark needed to do was stay afloat." Kent Hovind's website claimed the Ark would have been less stressed than a masted vessel (as though such a cataclysmic Flood would have been providentially calm just where the Ark happened to be)—cf. Moore (1983a, 22-24). Ross (1998, 161) reasoned similarly, but did not comment on the credibility of the Ark's given dimensions or whether mankind 20-30,000 years ago (when Ross suggested the localized Flood took place) was capable of even that level of naval engineering.

[222] The "advanced Bible folk" theory has an extended pedigree, with Rene Noorbergen (1977) an early advocate. Carl Baugh's "doctoral dissertation" blithely cited Noorbergen along with Charroux (1971b) and Landsburg & Landsburg (1974), as though these were works of legitimate scholarship. Showing no less confusion than Charroux (1971a) when it came to the accomplishments of "cave men," Sellier & Russell (1994, 103-104) hailed the "mind-boggling new discovery" of the Copper Age (3300 BC) "Ice Man" found in the Alps in 1991 (our chap of the 11 ribs). Early press referred to the body as "Stone Age," which misinformation they evidently took literally, remarking on the "advanced technology" the fellow possessed (a copper axe, some well-made arrows, his leather clothing and a plaited grass cloak). See Roberts (1993), Sjøvold (1993), Annaluisa Pedrotti, "Ötzi: The Ice Man," in Forte & Siliotti (1997, 114-119) and Dickson *et al.* (2003). I. D. E. Thomas also extolled the technology of the ancients when appearing on Noah Hutchings' "Watchman on the Wall" in 1993, though Thomas attributed the wonders of the Mayans, Egyptians, and such to the meddling of the "Sons of Man" fallen angels described in the *Book of Enoch*. For untethered hyperbole when it comes to hyping ancient technology, though, Goodman (1981, 217-218) deserves the award for claiming the primeval inhabitants of North America possessed "the applied understanding of the physics behind electromagnetics and Einstein's gravity waves." Jeffrey Goodman's peculiar views on human evolution in the Americas and impending doom àla Nostradamus will be encountered again in later chapters. But one can't pass up this: "Another scientific mystery exists in the Olmec's small, polished circular crystals of hematite and magnetite. These concave crystals are polished to such precision and with such precise progressive radii of curvature near the edges that Dr. Ignacio Bernal of Mexico's Natural Institute of Anthropology and History has wondered if they were camera lenses," Goodman (1981, 233). Actually, Bernal (1969, 78) described how those crystals (quite opaque) functioned as *mirrors*, which might possibly have been used "as a camera obscura" to aid in transferring reflected objects onto a tracing screen. Goodman evidently confused *camera obscura* with "cameras" of the Nikon photographic variety.

[223] Another example of sloppy production values occurred when the Minoans were being discussed in the segment quoted. The first picture to appear on screen was of the circular Caracol in the Mayan city of Chichén Itzá—2500 years and one hemisphere removed from Bronze Age Crete. As

the Mayans were mentioned at the end, it was possible the images were cued up in the wrong order.

[224] De Camp (1963), Hodges (1970) and Ronan (1973) survey "advanced" technology in the ancient world, most notably processes known but inadequately exploited, such as the Romans' neglect of steam power (no need to put the slaves out of work). Paul Veyne, "The Roman Empire," in Veyne (1987, 136-137) noted many such innovations would have required critical components only invented centuries later (such as the crankshaft and connecting rod "to transform longitudinal into circular motion"). See Brecher & Feirtag (1979) and Krupp (1978; 1997) on astronomical knowledge, Mayan and otherwise. Lauren (1974), Eggert (1996) and Fairley & Welfare (1998, 64-66) comment on the "Baghdad Battery," whose ritual and magic use is more likely than any galvanic industrial application. Interestingly one of the theories about what chemicals might have been used in it considered insect quinones a good bet.

[225] For instance, Henry Morris (1985, 126) maintained the Himalayas rose only within the time of man (mistaking a 1947 science reference to "the latest Tertiary and Pleistocene" that would still cover many millions of years). Only contemporary plate tectonics have explained not merely the formation of the mountains, as reflected in Palmer (1999, 142-143), but also the narrow gorge where the Brahmaputra River slices through to the Indian plain below. The Indo-Australian plate is plowing north two inches a year, causing the Himalayas to rise half an inch annually, forcing the river eastward to a weak spot where it makes an abrupt right turn through a steep canyon, Van Dyk (1988, 678-679). Another interesting case of a catastrophic explanation undermined by subsequent investigation concerns the claim in Velikovsky (1955, 83-89) that the Andes had risen recently, in part because of the existence of agricultural terraces seemingly too high to grow crops today. This has been relied on by as varied a crew as catastrophist Richard Milton (1997, 90) and Biblical creationist Kelly Segraves in his "Handy Dandy Evolution Refuter" (available at this writing online at parentcompany.com/handydandy/hdertoc.html). In the 1990s researchers discovered the reason owed nothing to geological upheaval, but rather to the adoption of European agricultural practices after the Spanish conquest. A fine PBS program on pre-Columbian agronomy showed how Andean terrace irrigation changed the frost penetration gradient. Andean farmers also had a broader repertoire of food crops, with over 200 varieties of the hardy native potato available. And maize (an import from its Central American homeland) could also be grown to an altitude of 13,000 feet, Daniel Lévine & Isabelle Tisserand-Gadan, "The Great Inca Empire of the Andes," in Forte & Siliotti (1997, 276-277). See also Keys (1999, 230-231) and Trawick (2002).

[226] Tiffin (1994, 39-41, 92-93) investigated the position of Whitcomb & Morris (1961) on this topic, including their proposition that Ararat was about two miles lower than presently, subsequently adding its current altitude through some frenzied post-Flood volcanism. Morris has shown some confusion in the course of criticizing competing Flood theories. Henry Morris (1972, 25) declared that "a flood which can cover a 17,000-ft. mountain for eight months is not a local Flood!" But Morris (1985, 252-253): "If the mountains were the same elevation then as now, which the local-flood theory assumes, the waters were at least 17,000 feet high (Mount Ararat, on which the Ark rested, is this high) for a period of at least nine months. To require such a condition to be a 'local' flood imposes impossible hydraulic demands on the water involved. One has to assume a sort of egg-shaped flood three miles high!" Morris & Morris (1996a, 67) repeat this, never considering how their scenario can't supply enough water either.

[227] See Robert Schadewald, "Creationist Pseudoscience," in Frazier (1986, 311-313). Brown's "Center for Scientific Creation" is in Phoenix, Arizona (with website at creationscience.com). Along the apologetic grapevine, Brown extolled "hydroplate" theory on D. James Kennedy's "Truths That Transform" antievolution weeks in 1993 and 1995. Ankerberg & Weldon (1998, 302) quoted an anonymous *Creation Research Society Quarterly* (Sep. 1996, p. 114) reviewer of Brown's 1995 book, who called the theory "elegant in its parsimony and explanatory power." Faid (1993, 44) slid off into hyperbole, claiming science refuses to acknowledge the truth about Brown's "hydroplate" interpretation of the seafloor because of "another scientific delusion—evolution." According to Faid, abandoning conventional geology means "they would be forced to admit the

existence of God." That would come as news to all those devout Christian creationists who established the outlines of modern geology in the eighteenth and nineteenth centuries.

[228] Tiffin (1994, 45-47) noted the evidence of seafloor sediment: no uniform Flood wash a few thousand years old—just sediment increasing in thickness (and age) the farther you move from the ridge. Crucial clues in the recognition of seafloor spreading were the signs of geomagnetic reversals (alternating bands of polarity running parallel to the rift). Creationists don't accept that, either, allowing for only magnetic decay (if it suggests the earth is young)—such as Henry Morris (1985, 157-158), Paul Taylor (1995, 14) or Huse (1997, 67-68), relying on creationist physicist Thomas G. Barnes. Criticism of Barnes focused on how he goosed the effect by laying the data along an exponential curve, Stephen G. Brush, "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 73-77), Kenneth B. Miller, "Scientific Creationism versus Evolution: The Mislabeled Debate," in Montague (1984, 40-41), Hayward (1985, 137-139), Robert Schadewald, "Creationist Pseudoscience," in Frazier (1986, 311-313), Strahler (1987, 150-155), and Kenneth Miller (1999, 65-66, 298n). The current edition of Henry Morris (1985, 157) hangs in there: "Thomas G. Barnes, *Origin and Destiny of the Earth's Magnetic Field*, 2nd Edition, (San Diego: Institute for Creation Research, 1983), 132 pp. In this new edition, Barnes firmly refutes the various arguments (e.g., supposed magnetic field reversals) that have been offered by evolutionists against this strong evidence." Old Earth creationist Hayward would take exception to his being lumped in that category! Morris & Morris (1996b, 322-326) reprise their opinions, though this time neglecting to mention that there had even been any criticisms. Which renders DeYoung (1989, 19) inversely prophetic: "Creationists eagerly await additional magnetic data, from either past records or present experiments, that will further refine our understanding of earth's magnetism." Which it has, though not as creationists might have hoped, where reversal patterns trace the tectonic shifts off the California coast, shown in Plate 3 (following p. 120) in Sieh & LaVey (1998), or along the Juan de Fuca Strait in the Pacific Northwest, Jon Erickson (1996, 42) and Hill Williams (2002, 1-17). Cf. Hollenbach & Herndon (2001) on theoretical mechanisms proposed for geomagnetism and field reversals.

