

Chapter 5. Planet of the Apes

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Few of those who have seen the 1968 film *Planet of the Apes* can easily forget its surprise ending. Stranded on what he believes to be an alien planet populated by intelligent apes, astronaut George Taylor (played by Charlton Heston) sets off to explore, accompanied by the mute human female Nova he had rescued from the apes' zoo. They ride along the desolate beach until they encounter the rusting remains of a metallic structure (revealed to the audience only in carefully framed shots to obscure its identity) which turns out to be the Statue of Liberty, buried askew hip-deep in the sand.

Taylor now realizes that he had made it home after all. And while a puzzled Nova looked on in complete non-comprehension at what was upsetting him, Taylor collapsed on the beach to declaim: "We finally, really did it. You *maniacs!* You blew it up! God damn you—god damn you all to hell."¹

If all you went by was this final scene, *Planet of the Apes* was a dandy statement against the futility of nuclear war. The symbolism of the Statue of Liberty was intensely visceral—an icon of what had been lost in a brief lapse of mankind's MAD strategic folly. But most of the film was about something other than the long-term suitability of Mutual Assured Destruction as a defense policy. *Planet of the Apes* was also a biting parable about the potential conflict between religious faith and scientific understanding. Indeed, Phillip Johnson should have been far more concerned over the philosophical impact of this movie than with any of the stereotypes he has objected to from *Inherit the Wind*.²

The bulk of the story turns on the work of two chimpanzee scientists, Cornelius (Roddy McDowall) and Zira (Kim Hunter). Based on his archaeological work, Cornelius favored the idea that the apes had evolved from a lower order, perhaps even man—but he backed away from these conclusions once the higher council proclaimed them heretical, contradicting the teachings of the Sacred Scrolls. At the trial to determine whether the talking intruder Taylor should be put to death as a social menace, Zira protested: "How can scientific truth be heresy?"

To which attitude the ruling orangutan elite embodied the quintessential creationist credo, articulated by Dr. Zaius (Maurice Evans): "There is no contradiction between faith and science—*true science.*"

Could Henry Morris have said it better?

But the implications of the plot twists in *Planet of the Apes* run still deeper, offering in miniature all the philosophical turmoil inherent in the recognition that humans too might have come "from so simple a beginning," as Darwin put it. While the apes' Sacred Scrolls purported to account for the origin of their life, its ape-centered perspective also ratified a traditional society where orangutans interpreted the law and religion, and gorillas fought the wars (rather a slur on the comparatively gentle gorillas of reality). Since defending the faith was inextricably linked to preserving the social order, Taylor's dropping in represented a threat to that arrangement by his very existence, and so had to be dealt with.³

Another problem facing Dr. Zaius was Cornelius' fossil dig, which had revealed an advanced pre-ape culture that challenged the historical validity of the Sacred Scrolls. It also afforded the cynical Taylor an opportunity to defend the superiority of "humanity"—a position he'd ridiculed earlier in the film. Believing that the bones being dug up were humanoids that had once existed on an alien world, Taylor could easily accept how these "people" had gone extinct even though they were "better" than the currently dominant apes. (The screenplay pulled a tactical trick, though, by having Taylor not consider that their demise might have been due to warfare rather than disease or climate change.) His self-esteem thus resuscitated, Taylor could now fix on the future even though all social interaction with his own humanity had been severed. And that was because he could still

imagine the inhabitants of far-off earth, still possibly going about their business safely back home. What he couldn't handle in the end was the idea that it was *our* species that had been so irrevocably stupid, ironically justifying the apes' insular mythology about mankind. We *had* been a world-destroying blight after all!

That queasy feeling you're supposed to get at the end of *Planet of the Apes* plays off a profound and natural anxiety about the human condition. Whether on the personal or collective level, being truly alone in the universe is not very inviting. Taylor's oscillating self-image was one sort of flinch against loneliness—the search for extraterrestrial intelligence in Carl Sagan's *Contact* is another. Even Robinson Crusoe needed his Friday. But with the thermodynamic clock ticking throughout the physical universe, eventually the whole shebang has to run down no matter how much effort is put into reversing the merciless arrow of entropy. Why then bother painting the bathroom if, in ten billion years or so, that and all other human accomplishments will have been reduced to so many rusted Statues of Liberty poking up from dead landscapes orbiting stellar cinders heading inexorably for absolute zero?

Thus is the angst of human mortality writ on the cosmic scale. Like it or not, we're all sailing on the *Titanic*, with the laws of thermodynamics playing the role of iceberg. The debate then is about more than the squabble between the “religious” and “scientific” explanations of how the ship got to be here—it concerns how long the physical vessel will take to sink, and what to do in the meantime.⁴

Antievolutionists of all persuasions cannot get by conceptually with *Homo sapiens* being merely the most extraordinary of living organisms, a sentient art-making species capable of such wonders as the Sistine Chapel, jazz, and the hamburger with onions ... but also of cruelties from human slavery to the industrial obscenity of Auschwitz. To avoid existentialist gridlock there must be the potential of an escape hatch from the mechanistic rut that “lower” animals are stuck in ... some way to circumvent the profane bumper sticker philosophy of “you're born, shit happens, then you die.” For Biblical creationists especially, humans must be favored, blessed, or even cursed—but at least *noticed* by whatever transcendence is knocking about upstairs.

Attention must be paid.

This eminently understandable concern about where we came from, accompanied by nagging fears that changing our views of that origin will affect where we are headed and why, permeates the creation/evolution debate. It underlies the orthodox Creation Science conception of man, of course, where a literal Adam and Eve are believed to have once lived in a physical Garden of Eden. It likewise informs Phillip Johnson's quest to graph man's “true creator” on the polarized dichotomy of “God or matter” (as well as his myopic vision of hominid fossils as playing an overarching role in general evolutionary thinking). But these foregone conclusions are swept along by a perilously flawed methodological wave that does not depend in the least on the Bible for its authority. Disconnect the theological governor that keeps a Gish or Johnson circling in scriptural place and that faulty method as easily flows off in service of a disparate range of ideologies, from Vine Deloria's stridently anti-Christian Native American creationism to the agnostic catastrophist mysticism of Richard Milton.

The development of evolutionary thinking on human origins has taken many fascinating twists and turns since Darwin's day. Just as in any human endeavor, conflicting personalities and prejudices have played their part, and it would be the obligation of a rigorous analysis to faithfully sort out all the flotsam to isolate the salient scientific facts. But such historical sieving is no more prevalent in modern antievolutionism than was a working Map of Time when it came to making sense of “fossil gaps.” When human evolution is the topic there is the same barrage of selective authority quoting, where the anthropological caveats of Charles Oxnard or Solly Zuckerman are marshaled long after their particular arguments were superceded by new evidence. And there is the revealing persistence of glib potshots, especially a fascination for beating dead paleontological horses like the Piltdown Man hoax.

The root of the scientific problem turns out to be one of mundane taxonomy: the anatomical similarities between humans and apes were too many to ignore even in the 19th century, and modern biochemical and behavioral studies have only added further congruencies. That the various living primates are by no means *identical* actually provides the wellspring of clues to the fossil

detective story, as we'll see. But the more basic epistemological point is that any evolutionary hypothesis that could see its way to embrace the common ancestry of forms so divergent as arthropods and chordates would have little compunction not to bunch all the primates together. We know how gingerly Darwin tiptoed around the issue at first—and that was precisely because nearly everybody at the time had no trouble spotting the slope of the curve. Shortly after the *Origin of Species* appeared, in fact, antievolutionist physicist James Prescott Joule wrote to commend his colleague William Thomson (later Lord Kelvin) for exposing “some of the rubbish which has been thrust on the public lately.” Joule was referring to the idea that the earth might be old enough to accommodate Darwin's gradual evolutionary transmutation, but the direction of that biological process was evident even apart from geology, as Joule berated those “philosophers who find a link between mankind and the monkey or gorilla.”⁵

Although some turn-of-the-century Biblical creationists strained to keep human and other animal evolution distinct, once it became clear how that approach wouldn't work in the face of continuing paleontological discovery of antecedent hominids, the only option was to fall back on the “all or nothing” stance of contemporary creationism. Phillip Johnson acknowledged the logic of this ineluctable escalation today by his affirmation that “evolutionary biologists are not content merely to explain how variation occurs within limits. They aspire to answer a much broader question: how complex organisms like birds and flowers and human beings came into existence in the first place.”⁶

But the package deal of evolutionary common descent runs foul of more than just religious objections about the nature of man (though that of itself was enough to stir up a hornet's nest). A considerable amount of the early critical reaction to Darwin fed off his general assumption that all human beings were the *same species*. And Huxley and Darwin freely vented another incendiary suspicion: that mankind probably originated where the great apes are to be found today, in Africa.⁷ Thus in one fell swoop Darwin managed to squash three very touchy philosophical toes. First, he was challenging the idea that humanity originated by special divine creation, and therefore undermining the foundations of a *religiously* based society. Secondly, without batting an eyelash he included “lower” races (blacks especially) as part of the human family tree—therefore undermining the foundations of a *racially* based society. And, on top of that, putting the noble Europeans (surely the pinnacle of creation!) on a side branch of descent from, ugh, the benighted inhabitants of the “Dark Continent” ... therefore undermining the foundations of a *Eurocentric* society.⁸

Is there any wonder that this triple whammy didn't catch on in certain quarters?

The virulent racism of the exceedingly talented Louis Agassiz, for instance, made it impossible for him to accept the idea that blacks were even the same species as man, let alone that all humanity might trace its origin to some Eocene primate. As a follower of Cuvier's idea of repeated independent creations following fossil extinctions, Agassiz found the specter of miscegenation so fearsome that he quickly adopted the parallel notion of “polygenism” (the multiple origin of the races of man) being promoted by those for whom slaveholding was no particular moral problem.⁹ While Agassiz rejected slavery, his sexually charged racial revulsion moved him to advocate a broad social apartheid to preserve the superiority of the white race. All of which gave a very serious political twist to the heated natural science debates Agassiz had in the late 1850s with Asa Gray, an early advocate of Darwinism who was a resolute abolitionist and staunchly pro-Union once the Civil War came¹⁰

Not that any of this juicy background surfaced in *Darwin on Trial* when Phillip Johnson thought to trot out the antievolutionary doubts of Agassiz, that “most prestigious of scientists.” For Johnson, Agassiz's 1866 assessment of the fossil record put the Harvard sage high on his list of authority figures to be quoted:

Most of the evidence relied upon by today's Darwinists was known to Darwin's great contemporary, the Swiss-born Harvard scientist Louis Agassiz. Agassiz's resistance to Darwinism did not stem from any failure to understand the evidence that made the theory so beguiling to others. Writing not long after the publication of *The Origin of Species*, he concluded that

It is evident that there is a manifest progress in the succession of beings on the surface of the earth. This progress consists in an increasing similarity to the living fauna, and among the Vertebrates, especially, in their increasing resemblance to man.

But this connection is not the consequence of a direct lineage between the faunas of different ages. There is nothing like parental descent connecting them. The Fishes of the Paleozoic Age are in no respect the ancestors of the Reptiles of the Secondary Age, nor does Man descend from the Mammals which preceded him in the Tertiary Age. The link by which they are connected is of a higher and immaterial nature; and their connection is to be sought in the view of the Creator himself, whose aim ... was to introduce Man upon the surface of our globe.

Agassiz's theological opinion is no more relevant to the empirical question than Gould's, but we may put it aside without affecting the strictly scientific content of his conclusion. His empirical point was that whatever might have caused the appearance of progression in the vertebrate sequence, the evidence of the fossil record is that it was *not* descent with modification.¹¹

Johnson was being more than usually coy here, because Agassiz had penned these remarks a ridiculously long time before the discovery of rhipidistian fishes, therapsids and hominids—or the DNA and homeobox genes whose natural variation plausibly contributed to their phylogenetic transmutation. If Duane Gish's use of the 1964 Ommanney quote on vertebrate origins was anachronistic—what then to make of Johnson's reliance on Agassiz's expertise from a century before? Figuring out that mystery returns us to the underlying problems of the creationist methodology, and where that might lead if disconnected from the traditional Biblical worldview.¹²

On the surface, Johnson was appealing to Agassiz's authority as a retroactive imprimatur on the validity of contemporary antievolutionism. Here Johnson went no further than his referenced source material, which consisted of a chapter on "Agassiz in the Galápagos" from a 1983 book by Stephen Jay Gould, along with a dollop of Douglas Futuyma. Knowing of Johnson's own metaphysical vision that evolution has triumphed solely on ideological grounds, the Research Notes for *Darwin on Trial* pigeonholed Agassiz as a perfect icon of correct thinking unjustly superseded by the faulty evolutionary mythology:

Louis Agassiz is the model of what happened to scientists who tried to resist the rising tide of evolution. Agassiz's tragedy is described in Gould's essay "Agassiz in the Galapagos," in *Hen's Teeth and Horse's Toes*. As Gould tells it, the Swiss-born Harvard professor was "without doubt, the greatest and most influential naturalist of nineteenth-century America," a great scientist and a social lion who was intimate of just about everyone who mattered. "But Agassiz's summer of fame and fortune turned into a winter of doubt and befuddlement," because his idealist philosophical bias prevented him from embracing Darwin's theory. All his students became evolutionists and he had long been a sad and isolated figure when he died in 1873. I agree that Agassiz's philosophical bias was strong, but no stronger than the uniformitarian bias of Lyell and Darwin, and it may be that his incomparable knowledge of the fossil evidence was more important in restraining him from embracing a theory that relied so heavily upon explaining away that evidence. Ironically, Agassiz's best-remembered work, the *Essay on Classification*, was published in 1859, now remembered as the year of *The Origin of Species*.

Futuyma's dismissal of Agassiz illustrates how eagerly the Darwinists accepted a single fossil intermediate as proving their case: "The paleontologist Louis Agassiz insisted that organisms fall into discrete groups, based on uniquely

different created plans, between which no intermediates could exist. Only a few years later, in 1868, the fossil *Archaeopteryx*, an exquisite intermediate between birds and reptiles, demolished Agassiz's argument, and he had no more to say on the unique character of birds." Futuyma, *Science on Trial*, p. 38. Specific cases of fossil intermediates are discussed in Chapter Six.¹³

Following this play of Skinner/Johnson (to that extraordinary Chapter Six where *Archaeopteryx* and the reptile-mammal transition were "discussed") *Darwin on Trial* turned to the references for Douglas Dewar and the whales. Which represented a truly sublime irony, since we know how Johnson has been no more willing to appreciate the inopportune appearance of "whales with legs" in the twentieth century than Agassiz was with the typologically impossible *Archaeopteryx* back in the nineteenth.

Of course we don't know whether Agassiz could have switched perceptual gears had Darwinists been able to throw fossil australopithecines at him along with *Archaeopteryx* in the 1860s. But given Agassiz's shudders at Negro table servants we can justifiably suspect that it would have been as difficult for Agassiz to pull that off as would Duane Gish willingly striking "dinosaurs" off the reservation plan for Noah's Ark.

On a larger scale, Johnson's tactical invocation of Agassiz's authority is entirely consistent with the historical revisionism popular among conservative Christians dissatisfied with the last tumultuous century of social and scientific thought. The radio sermons of D. James Kennedy regularly extol the mythic Christian America, as though philosophical Deists like slaveholding Thomas Jefferson or politic charmers like womanizing Benjamin Franklin had somehow been Redeemed *post hoc*. But just as the eighteenth century world of the Founding Fathers was more complex than Disney's audioanimatronic "Hall of Presidents," nineteenth century natural science was no blushing creationist innocent corrupted by the perfidious wiles of godless Darwinism.

The mixture of religion, scientific observation, social and racial prejudice, and unvarnished personal foible ranged along a broad spectrum. It was a lot easier for bigoted intellectuals to entertain separate racial creations if they didn't accept true common descent as Darwin did. So it was that in the 1880s geologist Alexander Winchell (like Agassiz, a racist who opposed interracial marriage) bypassed flat-out Darwinism to embrace the neo-Lamarckian evolution of paleontologist Edward Drinker Cope. On the theological side, evangelicals were by no means uniformly opposed to Darwinism, and often for much the same reason as Winchell. Benjamin Breckinridge Warfield could accept the physical argument for Darwinian common descent along with Biblical inerrancy because he was at heart a racial egalitarian. Likewise, the pious Asa Gray was persuaded of evolution partly because both he and Darwin were empiricists whose anti-slavery sentiments were naturally buttressed by the concept of a common humanity. Where Gray couldn't follow concerned Darwin's ultimate rejection of Paley-style design, a matter that remains the bugbear today as Phillip Johnson and Richard Dawkins duke it out from afar.¹⁴

Knowing more about Louis Agassiz's background (and how easily Johnson managed to miss it) reminds us of the need to be very careful when wading through the history of human thought. But no warning flags appeared for Henry Morris when it came to the even smugger historical name-dropping he undertook in *What Is Creation Science?* There the apologetic sport was played with a swift backhand:

Belief in this primeval special, completed, supernatural creation is consistent with all genuine facts of science, which is sufficient warrant for identifying this belief as "scientific creationism" or "creation science." This is further strengthened by the historical fact that most of the great scientists of the past who founded and developed key disciplines of science were creationists. Note the following sampling:

- Physics (Newton, Faraday, Maxwell, Kelvin)
- Chemistry (Boyle, Dalton, Pascal, Ramsay)
- Biology (Ray, Linnaeus, Mendel, Pasteur)
- Geology (Steno, Woodward, Brewster, Agassiz)

Astronomy (Kepler, Galileo, Herschel, Maunder)

These men, as well as scores of others who could be mentioned, were all creationists, not evolutionists, and their names are practically synonymous with the rise of modern science. To them, the scientific enterprise was a high calling, one dedicated to “thinking God’s thoughts after Him,” as it were, certainly not something dedicated to destroying creationism.¹⁵

What a mixed bag Morris has served up!

Of course the average creationist acolyte reading the present (and unrevised) 1997 printing of *What Is Creation Science?* would have no clue about Agassiz’s racially tinted brand of “creation”—or how it related to the development of 19th century science.¹⁶ Nor would they be able to discern the methodological and temperamental differences between the gentle Nicholas Steno, who was both a perceptive 17th century geological pioneer and a saintly man of faith, and his slightly younger British contemporary John Woodward, a self-made boor and plagiarist.¹⁷ Then there was the missing historical background of Galileo, whose deep faith (but confrontational personality) ran squarely into the brick wall of a retrograde religious authority that required him to disavow his nasty Copernican heresy, as well as spending the remaining years of his life under house arrest. And while we’re about being true to the historical facts, what would the reader make of Kepler were they to learn of his sideline as a practicing (and quite fervent) astrologer?¹⁸ This was an especially tart irony given that on the very next page Morris decried the “barren materialism of modern evolutionism” that in his view had spawned the resurgence of “evolutionary pantheism” in the guise of the New Age movement (complete with *astrology* and *religious mysticism*). Venerable old Isaac Newton would be all at home in that environment too, what with his fascination for alchemy, as well as an obsession with Biblical prophecies which might well have landed him a steady gig on Hal Lindsey’s long-running apocalyptic revues on Christian cable.¹⁹

These incidents of creationist name-dropping are so grating because its practitioners are not averse to calling attention to what they perceive as the benighted views of *evolutionists*—especially overtly Marxist or “very atheistic” ones, as we’ve already seen. For example, the only item under “racism” in the index of *What Is Creation Science?* concerned Gary Parker rolling out the antiquated views of comparative racial intelligence offered by evolutionist Henry Fairfield Osborn back in the xenophobic 1920s.²⁰ By so stacking the deck that only evolutionists are seen to have questionable beliefs, the unwary reader comes away with a very skewed historical picture (this was in the same section where Parker deployed his Cambrian “heterostracan fish,” by the way). We’ll see this approach of selective “spot the prejudice” spin out of control next chapter as creationists are followed tackling the sociopolitical aspects of the evolution debate, laying at the feet of “Darwinism” virtually everything they don’t like about the 20th century.

But there’s something else noteworthy about what it means to extol the “Scientific Disciplines and Contributions by Creation Scientists,” as Scott Huse titled his name-dropper list in *The Collapse of Evolution*. Huse went Henry Morris one better by putting *dates* to all his glee club members, but that only underscored a glaring commonality neither Huse nor Morris thought to remark on. Although 95 percent of all the scientists who have ever lived are alive today, not one of these Creation Scientists was born in the 20th century, and few had even made it *into* the 20th century. Even overlooking that their disparate creeds were by no means all compatible with the Young Earth dogma espoused by Huse *et al.*, when it came to analyzing the physical data of the world their “creationism” stopped contributing to the corpus of human knowledge a long time ago. Most notably absent were the relevant fields of paleontology and the life sciences—no one to shed light on the taphonomy of therapsids or the illuminating biology of sea squirts.²¹

This plummeting output coincides exactly with the period when the fossil evidence for human evolution started turning up, and it’s not hard to understand why. For a creationist the natural evolution of man is a philosophical impossibility, but with the unified character of the process that means putting *all* substantive evolution off limits. What point then in poking around for clues to something that cannot (indeed, *must* not) happen in the first place? So even though many religious institutions had the means to launch fossil expeditions, there was no practical incentive to do so because the fossil facts would only keep piling up in favor of evolution. Had human beings or other

animals not in fact evolved, it would have been altogether natural for creationist paleontologists to remain in the field, exposing the handiwork of divine creation as well as confounding the expectations of Darwinists. But just as the heavens don't really show the hand of God in the juvenile sense Creation Science would have it (and astronomy has flowed off to the Big Bang as a result), the fossil hunt hasn't been in the least embarrassing to evolutionists. Which is why they're the ones who have kept up the work.

And speaking of that ... what sort of "work" are we talking about here?

In all the hubbub of the creation/evolution debate it is painfully easy to lose track of the epistemological "big picture." If natural descent with modification has occurred in a particular instance, in the forefront of our mind should be a simple question: what would we expect to find in the fossil record to suggest whether that evolution had happened? This matter of defining what it is that would be looked for, and a willingness to let the paleontological chips fall where they may, has decidedly *not* been how antievolutionists have approached the problem. As we've seen, a host of true believers have discoursed on everything from *Archaeopteryx* to Cambrian invertebrates without saying what it was they would accept as positive evidence for the evolution of those forms. Indeed, when they have incautiously sidled out on a technical limb (as when demanding those "impossible" whale intermediates) the discovery of the appropriate transitions did not inspire them to reevaluate their unfavorable opinion. They simply backed away to another limb, whistling innocently in other directions to distract attention while sawing off the abandoned position before anyone on their side might notice.

In this public relations exercise the antievolutionist is abetted by the congenital reluctance of the follower to investigate any further. But that is no excuse for any discipline having ambitions of a serious *scientific* character, as both Scientific Creationism and Intelligent Design are jockeying for. Phillip Johnson's canard of "methodological naturalism" be hanged—if a critic of evolution isn't even capable of rigorously defining what they believe, and is unwilling to grapple with the implications of the evidence head-on, then all you have left is to dive into the nearest apologetic foxhole. There the argument turns into an incestuous quilting bee, in which a surprisingly thin blanket of "reasons" are stitched together from a limited repertoire of approved texts with the tactical aim of covering over whatever novel information chances by ... disputation by camouflage.

So, what do you have to think about in order to make sense of *human origins*?

In one respect the study of human evolution differs *enormously* from all other fields of Darwinian investigation. Unlike the study of kinkajous or herons, we know exactly what's going on inside our heads—or rather, we intimately recognize that all sorts of interesting things *are* going on there, even if their exact causal sources (be they physical or spiritual) are not entirely understood. As we'll see, there is a lot that remains unknown about the mechanism of our own consciousness, and that puts an extra weight on the balance of evidence that needs to be accounted for in any meaningful explanation of how human beings got to be the way they are.

But aspects of the methodological problem are by no means unique to us. If whales are self-aware in some way comparable to our own condition, and if they were apprised of the possibility that they too might have had an evolutionary history, they would presumably want to know how their essential "whaleness" came about no less than we are concerning our vaunted "humanness." But in either case all we have to draw on are the *fossils*, and the paleontological game becomes one of trying to draw truly reasonable inferences to shed whatever light we may on that greatest of neurological mysteries: that of consciousness itself, whether cetacean or human.

The first thing to mark down on the "human evolution checklist" is that the fossil parameters are both known and remarkably few in number. Our primary distinguishing features are our refined and habitual bipedal anatomy (no tail or climbing adaptations) topped off by specialized skulls that house brains that are comparatively immense for our body size. Just as the evolution of mammals is traceable through the amazing shift of its jaw anatomy, so too human evolution would leave telltale clues in the fossil record. But in what order would these elements have appeared, and why? All the controversies swirling around anthropology over the last century have turned on the *when* and *where* of this incremental process.

Comparative anatomy requires just as much familiarity with the details, and precision in assessing them, as pottery analysis for an archaeologist—or artistic conventions for someone trying

to make sense of Renaissance tarot cards. When it comes to our own family tree, not all the physical features of a primate skull are equally useful from a diagnostic point of view. Stephen Jay Gould pointed out one example in *Hen's Teeth and Horse's Toes*:

Many mammals, for example, develop a sagittal crest—a ridge of bone running along the top of the skull from front to back and serving as an attachment site for muscles. Most primates do not have a sagittal crest, in part because large brains make the cranium bulge and leave neither room nor material for such a structure. But a general rule for scaling of the brain in mammals holds that large animals have relatively smaller brains than relatives of diminished body size (see essays in *Ever Since Darwin* and *The Panda's Thumb*). Thus, the largest primates have a sagittal crest because their relatively small brains do not impede its formation. (This argument does not apply to the great oddball *Homo sapiens*, with an enormous brain despite its large body.) The largest australopithecine, *Australopithecus boisei*, has a pronounced sagittal crest, while smaller members of the same genus do not. Gorillas also have a sagittal crest, while most smaller primates do not. We would make a great error if, using the sagittal crest as a shared derived character, we united the australopithecine with a gorilla in a sister group and linked other, smaller-bodied australopithecines with marmosets, gibbons, and rhesus monkeys. The sagittal crest is a “simple” character, probably part of the potential development repertoire for any primate. It comes and goes in evolution, and its mutual presence does not indicate common descent.²²

But other features are far more significant. No less than with the reptile-mammal transition, a suite of characters allows the tracing of human descent with considerable confidence. To no surprise, in the chapter on human evolution in his critique of creationism, Christopher McGowan delineated some of those anatomical features that would have to change in order for an ape to evolve into a man, and how those elements turned up in the known fossils.²³

Comparing a chimpanzee with a human, the chimp's incisors and canine teeth are visibly larger, and there is a distinctive gap in the upper jaw (the “diastema”) between the second incisor and canines. The cheek teeth in a chimpanzee are arranged in a straight line parallel with those on the other side, unlike the gentle curve found in a human jaw. Where the two halves of the lower jaw meet, apes also possess a small “simian shelf” that we humans lack. But the differences also extend to dental development, and turn on those enlarged ape canines. Because an ape's canine teeth are so much larger than ours are, they naturally tend to take a lot longer to develop to full maturity. But there is considerable variation concerning when those permanent canines *erupt*—differences between the sexes can lead to the them appearing last, but not necessarily. Such natural variety has complicated the evaluation of hominid dental characters. Indeed, even the prudent McGowan ended up behind the curve here, proceeding as though all apes' permanent canines erupted after their wisdom teeth.²⁴

But then, McGowan's specialty is not primate anatomy—a distinction to recall later on.

Moving on out to the braincase, the bulge at the back of the skull (the “occipital protuberance”) is positioned high on the chimp, but very low on the human. More importantly, the opening where the spinal cord enters the brain (the “foramen magnum”) runs *backward* on an angle for the chimp, compared to straight down from the center on a human. The reason for that concerns our bipedality—which means that even lacking a pelvic structure, an isolated adult skull can suggest the locomotion of the body based on the position of the foramen magnum. When you do have the pelvis to examine, of course, a series of adjustments may be observed: the hips had to widen for balance (while in females, the flaring was accentuated due to child bearing) and the attachment to the vertebral column shifted down closer to the hip joint. To further the upright balancing act, the human femur angles inward, causing our knees to rub together as we walk.

This is not to say that all these changes have been pulled off with optimal efficiency. Indeed, as John Avise reminded recently in *The Genetic Gods*, an unintended downside to our bipedalism is that we are prone to a bevy of ailments related to the change, “ranging from pains in the lower

back, leg joints, and feet, to abdominal hernias, varicose veins, and hemorrhoids.”²⁵ Similar contingencies trouble the shift in our larynx during infancy that takes place because in adapting the primate throat to more complex speech we have relied on an arrangement predating even the development of mammals. Advise again:

Like other organisms, humans have their share of phylogenetic legacies that constrain adaptations far short of designer perfection. An excellent example of such a design flaw concerns an unwanted junction of our food-conveying esophagus with our air-conveying trachea (thus posing ever-present dangers of choking on food). How insensible it is that these two thoroughfares should intersect, necessitating constant attention by a highly conscientious but nonetheless fallible crossing guard (the glottis). A more intelligent solution to this engineering problem would entail complete separation of the respiratory and digestive systems, which is the case for insects and mollusks. It is something of an accident of history that the early ancestor of vertebrates was a small aquatic creature whose oral cavity simultaneously served as a feeding sieve and a gill apparatus for extracting oxygen from the water. Hundreds of millions of years later, our respiratory and digestive systems still retain this legacy.²⁶

The glottis does its job adequately enough in the other primates, but twisting the arrangement around to make our more elaborate vocalizations means that flap fails to seat quite so securely for us—hence the threat of choking to death should we swallow things “down the wrong throat.” Such are the pitfalls of “descent with modification” ... as well as the bane of Michael Behe’s Intelligent Design.²⁷

Now much of this basic anatomical information would have been available to a Darwin or Agassiz in the middle of the 19th century—but *not* the fossils that would decide whether any of these transformations had indeed taken place back in the mists of time. All that evidence has accumulated in the century since those two scientists lived, which means their opinions can’t really matter all that much when it comes to understanding subsequent discoveries.²⁸ Of greater interest, though, is the methodological comparison between how a succession of evolutionary anthropologists arrived at their conclusions about human ancestry and how Creation Science and Intelligent Design report that process in their communiqués to the faithful. When it comes to human evolution, the “creation hypothesis” doesn’t fly any farther than it did with *Archaeopteryx* or the reptile-mammal transition.

The epistemological side of working out human origins is a classic example of the accumulating “connect the dots” process already observed in other fossil cases. At first all you have is a blip or two, but as more information turns up theories flow back and forth in an effort to understand the larger picture with what little you do have. Some interpretations are supported by the evidence and survive, while others fall apart once new data appear. Personal egos and reputations also play a role, as they inevitably do whenever more than one opinion is involved. But individual scientists and their contentious disputes do pass on—allowing later investigators to sweep away the emotional dust and sort out the facts without feeling personally threatened by them. Phillip Johnson’s repeated assertions of overriding evolutionary ideological bias notwithstanding, there is an ever-expanding body of evidence to be explained and not all interpretations would be equally capable of accounting for them.

To get at the truth of human origins scientists in the first half of the 19th century had to get over a preliminary conceptual hurdle and accept that human beings had lived long before the traditional Biblical chronology of six thousand years. Once it was recognized that anatomically modern man like the European “Cro-Magnon” had coexisted with the extinct fossil animals that were increasingly turning up, the boundaries of Cuvier-style creationist catastrophism were breached and “antediluvian man” could become “prehistoric man.” With that perceptual door opened, the serious search for prehuman ancestors could begin.²⁹

The first to be known were the Neanderthals, the quintessential “cave man.” Being the nearest and most recent of our relatives, their discovery in the middle of the 19th century only hinted at the

range of controversy to come, as anthropologists tried to pin down where and when humanity might have developed.³⁰ The investigation of human evolution was thus getting underway at just the time the therapsids started showing up in the mammalian evolution tale. But discovering an ancestral insectivore does not touch the same raw nerves (both scientific and social) that unearthing a potential non-human ancestor for *Homo sapiens* does.³¹ Those European racists contemplating the “Caucasian” (let alone mythical “Aryan”) roots of man had to swallow hard even to allow a manlike Asian ape onto the family tree, such as the fragmentary “Java Man” the Dutch anatomist Eugène Dubois turned up late in 1891.³²

With this stage in the development of anthropology we are in the thick of the same sociopolitical quagmire that eventually exploded on the military side as World War I. European scientists were by no means immune from the nationalistic fancies that entangled their decaying monarchies in dangerously unstable alliances. While the upstart Prussians applied railroad timetables to defeat first Hapsburg Austria and then Napoleon III to create the German Empire, the French seemed to have all the luck when it came to harboring Stone Age fossils. From the supposedly hulking Neanderthals to the artistic Cro-Magnon Man, French anthropologists made the most of their hegemony by defining the terms of debate.³³

Frowning at these paltry Pleistocene men from across the English Channel were British imperialists who would like nothing better than to upstage their continental rivals by unearthing the earliest human ancestor (“Pliocene Man”) on native soil. At the time the reigning idea was that big brains had to have emerged first in man, followed by upright walking—meaning anthropologists were expecting to find highly apelike antecedents with comparatively bulging crania.³⁴ In 1912 just that sort of evidence conveniently turned up at Piltdown, Sussex, courtesy of an amateur fossil hunter (and solicitor) by the name of Charles Dawson. Eventually pegged at 500,000 years old, *Eoanthropus dawsoni* was the perfect theoretical combination of an apelike jaw with a human-style braincase. As well it should, since someone (most probably Dawson himself, whose professional career was riddled with hoaxes and plagiarism) had taken a medieval human skull fragment and orangutan jaw, filed down the apelike dentition on the mandible, and made (temporary) fossil history.³⁵

Why was such a seemingly transparent hoax accepted so readily? A mix of laziness and happenstance conspired to keep “Dawn Man” on the front table. The support of the Keeper of Geology at the British Museum, paleontologist Sir Arthur Smith Woodward, obviously lent an undeserved air of authority to the finds—though as an expert on fossil fish Woodward was not exactly qualified to judge the merits of a novel human ancestor. Another factor was that the putative hoaxer, Charles Dawson, passed on in 1916; apart from a few bone implements that turned up later in 1917 no further digging was undertaken at Piltdown either to confirm or confute the original work. By the time World War I was over the fossils had been tucked away at the British Museum—which meant researchers in the next decades had to rely on casts of Piltdown rather than the genuine article, further insulating them from spotting its problems.

As in the *Protoavis* case three quarters of a century on, there was no proof that the jaw and braincase were from the same animal, so one needn't have suspected outright fraud to harbor doubts. And, indeed, stray qualms on that front started at the get-go with Cambridge anatomist W. L. H. Duckworth, despite his close friendship with Piltdown supporter Sir Arthur Keith. Outside the British orbit and across the Atlantic, the Smithsonian harbored more entrenched skepticism. Curator of Physical Anthropology Aleš Hrdlicka doubted the jaw and braincase went together, and mammalogist Gerrit Miller not only challenged the British reconstructions as early as 1915, but by 1930 came to suspect the jaw itself had been fiddled. Given how important a find Piltdown Man started out, as the years wore on anthropologists less enamored of the glories of the British Empire had begun to pay progressively less attention to it.

To be fair, until after World War II the amount of useful fossil hominid remains against which Piltdown Man might be contrasted were *very* minimal: there was Peking Man (misnamed after Pearl Harbor) and a scattering of African australopithecines (notably the Taung Child).³⁶ Because scientific progress usually proceeds by comparative information, not grand deductions from theory, it took a mounting collection of rival discoveries to drive Dawson's brainy ape to the block. Postwar technology also gave a shove by providing new analytical tools, thus inspiring the sort of

fresh critical examination Piltdown should have received in the first place if the world were ever so neat and tidy. In 1949 the Piltdown bones were taken out of storage by Kenneth Oakley of the British Museum and subjected to his new fluorine test, which suggested they could hardly have lain in the ground half a million years without having absorbed more. Pent-up doubts could now leak freely: in 1951 American anthropologist Carlton Coon called attention to certain suspicious *striae* on the Piltdown molars. Finally, Oxford anatomist Joseph Weiner nailed the case in 1953 by establishing that the jaw was indeed a surprisingly crude forgery.

Now the historical moral of Piltdown would seem right up the creationist alley: well over a generation of evolution-blinded anthropologists blithely signing on to an imaginary human ancestor. It is in that light (and that light only) that evolutionary critics choose to bring up Piltdown Man.³⁷ Scott Huse is fairly representative of this refined parlor game. Relying exclusively on a handful of secondary (and more than typically questionable) creationist sources, his dramatic embellishments tended to careen around the details, but the important aspect of his commentary concerns how little Huse's philosophical focus ultimately had to do with the reformation of forensic anthropology:

The remains of Piltdown Man were allegedly discovered in 1912 by Charles Dawson, an amateur fossilologist. He produced some bones, teeth, and primitive implements, which he said he found in a gravel pit at Piltdown, Sussex, England. He took them to Dr. Arthur Smith Woodward, an eminent paleontologist at the British Museum. The remains were acclaimed by anthropologists to be about 500,000 years old. A flood of literature followed in response to this discovery with Piltdown Man being hailed in the museums and textbooks as the most wonderful of finds. Over 500 doctoral dissertations were performed on Piltdown Man. Surely this find will stand the test of time and establish evolution as a fact of science; or will it?

All was well until October of 1956 when the entire hoax was exposed. *Reader's Digest* came out with an article, summarized from *Popular Science Monthly*, titled "The Great Piltdown Hoax." Using a new method to date bones based on fluoride absorption, the Piltdown bones were found to be fraudulent. Further critical investigation revealed that the jawbone actually belonged to an ape that had died only fifty years previously. The teeth were filed down, and both teeth and bones were discolored with bichromate of potash to conceal their true identity. And so, Piltdown Man was built on a deception which completely fooled all the "experts" who promoted him with the utmost confidence. According to Mr. Bowden: "... the person responsible for placing the faked fossils in the pit at Piltdown was Teilhard de Chardin S. J."

Teilhard authored several philosophical books in which he attempted to harmonize evolution and Christianity. Exasperated by the lack of convincing evidence for Darwin's theory, Teilhard was apparently motivated into assisting the theory of evolution by fabricating the needed missing link.

It should be noted that Piltdown Man was viewed in stately museums and studied in major textbooks for several generations. What will today's "facts" of human evolution turn out to be in the near future? And so, once again, the veracity of "expert testimony" is called into question. How fitting are the words of Scripture that declare: "Professing themselves to be wise, they became fools" (Rom. 1:22).³⁸

Those antievolutionists who invoke Piltdown employ it as a proxy for everything about the proliferating human fossil record that they neither appreciate nor are up to refuting. But in his unqualified accusation against Teilhard de Chardin (letting Dawson off the hook by implication) Huse has tried to fell two victims with one blow. By so doing Huse has inadvertently exposed a curious undertow in the modern creationist metaphysic that deserves some comment.