[229] Pennock (1999, 12-13) remarked on the geophysical implausibility of Brown's "hydroplate theory" and how some creationists draw on Genesis 10:25 for reassurance that continental drift is Biblical: "And unto Eber were born two sons: the name of one *was* Peleg; for in his days was the earth divided; and his brother's name *was* Joktan." Under this "slim pickings" category are Gentry (1986, 281), Faid (1993, 39), and Kent Hovind (at his "Creation Science Evangelism" website). Hovind took the Peleg correlation so literally that he put the continental surge at 100-300 years after Noah (which would therefore be around 2300-2100 BC) but evidently before the confusion at Babel. In case Wendell Bird or Phillip Johnson care to branch out into *post hoc* accident litigation, there's an excellent opportunity concerning the decline of the Indus valley cultures that developed in northern India from 3300-1900 BC. Such reckless plate movement might offer an alternate explanation for their decline: whiplash following their homeland's abrupt collision with the Asian mainland. Though it is a pity their Mesopotamian neighbors (with whom the Indus maintained a lively maritime trade) were so inattentive not to witness the subcontinental landmass roaring across the Indian Ocean and throwing up the Himalayas when it struck. See Johnstone (1980, 173) on Ur-Indus trade, *Past Worlds* (1988, 130-131) for a quick overview of Indus society, and Massimo Vidale, "Urban Architecture of the Indus Valley," in Forte & Siliotti (1997, 191-197) or Mike Edwards (2000) for recent archaeological discoveries.

[230] Cohn (1996, 49-69) described Burnet and Whiston's geological theories, which (like Brown's) were contrived precisely to account for the Flood.

[231] Hayward (1985, 151-152) noted how Young Earth creationist Joseph Dillow (in his 1981 book *The Waters Above—Earth's Pre-Flood Vapor Canopy*) whittled down the dynamically unstable Whitcomb-Morris canopy model. The pre-Flood climate described in Henry Morris (1963, 68-70) was absurdly static, where all rivers formed through condensation and no storms or winds occurred—but such idyllic parameters are actually a necessity to keep the vapor canopy from jostling apart. Strahler (1987, 195-197) surveys canopy scenarios (notably that of Larry Vardiman) and the problems with them, particularly the atmospheric dynamics that would inevitably dissipate

any discrete vapor layer. Tiffin (1994, 35-38, 195-199) also explored how canopy theory required the water to be in *vapor* form, and the disagreeable consequences that steamy condition would have on terrestrial climate via absorption patterns and greenhouse effects. Ratzsch (1996, 98-100) exhibited high specific density when it came to this subject. Though aware of Strahler (1987) and Tiffin (1994), Ratzsch accepted at face value the Creation Science contention that the pre-Flood topography was different, as though it were a reasonable inference from scientific data and not an *ad hoc* postulate to rescue the theory from the selfsame facts. That Ratzsch pegged criticism of the Flood as a misrepresentation of the Creation Science position by *evolutionists* was an episode of analytical deconstruction on a par with the antics recounted in Sokal & Bricmont's *Fashionable Nonsense*.

[232] DeYoung (1989, 79). He did not identify what study he had in mind when it came to calculating canopy obscurantism.

[233] Tiffin (1994, 184-187), who as a botanist was aware of such things. Which does put a rather different twist to Gish (1990, 28): "Not only is photosynthesis very, very complicated, *it had to be in place from the very beginning!*" Cf. Robert Moore (1983a, 12-13) on Ark seed storage.

[234] Henry Morris (1985, 125), restating the well-aged opinion of Morris (1963, 68-70), conveyed to the youngsters in sugar coating via Gish (1990, 74; 1992, 76). Gish (1995, 127) made offhand reference to the success of the aforementioned polar dinosaurs being due to the "worldwide mild climate" permitted by the greenhouse effects of the canopy. Neither Morris nor Gish offered citations to buttress their opinions. Chittick (1984, 185-195) offered similar views with a few peripheral references (such as from the *Moody Monthly*). Faid (1993, 33-37) relied on Dillow and Vardiman, while Huse (1997, 93-94) directed the reader to Dillow alone for "further detailed information regarding the earth's pre-Flood vapor canopy." Schroeder (1997, 202-203) vaguely attributed the purported decline in post-Flood/Babel longevity to "a more demanding climate."

[235] As recounted in note 92 from chapter two, regarding Henry Morris (1985, 86).

[236] Henry Morris (1963, 44-45). No references were provided, particular apropos those "giant men!" Cf. Cole (1985b) on Biblical giantism (Burdick & Baugh thought Adam could have been 10-16 feet tall). Furthermore, however large sauropods may have got sixty million years from their prosauropod roots, the *earliest* representatives of the fauna Morris mentioned were the quite modest archosaurs and those downright diminutive basal mammals. See the relevant sections in Lambert & The Diagram Group (1985) or Rich *et al.* (1996).

[237] On each occasion Baugh tactfully skipped discussing how his fellow Biblical creationists had descended on the Glen Rose site over the years and failed to see the *in situ* "man tracks" he had promised. Baugh's theories on the pre-Flood environment were enthusiastically quoted by Sellier & Russell (1994, 236-238), and Baugh himself was lecturing to a blithely credulous host of Trinity Broadcasting Network's *700 Club* as recently as a February 28, 2002 airing.

[238] See Lambert & The Diagram Group (1985, 130-131) or Rich *et al.* (1996, 412-413) on *Dimetrodon*—at nearly 12 feet snout to tail, about the size of a Komodo dragon. Czerkas & Czerkas (1991, 42-49) describe the Permian milieu of *Dimetrodon* and its potential dinner. Listening to the "Watchman on the Wall" discussion was a comic treat: referring to prehistoric fauna as varied as plesiosaurs and pterosaurs invariably as "dinosaurs," Baugh distinguished dinosaurs from modern reptiles like crocodiles or iguanas by saying they had a different number of skull openings. Which is precisely opposite from the truth—and that's even throwing in the *antorbital fenestra* (the small openings in front of the eyes in archosaurs) which crocodiles share with their dinosaur and bird cousins, Fastovsky & Weishampel (1996, 88). Cole *et al.* (1985a, 2-3) and Hastings (1985, 13; 1987, 38-39) describe more of Baugh's paleontological confusion.

[239] Ankerberg & Weldon (1998, 302-303), no references cited.

[240] Not that NASA is immune from chasing rainbows, flushing a million dollars down the drain in the 1990s trying to replicate the supposed antigravity effects of the Podkletnov superconductor disc, Park (2000, 135-138). The critical Institute For Biblical and Scientific Studies (bibleandscience.com/carl%20baugh.htm) recounts further "scientific" Baughisms.

[241] This insight did not intrude on Paul Nelson & John Mark Reynolds, "Conclusion," in Moreland & Reynolds (1999, 99) when they gamely tried to exorcise Flood Geology's historical legacy of

inactivity. "In many cases, young earth creationists would need decades of fully funded research just to begin to get a grasp on a new way of looking at the mountain of current data. Skeptics of young earth creationism sometimes claim that we, too, have had centuries to work on these problems, but this is false. Young earth creationism failed to answer the initial geological (prior to Darwin) and biological (after Darwin) challenges. With the advent of each challenge, almost all scientists, philosophers, and theologians of note 'switched sides.' This was due in part to a commitment to naturalistic methodology that made any non-supernatural answer preferable, even for theists, to any theistic one. *The problem was philosophical* and not a matter of 'evidence.'" But if Young Earth lethargy back then really were due "in part" to philosophy, not evidence, of what then did the *other part* consist? This they did not explain—though implicit to their argument was the idea that features like Siccar Point weren't really old, but only looked that way to 18th century creationist geologists infected with the new naturalism virus. This is pure von Däniken defense, and put them on the same analytical divot as Phillip Johnson's coy disposition of the reptile-mammal transition.

[242] In a phone conversation I had with Kent Hovind in 1997 he mentioned the snake venom mutation but did not appear unduly concerned over Baugh's optimistic original *Dimetrodon* goal. A reply to a 1999 e-mail inquiry to the "Ankerberg Theological Research Institute" website (ankerberg.com) established that Dr. Weldon was out of the country and referred me to Baugh. Since Baugh's website offered his "doctoral dissertation" in its entirety, the short section on the biosphere experiment was revealingly sparse on technicalities. There was no allusion to potential dimetrodons or piranhas, and the only change claimed for the snake venom (a local copperhead) was that it had become "clear, and has the consistency of water" (as opposed to the normal condition: "milky, somewhat thick, and has a yellowish tint"). Apparently a control group was used for the fruit flies—though only "some" of the hyperbarically-challenged insects "lived significantly longer" (no data given). By happenstance a PBS program on aging aired during this writing and serendipitously mentioned Michael Rose's work with fruit flies. His 10-year effort (involving 100 fly generations) bred a variety with a doubled life span—but that was under normal living conditions. In an arid environment, for example, fruit flies normally drop dead in only 12 hours, while Rose's geriatrics survived five times that long. Somehow I doubt Baugh's experimental regimen will prove quite so meticulous as Rose's. And, of course, the clincher would be that such findings would have to be *independently replicated*—which is how science weeds out the biased one-shots that inevitably crop up when human beings let their ideological expectations get the better of them.

[243] Hovind's speaking engagements often run to several each week all through the year (posted online at drdino.com). Just to close the "blind leading the blind" circuit here, the Ankerberg website offers on audio and videotape the lecture "Kent Hovind Discusses Creation and Evolution." With unsurpassed irony a tag line reads: "Kent Hovind—Don't Check Your Brains at the Door." Speaking of which, don't forget the tendentious "authority quote" appendix Ankerberg & Weldon supplied for Moreland (1994a)—together with Hugh Ross, Kurt Wise, Stephen Meyer, and Phillip Johnson, thus did *The Creation Hypothesis* boat row merrily into the antievolutionary sunset. Pennock (1999, xvi-xvii, 31-32) remarked on the increasing popularity of creationist seminars at churches and colleges (from the traditional ICR-sponsored gatherings to Intelligent Design cavalcades featuring Phillip Johnson, Walter Bradley, and philosopher Alvin Plantinga), along with the creationist media activities of evangelists like Ankerberg. One tidbit Pennock mentioned was a 1992 edition of a Young Earth antievolutionary pamphlet "Big Daddy?" being distributed on his campus (the University of Texas). Apart from some new references to "Dr. Kent Hovind" and Scott Huse's *The Collapse of Evolution*, the content of the pamphlet was virtually identical to the 1972 version I had tucked away in my files, indicating how persistent the old ideas are, ready to be invoked by the unwary scientific illiterate like some theologically-correct version of the psychokinetic "Id" monster from the 1956 science fiction classic *Forbidden Planet*. Trenchant commentary on the scientific inadequacies of "Big Daddy?" is available at Talk.Origins; the pamphlet entire may be observed at the website of its California distributor, evangelist Jack Chick (chick.com). Both editions of "Big Daddy?" offer an appreciation to creationist Bolton

Davidheiser "for helping to make this book possible." Numbers (1992, 234) described his short stint on the board of the Creation Research Society in the 1960s: "Davidheiser, a Johns Hopkins-trained zoologist who preferred working in the secular environment of Disneyland to teaching at such liberal evangelical colleges as Westmont and Biola," was a "man of prickly principles" who "refused to continue on the CRS board so long as it tolerated such dangerous anti-Christian cultists as the Seventh-day Adventists, whose teachings he abhorred but never quite understood."

[244] Young Earth creationists Paul Nelson & John Mark Reynolds, "Conclusion," in Moreland & Reynolds (1999, 96) freely lumped claims of Noah's Ark wood in with Bigfoot under the "quacks and lunatics" column. "Cultures in decay often show an unhealthy interest in such marginalia," they gravely opined, "One thinks of the interest in the paranormal in Russian society before the disaster of 1917." This judgment was sheer historical revisionism: Russian culture has long been fascinated with traveling mystics and psychic phenomena, a milieu only partly suppressed during the materialist Soviet regime, as the undercurrent of surprisingly gullible psi research reported on so favorably by Ostrander & Schroeder (1970) indicate. Following the collapse of the Soviet Union, Russian superstition resurfaced at full strength—a process which skeptics consider not unrelated to the equivalent revival of that traditional cultural monolith, the Russian Orthodox Church. See Polidoro (1997) and Kapitza (1999) on the contemporary Russian pseudoscience scene. Further undermining Nelson & Reynolds' polemical point is the fact that spiritualism and psychical research enjoyed equally broad popularity outside Russia at the turn of the century. The tragedy of World War I then added grieving parents and widows trying to contact the "other side," sadly chronicled by the spiritualist writings of British physicist Oliver Lodge (1910; 1916). Cf. also Steven Hoffmaster, "Sir Oliver Lodge and the Spiritualists," in Frazier (1986, 79-87).

[245] This in an exchange I had with Meyer at the Whitworth "Creation Week." Phillip Johnson had earlier sloughed aside the issue of Young Earth creationism as a distraction of no consequence. Other than that, the subject didn't come up in any of the sessions I attended. Such a casual attitude toward the Young Earth is also evident at the Access Research Network website (arn.org). The "Featured Authors" consist of teacher and editor Mark Hartwig, Michael Behe, Phillip Johnson, Stephen Meyer, biologist Jonathan Wells, mathematician William Dembski, and Paul Nelson—the latter youthful quartet referred to by Pennock (1999, 29) as the "four horsemen" of the Intelligent Design movement. Nelson is the grandson of 1920s creationist Byron C. Nelson, who for a time helped spread the gospel according to George McCready Price, Numbers (1992, 100, 107-108) and Pennock (1999, 29). Paul Nelson's *nouveau* Young Earth creationism was not alluded to in the main biographical page. It drew only a passing glance in Dembski's 1996 paper, "What Every Theologian Should Know about Creation, Evolution, and Design," and none in Dembski (1999a). It played no part in "Homology: A Concept in Crisis," co-authored in 1997 by Wells and Nelson. Both articles (reprinted at the ARN website) acted as though the Young Earth was epistemologically irrelevant to deciding whether fossil evidence suggested evolution. Underestimating the implications of the fringe is a venerable creationist tradition, however, going all the way back to the days of Day-Age creationists praising Price's geological acumen because it supported antievolutionism, without fully comprehending how Flood Geology contradicted their own view of terrestrial chronology, Numbers (1992, 99-101).

[246] The "common enemy" argument was stated with particular stridency (not to mention *italics*) by the side with the most to gain from the revolution. Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 100): "Philosophical naturalism is retarding science, philosophy, and theology. It seems to both of us that our reviewers agree in finding such a situation intolerable. *To fail to unify with such people of goodwill in the assault on naturalism would not just be foolish; it would be intellectual treason.* There is no reasonable chance that a society forcibly wedded to naturalism will be interested in the young earth project. When the intellectual climate is different, the time will have come to explore these important issues." Hope thus springs eternal.

[247] Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 49) acknowledged the obvious: "Natural science at the moment seems to overwhelmingly point to an old cosmos. Though creationist scientists have suggested some evidences for a recent

cosmos, none are widely accepted as true. It is safe to say that most recent creationists are motivated by religious concerns." Robert C. Newman, "Conclusion," in Moreland & Reynolds (1999, 153) begged off from commenting on the validity of transitional forms as though paleontology were one of the Arcane Mysteries: "I don't have the enormous amount of specialized training and field experience in biology and geology that would be necessary for this." Finally, Howard J. Van Till, "The Fully Gifted Creation," in Moreland & Reynolds (1999, 182) maintained "that the Christian doctrine of creation provides a far more substantive foundation for the concept of evolution than does the worldview of naturalism." Yet his fifty-plus pages offered no specific animal illustration (either fossil or living) to lend such substance. This put Van Till's *evolving creation* interpretation in the same "coming attraction" bin as Nelson & Reynolds' missing Flood evidence, and helps to explain why theistic evolution is considered so irrelevant by special creationists (who take their Bible straight) and naturalistic evolutionists (who don't take it at all). Much of the debate (such as whether God "sustains" the creation) is reminiscent of the theological tussle that went on when Darwin's theory first hit the scene. For example, Van Till's conception of evolution sounds not unlike that of geologist James Dwight Dana, Livingston (1987, 74). For a more effective reconciliation of naturalistic evolution with Christian ideas about God, see Kenneth Miller (1999). One important note about the resources employed by the contributors to *Three Views on Creation and Evolution*: most cited Michael Behe (1996) as a star witness demonstrating evolutionary inadequacy—with only Van Till criticizing Behe's Intelligent Design position (though without venturing concretely what was wrong with it). Behe sightings in Moreland & Reynolds (1999, 81, 99, 115, 204, 220, 268, 273) were made respectively by John Jefferson Davis, Nelson & Reynolds, Newman, Van Till, Walter L. Bradley, Richard H. Bube, and Phillip Johnson. Farther afield, *Darwin's Black Box* was quickly recruited by Muncaster (1997, 27), a frenetically compressed antievolutionary pamphlet distributed by D. James Kennedy, while Ankerberg & Weldon (1998, 195-208) jumped on the bandwagon by devoting a whole chapter to recycling Behe's argument. Hunt (1998, 28-34) and Colson & Pearcey (1999, 88-89) also invoke Behe. The catchphrase of "irreducible complexity" may be expected to continue bobbing up in future Biblical creationist literature, much as Johnson's *Darwin on Trial* was embraced by Lubenow (1992, 26) and Gish (1995, 17-18). At the outer reaches of the creationist absorption band, evangelical apologists Thomas & Farnell (1998, 128n) recently cited Johnson (1993b) as "an excellent critique of evolution."

[248] Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 48, 56) twice reminded their fellows that the founders of the Christian church accepted Adam and Eve, Noah and the Flood as real events and personages; cf. Bert Thompson (1995, 95-103, 179-180) or Morris & Morris (1996a, 14, 62-63, 68). But even localizing the Flood as Old Earth creationists or theistic evolutionists are wont to do doesn't resolve why Jesus shared his contemporaries' befuddlement on this point. Johnson (1995, 109) tiptoed through this minefield with his customary obliqueness: "Where scientists sympathetic to Christian theism have been unable honestly to interpret the empirical evidence in a manner consistent with the Genesis chronology or a worldwide flood, that is a genuine empirical problem that intellectually honest Christians cannot ignore in deciding how to interpret the Bible or understand biblical authority." Whether this meant the Bible or the evidence was wrong he didn't venture (there were no applicable references in the Research Notes for that chapter to illuminate his remarks).

[249] Phillip Johnson, "Reflection 2," in Moreland & Reynolds (1999, 277). Johnson's lack of optimism re Nelson & Reynolds' "distinguished scientists" was warranted. E.g., Paul Nelson & John Mark Reynolds, "Conclusion," in Moreland & Reynolds (1999, 98) noted "in the 1994 *Proceedings of the International Conference on Creationism*, six creationist scientists, all with relevant terminal degrees, presented a paper entitled 'Catastrophic Plate Tectonics: A Global Flood Model of Earth History.' This paper provides a new theoretical way of understanding the flood of Noah and its impact on the geological record. It solves many problems, while providing a huge amount of room for future research." Nelson & Reynolds reveal no details of its content or the identities of the authors. But the Creation Science Fellowship website indicated they were Kurt Wise, Steven Austin, geophysicist John Baumgardner (with the Los Alamos National Laboratory),

physicist Russell Humphreys (of Sandia National Laboratory), geologist Andrew Snelling, and atmospheric scientist Larry Vardiman (who appeared on the 1993 CBS Noah's Ark show). Austin, Snelling, and Vardiman are presently among the "resident faculty" at the ICR (with Duane Gish, Henry and John Morris, biologist Kenneth B. Cumming, and Donald DeYoung). Baumgardner is a mix of traditional evangelical YEC ideologue (for example, at youngearth.org/baumgardner.htm) and accomplished technician (his TERRA program is widely used to model the earth's mantle). Cf. icr.org/research/jb/debatehighlights.html with the oblique coverage Witham (2002, 240) gave to Chandler Burr (1997). Frazier & Frazier (1998) describe the occasionally prickly interaction between Humphreys and his non-creationist Sandia lab associates. Johnson (1998b, 31) showed more enthusiasm for Nelson solo: "The notion that we can reprogram the developmental process by DNA mutation is likewise questionable. For example, a PhD dissertation by Paul Nelson, to be published in late 1998 by the University of Chicago's distinguished 'Evolutionary Monographs' series, explains in detail how all attempts to change the direction of embryonic development by inducing mutations have failed. This point is of central importance, because all existing macroevolutionary scenarios depend on the assumption that one can reprogram the DNA 'recipe' by inducing mutation, and thus change the direction of development and produce a viable adult phenotype. If this assumption were restated as a testable hypothesis, and examined objectively, I see no reason to believe it would survive." Johnson (2000, 61-62) is similar. The problem Johnson overlooked is whether current biology could really do that. In point of fact, most developmental genes haven't been properly isolated, let alone characterized to the stage where they might be tinkered with meaningfully (were such skills available). Next chapter, we'll see this methodological issue plaguing Michael Behe's "irreducible complexity" argument.