The background facts are plain enough. As a young paleontologist, Father Teilhard was involved both in the Piltdown flap and some of the digging in China that turned up the bone bits

eventually dubbed Peking Man—two of the main props underneath human evolution (at least in the pre-australopithecine 1920s). But Teilhard was also a Jesuit priest suffering from a decidedly mystical streak. His dreamy conception of evolution as a teleological quest for the Omega point of human perfection gained considerable popularity in the pot-addled Aquarian 1960s, which appears to be why theological conservatives like Phillip Johnson and Marvin Lubenow have also been drawn to the case implicating Teilhard in the Piltdown fraud.³⁹

Certainly Teilhard *might* have been involved in the hoax exactly as Stephen Jay Gould has argued—though Gould cautioned that the evidence against him as Dawson’s co-conspirator was purely circumstantial.⁴⁰ But Huse allowed no such anemic hedging. Filtered via British creationist Malcolm Bowden (a chap who believes *the earth doesn’t move around the sun*) Teilhard’s *sole* complicity became an established fact.⁴¹ Why might that be so? For a literal Christian creationist inured to the evils of godless Darwinism, an evolutionist faking the evidence was only to be expected, wasn’t it? But if the fraud might be pinned on a guru of New Age religious apostasy—well, all the better.⁴² One may also note that, for *really* conservative apocalyptic Protestants, the Roman Catholic Church is scheduled to perform the role of the Whore of Babylon in the coming Tribulation. As a *Jesuit* evolutionist, Teilhard had unknowingly stationed himself squarely behind several narrow creationist crosshairs.⁴³

With a focus like that, no wonder that Huse missed the broader methodological lessons of Piltdown. The simple moral that creationists hit on is that scientists can misjudge information, and can sometimes be very slow about admitting or correcting it (yawn). But since Piltdown there have been *zero* cases of fraud in paleoanthropology, forcing creationists to inflate minor interpretive molehills into mountains of supposed evolutionary mendacity.⁴⁴ It’s no coincidence that the other favorite creationist whipping boy in this area, “Nebraska Man,” also dates from the Piltdown era. This consisted of a single worn fossilized tooth found in 1917 by geologist Harold Cook in ten-million-year old strata from Nebraska—which happened to be the home state of William Jennings Bryan. When Cook forwarded the tooth on to Henry Fairfield Osborn in 1922, Osborn (a theistic evolutionist) was undertaking an editorial joust with fundamentalist Bryan over creationism in the *New York Times*. Stephen Jay Gould has suggested that serendipity played a substantive role in how Nebraska Man came to play out as it did.⁴⁵

After searching the Museum of Natural History’s massive fossil archive, Osborn found that a second tooth of the same type had already been uncovered in 1908 by an earlier dig Cook had undertaken in the same area. With two seemingly corroborative fossil blips on the scope, and Bryan’s fundamentalism obviously on his mind, Osborn jumped his conclusion, identifying the teeth as coming from the first known North American higher primate: *Hesperopithecus*, the “ape of the western world.” Other paleontologists who examined casts of the 1917 tooth were even less circumspect than Osborn, though, considering it a possible offshoot of the Asian “man apes” that were then entering the anthropological imagination. Piltdown supporter Sir Grafton Elliot Smith went so far as to promptly commission a hesperopithecine family portrait for the *Illustrated London News*—though the artist hadn’t the slightest idea what Osborn’s proposed specimen might have looked like, and so used the current image of Java Man as a model. Meanwhile, Osborn was not entirely settled about this new ape, and so sponsored (as well as participated in) expeditions in 1925 and 1926 to find more evidence. The results were thoroughly embarrassing: unworn teeth of the same type where found with enough associated remains to indicate the molar had actually come from an extinct pig. Having blundered big-time, Osborn let his colleague William King Gregory do the public retracting in 1927, and spoke no more himself of *Hesperopithecus haroldcookii*. Creationists, of course, have hardly been so mute, and energetically flail this particular dead horse to the current day.⁴⁶

Now Osborn’s error was not an entirely absurd one to make, since pig and human premolars really do resemble one another in ways the other teeth do not, and (like Woodward with Piltdown or McGowan with the Taung Child) Osborn was not a primate expert (though Gregory was).⁴⁷ Indeed, the original paper by W. D. Matthew (the Museum of Natural History’s crack paleontologist) and Cook on the 1908 tooth had actually warned how easily anthropoid and peccary molars could be confused. Double oops! A deeper irony lay in the rush to attempt to reconstruct “*Hesperopithecus*” from the molars alone—a risky extrapolation of the practice begun

by creationist Baron Cuvier, who relished rebuilding whole animals from the merest fragment, using the same broad assumptions of correlative deduction.⁴⁸ But more importantly, there was the guiding Piltdown combination of theoretical expectation, fueled by a desire to annoy the rising fundamentalist antievolution movement, as well as the nationalistic yearning for some nifty ancestors on our side of the Atlantic. With so few fossil players having been identified, the idea of Miocene Man strolling about Nebraska seemed far less implausible back before the full distribution of australopithecines and later Afro-Eurasian *Homo erectus* were known.⁴⁹

The historical reality of Piltdown and Nebraska Man is that evolutionists certainly do trip up occasionally—but in the free exchange of ideas it will be *evolutionists themselves* who will eventually call matters to account. Creationists from Duane Gish to Phillip Johnson have shown no appreciation of this nicety.⁵⁰ But the history of science speaks otherwise. Indeed, even in the days of Osborn and William Jennings Bryan, creationists were not among the active players.⁵¹ Since then, the Piltdown mix of theoretical desires, philosophical prejudice and some lazy antiquarian practice, is most commonly observed among the creationists plying the antievolution trade today. From the Paluxy River “man tracks” to the gymnastic denial of fossils like *Ambulocetus* or *Rodhocetus*, modern antievolutionists have regularly imitated Woodward, Elliot Smith and Keith on a bad day—not the expert ways of Kenneth Oakley or Joseph Weiner.⁵²

The reason for this ultimately turns on the role of *theory* in science. Anyone can get so carried away with their pet concepts that dumb mistakes are made—that’s human nature. But in the competitive interchange of solidly articulated hypotheses the odds are that serious goofs of the Piltdown magnitude won’t occur very often in this day and age, and won’t have a particularly long shelf life when they do. It is through the rugged interplay of theory interpreting the bald facts of nature that science manifests its laudable self-correcting properties.⁵³

This is bad news for modern creationism.

It’s not that creationists don’t have some rather firm ideas about things, but these intractable dogmas never graduate to the level of detail characteristic of a workable scientific model. That the average creationist also lacks the technical proficiency to make sense of the relevant evidence only exacerbates what is at root a failure of theoretical vision. So Phillip Johnson’s unctuous admonition that antievolutionists don’t really need to offer competing theories is only making a virtue of historical necessity. Creationists cannot muster a viable scientific alternative to evolution for the same reason generations of astrologers failed to notice they were missing a few planets that astronomers later detected for them. Not that this stopped astrologers from cravenly incorporating the new bodies into their horoscopes anyway (investing them coincidentally with the attributes of the Greco-Roman deities solely because astronomers hadn’t called them something else). Such parasitical sterility is just as characteristic of 20th century creationism (recall Duane Gish’s dinosaur book)—the sad practical outcome of promoting incompletely-baked ideas that are not *true* to begin with. Which is why Creation Science and Intelligent Design are habitually found carping from the sidelines, waiting for working evolutionists to drop fresh issues in front of them in lecture halls rather than poking their heads outside to investigate the natural world directly.

When it comes to human origins, this vicarious sport of apologetic target practice has to deal with the expanding body of serious fieldwork that took place after the Second World War. The dangerously invalid racial assumptions of some earlier evolutionists had by then been thoroughly discredited along with the Nazi ideology they partially inspired.⁵⁴ Cleared of that fulsome philosophical deadweight, the three old Darwinian assumptions of common human African ancestry could finally gain ascendancy, and these duly invigorated the practice of postwar anthropology. It was now abundantly clear that the wrong place to look for the *earliest* human fossils was in Eurasia—or the Americas. To make headway you’d have to go to anthropological Ground Zero: African deposits that cover the last few million years or so when humanity’s ancestors and those of the great apes were bidding one another adieu. Scientists eventually homed in on the valleys of East Africa, and that’s where the big fossil payoffs have turned up over the last quarter century (including more complete skeletons of both the australopithecines and *Homo erectus*).⁵⁵

But it happens that there are some critical snags in working out all the branches and twigs in the human family tree. Just as the threadbare Triassic vexes vertebrate evolution in the early Mesozoic and Duane Gish’s imaginary “Middle Cretaceous” obscures the transition from

protoceratopsids to ceratopsids ... so too has erosion won out over deposition in Africa on all too many occasions during the Tertiary. The primates start showing up during a general global cooling trend from the late Eocene on (about 45 million years ago). Unfortunately, their record gets spotty through much of the Oligocene, though improving early in the Miocene. But that coverage is a positive glut compared to the yawning hole where the critical late Miocene and early Pliocene ought to be (about 10-4 million years ago). That's when the australopithecines walked onto the stage.⁵⁶

You can spot here the golden opportunity for another hard pitch play of the creationist Bermuda Triangle Defense: mention the absence of fossil links for primate evolution without discussing the attendant geological reasons for them. And that is exactly how antievolutionists have approached the subject—when they approach it at all.⁵⁷

Indeed, the favored creationist fossil ape here is another red herring: the 15 million-year-old *Ramapithecus*, an ape whose initial sparse remains fell in the slot between the two major geological gaps. Back in the 1960s, the idea that *Ramapithecus* might have been part of the initial divergence along the line leading to man was not at all implausible, especially for anthropologists trained in the "British school," where human evolution was thought to have begun tens of millions of years ago. After a more complete specimen turned up, though, by the early 1980s proponents like David Pilbeam recognized that *Ramapithecus* belonged with its similar relatives on the stem group leading to orangutans.⁵⁸ While creationists prefer to paint the *Ramapithecus* story as a mini-Nebraska Man, the truth is that it was improving paleontological skills, and the increasing theoretical impact of molecular links underlying primate phylogeny, that brought about its reinterpretation in the natural course of scientific advance. As Ian Tattersall put it in the mid-1990s, "the fragmentary *Ramapithecus* could never have achieved distinction as humanity's remote ancestor had we known in the 1960s what we know today about how to extract information from fossils."⁵⁹

But dwelling on such historical and evidential context has never been a creationist long suit. A particularly brazen example of concealment regarding the treatment of primate evolution occurs in Davis & Kenyon's antievolutionary school text, *Of Pandas and People*, where their tendency to employ misleading illustrations instead of evidence reached its nadir. The volume flatly pronounced that, "The fossil record of primates contains a variety of distinct types which appear abruptly, remain essentially unchanged, and in some cases abruptly disappear from the record!"⁶⁰ The evidence for this consisted of no reference material whatsoever—only a lone chart on the next page that sported their customary graphic of solid bars representing various members of the primate order. The chronological grid had exactly three labels: "RECENT" at the top, "Miocene" farther down, and "CRETACEOUS" at the end—which suggested the markings were laid out in ten-million-year steps. Unfortunately, this means both of those African depositional lacunae cut squarely across the purportedly uninterrupted sequences, calling into question their certainty about which primate "types" were appearing or disappearing "abruptly." Another chart on the page after that compounded the omission. Skulls of *Australopithecus* species (*afarensis*, *africanus*, *robustus*, and *boisei*) and those of our own genus *Homo* (*habilis*, *erectus*, and *sapiens*) were displayed to reflect the competing views of Donald Johanson (*yea*) and Richard Leakey (*nay*) over whether the australopithecines belonged on the direct line of human descent. (The reasons for their dispute will be explored shortly.) But Davis & Kenyon couldn't resist a rhetorical double play: "Prior to the fossils shown on the chart, there is a time period of many millions of years for which there are numerous presumed transitional forms and much speculation, but no fossil evidence."⁶¹

Thus was the Bermuda Triangle Defense fielded with particular boldness, since either the authors of this proposed classroom resource were aware of the geological circumstances (and suppressed it in their pedagogical enthusiasm) or they were not (and so compiled their superficial account from vaulting ignorance). Pretty slipshod textbook writing, in either case ... where *are* the Gablers when you need them?

While creationists have been wagging their fingers at the gaps in between the fossil data, paleoanthropologists have understandably been more interested in making sense of the specimens themselves. And the outcome has been a series of conceptual revolutions, overturning a succession of theories that had been promulgated back before there was much in the way of data to go on. In this respect anthropologists were going through the same lurching process (and at about the same

time) as selenologists were once the Apollo program started dumping lunar rock samples in their lap. Once you actually have information to feed into the hypothesis formation mill, there is a tendency for weaker older scientific theories to go *snap*. Indeed, just as both of the major lunar origin models (captured satellite versus simultaneous accretion) turned out to be wrong, the stately prewar view of human evolution as ancestor A mellowing incrementally into B and thence into C over ten million years or more was in for a rude disconfirmation.

The first shakeup concerned the relative chronology of events ... where the pieces fell on the “map of time.” And here, a bit of history helps.

So long as all you had were Neanderthals living fairly recently, and fragments like Peking Man, the Taung Child, and the imaginary Piltdown, paleoanthropologists had no idea of the order in which the necessary skeletal and behavioral transformations had taken place. For years that factual void was filled by a menagerie of educated guesses intended to illustrate the pet theories of the major lights of early 20th century anthropology. It was a bit of an Anglo-American grudge match between Sir Arthur Keith, the anatomists Sir Grafton Elliot Smith (Australia) and Frederick Wood Jones (Britain) on one side, and the New York AMNH duo of Henry Fairfield Osborn and William King Gregory on the other. As described by Roger Lewin in his informative book *Bones of Contention*, these “great names” recognized what changes were involved going from ape to man. But without the background data and methods scientists have today, they ended up permuting the available variables every which way:

The main events in these stories are four, and they represent the evolutionary transformation of some kind of primitive primate ancestor into a civilized human being. They are as follows: the shift from the trees to the ground—terrestriality; the change of posture from walking on four legs to balancing on two—bipedalism; the expansion of the brain, with flowering of intelligence and language—encephalization; and the emergence of technology, morals, and society—civilization. Osborn and his four most prominent contemporaries agreed emphatically on the need for these four components of our transformation, but equally emphatically disagreed on the order in which they occurred.

Osborn, for instance, perceived the sequence of events as given above. It began with a distant ancestor leaving the trees and beginning life on the ground—terrestriality. This was followed by the development of bipedality; then brain expansion; and last, civilization. Overall, this is very much how Darwin saw things. For Keith, it was different. He envisaged the evolution of bipedalism in a still-arboreal ape, and the adoption of a terrestrial existence came second. The expansion of the brain—encephalization—followed the elaboration of technology and society, and did not precede it as Osborn believed. Elliot Smith had yet a different view, which placed encephalization as the first event. His brainy ape then became bipedal, while still leading a mainly arboreal life. Only then did Elliot Smith’s ancestor come to the ground, whereupon the development of civilization followed. Gregory’s scheme involved terrestriality as the first event, followed by the evolution of society and technology; bipedality and encephalization concluded the story in that order. Wood Jones’s ideas were similar to Elliot Smith’s, in that the ancestor became bipedal and brainy while still living in the trees. The order of events was, however, different: for Wood Jones bipedality preceded encephalization.⁶²

The fleshing out of the australopithecine fossil record after the Second World War ultimately settled a lot of issues for most evolutionists (though obviously not for those creationists circling like vultures nearby). The first item on the plate turned on their basic taxonomy: the australopithecines are justifiably ranked as “apes,” but with some notable deviations. Standing barely a meter tall, they looked a bit like a bonobo chimpanzee—the slimmer relatives of the more familiar (and comparatively aggressive) “Bonzo” variety invariably seen in films—with a

comparable brain size and adult growth pattern.⁶³ The australopithecines are also the earliest “apes” to lack the *simian shelf*—and that little number is one of the tics that nudges them onto our side of the primate fence much as the telltale sigmoid process allows paleontologists to reasonably classify *Pakicetus* as a whale. Beyond that, the australopithecine dental layout and tooth growth pattern resembles that of the other great apes ... except, here too they had begun diverging from the primate standard in several diagnostic ways. They had begun the reduction of the canines and incisors (thus somewhat narrowing the *diastema*), while enlarging the molars (often “dramatically” so in some of the later species).⁶⁴

Another mark on the australopithecine balance sheet concerned the bipedality debate. As fresh skeletal material turned up, Raymond Dart’s insightful inference from the Taung Child’s vertically positioned *foramen magnum* was confirmed. By the time the first fairly complete australopithecine skeleton was found in 1974 (the famous “Lucy”), there was no getting around the fact that they were indeed fundamentally bipedal.⁶⁵ More uncertain is whether they were also semi-arboreal, climbing trees or limb ambling in the manner of contemporary forest-dwelling chimpanzees or orangutans. Steven Stanley favors the view that the australopithecines retained a facility for tree climbing: using their flexible ankle and big toes along with the longer arms to function much like the cleats and pole strap of a telephone lineman.⁶⁶

These basic anatomical details prompt a fascinating evolutionary detective story—one of those speculative “just so” tales that helps pose some of the questions that need to be asked, even if not yet conclusively answered. Why did it take so long for the human mind to show up on the scene? Looking into the points raised in Stanley’s argument opens up broader issues: the impact of external forces like global climate fluctuation ... the role of accident and sporadic innovations ... and even the implications to be drawn from the distinctive shape of rock flakes.

First, the weather report: the environment was cooling off from the ice age that began to deep-freeze the Northern Hemisphere around five million years ago. That was the reason why the African rain forest canopies of hundred-foot trees were giving way to more widely spaced arbors half that height.⁶⁷ In that changing habitat a combination of bipedality and arboreality may have suited a lifestyle of mobile foraging—retiring to tree clusters for safer nocturnal refuge from prowling predators like *Dinofelis barlowii* (which resembled a stocky leopard). Indeed, whatever the australopithecine lifestyle was, the genus persisted for several million years ... not a bad run, as species go. And those same ecological factors that naturally select physical variations appropriate to the environment may have come into play on other occasions, as Barbara Stahl noted in *Vertebrate History*:

That the evolution of terrestrial, even semibipedal, hominoids may have taken place several times during such an interval is suggested by the discovery in early Pliocene deposits in Italy of a form called *Oreopithecus*. This animal, known from extraordinarily complete dental, cranial, and postcranial remains, was neither a hominid nor a pongid but represented an independent and ultimately unsuccessful catarrhine line. It bore a unique mosaic of characters: keeled lumbar vertebrae and molar teeth similar to those of cercopithecoids, elongated arms somewhat gibbon-like in proportions, and small canines followed in the lower jaw by bicuspid premolars like those of men. The long arms and curving fingers or *Oreopithecus* imply that it was adapted for brachiating through the trees, but its broad pelvis could mean only that it stood upright or nearly so part of the time. Since *Oreopithecus* was as large as a chimpanzee, it might have been at first glance hard to distinguish it from semibipedal forms of the early hominid group.⁶⁸

Now there might not seem all that notable a difference between an *Oreopithecus* brachiating through the forests of Europe and the australopithecines scrambling up and down trees as African woodlands began to thin into savannas many millions of years later. But the special quirks of the latter arrangement may have contributed to whatever pushed the australopithecines along the path

to human beings. Paleoanthropologist Ian Tattersall has noted some of the challenges and opportunities facing a biped venturing into a savanna-style habitat:

Thus both the distance to the horizon and the visibility of potential predators—especially in long grass—are vastly increased by raising eye level, while a vertical silhouette is less attractive to a carnivore than is a horizontal one. What’s more, the savanna was never simply a barrier to be crossed in the most efficient and least hazardous manner; it also represented a whole new range of food resources included the roots and rhizomes of shrubs and grasses, and—most fatefully—the remains of dead animals, an incomparable source of fats and proteins. Descended ourselves from the most expert of hunters, we are prone to think of scavenging of animal carcasses as a pretty humble and unsophisticated kind of occupation; but in reality this activity demands a wide variety of skills. Much has been made, for example, of the importance of the creation of “mental maps” of where food resources are to be found in the development of mankind’s vaunted cognitive skills. The fact is, however, that any primate you can name, certainly any fruit-eater, possesses the capacity to patrol its territory and to predict where certain resources are to be found in different seasons. What is different about scavengers on the savannas is in reality the lack of maps: lion kills are scattered about much less predictably in time and space than are fruiting trees, which can be relied upon to perform on a more or less regular schedule. To find carcasses out in the grasslands, you have to learn to read indirect signs: vultures wheeling in the air above; movements of herd animals. Of course, before the invention of stone tools there was a limit to the extent to which it was possible to exploit the kills of other animals; but the potential was there, and the savanna also provided opportunities to hunt smaller and more helpless forms of life, as chimpanzees have been observed to do in woodland settings.⁶⁹

But in the world of Darwinian change even the grandest of potentials may turn on the most inconsequential of triggers—and whatever mental patterns the australopithecines might have been storing up did not immediately snowball into an encephalization arms race. Why ever not? In his 1996 book *Children of the Ice Age*, Steven Stanley contended that was because no ape was going to develop a really big brain to exploit all that opportunity so long as its survival strategy depended on a body otherwise accommodated to life-or-death opportunistic tree climbing. The human mind couldn’t get off the ground, so to speak, until we’d got *on* the ground.

Stanley’s argument is that the “terrestrial imperative” means that a human ancestor would have to have their hands (and associated behavior) free enough to look after a comparatively helpless infant while its brain developed postnatally—which is what our species does with a vengeance.⁷⁰ Stanley had made that developmental connection back in 1979, but the idea remained dormant because the possible tree-climbing proclivities of the early australopithecines had been sidelined as part of the bipedality controversy. So long as it appeared that the bipedal australopithecines *had* properly freed their hands, though, their apparent failure to get noticeably brighter over a million and a half years posed a theoretical problem for Stanley. Following the refreshed arboreal clue, Stanley thinks the shift in the African forest ecosystem eventually forced the australopithecines through an adaptive bottleneck: those species unable to commit irrevocably to living on the ground went extinct (which most of them did). The survivor (now an obligatory biped) led to our own genus *Homo* and with that putative barrier to postnatal cranial growth removed ... the rest was, as the cliché would have it, history.⁷¹

How much of Stanley’s scenario will pan out under the scrutiny of evidence remains to be seen. But it does bring us to a fun bit: the nominal trigger for the Pleistocene glaciation was the formation of the Isthmus of Panama, which severed oceanic circulation patterns between the Atlantic and Pacific. Stanley observed that, “As a result of this modest geological construction, profound changes in oceans and climates cascaded around the world. The jarring implication of

this chain of causation is that we humans would not exist were it not for one small vagary of the earth's dynamic crust."⁷²

Or, put another way ... wouldn't that make mankind's "true creator" the future site of the Gatun and Miraflores Locks? At this point one can easily imagine Phillip Johnson having conniption fits. Yet such are the extraordinary gems to be uncovered in tracing a genesis of man that has been more convoluted and contingent than the digest version in John 1:1-3.⁷³

Antievolutionists and Human Origins: Not connecting the fossil dots

This is not to say that the resolute Berkeley lawyer has been unmindful of the problem of human origins. Indeed, the section on "From Apes to Humans" in *Darwin on Trial* was the longest stretch on fossil evidence in the book (half again longer than that devoted to the reptile-mammal transition). This certainly reflects the importance Johnson attaches to the subject, and underscores why he perceives the hominid fossil record as playing so overarching a role in general paleontology. But more importantly, with all that attention lavished on it Johnson managed to veer closer to the particulars of human evolution than he ever managed when it came to therapsids or the Cambrian Explosion. And therein lies more of methodological moment, for in observing what happens when Phillip Johnson decides to don the apologetic mantle of a detail-fiddler like Duane Gish, we can take a final measure of how Intelligent Design and Creation Science stack up in the end.

Here, in its entirety, is Johnson's treatment of human evolution in *Darwin on Trial*:

In the 1981 "Fact and Theory" article discussed in the preceding chapter, Gould cited the "half-dozen human species discovered in ancient rocks" as proof that humans evolved from apes. When he published a revised version of the same argument in 1987, the number of species had been reduced to five, one of which was *Homo sapiens* itself, but the point was the same:

Would God—for some inscrutable reason, or merely to test our faith—create five species, one after the other (*Australopithecus afarensis*, *A. africanus*, *Homo habilis*, *H. erectus*, and *H. Sapiens*), to mimic a continuous trend of evolutionary change?⁷⁴

[At this point a note intervened:]

The four ape-man species that Gould cites include the two *Australopithecines* on the ape side of the boundary, which had ape brains but are supposed to have walked upright, and the larger-brained *Homo* specimens. Louis Leakey's *Homo habilis* (handy man) is at the borderline and was granted *Homo* status mainly because it was found at a site with primitive tools, which it is presumed to have used. Readers who learned about this subject in school may be surprised to find out that *Neanderthal* man is frequently considered a subgroup within our own species and *Cro-Magnon* man is simply modern man. Some other familiar names were either dropped from the pantheon or absorbed into the four species. Hominid fossil classification is a fiercely controversial subject and was in chaos until the ubiquitous Ernst Mayr stepped in and set the ground rules.⁷⁵

[The main text body went on:]

That way of putting the question makes it sound as if Darwin proposed his theory because the presence of an abundance of fossil intermediates between apes and humans required some explanatory hypothesis. Of course what actually happened is that the theory was accepted first, and the supporting evidence was discovered and interpreted in the course of a determined effort to find the "missing links" that the theory demanded. The question this sequence of events raises is not whether God has been planting fossil evidence to test our faith in Genesis, but whether the Darwinist imagination might have played an important role in construing the evidence which has been offered to support Darwin's theory.

Physical anthropology—the study of human origins—is a field that throughout its history has been more heavily influenced by subjective factors than almost any other branch of respectable science. From Darwin’s time to the present the “descent of man” has been a cultural certainty begging for empirical confirmation, and worldwide fame has been the reward for anyone who could present plausible fossil evidence for missing links. The pressure to find confirmation was so great that it led to one spectacular fraud, Piltown man—which British Museum officials zealously protected from unfriendly inspection, allowing it to perform forty years of useful service in molding public opinion.

Museum reconstructions based on the scanty fossil evidence have had a powerful impact on the public imagination, and the fossils themselves have had a similar effect upon the anthropologists. The psychological atmosphere that surrounds the viewing of hominid fossils is uncannily reminiscent of the veneration of relics at a medieval shrine. That is just how Roger Lewin described the scene at the 1984 *Ancestors* exhibition at the American Museum of Natural History, an unprecedented showing of original fossils relating to human evolution from all over the world.

The “priceless and fragile relics” were carried by anxious curators in first-class airplane seats and brought to the Museum in a VIP motorcade of limousines with police escort. Inside the Museum, the relics were placed behind bullet-proof glass to be admired by a select preview audience of anthropologists, who spoke in hushed voices because “It was like discussing theology in a cathedral.” A sociologist observing this ritual of the anthropologist tribe remarked, “Sounds like ancestor worship to me.”

Lewin considers it understandable that anthropologists observing the bones of their ancestors should be more emotionally involved with their subject than other kinds of scientists. “There *is* a difference. There *is* something inexpressibly moving about cradling in one’s hands a cranium drawn from one’s own ancestry.” Lewin is absolutely correct, and I can’t think of anything more likely to detract from the objectivity of one’s judgment. Descriptions of fossils from people who yearn to cradle their ancestors in their hands ought to be scrutinized as carefully as a letter of recommendation from a job applicant’s mother. In his book *Human Evolution*, Lewin reports numerous examples of the subjectivity that is characteristic of human origins research, leading him to conclude that the field is invisibly but constantly influenced by humanity’s shifting self-image. In plain English, that means that we see what we expect to see unless we are extremely rigorous in checking our prejudice.

Anthropologists *do* criticize each other’s work, of course—their ferocious personal rivalries are partly responsible for the subjectivity of their judgments—but the question they debate is *whose* set of fossil candidates tells the story of human evolution most accurately, not *whether* fossil proof of the ape-human transition exists. For those who have chosen to devote their lives to exploring exactly how humans evolved from apes, persons who doubt the basic premise are by definition creationists, and hence not to be taken seriously. That there might be no reliable fossil evidence of human evolution is out of the question.

A prestigious outsider, however, has proposed the unthinkable. Solly Zuckerman, one of Britain’s most influential scientists and a leading primate expert, is a good scientific materialist who regards the evolution of man from apes as self-evident, but who also regards much of the fossil evidence as poppycock. Zuckerman subjected the *Australopithecines* to years of intricate “biometric” testing, and concluded that “the anatomical basis for the claim that [they] walked and ran upright like man is so much more flimsy than the evidence which points to the conclusion that their gait was some variant of what one sees in subhuman Primates, that it remains unacceptable.”

Zuckerman's judgment of the professional standards of physical anthropology was not a generous one: he compared it to parapsychology and remarked that the record of reckless speculation in human origins "is so astonishing that it is legitimate to ask whether much science is yet to be found in this field at all." The anthropologists not surprisingly resented that judgment, which would have left them with no fossils and no professional standing. Wilfred Le Gros Clark performed a rival study that came to more acceptable conclusions, and the consensus of the experts, meaning those who had the most to lose, was that Zuckerman was a curmudgeon with no real feel for the subject. The biometric issues are technical, but the real dispute was a conflict of priorities. Zuckerman's methodological premise was that the first priority of human origins researchers should be to avoid embarrassments like the Piltdown and Nebraska Man fiascos [*sic*], not to find fossils that they can plausibly proclaim as ancestors. His factual premise was that the variation among ape fossils is sufficiently great that a scientist whose imagination was fired by the desire to find ancestors could easily pick out some features in an ape fossil and decide that they were "pre-human." Granted these two premises, it followed that all candidates for "ancestor" status should be subjected to a rigorous objective analysis, and rejected if the analysis was either negative or inconclusive.

Zuckerman understood that it was probable that none of the ape-like hominid fossils would be able to pass this kind of test, and that as a consequence fossil evidence of human evolution might be limited to specimens like Neanderthal Man that are human or nearly human. The absence of direct evidence for an ape-man transition did not trouble him, because he assumed that the Darwinian model was established for humans as well as other species on logical grounds. Besides, evidence of ancestral relationships is in general absent from the fossil record. That being the case, it should be cause for suspicion rather than congratulation if there were a surfeit of ancestors in the one area in which human observers are most likely to give way to wishful thinking.

Zuckerman's position might have seemed reasonable to persons with no great stake in the question, but one also has to consider the cultural and economic aspects of the situation. The story of human descent from apes is not merely a scientific hypothesis; it is the secular equivalent of the story of Adam and Eve, and a matter of immense cultural importance. Propagating the story requires illustrations, museum exhibits, and television reenactments. It also requires a priesthood, in the form of thousands of researchers, teachers, and artists who provide realistic and imaginative detail and carry the story out to the general public. The needs of the public and the profession ensure that confirming evidence will be found, but only an audit performed by persons not committed in advance to the hypothesis under investigation can tell us whether the evidence has any value as confirmation.

For all these reasons I do not accept the alleged hominid species as independently observed data which can confirm the Darwinian model. I should add, however, that this degree of skepticism is not necessary to make the point that the hominid series cited by Gould is open to question. Some experts in good standing doubt, for example, that *A. Afarensis* and *A. Africanus* were really distinct species, and many deny that there ever was such a species as *Homo habilis*. The most exciting hypothesis in the field right now is the "mitochondrial Eve" theory based upon the molecular clock hypothesis discussed in Chapter Seven, which asserts that modern humans emerged from Africa less than 200,000 years ago. If that hypothesis is accepted, then all the *Homo erectus* fragments found outside of Africa are necessarily outside the ancestral chain, because they are older than 200,000 years.

Still, I am happy to assume *arguendo* that small apes (the *Australopithecines*) once existed which walked upright, or more nearly upright than apes of today, and that there may also have been an intermediate species (*Homo erectus*) that walked upright and had a brain size intermediate between that of modern men and apes. On that assumption there are possible transitional steps between apes and humans, but nothing like the smooth line of development that was proclaimed by Dobzhansky and other neo-Darwinists. We have to imagine what Steven Stanley calls “rapid branching,” a euphemism for mysterious leaps, which somehow produced the human mind and spirit from animal materials. Absent confirmation that such a thing is possible, it is reasonable to keep open the possibility that the putative hominid species were something other than human ancestors, even if the fossil descriptions are reliable.

The hominids, like the mammal-like reptiles, provide at most some plausible candidates for identification as ancestors, if we assume in advance that ancestors must have existed. That 130 years of very determined efforts to confirm Darwinism have done no better than to find a few ambiguous supporting examples is significant negative evidence. It is also significant that so much of the claimed support comes from the human evolution story, where subjectivity in evaluation is most to be expected.⁷⁶

And there we are, safely barricaded in the deep bunker Johnson has defended all the way through Niles Eldredge and beyond. There is no credible fear that evolutionists may somehow breach this redoubt, of course, simply because Johnson has carefully blocked off all possible logical entry (or *exit*—which may be even more interesting from a methodological point of view).

He started the portal-sealing operation at the beginning, with that revealing “makes it sound as if Darwin proposed” line. In this way Johnson has turned the process of scientific predictive success *bass-ackwards*. It is because so much evidence for the theory turned up later that it is possible to observe how handy the descent argument has been in anticipating what proto-humans really lived in the past. In other words, wouldn’t anthropologists be “testing” the Darwinian theory every step of the way? By so reversing the scientific method, Johnson has set up a “heads I win, tails you lose” situation. Any fossils predating Darwin (like the dribble of Neanderthals that were then known) would be dismissed as having already been covered by the theory, while subsequent discoveries (a parade of distinctive australopithecines and *Homo erectus*) are rejected as merely the *post hoc* reinforcement of the preconceived doctrine.⁷⁷

This is the Von Däniken Defense in high gear, where the actual data are literally irrelevant, since all evolutionary interpretations of them are discounted up front as only defending the materialist presumption—never as genuinely building on the logic of the accumulating evidence.

From there it is but a short philosophical hop to Johnson’s paean on evolutionary motivation, though logically it’s more of a freefall drop. After all, how legitimate was it for Johnson to contend that the “priesthood” of researchers, teachers, and artists responsible for the museum displays and television reenactments of evolutionary theory have too much of a philosophical and economic stake in the matter to be accounted any real objectivity? (And would this be the sort of “objectivity” that Johnson practices?) Had he unrolled this line of argument in any other area its flagrancy would have stuck out like a sore thumb.⁷⁸

Take the Civil War, for example. There are legions of historians and commemorative trinket distributors who devote their entire professional lives to promoting the view that a tremendous internecine conflict once embroiled the United States back in the middle of the 19th century. The Federal Government is even involved in this hype today, maintaining (at great expense) a sprawling network of scenic “battlefields” where these events allegedly took place. Just think of all the park rangers, hotel staff, and souvenir store clerks whose livelihoods utterly depend on the maintenance of the Civil War Myth. Add to that the armies of enthusiasts who regularly reenact these claimed “battles”—think how silly they would feel if they had to admit it was all a fraud! And haven’t historians been known to dispute the factuality of “original” documents, and occasionally even

tinker with the evidence? So who is to measure the lengths to which these desperate interests would go in order to preserve their lucrative Civil War industry?

At this stage one would be justified in bopping me on the head with a hefty copy of something by Bruce Catton, and pronounce me a blithering idiot. But that is only an inelegant way of saying that the Civil War really did happen, and that it therefore takes far more than a glib end run to dispose of it as merely economic self-interest driven by philosophy. To earn the right to challenge the history of the matter, at the minimum, it would be necessary to know a great deal about the historiography of Abraham Lincoln, Robert E. Lee, and so on. That is ... unless I didn't have to know anything about it, because I had so changed the rules as to render the technical arguments worthless *a priori*. Split into sufficiently piecemeal chunks, no single item of evidence can possibly establish to the pathological skeptic that the Civil War was anything but a myth.

I chose the Civil War example for two reasons. First, precisely because it was so jejune. Unfortunately, not all such classes of kooky reasoning are that abstract—we do have Holocaust deniers, after all, and that branch of historical revisionism reduces to the same thing (except dipped in a more corrosively ugly coating).⁷⁹ On the other side of the metaphysical fence, I have encountered over the years strident atheists who readily insist that all Christian preachers are “only in it for the money.” It is true that a sizable (and literal) “priesthood” is involved here, with vast church properties to defend (including colleges, religious publications, radio and television networks, along with trendy Internet websites). Nonetheless, I would aver that such a blanket indictment of religious motivation is exactly as unwarranted and pompous as Johnson's flip characterization of evolutionary drives.

The second reason why the Civil War analogy is particularly apt is that it is *historical*, in exactly the same way that paleontology and archaeology are. Only astronomers have the luxury of actually being able to “observe” the past, and that only in selected receding slices of time, such as supplied with breathtaking clarity by the Hubble Space Telescope. Everything else temporal falls under what cladist paleontologist Henry Gee calls “Deep Time”—or what I've covered as the “Map of Time” problem. In this respect, a fossil hominid jaw poses the same analytical challenges of stratigraphy and developmental sequence as Bronze Age Minoan pottery shards. Yet Phillip Johnson seems no more appreciative of the implications of this confluence than was Richard Milton.⁸⁰

The setting was earlier in *Darwin on Trial* when Johnson took Stephen Jay Gould to task for comparing apples to fossils. Gould had sought to tease apart observation from theory, noting that apples fall by gravitation independent of whether the Newtonian conception or the Einsteinian alternative was the correct *theory* of that gravitation. Similarly, the fossil sequence is a physical observation that speaks relentlessly of branching common descent (remember those macroevolutionary therapsids), while the Darwinian mechanism of natural selection would be but one of the more favored rival *theoretical* accountings for that pattern.

But Johnson would have none of that:

The analogy is spurious. We observe directly that apples fall when dropped, but we do not observe a common ancestor for modern apes and humans. What we *do* observe is that apes and humans are physically and biochemically more like each other than they are like rabbits, snakes, or trees. The ape-like common ancestor is a hypothesis in a *theory*, which purports to explain how these greater and lesser similarities came about. The theory is plausible, especially to a philosophical materialist, but it may nonetheless be false. The true explanation for natural relationships may be something much more mysterious.⁸¹

Just how “mysterious” Johnson is willing to get in this exercise we never do find out, since theoretical explanation is not a favored Theistic Realism indulgence. Consequently Johnson seems utterly unaware of how he is dancing on an epistemological precipice. There are a host of historical issues just as “mysterious” as the question of human origins (we'll see some dandy ones later in the chapter). Applied with any consistency, Johnson's “object versus theory” rule would render *all* historical analysis inherently inconclusive—not just the hominid ancestry he wants out of the

picture. That's because you don't *observe* Caesar crossing the Rubicon any more than you can witness a hominid giving birth to the genetic ancestor of humanity. Indeed, to be picky about things, you don't even "observe" Caesar at all, since his earthly remains apparently went up in smoke in the Forum over two millennia ago following that untidy senatorial conference on the Ides of March. The category "Caesar" is like that of "Homer" (or "Jesus" for that matter)—relying exclusively on historical records to document their existence and doings. Shorn of the inductive logic that allows pattern to mean something, Caesar (or Homer or Jesus) is even *less* of a corporeal fact here than Lucy the "Jane Doe" australopithecine, whose skeletal parts scientists really do have at their disposal to make best-educated sense of.⁸²

So long as the role of sound science and history is to do justice to the evidence, we've got to stick to the basics: the facts have to matter. Although theories are tremendously important, and drive the interplay of evidential argument, in the end it is the volume and quality of the data the theories are meant to explain that set the limit on allowable interpretation. The sequence is apparent enough: we have manlike apes (australopithecines) appearing before the apelike men (*H. erectus*) that directly antedated manlike men (*H. sapiens*). What are we to make of all this? Would Johnson hold that *any* explanation is equally plausible when it comes to accounting for these observed fossil data? Supposing the genetic engineer responsible here was God, may not von Däniken chime in from the peanut gallery to query, "Was God an Astronaut?"

Whether Johnson likes it or not (or thinks about it or not) it is clearly indefensible to entertain the idea that all historical and scientific inferences are equally supportable by the available material. So it is that historians ought to be reasonably certain that Caesar (and Jesus—and maybe Homer too) really existed. But one can go further: Caesar would not have crossed the Rubicon using a nuclear-powered hydrofoil. And neither would Jesus on the Sea of Galilee (though whether he walked on water there instead is quite another issue—one involving faith, not technical inference). For similar analytical reasons the hominid classification of the australopithecines would be significantly harder for evolutionists to defend had those bipedal primates possessed a simian shelf.