[250] Pennock (1999, 30, 84) called attention to Phillip Johnson's "pleading the Fifth" reluctance to engage the Young Earth issue in his antievolutionary works. Cf. Johnson's "Weekly Wedge Update" for July 9, 2001 (at arn.org). As for Johnson's intuition about how "awkward" the idea of a genetically meddling deity is, the extent of that will be examined next chapter.

[251] Johnson (1991, 114-115). A footnote to the first sentence declared: "A variety of terms have been used in the literature to designate the philosophical position I call scientific naturalism. For present purposes, the following terms may all be considered equivalent: scientific naturalism, evolutionary naturalism, scientific materialism, and scientism. All these terms imply that scientific investigation is either the exclusive path to knowledge or at least by far the most reliable path, and that only natural or material phenomena are real. In other words, what science can't study is effectively unreal." Johnson (1995, 37-38) reiterated this caricature. In a comment on the Kansas science standards flap (December 1, 1999, obtained online at Discovery Institute) Michael Behe translated naturalism into the stipulation that "if God is forbidden to act in history, miracles are out." Cf. note 39 (chapter six) on William Dembski. Similar angst spans the antievolutionary rainbow in Moreland & Reynolds (1999, 62-63, 87-88, 123, 165n), from YEC Paul Nelson & John Mark Reynolds to the riposte by J. P. Moreland. OEC Robert C. Newman was "concerned about the prevalence of the idea that science by definition excludes the supernatural." And theistic evolutionist Howard J. Van Till chose "to use the terms 'naturalism' and 'naturalistic' only in reference to a comprehensive and atheistic worldview" (to be distinguished from an operational reliance on God-given natural properties, which he calls the "robust formational economy principle"). See Pennock (1999, 189-194) for a tidy survey of the philosophical varieties of "naturalism" and how such selected definitions relate to them.

[252] Robert C. Newman, "Progressive Creationism," and Howard J. Van Till, "The Fully Gifted Creation," in Moreland & Reynolds (1999, 126, 165-169) indulged in similar omissions when they characterized how naturalistic evolutionists approach teleology.

[253] This is certainly the attitude that pervades works from Sagan (1996) and Kurtz (2001) to any random issue of *Skeptical Inquirer*, whether they are talking about the peculiarities of historical Christian belief, the New Age channeling mythology of Shirley MacLaine, or the abduction stories of UFO contactees.

[254] The chapter on "Darwinist Religion" in Johnson (1991, 123-132) was long on overall philosophy and short on particulars. For example, the Darwinist insistence on the mechanistic

evolution of sauropods would have little bearing on whether the Biblical injunction to execute witches (Leviticus 20:27 & Exodus 22:18) ought to be enforced today, or whether deciding to forgo the penalty would call into question pronouncements on other moral and social matters. Pennock (1999, 294-298) has taken this element even further, inquiring whether there was to be a "theistic legal system" in store along with "theistic science" that will put that sort of bite back into jurisprudence in the post-naturalism era. Pennock dubbed it "the problem of the demon lettuce" (where the 6th century St. Gregory discerned that a woman had eaten a demon in the form of a lettuce). Pennock (1999, 300) noted Johnson was in the audience when he presented this argument but declined to comment on it, nor did Johnson (2000) allude to it in his criticism of Pennock. I doubt Johnson was amused.

[255] Johnson (1995, 49). Pennock (1999, 185-187) regards Johnson's loaded use of a narrow atheistic definition of "evolution" set against a broad "mild-mannered creationism" as only the latest incarnation of the basic creationist "dual model" approach to antievolutionism.

[256] Dalrymple (1991, 15-16) lists an assortment of estimates for the age of the earth. That includes the rearguard action lead by renowned physicist Lord Kelvin (the discoverer of the second law of thermodynamics), whose calculations steadily whittled the earth's age down to under 40 million years (and the sun to around 100 million years). See Stephen G. Brush, "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 61-62), York (1997, 26-37), Hellman (1998, 105-119), Zimmer (2001g, 58-62) or Gould (2002a, 492-502) on Kelvin's theories and the fate radioactivity had in store for them. (The aged Kelvin lived to attend Ernest Rutherford's 1904 lecture describing the new phenomenon.) Four score years later, Chittick (1984, 231) valiantly manned the YEC barricades: "With appropriate evolutionary assumptions, it was possible to use data from radioactivity to calculate an age very much greater than that given by Kelvin's calculations. This dating technique could give the vast ages needed by evolutionists. As a consequence, Kelvin's conclusions were no longer considered valid." But it was the very *existence* of radioactivity that pulled the plug on Kelvin's figures, founded as they were on the mistaken idea that no internal heat source other than gravitational contraction existed to contribute to the observed thermal characteristics of the earth.

[257] Longair (1996) ably surveys the development of current cosmological thinking and the many unresolved challenges still ahead for the discipline (more on this in chapter seven). Noted also by Gribbin (1998, 118-128), the big cosmological questions involve how much "dark matter" there is in the universe, and whether neutrinos have mass (there are so many of them even a teensy-weensy value would have profound implications for galaxy formation).

[258] Henry Morris (1985, 137-149) and Chittick (1984, 232-238) are typical Creation Science examples. Melvin Cook crops up as the closest thing to an accredited expert here, something which especially impressed catastrophist Milton (1997, 37-45). Ankerberg & Weldon (1998, 290-295) added Lubenow (1992) to their citational arsenal along with Cook. Among the tidiest anticreationist responses to Morris, Cook *et al.* was by physicist Stephen G. Brush, "Finding the Age of the Earth: By Physics or By Faith?" in Zetterberg (1983, 296-349), abridged as "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth, in Godfrey (1983, 59-71). The radioactive dating defenses of Kitcher (1982, 156-162) and McGowan (1984, 83-86) were more general and brief. See Dalrymple (1991) for an overall survey of dating methodology, radiometric and otherwise—even at the risk of incurring the wrath of Milton (1997, 265), who fumed that "Darwinists now invoke Dalrymple's name like a talisman." Or one may peruse Palmer (1999, 166-167) and Zimmer (2001d). R. Taylor (2000) recaps the contribution of radiocarbon dating (including even the touchy subject of the Shroud of Turin). The discussion in Strahler (1987, 155-158) related carbon-14 fluctuations to long term climate analysis—a process that has continued apace, such as by Kitagawa & van der Plicht (1998). Broecker (1995, 64-65) noted how a shutdown of the oceanic thermal conveyor can disrupt carbon-14 balances (though this would make living things from such a period date *younger*, not older).

[259] Henry Morris (1985, 146-147, 162) duly noted such anomalistic argon and radiocarbon dates, though in the latter case Morris did not explore the role of industrial carbon output. Huse (1997, 66) and Milton (1997, 47) subsequently drew off Morris for the argon finding—Huse citing Morris

directly, while Milton evidently used *Scientific Creationism* as a springboard as he had with Colbert on the dinosaurs (again quoting the identical passage and information in the same order). Morris & Morris (1996b, 320-322) reprise their position, though citing no material more recent than 1974. A failure to appreciate how scientific practices change and improve with experience hobbles one YEC website ("Word on the Street" at 2eternity.com/science/sci1.htm) when they confidently field Keith & Anderson (1963) and Riggs (1984) for anomalous radiocarbon datings, but without explaining the reasons the authors supplied for why the figures were so off (incorporation of carbon-14 deficient humus in the case of river mollusks and fixation of dissolved HCO_3 for snails living in desert springs, respectively). Another piece from the 1963 *Science* they did not cite, Rubin & Taylor (1963), similarly explored how radiocarbon readings needed to take into account other factors, such as mass spectrometric isotope studies to provide baselines for dating calibration. All this was necessary groundwork for assessing readings of fossil and living samples, of course, and could hardly support an indictment of how radiocarbon analysis is conducted *in 1999* (the copyright date for the site). See also Weber (1982) and Kevin R. Henke (tim-thompson.com/plaisted-review2.html) on YEC radiometric dating claims.

[260] Dalrymple (1991, 102-121) has an exceptionally clear description of the principles of isochron dating; see also Kenneth B. Miller, "Scientific Creationism versus Evolution: The Mislabeled Debate," in Montague (1984. 26-36) or Miller (1999, 72-76). Other critics of Young Earth creationism noting the implication of isochrons include Stephen G. Brush, "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 61-62), Hayward (1985, 106-112), and Strahler (1987, 130-138).

[261] For instance, Henry Morris (1985) and Gish (1995, 50) didn't feel the need to discuss isochrons. Consequently, as with the reptile-mammal transition, Huse (1997) and Ankerberg & Weldon (1998) sported no derivative allusions to them. Paul Taylor (1995, 64) briefly dismissed isochrons, which may be compared to the background provided at Talk.Origins by Chris Stasson.

[262] Austin (1994, 116-128). Ham (1998, 105) duly repeated Austin's findings as though they signified something other than sleight of hand. Talk.Origins contributor Chris Stassen related the history of Austin's Grand Canyon pseudo-isochron adventures (along with its methodological trick) at ics.uci.edu/pub/pub/pub/bvickers/origins/isochron-dating.txt; cf. Wise (1998, 165).

[263] Milton (1997, 53-56).

[264] Roger Lewin (1987, 189-210, 225-252) wryly described the controversy in considerable detail, drawing on his own personal correspondence with the participants, all part of the rather select paleoanthropological club.