The facts have to matter.

By that standard, the shriveling skepticism of Theistic Realism is a profound intellectual flop. Shorn of functional and theoretical precision, *as it is both on principle and in practice*, Johnson's defensive reductionism handily morphed "plausible" into a synonym for "ambiguous" whenever he needed to discard fossil hominid evidence he didn't like. But snarling outside Johnson's sturdy defensive wall is an unruly and nagging question: what would *unambiguous* human fossil ancestors look like—and would our Berkeley lawyer ever be likely to admit them? The experience of his many books and lectures suggests "fat chance," for to do so would reopen one of those carefully blocked doorways, and allow in a plethora of diagnostic technicalities (from *diastema* to *foramen magna*) that would sap his steadfast assertion about the intractable "subjectivity" of paleoanthropology.⁸³

Grumping that those scientists investigating natural human evolution haven't been "extremely rigorous in checking" their alleged "prejudice" is highly disingenuous because Johnson never got around to saying what it was they were supposedly being prejudiced about.

In this studied conceit Phillip Johnson is far from alone.

If you'd care to guess how many prominent antievolutionists have gone into the sort of comparative anatomical detail that Chris McGowan did with the hominids ... well, here's a hint: it's about the same as the number of contemporaries of Caesar who could build or service nuclear-powered hydrofoils. It doesn't much matter whether we're talking the Young Earth creationism of Henry Morris, or Alan Hayward's Old Earth alternative ... or the fence-straddling intermediate of Davis & Kenyon ... or even the catastrophic antievolutionism of Richard Milton—let alone the smaller fry that rely on the bigger fish parasitically. It's all the same collective vacuum. It simply doesn't occur to them that they might need to define what it was they would see in a fossil to qualify (or disqualify) it as a human evolutionary ancestor.⁸⁴

There are a few exceptions, of course, but these only serve to "prove the rule."

Lee Spetner could acknowledge some of the taxonomical benchmarks (including the simian shelf, the diastema, and the foramen magnum) in his 2001 essay ... but only at the expense of trying to attribute the obvious intermediate character of the hominid record to humans inbreeding with

apes. Such a novel conclusion was not on the agenda for the other example, Michael Cremo & Richard Thompson's *Forbidden Archaeology*, which set out to defend some theological real estate far from Eden or Ararat: the Vedic tradition that human beings have lived on earth for tens of millions of years.⁸⁵

Much like Henry Morris or Carl Baugh, Cremo & Thompson do not find the idea of humans and dinosaurs frolicking together intrinsically implausible. Where they differ from Young Earth ideology is in their ready acceptance of conventional geological dating (a congruence with some fallout, which we'll see shortly concerning their participation in "The Mysterious Origins of Man" television special).

Also like their Creation Science counterparts, Cremo & Thompson aim to present a purely *scientific* defense for what is in the end a matter of strictly nonnegotiable religious conviction. Because they went into so much seemingly exhaustive detail (their book was twice the length of Lubenow's *Bones of Contention*), in due course three of the relevant hominid taxonomical points managed to come up (simian shelf, diastema and foramen magnum).

The simian shelf came up exactly once, apropos an idea Louis Leakey had about the function of the characteristically prominent human chin:

According to Leakey, the purpose of the chin eminence is to strengthen the front portion of the jaw. In apes this is accomplished by the simian shelf, a ridge of bone running between the two side of the forward part of the lower jaw. In Neanderthals, *Homo erectus*, *Homo habilis*, and *Australopithecus*, none of which have a simian shelf, the strengthening is accomplished by thickening the entire front portion of the jaw.⁸⁶

And that was that. Without blinking, they listed that exclusive band of hominid suspects, all lacking an otherwise common primate feature. But instead of thinking about how the hominid jaw and skull and body represented a whole suite of distinctive (and ultimately diagnostic) shifts in structure, they tossed it off as but an isolated peculiarity.

That was even more so with their *en passant* jabs at the diastema, which trickled through their account in ways like this: "Many *Homo erectus* jaws are characterized by projecting canines and a diastema, a gap in the teeth that accommodates the tip of a projecting canine." But how "projecting" were the canines of *Homo erectus* compared either to australopithecines or modern man, and just how *big* "a gap" did these require? As it happens, by the time the hominids had reached the *erectus* stage their dental kit had become almost human, and Cremo & Thompson offered no sources to justify their contrary opinion. Nor were any illustrations provided that might have allowed the reader to make up their own mind as to what had happened with hominid canines, and in what order.⁸⁷

A picture, as the saying goes, is worth a thousand words. But antievolutionists tend to skimp on both sides of the equation. That's because it is not advantageous to their position for the reader to have a clear idea what hominid (or therapsid) jaws really looked like, so such omissions are a tactical necessity. Not that there's anything wrong in principle with the "all text" approach to a subject—my own disquisition has no more pictures in it than Phillip Johnson's assorted writings. But to justify that option you do need to make up for it with a thorough treatment of the relevant data not being overtly depicted. Should the antievolutionist take the further step of incorporating *some* illustrations in the text, however, that considerably ups the ante. We then get to inquire whether the selected pictures are relevant and informative—or are they merely there as window dressing, to give the illusion of scholarly precision? You may take another guess as to which of these has been the guiding principle of creationist apologetics.⁸⁸

Take the creationist claim that australopithecine skulls were essentially like those of chimpanzees, and so nothing much to bother about. When Gary Parker wanted to score points on the "Cambrian" he had shown that Ordovician landscape, but for this hominid magic act he merely *alluded* to a purported depiction of the proof, rather than showing it to his readers.⁸⁹ Meanwhile, Cremo & Thompson fronted an illustration to directly suggest the same idea, but because chimp and australopithecine skulls differ in visible ways, they had to be mighty careful about how to do it.

So they compared an australopithecine fossil that happened to lack the teeth as well as the whole lower jaw—the very parts that (if seen in place) would have drawn attention to the overall shortened snout, reduced canines, and differing hominid jaw shape that don't match up with the chimpanzees. *Voila*—trick done!⁹⁰

Cremo & Thompson's argument hinged on the familiar anti-Darwinian dodge of Zeno-slicing the data into such thin slivers that no sense could be made of any of it. That was the case when they blithely declared the australopithecines had that “noticeable” apelike diastema, then later on that the juvenile Taung Child didn't.⁹¹ This blundered into another item that simply didn't occur to them—or to that larger body of antievolutionists who haven't even progressed as far as they had in assessing the evidence. As we saw in the embryology of the mammalian jaw, many clues to the evolutionary history of organisms are seen in their developmental processes. The Taung Child was saying something quite important here, but Cremo & Thompson weren't stopping long enough to let the pieces come together. They were too concerned with disposing of the incriminating position of the foramen magnum in the Taung Child—though that was a moot point, since by 1993 newer skeletal finds had already settled that issue.⁹²

Instead of relating that subsequent evidence to the problem, *Forbidden Archaeology* trotted out Sir Arthur Keith's 1930s observation that the Taung Child didn't amount to much because juvenile chimpanzees start out with the foramen magnum in about the same position.⁹³ That was actually true . . . but this exposed a fascinating aspect of the evolutionary process that Cremo & Thompson missed completely: *neoteny*. This is the realization that some organisms develop into novel adult forms by holding on to their juvenile layout—stepping back to leap forward, as it were. That is the working evolutionary hypothesis when it comes to swimming chordates, remember, which are thought to have retained a mobile larval stage comparable to that of the otherwise sessile adult tunicates.⁹⁴

Gamlin & Vines dubbed the root of this process the “Peter Pan Syndrome,” which persists as a most evident trait in living salamanders:

Like other amphibians, many salamanders have an aquatic larval stage. In some groups, however, development stops there and the adult stage fails to materialize. Instead the larva develops sexual organs and is able to breed. This phenomenon, known as pedomorphosis, is seen in the Mexican axolotl, which is sometimes kept as a pet. It grows up to 30cm long, and has small, weak limbs, but retains the larva's tail-fin and external gills.

Many other species of salamander share this trait, but to different degrees, and a small environmental change may determine whether the salamander develops into the adult form or not. Some that never become adults can be induced to do so by feeding them thyroid gland from a calf, which contains the hormone thyroxine. The fact that a mammalian hormone has such a specific effect on an amphibian points to the common evolutionary origin of all land vertebrates.⁹⁵

When it comes to human beings, the legacy of primate neoteny is most apparent right up front, as Steven Stanley observed: “Our relatively flat face, weak brow, and tall forehead are among the juvenile traits of our ancestors that we retain into adulthood.”⁹⁶ But the connections run deeper than that. Stephen Jay Gould related them to that persistent theoretical question of how much of human evolution was adaptive in nature, and how much more likely a contingent spandrel:

The theory of human neoteny, often discussed in my essays (see my disquisition on Mickey Mouse in *The Panda's Thumb*) is an expression of this theme. It holds that a slowdown in maturation and rates of development has led to the expression in adult humans of many features generally found in embryos or juvenile stages of other primates. Not all these features need be viewed as direct adaptations built by natural selection. Many, like the “embryonic” distribution of body hair on heads, armpits, and pubic regions, or the preservation of an

embryonic membrane, the hymen, through puberty, may be nonadaptive consequences of a basic neoteny that is adaptive for other reasons—the value of slow maturation in a learning animal, for example.⁹⁷

That is the implication of hominid cranial neoteny. It's not so much that our mug resembles that of a baby chimp, but that the postnatal growth of the brain inside might also have been let to run on in ways not found among the non-hominid apes. Nor was it the case that the expansion of the australopithecine cortex promptly swung into high gear. That's not what needed to happen anyway—it was only important that the neural wiring remain fluid for a longer time, piling up connections in ways that might later kick into action as an exaptation. And for evidence for what might happen in that event, you need to look a long way down the road ... a million years or so, in fact, towards the end of the australopithecine heyday. It was something that even Phillip Johnson occasioned to mention—though it was with all the casual insouciance of Henry Morris or Duane Gish waffling on the toothed Cretaceous birds. It was when Johnson tossed off how the later *Homo habilis* “was found at a site with primitive tools.”

Now whatever was a mere “ape” doing making *stone tools*? There was an extraordinary cultural (and therefore *intellectual*) leap implied by that offhand remark, yet Johnson let drop this rather clunky shoe with no further comment. Indeed, creationists generally have shied away from pondering who might have taken to flaking and chipping those most rudimentary of “Oldowan” tools so long ago in Africa.⁹⁸ One can sympathize why: the creationist cannot allow true intermediates to exist between “humans” and “apes”—anything that is found in Deep Time has to be pigeonholed on one side of the unbridgeable divide or other. The problem with the Oldowan tools is that this particular enterprise went on for well over a *million years*. That's a mighty long rut to be stuck in if the creationist wants to attribute them to anatomically modern humans (capable of going from spearing mastodons to landing on the moon in 10,000 years flat). But that's exactly the “awkward” position Cremo & Thompson ended up boxing themselves into ... not exactly a feather in the technological cap of Vedic man.⁹⁹

The other creationist alternative to the obvious evolutionary one (that those responsible for the primitive Oldowan tools were the primitive hominids that lived at the same time) was to claim that the apes had made them after all. From astride their narrow pedagogical fence, Davis & Kenyon used this approach to straddle both creationist explanations at once:

Much is made of the presence of primitive tools near some *Homo habilis* finds. Living apes exhibit the opportunistic use of available materials as tools. For example, chimps will use sticks to probe a termite mound for food. There is nothing in the intelligent design view inconsistent with this use of naturally occurring materials, or even chipping stones, breaking sticks, etc., for simple purposes. At any rate, the presence of tools in the vicinity of the *Homo habilis* fossil might be explained by the discovery of human fossils that were found in the same area by later excavation.¹⁰⁰

Some delicate wordplay was indulged in here. One may note that singular *Homo habilis* “fossil,” as though we were talking about a lone individual rather than a valid population.¹⁰¹ Nor did Davis & Kenyon offer any references as to what human fossils were found in “the same area” or how these might legitimately affect the proper interpretation of the Oldowan tools. Modern humans have been living in Africa for a long time, just as the lovers in *Sleepless in Seattle* met at an Empire State Building that occupied the same address as the original Waldorf-Astoria Hotel—and a generation before that, the old Astor Mansion. Davis & Kenyon therefore needed to offer something more concrete to suggest that any anatomically modern humans dated to the same *time* as the Oldowan tools. In lieu of that, their remark was more the wishful thinking of authors who refuse to make up their collective mind whether the earth is young or old, and so aim to have their stratigraphic cake and eat it too.¹⁰²

But the major flaw in their argument concerns the tools themselves, which they never thought even to describe, or reference. These resemble flattened stones with the tips bluntly sheered

away—about as basic a modification to a piece of rock as you can get. But is such a skill really comparable to what higher primates are observed to do with sticks and stones in the wild today? Again Davis & Kenyon let that issue dangle unresolved—but not so the anthropologists actually involved in doing the hard work. They have sought to reveal something of the mindset of the Oldowan toolmakers through active experiment. Ian Tattersall recently summarized the results of this forensic detective story:

As work progressed at such East African sites as Olduvai and Koobi Fora, the range of questions that the archaeologists asked of the material at their disposal considerably broadened. Among other things, attention began to shift from the shape of the artifacts found to the technology that produced them. For the experimental production of stone tools by archaeologists taught them that the shape of a stone implement results at least as much from the form and nature of the piece of rock chosen to start with as from the intentions of the toolmaker. So if you want to know about what was going on in the toolmaker's mind (and archaeological evidence for behavior tells you a great deal more about that than does the size and outside shape of his brain), the manufacturing process is much more informative than the end product. Mary Leakey, for example, put a great deal of effort into sorting Oldowan tools into a large number of different categories, identifying a whole "kit" of implements: spheroids, polyhedrons, discoids, choppers, and so forth. Most of these consisted of one or another kind of modified "core": cobbles off which flakes had been struck. The assumption was that the cores—the pieces of stone that had actually been modified—were the implements that the toolmakers had intended to produce. Experiments, however, showed that quite likely it was the sharp flakes knocked off in this process that were the actual tools used for cutting. The idea that different core types represented "mental templates" in the heads of the toolmakers did not seem to be borne out: they were simply by-products of varying amounts of flake production using cores of different shapes, sizes, and materials.

But did this mean that the Oldowan hominids, the makers of the earliest stone tools, were simply opportunists who struck flakes from whatever pebbles happened to be handy where cutting tools were needed? The answer to this one appears to be no. Mary Leakey had noticed early on that Oldowans had carried suitable rocks quite a distance to the places where she found the tools made from them. As it turned out, these early toolmakers were not highly selective; although they collected rocks that were suitable for toolmaking, they didn't everywhere make a great effort to amass the best possible materials. But at many localities in the Koobi Fora region, for example, the nearest natural sources for the lava cobbles turned into tools at archaeological sites turned out to be several kilometers away. Hominids must have carried these raw materials in over such considerable distances, and that flaking took place on site is shown by the fact that often flakes found close together can be joined up to reconstruct an intact core. Moreover, it is not uncommon for archaeologists to find more than one type of "foreign" rock at a given site, indicating that such objects had been brought in from several distant points on the landscape. Such activities on the part of early hominids require a degree of forethought quite out of the range of living apes, who, on the rare occasions when they make tools—most famously the stripped twigs used in "fishing" for termites—pick up raw materials at the spot where they are used.

Experiments carried out by Nick Toth of Indiana University suggest the same thing from another vantage point. Lumps of rock battered into roughly spherical shapes are quite commonly found worldwide at Stone Age sites, sometimes in large numbers. What these apparently deliberately shaped objects were remained a puzzle for many years, although they were often seen in earlier

times as “bola stones,” tied together by thongs and thrown to entangle the legs of prey animals. By experiment, Toth was able to show that almost any lump of stone he chose would assume this spherical form after many hours of being banged against other pieces of rock. The distinctive shape was thus a passive result of use as a hammer, reflecting no intent on the part of the toolmaker to produce a spheroid. Once more, then, the “mental template” idea failed. On the other hand, this finding did nothing to diminish the fact of the toolmaker’s intent. For it took far more than a single session of tool making to produce a spheroid, implying that the toolmakers habitually carried their favored hammerstones around with them from place to place in anticipation of needing them.

One interesting experiment performed by Toth, his Indiana University colleague Kathy Schick, and a group of psychologists at the Yerkes Primate Research Center concerned the ability of a living ape to make and use tools. Noting that it had become fashionable to look upon the early bipeds—roughly, anything prior to *Homo ergaster*—as “bipedal apes”, Toth, Schick. And colleagues tried to determine how far a bonobo (“pygmy chimpanzee”) could be trained to flake simple stone tools. Their subject, Kanzi, a star in communication experiments, showed an immediate interest in having sharp flakes available to cut cords that held a fruit-containing box closed. He got the idea of striking flakes from a core, but even after many months of training he was still nowhere near the skill level of the Oldowan toolmakers. The latter clearly understood the major properties of the stones they worked and selected the most effective points at which to strike an inevitably irregular core. Not so Kanzi, who never mastered the idea of striking stone at the optimum angle. His best products are rather like the “eoliths” that so confused early archaeologists: rocks randomly banged together and flaked as they rolled along riverbeds. Toth and colleagues concluded from this that the early hominid toolmakers had a much better cognitive understanding of what toolmaking is all about than any modern ape is able to acquire. And from that they hazarded that in hominid prehistory there must have been a stage of stoneworking that preceded the Oldowan, but that by its very nature it would be difficult or impossible for archaeologists to identify or to discriminate from the results of natural forces. Still, these experiments give some idea of what one might need to look for.¹⁰³

That is, of course, if one were of a mind to look for evidence ... and then be willing to put those pieces together before stepping back to assess how the “big picture” was shaping up. But in this field of interpretive vitality creationists have shown no more natural aptitude than Kanzi had when it came to tool flaking.

Despite their often-evident gymnastic rhetorical skills, creationists are still saddled with what is at heart a fundamentally inadequate methodology. Second stringers (like Scott Huse or Ankerberg & Weldon) never realize how far removed they are from the facts because they rely primarily on other antievolutionists (such as Henry Morris or Marvin Lubenow) who don’t always know any more about the subject than they do. But when it comes to the heavy guns in the creationist arsenal, another explanation elbows to the fore: *the positive suppression of inconvenient evidence*. We know that has happened with Duane Gish, in examples running the phyletic gamut from arthropods to vertebrates (most plainly in Gish’s serpentine foray into bird origins covered in chapter two). Regarding human evolution, Arthur Strahler specifically criticized earlier editions of Gish’s work for misrepresenting the facts on australopithecine skulls, including Gish’s failure to discuss the foramen magnum. Since we know that by 1995 Gish had read both McGowan and Strahler, the fact that none of this salient information surfaced in the revised *Evolution: The Fossils STILL Say NO!* means Gish has held true to form.¹⁰⁴

As for the avatar of Theistic Realism, Phillip Johnson has relied just as heavily on a variant form of superficial parasitism. He seldom ventures far beyond the scholarly confines staked out by the Intelligent Design cadre (notably Michael Denton, and more recently Michael Behe), while

slipping in the odd creationist argument (like Douglas Dewar on the whales) when the risk of it blowing up in his face seems remote. The task of spotting Johnson actively spiking relevant information is further complicated by his knack for so distancing himself from the grubby facts that it might seem to the unwary observer that there was no information to leave out.¹⁰⁵

But not this time.

Johnson's obliging (and atypical) attention to detail in the extensive Research Notes he devoted to the human evolution section comes back to haunt him. This partly concerns Johnson's stonewall defense of evolutionist Lord Zuckerman's views on the australopithecines. But along the way to that philosophical cul-de-sac Johnson poked into several peripheral metaphysical corners that ultimately lead off in directions Theistic Realism is most unwilling to follow. Again in its entirety, here's what Johnson thought the reader needed to know about his research on human origins:

Roger Lewin is a fine science writer who has written several books on human evolution. For this chapter I relied particularly on his *Bones of Contention* (1987). The two most prominent fossil discoverers, Donald Johanson and Richard Leakey, have also authored or co-authored informative books. For a brief overview of the whole subject, I recommend the article by Cartmill, Pilbeam, and Isaac, "One Hundred Years of Paleoanthropology," in the *American Scientist*, vol. 74, p. 410 (1986).

There are two debunking accounts of the human evolution story from authors outside of mainstream science that deserve careful scrutiny. One is the privately printed *Ape-Men, Fact or Fallacy*, by Malcolm Bowden. Bowden is a creation-scientist, but unprejudiced readers will find his book thoroughly documented and full of interesting details. Bowden has an intriguing account of the Piltdown hoax, and like Stephen Jay Gould he concludes that the Jesuit philosopher and paleontologist Teilhard de Chardin was probably culpably involved in the fraud. Bowden persuaded me that there are grounds to be suspicious of both the Java Man and Pekin Man fossil finds, which established what is now called *Homo erectus*. The book is available from Sovereign Publications, P.O. Box 88, Bromley, Kent BR2 9PF, England. I would like to see the details he reports examined critically but fairly by unbiased scholars, but this is a pipedream.

The other non-mainstream debunking account is *The Bone Peddlers: Selling Evolution*, by William R. Fix. This book is marred for me by its later chapters, which accept evidence of parapsychological phenomena uncritically, but the chapters about the human evolution evidence are devastating. Fix opens with an account of a 1981 CBS television news story about presidential candidate Ronald Reagan's statement that the theory of evolution "is not believed in the scientific community to be as infallible as it once was believed." A spokesman for the American Association for the Advancement of Science responded that the 100 million fossils that have been identified and dated "constitute 100 million facts that prove evolution beyond any doubt whatever."

Stephen [sic] Stanley's *The New Evolutionary Timetable* provides an analysis of the hominid evidence in Chapter Seven. Stanley points out that the accepted hominid sequence is radically inconsistent with Dobzhansky's neo-Darwinist theory (in *Mankind Evolving*) that Australopithecine-to-man evolution occurred in a continuous lineage within a single gene pool. On the contrary, Stanley reports, there were a very small number of discrete, long-lived intermediate species that may have overlapped each other. Stanley proposes a model based on "rapidly divergent speciation."

The statements by Solly Zuckerman (now Lord Zuckerman) are from his 1970 book *Beyond the Ivory Tower*. Zuckerman returned to this subject in his 1988 autobiographical work *Monkeys, Men and Missiles*, where he recounted his

“running debate” with Sir Wilfred Le Gros Clark on the interpretation of the australopithecines. Zuckerman believes that Le Gros Clark was “obsessed” with the subject and incapable of rational consideration of the evidence. No doubt the opinion was reciprocated.

Donald Johanson and Maitland Edey’s popular book on the discovery of *A. Afarensis*, *Lucy: The Beginnings of Mankind* (1981), does a good job of describing the main point at issue between Zuckerman and the anthropologists:

To give Zuckerman his due, there were resemblances between ape skulls and australopithecine skulls. The brains were approximately the same size, both had prognathous (long, jutting) jaws, and so on. What Zuckerman missed was the importance of some traits that australopithecines had in common with men. Charles A. Reed of the University of Illinois had summarized Zuckerman’s misunderstandings neatly in a review of the australopithecine controversy: “No matter that Zuckerman wrote of such characters as being ‘often inconspicuous’; the important point was the presence of several such incipient characters in functional combinations. This latter point of view was one which, in my opinion, Zuckerman and his co-workers failed to grasp, even while they stated they did. Their approach was extremely static in that they essentially demanded that a fossil, to be considered by them to show any evidence of evolving toward living humans, must have essentially arrived at the latter status before they would regard it as having begun the evolutionary journey.” In other words: if it wasn’t already substantially human, it could not be considered to be on the way to becoming human. (p. 80)

This argument revealingly supports one of Zuckerman’s main points, which was that attempts to place the fossils in an evolutionary sequence “depend ... partly on guesswork, and partly on some preconceived conception of the course of hominid evolution.” The *Australopithecines* possessed incipient characters, more visible to some eyes than to others, which might have developed into human features and which also might not have done so. If the fossil creatures were “on the way to becoming human,” then the same was undoubtedly true of the disputed “incipient characters,” but if they weren’t then the characters were probably insignificant. The description of what the fossils were is influenced decisively by the preconception about what they were going to become.

Zuckerman’s article “A Phony Ancestor,” in *The New York Review of Books* for November 8, 1990, provides some additional comments in the course of a review of a book on the Piltdown fraud. He refers readers to an article he published in 1933 denying the “uniqueness of Peking Man” and suggesting that the hominids should be divided into two families containing: (1) Peking Man and Neanderthals; and (2) those with skulls like modern men. Zuckerman attributed the success of the Piltdown forgery to the fact that anthropologists deluded themselves in thinking that they could “diagnose with the unaided eye what they imagined were hominid characters in bones and teeth.” He concluded that “The trouble is that they still do. Once committed to what they or someone else’s eyes have told than, everything else has to accord with the diagnosis.”

Zuckerman’s biometric debunking of the *Australopithecines* occurred before the discovery of “Lucy” by Johanson. Lucy is a more primitive specimen of the genus than Dart’s *A. Africanus*, and hence would be disqualified *a fortiori* if Zuckerman’s conclusions about *Africanus* are correct. Although Johanson and his colleague Owen Lovejoy confidently assert that Lucy walked upright like a

human, this claim has not gone unchallenged. The controversy is briefly summarized in Roger Lewin's *Human Evolution: An Illustrated Introduction*:

Although Lucy's pelvis is most definitely not that of an ape, neither is it fully human in form, particularly in the angle of the iliac blades. Nevertheless, concludes Owen Lovejoy of Kent State University, biomechanical and anatomical studies of the mosaic pelvis indicate that the structure is consistent with a style of bipedality that is strikingly modern. By contrast, two researchers at the State University of New York at Stony Brook interpret the mixture of characters in Lucy's pelvis as indicative of a somewhat simian form of bipedality, a bent-hip, bent-knee gate. The difference of opinion is yet to be resolved.

Studies on the Lucy skeleton and on other Hadar specimens show *A. afarensis* to have had long forelimbs and relatively short hindlimbs—an ape-like configuration. (Milford Wolpoff, of the University of Michigan, argues, however, that Lucy's small legs are the length one would expect in a human of her diminutive stature.) Even more ape-like are the distinctly curved finger and toe bones. The Stony Brook researchers, Randall Susman and Jack Stern, interpret these features as adaptations to significant arboreality. Others, including Lovejoy and White, suggest other interpretations might be possible. (p. 41.)

No doubt many interpretations are *possible*, but the hypothesis being tested in this chapter is that Lucy and the other hominids have been conclusively identified as human ancestors, without assistance from any presumption that the questioned ape-to-man transition must have occurred.

The “mitochondrial Eve” hypothesis and the resulting conflict between the molecular biologists and the physical anthropologists is given a good popular treatment (if one can overlook the vulgar writing style) in Michael H. Brown's *The Search for Eve* (Harper & Row, 1990). Brown seems unsure about whether his subject is science or imaginative fiction, and I think many readers will feel that his uncertainty is justified. The book shows the contempt that “hard science” molecular biologists have for the “softer” paleontologists who base their theories about human evolution upon reconstructions from isolated teeth, shattered skullcaps, and fragmented jaws. According to Allan Wilson's colleague Rebecca Cann: “Many paleontologists fear that if they expose the legitimate scientific limits of the certainty of their theories, fundamentalists and creation ‘scientists’ may misrepresent these data to dispute the fact that evolution occurred.” (p. 239.)

Brown also quotes an interesting remark by Alan Mann, a professor of Paleoanthropology at the University of Pennsylvania: “Human evolution is a big deal these days. Leakey's world known, Johanson is a movie star, women moon at him and ask for his autograph. Lecture circuit. National Science Foundation: big bucks. Everything is debatable, especially where money is involved. Sometimes people deliberately manipulate data to suit what they're saying.” (p. 241.)¹⁰⁶

And on this note of sour grapes, Johnson turned his attention to the research material on the whales, which included the aforementioned Douglas Dewar.

Now the first thing to clarify here concerns Johnson's amazing philosophical about-face on Solly Zuckerman. As we've seen, Johnson has been all too consistent in employing the Von Däniken Defense to dismiss the evolutionary implications of fossil evidence solely on the grounds that such conclusions were irremediably tainted by *a priori* Darwinian expectations. That is ...

except when we get to Lord Zuckerman. Suddenly we are presented with an evolutionist who apparently lacks “some preconceived conception of the course of hominid evolution” that might otherwise contaminate his analysis. Indeed, as Johnson put it in the main text quoted earlier, while Zuckerman “regards the evolution of man from apes as self-evident,” this position “was established for humans as well as other species on logical grounds.”

How effete!

The problem with this position is that Johnson had to know that Zuckerman’s contrary assessment of the australopithecines was knee deep in underlying evolutionary assumptions, and that these significantly guided his conclusions no less than have those of Donald Johanson or any other working paleoanthropologist. The reason we may reasonably conclude this is because Roger Lewin in *Bones of Contention* (the work which Johnson “relied particularly on”) had explicitly explained the background that made Zuckerman’s long-running dismissal of the australopithecines absolutely inevitable:

Zuckerman, like Sir Arthur Keith before him, believes that apes and humans diverged way back in the Oligocene, some 25 million years and more ago, a view he developed early in his career and clings to still. It is therefore difficult to see what could persuade him to accept as hominid anything that was anatomically primitive and yet lived only a couple of million years ago. To be admitted into the human family, a creature as recent in time as 2 million years must surely be much more humanlike and much less apelike than *Australopithecus* obviously was, for in Zuckerman’s estimation it would have been separated from the apes for at least 20 million years.¹⁰⁷

Once more, a familiarity with some of the history helps put the flap in perspective. The tendrils of Keith’s ivied “British school” survived Piltdown by a good generation. Louis Leakey was as steeped in this tradition as Solly Zuckerman, and that leisurely model of human evolution supplies a theoretical context for the Leakey family’s justly celebrated contribution to 20th century anthropology.

The focus of the dispute arrived in 1960, when Jonathan Leakey (Louis and Mary’s eldest son) uncovered a new Olduvai hominid (OH 7, from around 1.75 million years ago). Its brain was somewhat larger than the australopithecine average, falling about where a cerebrally advanced human ancestor ought to in the “British school” view of things. Combined with specialized shifts in dental characters and overall skull shape, the Leakeys saw this combination as falling sufficiently beyond the range of the known australopithecines to justify its membership in our own genus: enter *Homo habilis*.¹⁰⁸

This background clarifies that difference of scientific opinion *Of Pandas and People* alluded to concerning Donald Johanson and Richard Leakey. Once son Richard got over his youthful reluctance to take up the family business, he vigorously defended the position that *Homo* had to have branched off from the primates somewhere between 5 and 7.5 million years ago (thus long before the australopithecines showed up).¹⁰⁹ That presumption channeled Leakey’s confident 1977 assessment of the importance of the new ER 1470 “*Homo habilis*” specimen: “With this crucial piece of evidence now in our group, the newly-emerging theory of man’s origins gradually gained strength. It was now possible to predict that some day fossil hunters would unearth early specimens of *Homo* individuals perhaps as old as four or five million years.”¹¹⁰

That didn’t happen. In fact, when Richard Leakey took a second look at the field fifteen years later in *Origins Reconsidered* there were still no four or five million-year-old *Homo* fossils to show, nor did their appearance seem especially imminent. With the “British school” crystal ball clouded by a mounting glut of contrary australopithecine taxa, no comparable predictions about the trajectory of hominid discovery surfaced in Leakey’s 1992 retrospective.¹¹¹ Which left an increasingly isolated Lord Zuckerman to keep the candles lit for the hallowed creed. As late as 1991 he ventured a hope for *erectus* far outstripping even Leakey’s ebullient 1977 *habilis* expectations: “One view, for what it is worth, has it that the first men styled *Homo erectus* sprang into being in Africa some five million years ago.”¹¹²

Having cleared away Johnson's revisionist smokescreen that Solly Zuckerman had no theoretical axes to grind, we are left with two substantive questions. First, how conclusive was all this "biometric debunking" of the australopithecines? And second, was the "rival study" of Le Gros Clark really the work of someone "incapable of rational consideration of the evidence" as so darkly intimated in *Darwin on Trial*?¹¹³ As with the finer points of therapsid jaw articulations, when the fateful moment came for Johnson to take the plunge and defend these claims with concrete data he headed for the exit: "The biometric issues are technical, but the real dispute was a conflict of priorities." Johnson's oblique way of saying that he didn't want to discuss them.

Which is curious, because the issues weren't really all *that* "technical." Just as a fleet cheetah's limbs are proportioned differently than those of a stalking leopard, the anatomy of a primate's extremities are going to reflect its lifestyle. What Zuckerman and associates like Charles Oxnard undertook in their multivariate biometric studies was the comparison of multiple characters (bones, joints, musculature, etc.) in order to establish the range of natural variation. When plotted graphically, clusters of adaptive specialization were plainly visible—tree swingers showing up in a different position than branch hoppers, for example. Nothing incendiary here.¹¹⁴

But you can see a problem with such seemingly "objective" analysis when it comes to evaluating extinct animals—especially ones with a fragmentary fossil record, which was undeniably the case for the australopithecines back in the 1930s when Zuckerman was getting his feet wet in this area. Secondary variations (like the comparatively long arms of the partially arboreal australopithecines) would inevitably drag their position on the primate plot offline, thus obscuring features common to the other hominids that would be quite apparent when the animal was viewed *as a whole*.

This limitation was clearly evident in a critical article Charles Oxnard wrote on the australopithecines for *Nature* in 1975. Most of his piece trod familiar ground: plotting the variation of living ape anatomy. But not one of his several chartings included even a single hominid example. He only got around to discussing the australopithecines at the end, and restricted his coverage to a sparse table listing eight bones of the australopithecines deemed to bear a particular resemblance to those of man. Of these, Oxnard decided half resembled an orangutan (scapula, clavicle, phalanges and talus) while the others (humerus, metacarpal, pelvis, and toe phalanx) were held to be "unique" (in what ways he did not specify). Nor did he go into detail on which fossil specimens were the subject of the analysis ... and no illustrations were included that might have assisted the reader in deciding how "unique" these features truly were.¹¹⁵

Going by the evidence Oxnard himself presented, his argument failed to even dent the case for placing the australopithecines on the direct line of human ancestry—a situation not improved by the quarter century of subsequent information creationists have conveniently avoided looking into. Which makes it very curious indeed to see how willing creationists have been to place Oxnard and Zuckerman on a scientific pedestal they reserve for no other evolutionist. Given how tentative and argumentative Oxnard's case was, for instance, under any other circumstances creationists would have summarily rejected it as mere evolutionary dogma. Why then change the rules this time? Well, no real mystery here: creationists arbitrarily invest such credibility in Zuckerman and Oxnard for the same reason Young Earth opponents of the Big Bang gravitate to the sayings of Fred Hoyle. They have no choice.

Just as Johnson had with Zuckerman alone, Duane Gish opined how "Creation scientists are apt to give greater credibility to physical anthropologists, such as Charles Oxnard, who has tirelessly applied the best methods of anatomy to his analysis of fossil material, than to Donald Johanson and Tim White, who laid their fossil material out on a table for eye-ball examination, a process decried by Lord Zuckerman as the 'myth of anatomy.'"¹¹⁶ But that "myth of anatomy" turns out to have been Solly Zuckerman's way of rationalizing why the rest of anthropology had stopped paying any attention to him. We've seen that the anatomical diagnostics linking australopithecines to man involves a lot more than merely an "eye-ball examination"—but that is how Gish has had to play his hand in order to salvage what little was left of the "British school" position for his own narrow apologetic ends.

Although a lot of fossil dust had already settled, Gish confidently ventured down the garden path of armchair prophecy:

Creation scientists are predicting that Zuckerman, Oxnard, and others who hold similar views will turn out to be right, and as a human ancestor, *Australopithecus* will suffer the same fate as Piltdown Man (a hoax), Nebraska Man (a pig's tooth), Neanderthal Man (*Homo sapiens*), *Dryopithecus*, *Oreopithecus*, and *Sivapithecus-Ramapithecus* (all just apes with no relationship to man).¹¹⁷

Meanwhile, Cremo & Thompson backpedaled on the philosophy clear to its roots, ending up parked right where it all began, beneath the superannuated shade of Sir Arthur Keith:

We also examine the status of *Australopithecus*. Most anthropologists say *Australopithecus* was a human ancestor with an apelike head, a humanlike body, and a humanlike bipedal stance and gait. But other researchers make a convincing case for a radically different view of *Australopithecus*. Physical anthropologist C. E. Oxnard wrote in his book *Uniqueness and Diversity in Human Evolution* (1975): "Pending further evidence we are left with the vision of intermediately sized animals, at home in the trees, capable of climbing, performing degrees of acrobatics, and perhaps of arm suspension." In a 1975 article in *Nature*, Oxnard found the australopithecines to be anatomically similar to orangutans and said "it is rather unlikely that any of the Australopithecines ... can have any direct phylogenetic link with the genus *Homo*."

Oxnard's view is not new. Earlier in this century, when the australopithecines were discovered, many anthropologists, such as Sir Arthur Keith, declined to characterize them as human ancestors. But they were later overruled. In his book *The Order of Man* (1984), Oxnard noted: "In the uproar, at the time, as to whether or not these creatures were near ape or human, the *opinion* that they were human won the day. This may well have resulted not only in the defeat of the contrary *opinion* but also the burying of *that part of the evidence* upon which the contrary opinion was based. If this is so, it should be possible to unearth this *other part of the evidence*." And that, in a more general way, is what we have done in *Forbidden Archaeology*. We have unearthed buried evidence, evidence which supports a view of human origins and antiquity quite different from that currently held.¹¹⁸

A "view of human origins" quite different from anything Oxnard would have credited, either—but that's hardly the biggest of Cremo & Thompson's interpretative problems here. They needed to explain exactly how Charles Oxnard (or anybody else) could have arrived at any firm conclusions about the particulars of australopithecine anatomy without making reference to all the available fossils, especially the first fairly complete skeleton of one (Lucy, which had just turned up in 1974). Phillip Johnson was certainly aware of this little difficulty, having acknowledged that "Zuckerman's biometric debunking of the *Australopithecines* occurred before the discovery of 'Lucy' by Johanson." What Johnson didn't acknowledge was that Zuckerman's arguments were weak even at the time. Instead, he tried to rescue those obsolete sentiments with one of the more mind-boggling declarations in the antievolutionary magic act: "Lucy is a more primitive specimen of the genus than Dart's *A. africanus*, and hence would be disqualified *a fortiori* if Zuckerman's conclusions about *Africanus* are correct."¹¹⁹

Does Johnson realize what he's just said? An unconvincing study based upon inadequate data is not to be challenged even when *new* information comes along that directly contravenes the earlier claim. Precedent is all well and good in the legal profession, but when it comes to the sciences it doesn't count for diddly unless you happen to have the facts to go with it. Which does give one pause to wonder whether Johnson has been too hasty in abandoning *cosmological* precedent by jumping onto that now widely accepted Renaissance bandwagon about the earth not being the fixed center of the universe. Since Malcolm Bowden was able to persuade Johnson "to be suspicious of both the Java Man and Peking Man fossil finds," perhaps Bowden's equally adamant conviction that

the earth *doesn't* orbit the sun after all might also be “examined critically but fairly by unbiased scholars, but this is a pipedream.” Indeed.¹²⁰

In retrospect, Charles Oxnard “won” at least part of the argument—since, as we’ve seen, many 1990s anthropologists have come to agree that australopithecines didn’t have exactly the human mix of exclusive bipedality. What creationists have had to actively downplay is what bearing this would have had on the position the australopithecines may hold on the human family tree.¹²¹ Because that dispute rested on more than a difference of theoretical opinion about the pace of human evolution, the only way to resolve it would have been to take a much closer look at the taxonomical data. But this is the opposite of what the antievolutionary gang has tried to do here.¹²²

In Johnson’s case, however, we can see just how much data he had to climb over (and therefore ignore) in order to reach his own conclusions about Zuckerman’s primacy in the game of australopithecine analysis. For as it happens, in their book on “Lucy” Johanson & Edey had done altogether too much of “a good job of describing the main point at issue between Zuckerman and the anthropologists.” In the paragraph immediately preceding the passage Johnson selected, they had explained: “With Zuckerman kicking up more and more biometric dust, Le Gros Clark thought it appropriate to challenge him to produce a full set of chimpanzee teeth that bore any resemblance to a set of australopithecine teeth. Zuckerman could not. He ignored the challenge and continued to fire off statistical salvos until professional statisticians began pointing out that his figures had not been calculated properly.”¹²³

One may note Phillip Johnson made no effort to mention (let alone challenge) any of these charges. Didn’t he think it mattered? There is indeed a “conflict of priorities” here—but not quite the one Johnson was trying to make out. For after Johanson & Edey had given Zuckerman “his due,” they went on to describe how, “When Zuckerman was finally subdued by questions about the validity of his statistical approach, Le Gros Clark got down to the really important business of his analysis. He checked the australopithecine data against his list of ape-human differences and found that in virtually every respect they resembled the human model and not the ape model.”¹²⁴

At this point an asterisk identified what would have seemed for any reasonably attentive scholarly observer a hard-to-miss footnote: “For an analysis of the Le Gros Clark study, see page 262.” And of what exactly did that consist? A dozen pages of point-by-point comparison of the teeth, jaws, and other cranial features from the more recent Laetoli-Hadar finds—*new* fossil information which only underscored the legitimacy of identifying the australopithecines as transitional forms between apes and humans.¹²⁵ Chris McGowan noted much the same thing when he drew on Le Gros Clark’s comparisons for his own 1984 critique of creationism: “although this work was done back in 1950, his findings and conclusions have only been strengthened by later studies.”¹²⁶

Knowing just how much information Johnson had at his disposal, what are we to make of the fact that none of it found its way into *Darwin on Trial*?