[265] Lubenow (1992, 247-266)—thence secondarily cited by Ankerberg & Weldon (1998, 294-295). Cremo & Thompson (1993, 693-698) offered a similar assessment of the KBS Tuff case in furtherance of their Hare Krishna perspective (where human beings have been around for hundreds of millions of years). Their "Old Humanity" view may be contrasted with the general rejection of radioactive dating by Young Earth creationism, such as Henry Morris (1985, 144-145). As for Lewin's own version of the KBS Tuff controversy, Lubenow (1992, 286n) argued that, "By omitting many of the details that I have included, he is able to make the affair a graphic victory for the dating methods. Accounts like his explain why many people continue to put almost unlimited faith in the dating methods."

[266] Dummett & Mann (1980, 65-69). The misidentification stemmed from a reference in the account books of King Charles VI of France recording the purchase of three packs of cards from the painter Jacquemin Gringonneur in 1392. The Bibliothèque Nationale did have a partial set of tarots, and even though nothing suggested the Gringonneur cards were specifically tarots, one mid-19th century author decided to equate the two. This conclusion jump was duly promoted by 20th century occult tarot enthusiasts yearning for a preemptively early date for the tarot.

[267] Roger Lewin (1987, 75) and Eldredge & Tattersall (1982, 79-80). More will be said about Piltdown Man in due course—especially the cultural prejudices that accounted for why the fraud was accepted in the first place.

[268] Whitcomb & Morris (1961, 343-344). Not that such a QED was unexpected. Morris (1972, 89): "We are forced to the conclusion, as Bible-believing Christians, that the earth is really quite

young after all, regardless of the contrary views of evolutionary geologists. This means then that all the uranium-lead measurements, the potassium-argon measurements and all similar measurements which have shown greater ages have somehow been misinterpreted." Lloyd Bailey (1993, 27-29) noted a curious feature about Creation Science rejection of radiometric datings. Since *everything* is supposed to be the same few thousand years old, a sliding calibration scale is required—where the isotope balances presumed to have been seeded in the primordial rock labeled "Cambrian" had to be different from those in "Jurassic" deposits. See also Kenneth Miller (1999, 76-80).

[269] Henry Morris (1963, 56-58), citing Simpson, "'The History of Life,' in *The Evolution of Life* (Sol Tax, Ed., University of Chicago Press, 1960), p. 175." Morris & Morris (1996a, 19; 1996b, 316) are far briefer, but still press the doctrine. Cf. Price (1980) on the slippery (and selective) slope of YEC "omphalos" reasoning (so-named for the 19th century antievolutionary apologist Philip Gosse who claimed the geological record was simply created to look old).

[270] There are cosmologists like Magueijo (2001) or Davies *et al.* (2002) who propose tinkering with c (especially for the *very* early universe)—cf. Morrison (2003) reviewing Magueijo (2003). But Australian creationist Barry Setterfield's *infinite* c at creation creates quite a mess, Hayward (1985, 139-141). DeYoung (1989, 128-129) appeared unaware of such problems in his defense of Setterfield, unlike the Answers in Genesis website (which opts instead for a new Bible-friendly cosmology proposed by Russell Humphreys). Cf. Pennock (1999, 83-83) on a 1997 Young Earth conference on radioactive dating that flirted with faster decay rates in the past without resolving the problem of how to dissipate the extra heat implied by that change.

[271] As has been seen in other cases, the position of Whitcomb & Morris (1961, 369) on creation with apparent age for starlight was repeated without elaboration or technical defense in later sources, such as Henry Morris (1972, 62; 1985, 210). DeYoung (1989, 80-81) renames the idea "mature creation," but the rose even by this name is still pretty wilted.

[272] In case you were wondering how astronomers can be so certain Andromeda really is some 2 million light years away, this flows from the implications of stellar parallax and apparent magnitude. Measuring parallax is simple trigonometry. When a star shows a parallax shift of one second of arc compared to its position seen when the earth was on the other side of its orbit, the star is one "parsec" away—a bit over 3 light years. (Incidentally, in *Star Wars* Han Solo used the term "parsec" incorrectly, treating it as a measurement of *time* rather than *space*—it was like saying you did the trip to the store "in three miles." But then, no one has ever claimed George Lucas was an astronomer.) In 1838 detailed parallax measurements determined the star 61 Cygni was about 10 light years from earth. Since we now knew the absolute distance of 61 Cygni, its *apparent luminosity* could be converted to the *absolute brightness* of the star. In 1843 French geologist Marcel de Serres used that piece of info for this subtle bit of reasoning: if Andromeda had *even only one* star as bright as 61 Cygni, just how far away would it have to be for its apparent magnitude to be so dim as it was? Serres reckoned it was at least 230,000 light years away. Modern astronomy has improved the determination, but the reasoning is basically the same. See Stephen G. Brush, "Finding the Age of the Earth: By Physics or By Faith?" in Zetterberg (1983, 305-306) and reprised as "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 53-54). Cf. also Freske (1980, 34-37).

[273] Although Chittick (1984, 37) opined that astronomers "cannot directly observe the past," that is *exactly* what they do—a point equally lost on Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 52), who offered one of the more labored analogies in defense of "apparent age." As one of their mothers was fond of making ersatz antique furniture, "Was she deceiving her guests when she placed such a chair in the living room?" Blissfully unaware that anything 6000 (or whatever) light years away should be showing the *actual moment of creation*, with everything beyond that "apparent age" artifice, the cosmological living room would consist of practically nothing but fake chairs. All the stars visible to the naked eye are well within our galaxy, and most are quite close—Polaris only 400 light years. Thus it is the mind-bogglingly vaster telescopic universe that would be window dressing if "creation with apparent age" were true.) Though Nelson & Reynolds insisted "the Bible and certain small indications in the

natural world" label the "natural" stars from the imitations, they did not identify what those might be.

[274] A sign of the weighty crush of astronomical evidence is how the firmly-YEC Answers in Genesis' 2002 criticism of Kent Hovind (re note 61 above) nonetheless recognized that distant starlight represents the outcome of stellar events. Meanwhile, the fence-mending Ratzsch (1996, 96) accepted the more doctrinal Creation Science "logic" here without even a grain of salt: "if God wishes to present the new humans with a dazzling stellar night sky involving a wide variety of objects at genuinely stellar distances, he would have to either sit and wait millions of years for the light to arrive at the earth or else create light in transit, giving the appearance of age." *Objects* again. Without considering any of the methodological implications of "apparent age" when applied to astronomy, Ratzsch dubbed the short criticism on this point by Dawkins (1986, 293) an "egregious" error. Unaware how far out on the pseudoscience limb he was sliding, in his notes for the section Ratzsch (1996, 211n) innocently sawed it off, remarking that John Whitcomb "thinks that only the unavoidable appearances of age were present. Thus, for example, created trees had no growth rings. Whitcomb would probably be delighted with recent reports of fossilized wood showing 'no evidence of tree rings.'" But the passage Ratzsch cited from Sereno (1995a, 44) read: "Fossil conifer wood near the theropod site showed no evidence of tree rings, suggesting that the ancient climate was not marked by strong seasons or by periods of drought." Since Creation Scientists contend the pre-Flood climate was equally non-seasonal, lack of growth rings would say nothing whatever about whether the stumps were examples of the original created trees. Sereno's African Cretaceous dinosaurs were buried in a "flood," by the way—but only one of river proportions, as noted concerning the deposits.

[275] DeYoung (1989, 76, 77): "The birth of a star has never been observed" and "Once again we can conclude that the universe of *created* stars is slowly dying." The Creation Science idea that supernovas (from which pulsars emerge) don't involve stellar evolution is quaint, but Ecker (1990, 187) and Lloyd Bailey (1993, 33-35) have noted the astronomical facts are otherwise. Meanwhile, the current edition of *What Is Creation Science?* still has Morris proclaiming that "as long as men have been observing the stars and galaxies, they have been stable, with no evolutionary changes ever observed since the beginning of recorded history," Morris & Parker (1987, 262). Cf. also Morris & Morris (1996a, 37-38). Apart from the historical revisionism here (most of the known universe was unavailable to naked eye astronomy, and "galaxies" *per se* were invisible until the 20th century), we now have the Hubble Space Telescope and other comparable instruments (not to mention radio astronomy) to explore the stellar nurseries of deep space, Reston (1995). All of which makes Morris & Morris (1996b, 204) even more anachronistic: "Furthermore, despite all the elaborate theories of stellar evolution, no one has ever observed a star evolve out of interstellar dust, nor one type of star into a different type." As for the Orion nebula, Morris & Morris (1996b, 228) drew on a 1981 *Scientific American* article, as though nothing significant had happened in the meantime. Pulling out to an even larger scale, one may consider Longair (1996, 101-102) describing two colliding galaxies, where computer modeling has deftly accounted for the curious filament of stars between the two. Now how long does it take for a result like that to come about, and why ever would God want to fake a picture of a whole *galactic* smashup? Cf. Elbaz & Cesarsky (2003).

[276] Henry Morris (1972, 57). For some pithy ICR speculation in this area, see Morris & Morris (1996a, 187-197)—a work David Buckna extolled during a fruitless exchange with Alan Hale (co-discoverer of comet Hale-Bopp) at infidels.org/library/modern/alan_hale/creationist.html.

[277] Old Earth creationists expressing qualms over the fictitious nature of the heavens suggested by "apparent age" run from Hayward (1985, 99-100) and Ross (1994, 40) to J. P. Moreland, "Response to Paul Nelson and John Mark Reynolds," and Robert C. Newman, "Progressive Creationism," in Moreland & Reynolds (1999, 87, 109). Ironically, these creationists are appealing to the very argument that Cornelius Hunter (2001; 2003) complains evolutionists use: that certain patterns of evidence support a naturalistic relationship because the alternative would require God to have maliciously contrived the facts to appear as something they weren't. We don't know whether

Hunter could reject "creation with apparent age" without blurting out "God wouldn't have done it that way" because YEC issues were not discussed in his books.