Well, we’re certainly a long way from the scientific alternative to “methodological naturalism” that Johnson is ostensibly so exercised about. The innocent reader is left in the lurch, since they can hardly be expected to sort out any of the “conflicting priorities” when the facts to be explained never made it past the sacrificial altar of apologetic expediency. That Johnson’s Theistic Realism ends up depending on the same desperately creative information management as Duane Gish’s *Protoavis* dog-and-pony show establishes how eerily alike Intelligent Design and Creation Science are whenever they elect to blunder too close to the data.

Unfortunately, what is missing here is any trace of *honest curiosity*. These hominids all existed, their bones have scientific tales to tell . . . and that would be just as true for a created taxon as one that had evolved under purely Darwinian constraints. Yet nothing about these extraordinary creatures seems to interest the antievolutionary imagination apart from the desire to keep them cordoned off from the human family tree. Trilobites and their “famous” eyes are allowed to be a feather in the Creator’s cap . . . but let a hominid start chipping stone tools and the creationist is looking for the philosophical off ramp.

Not unexpectedly, such myopia has practical consequences. To keep from getting run over by the fleet Achilles, the creationist Tortoise has to keep all attention nervously fixed on the rearview mirror. The passing scientific scenery thus holds no special attraction, and explains why

antievolutionists have managed to muddle (or miss entirely) the thrust of the last quarter century of anthropological thinking.

Which brings us to yet more succulent irony.

All the while that the “British school” was defending the crumbling ramparts of ancient *Homo*, a theoretical convulsion really was going on over the australopithecines: there were turning out to be a *lot* of them. So many, in fact, that it was straining the credibility of the “single species” concept of human evolution, a notion promoted back in the 1960s by C. Loring Brace (Duane Gish’s anthropological debating foil). Though the idea goes all the way back to Darwin, Brace’s version derived more from recent ecological considerations—that humans are sufficiently pushy that there could only have been one of our species going on at any given time.¹²⁷ By ruling out the possibility of overlapping (but not necessarily competitive) species, only one of which would have eventually branched off into the *Homo* line, the single species view required relentlessly pigeonholing each new hominid—for example, interpreting some larger australopithecines as the sexually dimorphic males of the main species. But by the 1970s simply too many variants had become known for all of them to be comfortably submerged into a monolithic *Australopithecus*.¹²⁸

Further refinements in ecological thinking knocked out another prop as well: based on his experience with bivalve mollusks, Steven Stanley pointed out that heavy predation can actually promote the territorial coexistence of related species. That is the condition that prevailed for the predator-haunted savanna australopithecines.¹²⁹

All of which means that sorting out which hominids were most closely involved in the path of human evolution has followed the same trend as seen with the reptile-mammal transition: increasingly a matter of selecting from a surfeit of candidates. On one side we have the quiet australopithecine crowd, stuck in their vegetarian *robust* and more omnivorous *gracile* ruts for several million years ... until a blurry phase ensued about 2.5 million years ago, when a bunch of “almost” and “maybe” forms started showing up: *habilis*, *rudolfensis*, and *ergaster*. Which of them was on the direct line of human ancestry is not easy to resolve on the basis of the available data—but most any of them *could* have been. They were all highly intermediate models with features near enough to the resulting *Homo erectus* to make the tagging game a challenge of options.¹³⁰

Exactly the same pattern of intermediate species diversity figures later on in the tale, as *erectus* slides just as bumpily into our own *Homo sapiens*. For such occasions Ian Tattersall has what he wittily characterizes as a “grotesque” rule of thumb: “if you can tell skulls apart at fifty paces, you have two genera, while if you have to scrutinize them close up to tell the difference, all you have is two species.”¹³¹

Applied to the transition to modern man, “Tattersall’s Law” separates the cast of characters into at least three main groups:

This realization, born of years of studying the diversity of the lemurs (the “lower” primates of Madagascar), made conventional interpretations of species diversity in the human fossil record look a little odd to me. Oddest of all in the mid-1980s was the way in which most paleoanthropologists divided up the fossils representing the most recent half-million years or so of human evolution. Everything from this period (except for a few late *Homo erectus* stragglers such as those from Zhoukoudian) was classified in *Homo sapiens*. Yet there was among these fossils a very large amount of morphological variety, and this variety was well enough compartmentalized for at least three informal names to be in common use for different groups of them: Neanderthals (a.k.a. *Homo sapiens neanderthalensis*), “archaic *Homo sapiens*” (just about everything else that didn’t happen to look like us), and “anatomically modern *Homo sapiens*.” Well, if various groups of fossils are distinct enough to be identified by name, you can be pretty sure that you have at least as many species as you have names. I suggested this in a paper published in 1986; and, while I can hardly claim that my contribution revolutionized paleoanthropology, I think it was at least symptomatic of a trend that has recently gathered some steam. Specifically I urged that, at the very least, the Neanderthals be restored to separate species

status as *Homo neanderthalensis*. Similarly, the Arago, Petralona, Bodo and Kabwe fossils should be classified together with others like them in their own species. If the Mauer jaw belongs to this group, as we can reasonably assume—if not prove, for lower jaws don't have a lot of diagnostic characters—we can call this one *Homo heidelbergensis*. Most emphatically of all, I stressed that our own living species, *Homo sapiens*, is as distinctive an entity as exists on the face of Earth, and should be dignified as such instead of being adulterated with every reasonably large-brained hominid fossil that happened to come along.¹³²

What is interesting about this passage is how avidly Tattersall is *not* willing to dump every fossil into either the *Homo sapiens* bin or even to our direct ancestry (the place of Neanderthal, most significantly so, as we'll get to presently). What the serious paleoanthropologist endeavors to do is to work out the *correct* relationship, and for that every bit of data has to be assessed. As we've seen, the overall taxonomical relationship of the australopithecines to *Homo* has been "tested" (as Johnson certainly wouldn't put it) by the steady accumulation of fossil data. Having reached that position, anthropologists have therefore moved on, concerned about straightening out their understanding of what happened next.

Not so for creationists, who have only their rigid antievolutionary position to defend (come what may in the factual department). So it is that creationists have been characteristically slow to assimilate these new conceptions of population dynamics, competitive speciation, and the parsimony analysis of cladistics. Part of this is due, ironically enough, to the fact that the defunct "single species" doctrine remains firmly cast in concrete on their side—where it performs the restricted role of *anchor*, with which they hope to sink human evolution.

The creationist argument runs as follows:

If multiple hominid species cannot coexist because the new population "comes into direct competition with the older unchanged group and eventually eliminates it through death," as Marvin Lubenow gloomily put it, then any new hominids had to have evolved from the *last* population of the precursor form.¹³³ Proceeding from that quite arbitrary assumption, all the antievolutionist has to do to satisfy their own critical doubts is to establish hominid coexistence and that's that for human evolution. By such rudimentary logic Wendell Bird declared "Australopithecines could not be ancestors of man, because the more modern *Homo erectus* overlapped the same general time and place."¹³⁴

This may have been what Phillip Johnson was hinting at by his airy musings over those Asiatic *erectus* stragglers, as though they posed some inherent theoretical obstacle for an evolutionary origin of man back in Africa. Marvin Lubenow was more direct in this area, seizing on that circumstance to jump his own far broader conclusion: "if *Homo erectus* people persisted long after they should have died out or changed into *Homo sapiens* the concept of human evolution would be falsified."¹³⁵

Just as Johnson missed the gist of invertebrate evolution because of his own misconceptions about species stasis, antievolutionists have insufficiently appreciated what species overlap means for their own *creationist* position. It concerns the taxonomical rail that Phillip Johnson caromed off ever so lightly with his gratuitously dumb remark that "many deny that there ever was such a species as *Homo habilis*." But apart from creationists who misrepresent the case, the issue has never been whether *habilis* existed as a distinct *species*—the question was to which *genus* did it properly belong? And that uncertainty only arises because the history of *Homo* has operated under *Darwinian* ground rules. Unlike the unbridgeable "kinds" and "types" populating the static (and historically fictitious) creationist landscape, natural speciation generates just the sort of squishy boundary zones as have been found at critical junctures in the hominid story.¹³⁶

This problem becomes even more acute the farther we get from the original split with the apes. Since the very earliest hominids had obviously only just diverged from their primate cousins, it's been no chore for creationists to call the apelike australopithecines "apelike."¹³⁷ But jump ahead two million years to *Homo erectus* and we are observing a hominid morphology considerably more like our own—and therefore much harder for antievolutionists to spike as either "man" or "ape." Insofar as the issue has arisen at all, there appears to be a significant split among creationists. As

seen above, Phillip Johnson intimated that *erectus* was no less an odd extinct ape than were the australopithecines, and Davis & Kenyon took a similar position: “little more than apes.”¹³⁸ But over on the orthodox Creation Science side, Marvin Lubenow regards *erectus* as “a post-Flood descendent of Adam, and a smaller version of Neanderthal.”¹³⁹ Deciding that brain volume alone mattered in this instance, Lubenow played the lumping game: “When we compare the crania of *Homo erectus* with those of archaic *Homo sapiens* and Neanderthal, the similarities are striking. My own conclusion is that *Homo erectus* and Neanderthal are actually the same.”¹⁴⁰

As you make your way past *Homo erectus* the part above the neck continues to become more human, of course—which has left the creationist in something of a quandary. If *erectus* is held to be an ape, as *Of Pandas and People* did, it is exceedingly tricky to decide where to pigeonhole the slightly more human “Archaic sapients” known to have existed in between *erectus* and us. Davis & Kenyon resolved this difficulty by leaving out any skull illustration for that phase, as though no relevant fossils existed. Out of sight ... out of mind. Unfortunately, half a dozen of these “archaic” *heidelbergensis* models were known at the time they were writing, and further skulls were being discovered in Spain at the Atapuerca cave just as their 2nd edition came out.¹⁴¹

For those creationists who have decided *erectus* is a human, though, all those “archaic” *Homo sapiens* represent only more of the same. Thus spake Marvin Lubenow: “The dating and morphology of this category helps to falsify the concept of human evolution and serve to demonstrate the wide degree of skeletal and cranial diversity that is found in the human family.”¹⁴² But such a position is much riskier without the compressed Young Earth chronology to fall back on to squash the temporal sequence. If supposedly modern humans were toddling about half a million years ago, that not only puts Adam a long way back in time, but means the human family in those days was objectively as culturally dull as a sack of hammers. To remedy that sour impression, Lubenow sought to upgrade such fossils as the Kabwe skull (a.k.a. Broken Hill 1 or “Rhodesian Man”) to the technological sophistication of modern man. Found in 1921 in a natural cave being mined for its lead and zinc deposits, Lubenow arbitrarily decided “Rhodesian Man” really dated from when the cave was being employed as a mine, and thus “smacks of a rather high degree of civilization and technology.” Pulling out all the stops, Lubenow opined:

It is amusing that many evolutionists, when reporting on the details of Rhodesian Man, say that he was found in a cave. Technically, I suppose, they are right. A mine shaft is just a cave, of sorts, in the same way that diamonds and emeralds are just pebbles. One wonders if this is a crude attempt to minimize the technical abilities of ancient humans. The Book of Genesis clearly confirms the advanced culture and technology of the ancients, specifically mentioning metallurgy in Genesis 4:22 and music in Genesis 4:21.¹⁴³

This allusion to the imagined technological prowess of “Rhodesian Man” was doubly ironic, precisely because it is the tool use of early *Homo* that serves to track the emerging human mind. Regarding the 600,000-year-old Bodo cranium found in 1976, Johanson and Edgar have noted:

Creationists love to argue that paleoanthropologists lack transitional fossils to show that one hominid species evolved into another. The specimen known as Bodo, after its place of discovery in Bodo d’Ar, Ethiopia, refutes that argument. It possesses a range of anatomical features typical of different species of *Homo* and as such does not fit easily into any one species. Even as this specimen captures a biological transition in progress, the stone tools collected at Bodo reflect an unfolding cultural tradition.¹⁴⁴

A “cultural tradition” which, of course, creationists have paid no attention to ... remember how Phillip Johnson let the matter dangle with the tool use of *Homo habilis*. But the shift to *erectus* marked yet another level to the human evolution story. Equipped with a brain about the size of a one-year-old human (which is twice that of a chimpanzee), the *erectus* clan all but exploded out of Africa virtually as soon as they appeared. As early as 1.8 million years ago they

had reached the far corners of Asia, and (dodging glacial advances) had settled in Europe by 900,000 years ago.¹⁴⁵ Their hegemony lasted about as long as had that of their stay-at-home australopithecine forebears: about two million years. During this time *erectus* continued their productive Oldowan tool industry and towards the end of their successful run they appear even to have begun using *fire*—all of which adds up to a lot more than *erectus* being a garden variety ape.¹⁴⁶

But still they were not yet human, as Richard Leakey rather deftly observed when he described the rather obvious distinguishing features of *erectus* anatomy back in 1977:

If, by some magic, a *Homo erectus* individual attended a masked party—Halloween for instance—in twentieth-century London or New York, his stance and general appearance would have occasioned no special comment; a little on the short side perhaps, but nothing out of the ordinary. But what a shock the other guests would have had as midnight approached, and the time came to discard masks! Our atavistic guest would have a strangely flattened skull, prominent brow ridges, and a protruding jaw. And if anyone cared to look, his molar teeth would have appeared as much bigger than a modern dentist would be accustomed to see.¹⁴⁷

And then there is the *erectus* mind to consider. The culture of these far-flung ancestors is of paramount concern in trying to figure out how our own human intellect came to be as it is. From a creationist standpoint, of course, whatever was going on in the head of a Chinese *Homo erectus* a million years ago would be quite inconsequential ... but from an evolutionary perspective their brain activity is of the utmost relevance.

With a more omnivorous diet that included meat, *erectus* adapted their increasingly sophisticated toolmaking skills to butchering—through opportunistic scavenging, but also in the hunt. As the *National Geographic* recently put it, “Meat and bone marrow also gave them the extra energy to grow larger brains. Thus early *Homo* became an ever more clever omnivore, following the big cats that followed the game.”¹⁴⁸

Making Up Our Minds: *Homo erectus*, Neanderthal and the roots of us

That *erectus* hunted in a way no living primate apart from man does today is a circumstance that has led to a divergence of opinion on what might have been going on in the brains of these exceptional animals—or were they in some sense by then “beings”? What to make of *erectus*’ culture? The range of opinion here is conveniently represented in the contrasting views of anthropological colleagues Alan Walker and Meave Leakey. Allison Jolly recently summed up their telling difference of opinion:

The paleontologist Alan Walker calls *Homo erectus* “the velociraptor of its day. If you could look into its eyes, you wouldn’t want to. It might appear to be human, but you wouldn’t connect. You’d be prey.” Meave Leakey (another paleontologist Leakey, wife of Richard, who is in turn the son of Mary and Louis) counters: “Anyone who has spent just a few seconds with a chimp or a gorilla knows that these creatures relate closely to us. Certainly *erectus*, with a brain capacity greater than living apes’, would relate even more closely to us.” *Erectus*, to me, is even more of a mystery than the australopithecines: a hugely successful species, almost human, widespread, skilled, perhaps with conjugal sharing and love, but still somehow lacking imagination.¹⁴⁹

It is precisely that imagination (or lack of it) that draws the anthropologist, much as a detective story junkie cannot resist the lure of the puzzle. The origin of the human mind is a conundrum to be resolved—requiring the observational focus of Sherlock Holmes tempered by the benign patience of Inspector Maigret. And, like a good mystery, clues are to be found in the most

mundane of circumstances: what do you have to be *thinking* in order to fashion a particular stone tool? Innovations in tool fabrication (reflecting in turn possible new uses) cannot be disconnected from what was going on in the brains of the hominids responsible for them. That in turn raises the question of where such skills lie on the spectrum of creativity. On one end is a chimpanzee picking up a stone to whack something simply as a hammer ... and on the other, Michelangelo perceiving the form of “David” trapped within a block of marble and figuring out how best to release it.

The basic fact is that, starting about a million and a half years ago, new varieties of stone implements began to appear in the *erectus* world—but not all at once.¹⁵⁰ That sequential introduction is telling us something very significant about the genesis of the human intellect. Tattersall picks up this trail with the first of the new technologies, the Acheulean:

You’ll recall that the handaxe and cleaver, the typical Acheulean implements, were the first tools to be made to a set and regular pattern: to a “mental template” which existed in the mind of the maker. Oldowan toolmakers—as many Acheuleans also continued to do—had, in contrast, been most interested in producing sharp stone flakes that they could use as cutters and scrapers. They were thoroughly aware of the principles of striking stone at the correct angle for producing such flakes, but they were not concerned to produce tools of particular shapes. The Acheuleans were, however—and they came to revel in it. Identical handaxes litter many localities in almost unimaginable abundance, and at sites such as Tanzania’s Isimila they may be of extraordinary size—in some cases too heavy to lift with one hand. Apart from showing us that the toolmakers were far stronger than any humans are today—for the shaping of large stone cores of this kind demands prodigious physical power—such tools as those from Isimila maybe even show a sense of humor, or at least a sense of pure design: some of these tools were simply too large to use, certainly with deftness. Such caprices apart, however, the Acheulean handaxe has been aptly described as the “Swiss Army Knife of the Paleolithic,” subserving a diversity of functions such as cutting, hacking, scraping, and digging. And its manufacture endured for well over a million years.¹⁵¹

Of particular importance is the chronology. This revolution does not appear to have been directly related to changes in the physical anatomy of the *erectus* cranium.¹⁵² Of course, there could have been new neural hardware connections going on, ones not effecting overall brain volume or configuration. But perhaps something far subtler and more arresting was going on. Could the hominid brain have reached the stage where altered toolmaking behavior appeared because the existing brain could adapt to new behavior solely by transformations in the *software* running in their prehuman cortex? In other words: *cultural* innovation.¹⁵³

That creationists don’t give a hoot about any of this (to borrow Michael Behe’s punchy way of putting his attachment to whale phylogeny) is clear enough. They have consistently avoided even acknowledging these telltale stages in tool production, let alone offer some cogent reason why “mere apes” should have been churning out such things in the first place. All Johnson could muster was his harrumph about Steven Stanley’s “rapid branching”—that supposed “euphemism for mysterious leaps, which somehow produced the human mind and spirit from animal materials.” But Johnson was all too typical of the creationist mindset in neglecting to specify whether there were any components to the human mind or spirit that might be detectable in the products of an earlier ancestral form during those proposed evolutionary leaps.