[278] One may consider Henry Morris' downbeat assessment of the spectacularly exciting and productive planetary exploration program. "The tremendous amounts of money budgeted for America's NASA program was defended mostly by the hope that it would lead to an understanding of the evolution of the earth and solar system, as well as of life on earth. As it turned out, however, these questions have not been resolved at all, and now seem more confused than ever," Morris & Parker (1987, 265). At the ready to return astrophysics to the 19th century, DeYoung (1989, 49-50, 130-131) questioned whether fusion powers the sun, and dangled the prospect of the Kelvin-era gravitational collapse theory for solar energy. Morris & Morris (1996b, 205) skirted around this issue when they declared that "none of the basic elements evolve into higher elements"—though that synthesis is exactly what happens in the cores of main sequence stars, as their anti-Big Bang hero Fred Hoyle helped establish decades ago. Gish (1990, 14-15) likewise assured the kids that gas pressure in the early universe was a hundred times too great for gravitation to form a star. Whether Longair (1996, 33-63) or Ray (2000) will feel obliged to junk what they have learned so far about the complex dance of gravitation and magnetism going on in the gas clouds that generate stars is another matter. Duane Gish (1993, 220) indicated the vast scale (and sheer athletic logical leaps) of Creation Science ambition in criticizing philosopher Kitcher (1984) for making "no attempt whatsoever to describe what process, what machinery existed that could have converted expanding hydrogen gas into highly condensed stars, galaxies, and solar systems, or what could have transformed simple gases into proteins, DNA, and RNA, and subsequently into the intricate, highly condensed systems found in living cells." The impression that *nothing* is known about at least some of the steps in that process is hubris of the first order. But then, DeYoung (1989, 77-78) remarked on "the poetic generalization that we are all 'made of stardust' and are therefore 'one with the universe.' This false idea fits in well with the New Age movement, a satanic activity of our day. Man—in the form of Adam—was indeed made from the 'dust' of the ground. However, the earth and its component materials were created *before* the stars, not *from* the stars (Gen. 1:16)." DeYoung was evidently unaware how little "New Age" there was about arch-skeptic Carl Sagan (someone especially fond of the "we are stardust" phrase).

[279] I must confess some personal satisfaction when I described this "library card" metaphor to Old Earth creationist Stephen Meyer at the 1998 Whitworth "Creation Week." Meyer doubled over in laughter and asked if he might borrow the story. I was happy to oblige—though I do hope he attributes the source correctly.

[280] Kenneth B. Miller, "Scientific Creationism versus Evolution: The Mislabeled Debate," in Montague (1984, 36) and Miller (1999, 69-72); cf. Freske (1980, 37-38). Were the earth only a few thousand years old, virtually anything organic could be carbon dated. The YEC team at creationism.org (relying on worldbydesign.org) claims just that about dinosaurs; Paul Taylor (website re note 46 above) describes their Alaskan field trip. But cf. OEC Hayward (1985, 128) on coal: "The nature of the stuff is all wrong, from the 'Flood geologists'' point of view. If they were right, coal should contain plenty of fossils of modern vegetation. *But it doesn't*. Most coal was made in the Carboniferous Period from species of fern now extinct. Such coal contains no flowering plants or trees, and none of their pollen which finds its way into practically all the more recent sediments. And radiocarbon tests on coal cut from virgin seams deep inside the earth *always* give the same result: 'Too old to give a meaningful reading.' This is so well established that radiocarbon laboratories now use coal samples to check the zero readings of their equipment." Cf. Kathleen Hunt at Talk.Origins on "Carbon-14 in Coal Deposits."

[281] Old Earth creationist Ross (1994, 118) put the issue baldly: "Talk radio host John Stewart asked John Morris (a geological engineer) in my presence if he or any of his associates had ever met or heard of a scientist who became convinced that the earth or universe is only thousands of years old based on scientific evidence, without any reference to a particular interpretation of the Bible. Morris answered honestly, 'No.' Stewart has since asked the same question of several other prominent young-universe proponents, and the answer has been consistent: *no*."

[282] Johnson (1991, 113).

[283] A view expressed by Henry Morris (1972, 14-18; 1985, 211-213), where it is claimed the first and second laws of thermodynamics are the consequence respectively of God's sustaining power (conservation of energy) and Adam's sin (entropy). Huse (1997, 111-114) retells this argument in a chapter on "Physics." More will be said about the purported thermodynamic lessons of the Bible and the potential fruits of literal creationist science education.

[284] In the Research Notes for the chapter in *Darwin on Trial* on "The Rules of Science," Johnson (1991, 184) laid out references to the Arkansas creationism trial. "For additional accounts of the trial by participants, see Langdon Gilkey's *Creationism on Trial: Evolution and God at Little Rock* (1985), and Robert V. Gentry's *Creation's Tiny Mystery* (2d ed. 1988). Gilkey is a liberal theologian who testified for the plaintiffs; Gentry is a physicist and a creation-scientist who testified in defense of the statute."

[285] Gentry (1986). Huse (1997, 71-72) cited "Melnick, Jim, *The Case of the Polonium Radiohalos*, Students for Origins Research, Santa Barbara, California, Vol., 5, No. 1, 1982, pp. 4-5" for his account of Gentry's claims. The current edition of Henry Morris (1985, 170) relied on Talbot (1977), who drew on the nonreligious reports Gentry published in *Science* and *Nature*. Incidentally, Talbot had been editor of *Pensée*, a journal at Lewis and Clark College in Portland, Oregon, that took up the Velikovsky cause in the early 1970s (I was familiar with this undertaking firsthand, having served one summer as their research assistant in the Velikovskian phase of my jaded youth). One *Pensée* contributor was Vine Deloria (1974; 1999, 339-353).

[286] Stephen G. Brush, "Finding the Age of the Earth: By Physics or By Faith?" in Zetterberg (1983, 333-336) and abridged as "Ghosts from the Nineteenth Century: Creationist Arguments for a Young Earth," in Godfrey (1983, 68-72) was an early survey of the criticisms. Brush noted Gentry was part of the team that prematurely claimed in 1976 that the super heavy element 126 had been found extant in natural rock—another discovery that didn't pan out. Wendell Bird (1989, Vol. 1, 419-422) acknowledged there had been criticism of Gentry's claims, but relied entirely on Gentry's view that they had all been adequately addressed. Later critiques include Strahler (1987, 138-140), Wakefield (1987), Ecker (1990, 152-153), Ross (1994, 108-110) and York (1997, 46-51), as well as several detailed pieces at Talk.Origins.

[287] For instance, Gentry (1986, 287-289) proposes with completely straight face a "Revolving Steady State" theory of the universe, where all the galaxies are literally orbiting God's throne (which he refers to rather less than majestically as "C"). Just as would be seen in a revolving galaxy, appropriate blue and red shifts ought to be detectable for the whole universe, but the absence of such corroborative evidence does not slow him down. Gentry (1986, 290): "No observational data as yet seems to locate the direction of C in that plane. On the other hand, Orion is in that plane, as is prominently mentioned in Scripture (Job 9:9; 38:31, Amos 5:8). As a working hypothesis I suggest that C may lie a few million light years beyond Orion." LaHaye (1999, 113) suggests the Throne of God may lie behind the North Star.

[288] Gentry (1986, 200-203) recognized the technical caveats. Strahler (1987, 139) noted: "To produce the biotite crystals would require extremely slow cooling, which in nature probably takes hundreds of thousands of years or more."

[289] Gentry (1986, 85). Gentry's allusion to funding may have been intended to carry an ironic barb, as he ran into trouble himself when he sought National Science Foundation grants to hunt for further proof that the world was only 6000 years old. Wendell Bird (1989, Vol. 2, 404-405) and Ankerberg & Weldon (1998, 105-106) subsequently listed Gentry as an instance of scientific discrimination. Brumfiel (2002) notes a recent example of Gentry's professional activities.

[290] As a 1996 episode of the Discovery Channel's "Discover Magazine" devoted to time mistakenly referred to the 1/1000 second per day loss, Hovind could have got the misinformation from such a source without checking. Thwaites & Awbrey (1982) noted Walter "hydroplate" Brown's even more inaccurate "leap second" mistake (claiming the earth was slowing by "almost one second a year"). As noted by Hartmann & Miller (1991, 54, 95, 139), the day was 10 hours long 4.4 billion years ago, and fossil evidence of annual sedimentation from 2.8 billion years ago lends support to the more leisurely increasing day length. By 650 million years ago (thus just before the Cambrian Explosion) it was a more familiar 22 hours—and only a half-hour shy of the modern value by 100

mya. The earth is slowing because of our moon, which is moving away from us in a dynamic concert. Huse (1997, 69-70) was aware of this connection, but missed the actual data since he relied on the creationist spin supplied by Randy Wysong and Thomas Barnes. While Hayward (1985, 95-96) briefly touched on the rotation change issue, Strahler (1987, 146-147) thoroughly dismantled Barnes, Brown, and Donald DeYoung in this area. It may be noted that the earth rotation claim does not appear in DeYoung (1989).

[291] For instance, Henry Morris (1985, 31) still calls attention to the fact that most of the mass of the solar system consists of the sun, while the angular momentum resides in the planets, as though this remained a mystery. Ecker (1990, 182) noted recent research incorporating the braking effect of magnetic fields, which accounts for the momentum transfer to the planets. "One has to wonder why the ICR cites the solar mass/angular momentum problem without mentioning the fact that it has been theoretically solved." I think we already know the answer to that. See also Plait (2002, 187-201) on the vagaries of "astronomy" Creation Science style.

[292] Judging from the intercuts on the tape, Hovind's audience ranged from older couples to families with young children. It was a small crowd, perhaps 20 or 30, gathered in a modest lecture room with banked seating. For anyone unfamiliar with the background facts it would be an entertaining and convincing show. I heartily recommend Intelligent Design believers to take a look at it, and demonstrate the utility of "theistic realism" by explaining where Hovind falls on the creationist spectrum and how they would propose to deal with his assorted Biblical arguments. "MN" would certainly have some tart observations about Hovind's patriarchal chronology (where Adam's 800-year life span overlaps with Noah's father)—but what would the "TR" position be?

[293] Only some 0.7% solar mass is lost by energy conversion as roughly 600 million tons of hydrogen fuses into helium each second. Patrick Moore (1983, 7, 16) gave 4×10^6 tonnes/sec net loss, but as a metric ton runs just shy of 2205 lbs., at this scale English tons are close enough after you multiply 30 million sec/year by 4 billion years by 5×10^6 tons/sec.

[294] This again is mere geometry. The diameter of the sun is 1.4 million km, and the earth is 150 million km from the sun—meaning the solar radius of 700,000 km has to be ratcheted 214 times. The volume of a sphere being $(4\pi r^3)/3$, that's scaling the total by 9.8 million. Stars like the sun can engulf the inner planets in their red giant phase, of course, but that wasn't what Hovind was claiming—nor would the tiny added mass bring that about. The development of stars depends on many factors, such as the relative abundance of heavier elements, as explained by Larson & Bromm (2001) regarding star formation in the early universe. At this point the physics has progressed way beyond the simple long division where Hovind has gone astray.

[295] Akridge (1980), duly criticized by Robert Schadewald, "Creationist Pseudoscience," in Frazier (1986, 311-313), Strahler (1987, 141-142) and Ecker (1990, 182-183). Creationists from Snelling (1989) to Paul Taylor (1995, 16, 69-70) have been reluctant to give it up. Henry Morris (1985, 169-170) picked on a 1983 article by John Gribbin in *New Scientist* to conclude the sun didn't run on fusion, "a fact independently confirmed by the missing neutrinos." DeYoung (1989, 49-50, 130-131) and Lubenow (1992, 208-210) are similar, though nowhere near as gutsy as Faid (1993, 189-196) in a section called "Has God Already Turned Off the Sun? Scientific Evidence Says Maybe!" Faid took the missing neutrinos and shrinking sun as a fulfillment of Matthew 24:29: "Immediately after the tribulation of those days shall the sun be darkened, and the moon shall not give her light, and the stars shall fall from heaven, and the powers of the heavens shall be shaken." The neutrino "mystery" was a real one in the 1980s, Patrick Moore (1983, 17). Part of the reason was instrumental—improved techniques in the 1990s found about 2/3 of the expected values, Longair (1996, 37-40), and neutrino mutation has accounted for the rest, Collins (2001) and McDonald *et al.* (2003). See also "The Solar FAQ" by Sverker Johansson at Talk Origins. Unrecognized nuclear processes continue to turn up to refine stellar dynamics, such as "halo nuclei" (where excess neutrons physically orbit the nucleus of unstable atoms), Austin & Bertsch (1995, 95)—this is not to be confused with Gentry's polonium halos, by the way. Henry Morris' use of Gribbin again illustrated the creationist tendency to compartmentalize evidence, or at least failing to anticipate their scientific fruit. The early work of Eddy and Ronald Gilliland in the 1980s sparked a trail of inspiration in stellar physics, leading to new understanding of how fluctuations in the sun

would affect the ability of neutrinos to escape the solar furnace and make it to terrestrial observers. Someone who has followed that fascinating trail at length was none other than John Gribbin (1998, 65-90).

[296] Hovind's website featured one stab at mathematical analysis. I Kings 7:23-26 and II Chronicles 4:2-5 describe a brass cauldron made for King Solomon with a diameter of 10 cubits and a circumference of 30—which would appear to define $\pi=3$. "This apparent mathematical error caused me, as a new Christian, to doubt the accuracy of the Bible." While Archer (1982, 198-199) simply chalked it off as an approximation, Hovind took the interior circumference as 30, and allowed enough brass width (about four inches) for the outer diameter to be 10. "Rest assured God makes no mistakes, mathematical or otherwise." That assertion will be addressed in greater detail in chapter six—though cf. McKown (1993, 58) on the π matter.

[297] My own personal experience with Johnson via e-mail and at the Whitworth "Creation Week" confirms the common refrain of Johnson's critics that it is impossible to pin him down on theory or substance. Gardner (1997, 19; 2000b, 20-21): "It's like writing a book denying that Earth is round but never indicating what shape you think it is. Hoping to gain some answers to these questions, I exchanged a dozen letters with Johnson. He flatly refused to tell what variety of creationism he espoused. His reason? *Darwin on Trial* was intended only as an attack on godless Darwinism. He saw no need to reveal what should go in its place." Pennock (1999, 197) wondered whether a reference to science's exclusion of "sacred books" and "mystical states of mind" in Phillip Johnson's 1990 book *Evolution as Dogma: The Establishment of Naturalism* meant these were possible sources of evidence for creationism. "I asked Johnson just this question following one of his public lectures and he replied that he was not defending this position. However, neither did he deny that such appeal to scriptural authority or mystical experience would count as positive empirical evidence. Johnson seems to be pleading the Fifth on this important issue." As for the allusion to camels and rich men in Matthew 19:24, Mark 10:25, and Luke 18:25, that is analogous to the Atlantis "larger than" problem, with the term for camel (*kamhlos* or *kamälos*) being a possible mistranslation of hawser or rope (*kamilos*)—a term in use by 150 AD (which might only strengthen the skeptical argument that the New Testament underwent a few editing slips by the time it found full written form).

[298] My hook was: "Should you encounter, for example, an assertion of the form 'the Cretaceous iguanodontids most likely evolved from the camptosaurids,' what avenues of inquiry would you pursue in characterizing such a claim? Do you personally research individual instances, or do you have a body of experts in the field to whom you would consult for technical analysis, and if so, who might they be?" Johnson replied that he had "a couple of fairly knowledgeable people to consult, but most of what I have written comes from my own evaluation of the literature." These experts he did not identify, but "If you've read chapters 4-6 of DOT, with the research notes, you know my sources and methods." Which was unfortunately true—those chapters being where the Cambrian and therapsids were discussed. What particularly struck Johnson's trained eye was my "most likely evolved" terminology, considering it "so typical" of evolutionists who do not offer specific ancestor-descendant lines (and promptly jumped to the lobe-finned fish believed to be ancestral to the amphibians). But if Johnson had no idea what "camptosaurids" or "iguanodontids" were, how would he know they *weren't* being offered as specific lines of descent? My reply probed a little further, dangling those sauropodomorphs Duane Gish has also so assiduously avoided. "I noted the camptosaurid/iguanodontid matter because it appears rather relevant to the issue of to what extent the process of 'microevolution' applies in the past (one might as easily have used the anchisaurids, plateosaurids, cetiosaurids and diplodocids). Is an iguanodon more or less divergent from a camptosaur than, say, the Galapagos finches (which are variations on a 'finch type,' as you put it)? And further, are the hadrosaurs allowable variations on the iguanodontids, and thus are they further an example of a camptosaurid 'type' if the iguanodons are?" At which point Johnson tersely returned the ball to my court: "I invite you to undertake such research." In my response I let the cat out of the bag, revealing my insidious evolutionary affinities, and with that Johnson abruptly metamorphosed into his "us or them" mode. See next chapter for Johnson's parting shots on the invertebrates as he yanked up the conversational drawbridge.

[299] Johnson (1995, 107-108). Concerning John 1:1, cf. Greenspahn (1983, 32-38) on the distinctly neo-Platonic associations of "the Word" (*logos*) and its Talmudic analog "wisdom" (mentioned in Proverbs 8:22-23). Cf. the paean to the Book of Wisdom by the anthropically minded Barr (2003, 66-67, 265-266).

[300] This is the position of Paul Taylor (1987, 51-52) and Kent Hovind. Off at the ICR website, John Morris presents the view that the switch to herbivory took place at some stage after the curse of Adam (BTG No. 100b). He offered three possibilities for how this came about: "God, in His foreknowledge, knew that soon things would change, and so He created animals with features they would need in the new economy." Or "a great deal more potential for variation was placed in the original genome"—as though carnosaurs descending from a herbivore could take place within a created "kind" without this spilling over into the domain of naturalistic evolution. But the zinger was the third possibility that "something more sinister was involved," namely Lucifer indulging in genetic engineering "to ruin God's beautiful creation." Sounding hilariously like the recent vaporings of Erich von Däniken on this topic, Morris opined that "Perhaps even the ancient legends of composite mixtures of beasts and half men/half beast have some basis in fact." Ritvo (1997, 199) offers an ironic historical note on antediluvian herbivory: back in the 19th century the rising British vegetarian movement were the ones invoking such reasoning to give their dietary philosophy a scriptural underpinning—and their critics included outraged fundamentalist Christians (at least the unapologetic carnivorous ones!).

[301] Ham (1998, 22). Duane Gish (1990, 71) on *T. rex*: "It is supposed that his main diet consisted of other dinosaurs, but it also may be that these teeth and claws were used to eat tough roots and bark, etc." Strahler (1986, 358) remarked on the similar position of Whitcomb & Morris (1961, 461, 464) that no carnivorous beasts existed before the Fall, and how this appeared to require post-Curse anatomical transformations of an unfortunately broad character.

[302] Since Ham was aware of the work, the reader may consult P. Martin Sander, "Teeth and Jaws," in Currie & Padian (1997, 717-724) for the basics of identifying dinosaur tooth function.

[303] Ham (1998, 48).

[304] William L. Abler, "Tooth Serrations in Carnivorous Dinosaurs," and Anthony R. Fiorillo & David B. Weishampel, "Tooth Wear," in Currie & Padian (1997, 740-743, 743-745) are of relevance here. Abler (1999) specifically covers *T. rex*'s dental tool kit. How such principles are applied in another case (whether prosauropods were carnivores, omnivores, or herbivores) is illustrated by Paul Upchurch, "Prosauropoda," in Currie & Padian (1997, 602-603); the evidence currently favors a largely herbivorous diet.

[305] Ham (1998, 123n), quoting Benton (1992, 105). My American edition of Benton substitutes "tiny" for "buttony." Lambert & The Diagram Group (1985, 168-171) show the mammal tooth layout in several extinct models. One may contrast the slicing cheek teeth in the skulls of the carnivorous creodonts and condylarths with their flatter-crowned counterparts in the herbivorous cave bear and lumbering amblyopods (where prominent retained canine teeth and horns offered defensive options).

[306] Ham (1998, 124n), quoting "Laidler, Keith & Liz. 1992. Pandas: Giants of the Bamboo Forest, BBC Books, London. P. 80-1." See Lambert & The Diagram Group (1985, 188-189) or Rich *et al.* (1996, 558-562) for the range of camel kin.

[307] Discussion of all the grizzly details may be found in Paul (1988, 87-99), and the latest fine-tuned view in Gregory Erickson (1999). Or from the Old Earth creationist camp, Ross (1994, 63) noted something else: "Considering how creatures convert chemical energy into kinetic energy, we can say that carnivorous activity results from the laws of thermodynamics, not from sin." An ironic jab, given the thermodynamic obsessions of Creation Science. Ross (1998, 97-98) presents similar views, though less forcefully.

[308] Larson & Donnan (2002, 213): "We know *T. rex*'s punchlike teeth could neither strip leaves from trees nor crush and process fruits and berries. They had only one use, and that was to cut through flesh and bone. We know what happened to Sue's dinner after she ate because we found the acid-etched tail vertebrae of an *Edmontosaurus* in her stomach contents, along with other digestive tract material." One may toss in an apparently cannibalistic theropod from Madagascar,

Rogers *et al.* (2003). Getting back to Ham's available source material, Aase R. Jacobsen, "Tooth Marks," in Currie & Padian (1997, 738) noted signs of predation are more common than earlier supposed (though still found on only a few percentage of the bones in an average ensemble). They were quite prevalent, however, on the disarticulated fossil array from one Utah segment of the Morrison Formation, Joshua B. Smith, "Cleveland-Lloyd Dinosaur Quarry," in Currie & Padian (1997, 126). This was most likely an *Allosaurus* hunting ground where the predators occasionally got as stuck in the mud as their prey, Norell *et al*. (1995, 110-112). Czerkas & Czerkas (1991, 214-216) likewise described a herd of centrosaurs (smaller cousins of *Triceratops*) that perished in a river flood in Late Cretaceous Alberta, with predator marks present on the carcasses. Gish (1992, 29) was evidently referring to this site when he said, "A large herd was found buried together in Canada. One record states that some of the bones were 'broken and trampled as if they had been in a stampede … trying to cross a raging river'—perhaps the Great Flood of Noah?" See David A. Eberth, "Judith River Wedge," in Currie & Padian (1997, 379-383) for the paleoecology of the region. And let's not forget the predatory implications of the Cambrian shelled fauna. Whether the Biblical proscription on carnivory will be taken to apply to marine invertebrates is another question to put on the already overcrowded Creation Science "things to do (if you want to be taken seriously as a science)" spike.

[309] Ham (1998, 127n). Incidentally, beneath the text was a "**CREATION**WISE" cartoon. The first frame showed a beaming youth saying, "THE BIBLE IS **100% TRUTH**, FROM START TO FINISH!" Later (as a student at "LIBERAL U") he declares, "THE BIBLE HAS SOME MYTHS, BUT IS MOSTLY TRUE!" Later still as an adult he says, "THE BIBLE HAS LOTS OF MYTHS AND SOME TRUTH." The last frame shows him as an older man, tossing the Bible away with the cry, "HOGWASH!" The main caption reads: "SAD BUT TRUE—THIS KIND OF EVOLUTION DOES HAPPEN!"

[310] Johnson (1997, 92-95) described "the wedge" as "A Strategy for Truth" where Christians and observant Jews would unite their energy to the common purpose of defeating naturalism and affirming "the reality of God." Afterward, they could talk about their "remaining points of disagreement with renewed goodwill." Such an approach sounds indistinguishable from that advocated by Young Earth creationists Nelson & Reynolds in the passage quoted above in note 245. Johnson put forward his own oeuvres as "the sharp edge of the wedge," subsequently broadened by Behe (1996) and conferences where everyone comes to recognize the inadequacy of Darwinian explanations based on small variations. A sharp wedge perhaps, but on which side has it been honed? Interestingly, Johnson's 1997 position is that without materialism "the common ancestry thesis is as dubious as the Darwinian mechanism." Recall first that non-materialist Behe supposedly accepts that very thesis (though possibly in the same sense that Johnson "accepts" the reptile-mammal transition). Then compare Paul Nelson & John Mark Reynolds, "Young Earth Creationism," in Moreland & Reynolds (1999, 45): "Thus, many moderns no longer seek justification for evolution in biological evidence because it no longer resides there. They go straight to the philosophy of science. The common ancestry of organisms by natural selection flows as a scientific theory not from what we know about life but from the philosophy of naturalism, which binds what scientists may infer about nature."

[311] Not to be confused with the sentiments of Matthew 6:10: "Thy kingdom come. Thy will be done in earth, as *it is* in heaven."

[312] Johnson (1997, 88-89). This also happens to be exactly the view of Ken Ham (1998, 79) about dinosaurs: "If one accepts the atheistic evolutionist teachings on dinosaurs, then God's Word (the Bible) is not authoritative, and all things can be explained by natural processes—there is no God!" Ham wins points on brevity.

[313] As Ken Ham and Kent Hovind are not fictional, Johnson (1997, 96) is at best ingenuous: "Materialists tend to think the only alternative to materialism is some form of primitive superstition, where science would be impossible because all events would be produced by the whimsy of capricious gods. This is nonsense, of course. Intelligent Design does not mean unintelligent chaos. Computers and space rockets are designed, but they work according to lawlike principles." It is ironic that Johnson should use a *technological* analogy, so many Creation Scientists being physicists and engineers. But for the same reason that astronomers cringe at "apparent age,"

paleontologists have every right to be horrified at the prospect of what "theistic realism" has in store for their discipline. I'm sure they would like to know what manner of "lawlike principle" Intelligent Design envisages for the therapsid jaw articulation. It may not be coincidental that Johnson feels himself ideally unprejudiced in his crusade against naturalistic evolution because his formal scientific training ended in high school, as noted by Pennock (1999, 184).

[314] Henry Morris (1985, 214). Unsurprisingly, the discussion of Flood options in Morris (1985, 250-255) or Morris & Morris (1996a, 29, 35-72) required applying Scriptural text literally.

[315] The remarks of Morris' son John in his icr.org commentary (BTG No. 110b) on the 1997 PBS "Firing Line" evolution debate are particularly revealing. The debate pitted Phillip Johnson, Michael Behe, philosopher David Berlinski, and William F. Buckley against philosopher Michael Ruse, biologist Kenneth Miller, "anti-creationist activist Eugenie Scott, and advocate for liberal causes Barry Lynn." (Scott is an anthropologist and science educator, Lynn a lawyer and Congregationalist minister.) Morris cautioned that "None of the anti-evolutionists were Biblical creationists, choosing to leave God and His record of origins out of the discussion. By not relying on the Genesis Flood to explain fossils, the curse as the ultimate source of mutations and extinctions, the God of the Bible as the intelligence behind the design we see, their position was weakened and disunited. ICR very much appreciates the work of Johnson, Behe, and Berlinski, but we recognize that without Biblical creationism they fall short of a God-pleasing mark. Any form of old-Earth thinking, theistic evolution, or progressive creation is so similar to secular evolution that their defense is ultimately a waste of time." This attitude may explain why none of Johnson's *oeuvres* surfaced in the Morrises' 1996 *Modern Creation Trilogy* (and Intelligent Design was conspicuously absent at a Seattle Creation Science church lecture I attended in March 2001). Meanwhile, Johnson (1998a, 88) saw the "Firing Line" debate very differently, declaring how "the evolution team, which included Eugenie Scott, labored mightily to give the impression that the 'evolution' science teachers are promoting is a God-guided process. Their 'team captain,' attorney Barry Lynn, went so far as to quote John 1:1 ('In the beginning was the Word'), to suggest that the 'Word' was *Evolve*." What the agnostic Scott and minister Lynn were doing was to reject Johnson's presumption that religion and naturalistic evolution were inherently at odds. There are indeed profound and serious religious implications stemming from the occurrence of naturalistic evolution (though, as we'll see in due course, these are not always quite what either side in the "God versus materialism" debate has been used to). But the uncompromising antipathy Intelligent Design has toward naturalistic evolution has primed them to hand the metaphysical ball over to Biblical literalism without even realizing it. A 1993 essay reprinted in Johnson (1998a, 33) maintained rather diplomatically that "Theistic evolutionists accomplish very little by trying to Christianize the answer to a question that comes straight out of the agenda of scientific naturalism. Instead we need to challenge the assumption that the only questions worth asking are the ones that assume that naturalism is true." William Dembski's essay, "What Every Theologian Should Know about Creation, Evolution, and Design," was considerably blunter: "*Design theorists are no friends of theistic evolution*. As far as design theorists are concerned, theistic evolution is American evangelicalism's ill-conceived accommodation to Darwinism. What theistic evolution does is take the Darwinian picture of the biological world and baptize it, identifying this picture with the way God created life. When boiled down to its scientific content, theistic evolution is no different from atheistic evolution, accepting as it does only purposeless, naturalistic, material processes for the origin and development of life." Dembski (1999a, 109-111) toned down his rhetoric, though his conclusions were the same. For Dembski (1999a, 101), "Naturalism leads irresistibly to idolatry"—thus the eradication of the naturalism disease is essential to a healthy theological body. But nipping at Dembski's philosophical heels are the likes of Lubenow (1992, 223-246) or Bert Thompson (1995) who methodically reject as unacceptably non-Biblical any interpretation of the physical world which does not acknowledge a recent creation and the global Flood exactly as described in Genesis. Cf. also Carl Wieland's wary 2002 "AiG's views on the Intelligent Design Movement" (answersingenesis.org/docs2002/0830_idm.asp). If one is looking for slippery slopes, creationism is one fast toboggan ride, as will be seen in the concluding chapter when creationist apologetics are seen to collide with secular science education.