As for rapidity ... it is interesting to note that, as the physical evidence continued to play out, those “apes” shortened the time to the next technological “revolution.” While it had taken all of a million years to slog from Oldowan to Acheulean toolmaking, the next intriguing wrinkle arrived in about *half that time*. Though you had to approach the subject in a particularly tactile way to recognize its significance. Tattersall again:

Thus, following the invention about 1.5 myr ago of handaxes and related bifacial implements such as picks and cleavers, we have to wait another 0.5 myr before we encounter any notable advance in stone-working technology. And even here, change expressed itself simply as a refinement of the basic handaxe-making technique. At about 1.0 myr ago, handaxes began to be made thinner, using a technique known as “platform preparation,” in which the axe’s edge was initially made less oblique, to provide a surface at which more force could be directed. This advance was associated with at least the occasional use of “soft hammers,” made of gentler organic materials—bone, wood, antler—rather than of brittle stone. Who was responsible for this invention? We don’t know; associated hominid fossils don’t exist. But we can be pretty sure that these early hominids had some powers of abstract reasoning, for as Kathy Schick and Nick Toth point out, platform preparation is not an intuitively obvious procedure.¹⁵⁴

Thus Acheulean toolmakers progressed from the Oldowan method of knocking a chunk off a stone piecemeal to altering the stone itself first to turn it into a working platform where the more detailed flaking could proceed with increasing deliberation. By physically replicating that process, researchers like Schick and Toth know first hand what thought had to go into making them. Such tools are just as representative accomplishments as Chartres cathedral would eventually be for our own species. If the *erectus* crowd was not developing, step by halting step, into something increasingly recognizable as a being possessed of some sort of mind, the physical evidence turning up along the way was doing a darned good circumstantial imitation of it.¹⁵⁵

Now the next step in this extraordinary journey is the transition to *Homo sapiens*, and that returns us to C. Loring Brace, whose theoretical influence plays a significant supporting role in that “mitochondrial Eve” hypothesis Phillip Johnson alluded to with such beguiling brevity. By trying to pass this off as simply a dispute between anonymous blocs of “physical anthropologists” and “molecular geneticists,” Johnson did his usual do-si-do of skirting around the actual points at issue. Did human beings originate in one African spot, and spread out to *replace* indigenous *erectus* populations ... or did *sapiens* somehow emerge *regionally*, by gene flow among those same indigenous peoples?¹⁵⁶

The debate is again one about the nature of speciation itself. And once more the difference between how evolutionists and creationists have approached the problem is worth exploring. There’s also a dandy “Purloined Letter” punch line, too ... but first, the history.

Loring Brace’s ideas about species competition heavily influenced Milford Wolpoff, point man for the minority multiregional model of human origins. Initially proposed by Franz Weidenreich back in the 1930s, the multiregional concept was filtered through Carleton Coon, and amplified by William Howells in the 1960s. Unfortunately, the idea that the human species developed along somewhat isolated regional tracks was also embroiled in issues of potential racism, since a simplistic reading of multiregionalism tended to confuse it with the defunct notions of entrenched racial inequality promoted by polygenism. The revival of the multiregional approach by Wolpoff and Alan Thorne in the early 1980s had to carefully defuse this spurious “racism” charge—after which the matter could progress onto the less emotionally divisive technical ground of fossil interpretation.¹⁵⁷

The multiregional case stresses the apparent physical continuity of local fossil populations—features such as the turn of a brow ridge that seem to be carried over from regional *erectus* into the later early humans that “replaced” them. But are such characteristics due to genetic inheritance from those ancestors ... or *convergence*, driven by environmental considerations or even pure happenstance? We are dealing here with closely related taxa, after all—species within the same genus *Homo*—so the convergence issue was actually of some relevance. How ironic then that this failed to ring any “other example” bells for Johnson when he gamely invoked the Von Däniken Defense. Stressing how those “few ambiguous supporting examples” of human evolution are as inconclusive as the *mammal-like reptiles* (where Johnson had last invoked “convergence”), he allowed them to “provide at most some plausible candidates for identification as ancestors, if we assume in advance that ancestors must have existed.”

That Johnson would later provisionally “accept” the therapsids boomerang-fashion in his 1993 tête-à-tête with Gould illustrated how philosophically insubstantial this position really was. The actual characteristics of the fossil data have never played a role in Johnson’s thinking—only the absolutist materialist dogma he is dedicated to exorcising from the body scientific. Of course, to venture forth on even the specialized issue of human evolution would require a level of study that might seriously crimp his variegated lecture schedule, let alone his Sunday sermonizing (more on that next chapter).

The therapsid example is pertinent in another way: the mounting physical evidence is certainly sufficient to document the evolutionary transformation of man—in exactly the same sense that the synapsid turnover way back in the Triassic benchmarks the emergence of mammals. If God didn’t want us to believe in macroevolution, he shouldn’t have created therapsids ... and if human evolution never happened, why then populate the African woodlands with bipedal australopithecines, only to follow things up with those tool-making *erectus* with a wanderlust for far horizons? But so far there are insufficient physical data to settle the fine-resolution question of exactly how that last stage of our evolution took place, whether by persistent gene flow among the widespread local *erectus* populations, or by replacement from one or more migrations of African *erectus* or *ergaster*-like groups.¹⁵⁸

Given that situation, it would not be surprising for creationists to weigh in at this point with the venerable Bermuda Triangle Defense, but that actually hasn’t happened. This is largely because they haven’t paid all that much attention to this phase of human evolution (recall how gingerly *Of Pandas and People* glided past those “Archaic sapients”).¹⁵⁹ Indeed, Marvin Lubenow is noteworthy for trying to run the argument the opposite direction: that there exists a bounteous fossil collection establishing the coexistence of modern humans with unrelated apes all the way back to Eden. According to his “own ‘dead reckoning,’ a conservative estimate, *the total number of hominid fossil individuals discovered to date exceeds six thousand.*”¹⁶⁰ Pulling a Garrett Hardin, though, Lubenow couldn’t resist showing his own “most comprehensive” catalogue of these antediluvian men. That list was nowhere near 6000. Even padded with a wad of fragmentary and partial finds (isolated femurs and such) all he could muster was 335 examples. And those were gathered by mixing together one third archaic and modern *Homo sapiens* with two thirds *Homo erectus*—that anatomically intermediate taxon whose diagnostic features Lubenow had not gone out of his way to specify.¹⁶¹

Only by such indiscriminate lumping was Lubenow able to leap to his grand conclusion, which was nothing if not firm:

This condition is what the creation model would predict. It is what we would expect if creation were true. The evidence, in fact, is so strong for the creation model of human origins that it is extremely unlikely that any future fossil discoveries would weaken it. This is because no future fossil discoveries in the 1-4.5 m.y.a. time period could cancel out the solid body of factual evidence that has already been accumulated. Up to now, new fossil discoveries have only strengthened the creationist position. It is understandable why evolutionist books no longer carry this type of human fossil chart. Charts of bits and pieces of the human fossil record abound in evolution books, but one will look in vain in an evolutionist work for a time chart that places *all* of the relevant human fossil material on a chart according to the morphological description of the individual fossils.¹⁶²

But Lubenow was whistling Dixie on both fronts. His own “charts” showed not a single illustration—they consisted simply of excavation tags with the briefest of description. For example, the oldest of the supposedly “Anatomically Modern *Homo sapiens*-like Fossils” was “Kanapoi (KP 271) arm fragment, Kenya” dating from nearly 5 million years ago.¹⁶³ Without checking on what such fossils represented, the reader would have absolutely no clue what any of his “charts” actually indicated. This would in turn be abetted by the general creationist reluctance to challenge their own assumptions by investigating the source material on their own. Meanwhile, evolutionary

authors seemed not at all shy about showing both skulls and chronology, as well as explaining in their texts exactly on what basis such identifications were made. Lubenow's bravado here was shallow indeed.¹⁶⁴

Teasing apart this material only confirmed what conventional paleontology had already established ... the earliest of our own species showed up on the scene sometime during the last days of *erectus*. But if African Eve v. Multiregional cannot be settled by the fossils alone, what about the genetic end? That's where those mitochondria came in. These are usually (though perhaps not exclusively) inherited from the female side of the line, so given a series of sequence variations it is theoretically possible to derive a ballpark phylogeny of which changes occurred and in what general order.¹⁶⁵ There is also "Y-chromosome Adam" to consider: discrete genetic packets handed down exclusively along the *male line*, which likewise are subject to dating by the random mutations that have accumulated in them. This too suggests a similar time frame for the African genesis of the human species.¹⁶⁶ Given how gene flow occurs in living populations, a DNA mixing bowl blurred across large pieces of real estate has a harder time preserving such discrete packets, and for that reason the clear trend among paleoanthropologists has been away from the multiregional model.¹⁶⁷

Which leaves African Eve?

Creationists understandably see things very differently. There is no choice to be made between mitochondrial Eve and the multiregional model, since the natural evolution of man is for them a foregone non-conclusion. For Lubenow, any genetic analysis endeavoring to measure the time since a population has diverged is founded on unjustified evolutionary presumptions—in other words, he's dismissing them *a priori* by the same Von Däniken Defense Phillip Johnson has employed so athletically over on the Intelligent Design side.¹⁶⁸ But at least Lubenow is more open and forthright about what he sees as the undeniable alternative:

The Bible is a revelation from God. Genesis is part of that revelation. God's revelation is more than just the passing on of information; it is the imparting of truth which humans *could not know* by any other means. The failure of the African Eve theory is just another illustration of the impossibility of constructing an authentic record of human origins by scientific means. It is because we could not know with certainty our origins any other way that God gave us an authentic revelation of our origins in the Book of Genesis.¹⁶⁹

Three cheers for the Book of Genesis ... except here is where we encounter our Purloined Letter. For it is only possible to talk about using mitochondria as a genetic clock in this way because we have mitochondria in our cells to begin with—and why is that? Lubenow sniffed at the problem, turning away the moment he smelled something "evolutionary" about it. But Johnson didn't even get that close, and that's because he never bothered to examine the symbiotic origins for mitochondria—not in *Darwin on Trial* or since.¹⁷⁰

Which puts Phillip Johnson a tad farther behind the scientific learning curve than even George Lucas in the opulent Star Wars prequel *The Phantom Menace*, which attributed "the Force" to the collective effect of all the mysterious little "midi-chlorians" residing in our cells.¹⁷¹

Real mitochondria do not grant us paranormal powers, of course. But they do serve as the energetic mainsprings for our cellular power cycle. And in that respect they comprise something very unlike a neatly designed Paley Watch. For recall what John Avise had to say last chapter about that—how mitochondrial DNA was inextricably tangled with the exons required for our own cellular function. Creationists never think to ask why it was that a creator should have elected to bring mankind into being with every one of our cells using randomly mutated versions of exactly the same strangely contrived powerhouse found in the "lower" organisms we supposedly weren't related to. What was it ... *absentmindedness*?¹⁷²

Thus, while only orthodox Creation Scientists are compelled by their theology to embrace such absurdities as "creation with apparent age," all antievolutionists are facing the inevitability of accepting an equally "awkward" conceit. From fossil sequences like the reptile-mammal transition

to the biological implications of mitochondria, the physical evidence for evolution can only be wriggled around by believing in “creation with apparent ancestry.”

Such niceties have yet to filter down through the antievolutionary literature, of course. Instead, creationists have picked up on the technical aspects of the African Eve debate solely as a crowbar to pry loose the connecting links in the recent evolution of man. Which certainly lends an air of irony to Phillip Johnson having pointedly quoted Rebecca Cann on how “paleontologists fear that if they expose the legitimate scientific limits of the certainty of their theories, fundamentalists and creation ‘scientists’ may misrepresent these data to dispute the fact that evolution occurred.”¹⁷³

With due apologies to Dr. Cann, there’s been no “may” about it ... that’s exactly what antievolutionists have done, to the exclusion of even thinking through the logic of their own position.

Which presents a further irony: it has been the Intelligent Design branch of modern creationism that has most consistently played the “don’t air your dirty linen in public” game. Johnson’s own apologetic Wedge has elevated this tactic to a Commandment. Thou shalt not criticize a fellow Christian creationist (*no matter how idiotic their arguments may be*); lest comfort be rendered unto thine enemy (*Darwinian evolution*). In the meantime, the evolutionary community has shown no inclination to heed Rebecca Cann’s caution and clam up. Quite the contrary: practitioners of the science at all levels have remained just as scrappy about openly thrashing out the implications of the data, even though many of them are well aware how freely creationists are apt to bottom feed on their assorted comments. Gould and Eldredge come handily to mind—but even evolutionists Zuckerman and Oxnard qualify in this area.¹⁷⁴

So it is that anthropologists have plowed ahead into the final phase of human evolution, when *erectus/ergaster* began its blur into Neanderthal/*sapiens*. And, arguably, this is the area where creationists have had to turn their vaguest by dire necessity. For at some time along that road the observational history of man has to overlap the legendary boundaries of Eden. The only problem is, what anthropologists have discovered about the sequence of man’s immediate past looks nothing like the version recounted in Genesis ... as one particularly steadfast opponent of evolutionary thinking recently put it: “In the world as modernists understand it, only matter existed at the beginning. Human beings did not fall from perfection into sin but evolved from savagery to civilization. Sin itself is an illusion, a guilt trip imposed by manipulative religious authorities.” On the following page, that same author cemented the supposed division: “The story of salvation by the cross makes no sense against a background of evolutionary naturalism. The evolutionary story is a story of humanity’s climb from animal beginnings to rationality, not a story of a fall from perfection.”

Might this be the Gospel according to Henry Morris? *Au contraire* ... it is the exegesis of Phillip Johnson, as dribbled out in *Defeating Darwinism*.¹⁷⁵

And I mean *dribbled* ... for this is actually as close as Johnson has ever come to spelling out what his position might be on the nature of man’s recent prehistory. But if you think about it from a theological perspective, Johnson’s stance here is perfectly conventional Old Time Religion. His remarks can only be understood against a background founded on *the reality of Adam’s Sin*. Under this view, God is obviously not allowed to take an interest in mankind’s spiritual welfare unless he had personally called them into being in their present form, presumably back in Eden. Nor is the profound sacrifice of the Resurrection evidently permitted unless there were a literal human “sin debt” in need of repayment, operating under some manner of celestial contract law set in motion by that vile tempting Serpent.¹⁷⁶

The Biblical creationist has no theological leeway sufficient to accommodate the idea that God might show care for a humanity naturally descended from a population of australopithecines (or Triassic insectivores ... or even Precambrian bacteria, if we run back far enough). This is all the more theoretically intriguing, given how mortal beings coming from such humble beginnings would be just as in need of spiritual salvation as Adam’s progeny. If one posited that the creator of the universe had structured matter so that self-aware entities were possible now and then (even if not ordained in a particular instance), nothing would preclude the deity stepping in with a special deal to allow them to escape their otherwise ineluctable personal extinction. Thus evolution and redemptive Christianity are by no means theoretical adversaries in principle.

But that is no more an allowed variation on the traditional Christian salvation theme than spot creation of Madagascar tenrecs would have been for Duane Gish's doctrinaire Flood Geology. Which explains why Phillip Johnson sounds so much like Henry Morris here. Both are drawing on the same "Rock of Ages" metaphysic ... a venerable conception that first bumped into the scientific debate on human origins back in the 1920s with the antievolution crusade of William Jennings Bryan.¹⁷⁷

The centrality of this notion cannot be overstressed. In their recent tome of cultural criticism *How Shall We Live?* Chuck Colson and Nancy Pearcey reaffirmed this fundamental doctrine:

As the apostle Paul declares again and again in Romans 5, Adam and Eve's fall into sin was as historical as Christ's redemptive work on Calvary. And the reverse holds as well: Because the Fall was genuinely historical, the second person of the Trinity had to enter history and suffer a historical death and resurrection to bring about the redemption.¹⁷⁸

No equivocation here: the Biblically correct creationist is stuck with defending the physical reality of the unique human ancestors "Adam" and "Eve" for theological reasons, as an integral part of the "salvation" equation. But figuring out how to fit that couple into the increasingly documented anthropological history of man presents a minefield Creation Science is no more willing to traverse than Intelligent Design.

For our analytical purposes, Loring Brace conveniently threw down a big piece of the gauntlet back in the 1980s:

One of the more indefensible predictions offered by the recently resurgent creationists movement is the idea that the origin of "civilization" is contemporaneous with the origin of "man" (Morris, 1974, p. 13). Thus they have predicted that "man's agriculture and other basic technologies are essentially as old as man himself" (Morris 1975, p. 152). Such a position can only be maintained by deliberately choosing to ignore more than a century of archaeological research.¹⁷⁹

In "replying" to this point in *Creation Scientists Answer Their Critics*, Duane Gish indulged in one of his most jejune convolutions. He did not deny that Morris had claimed exactly what Brace had said he had. Instead, Gish recycled the mainstream scientific research Henry Morris drew on indicating agriculture and animal domestication originated around 9000 BC. A perfectly valid data set, as it happens—but totally irrelevant to the issue, since neither Morris nor Gish offered evidence supporting the point in dispute (the coincidence of agriculture and civilization with the *earliest* true humans). To add to the irony, the ICR sages were siphoning off material that relied on the same dating methodology that put the origin of mankind back beyond 100,000 years—meaning they were trying to selectively use one part of the process to pretend that the other end didn't exist.¹⁸⁰

However did Gish think this blundering trick might work? With no less astonishing *chutzpah* than Kurt Wise and his "stratomorphic intermediate" argument, Gish tried to turn what is a serious problem for the Biblical interpretation of prehistoric man into a difficulty for *evolutionists*:

Thus, for about 650,000 years, we are told, there was essentially no progress in human technology and civilization. Then, so it is said, Neanderthal people, with a fully *Homo sapiens* status (Brace, p. 254) abruptly appeared in Europe and other places, possessing an average cranial capacity of about 1600 cc, even greater than that of present-day man (averaging about 1450 cc). If the Neanderthal people were fully developed when first noted in Europe, they would have had a large cranial capacity for perhaps tens of thousands of years prior to 100,000 years ago, if evolutionary theory is accepted. The questions then are, what in the world were our advanced hominid ancestors doing for almost a million years? Why was evolution, both physical and cultural, so quiescent for

such a vast stretch of time? If *Homo sapiens* had evolved perhaps as much as 150,000 years ago or even longer, why was it that he invented agriculture and domestication of animals so recently and so abruptly? (Certainly “abruptly” is an appropriate term, if we use the evolutionary time scale.)¹⁸¹

In trying to gavotte around the difficulties presented by the Creation Science view of recent human origins in Eden, Gish has obligingly spelled out exactly what Old Earth creationism and Intelligent Design aren’t prepared to think about either: *why so long?* Why did our own mix of intelligent behavior unwind so slowly if the Neanderthals already had brains bigger than ours? Here is where Gish hit the creationist speed bump, of course, for he has begged a sizable question: were the Neanderthals really “fully developed” in the way he would have it?

The tantalizing thing about the Neanderthals has been how so *nearly* like us they were. We can readily identify with the fact that they were active hunters who used fire and buried their dead. Certainly there were singular anatomical variations between Neanderthals and modern man, but in the heyday of Brace’s “single species” lumping, paleoanthropologists tended to downplay those distinctions and started classifying Neanderthal as a subspecies of man, *Homo sapiens neanderthalensis*.¹⁸² But the cladistically trained anthropologists of the new generation are much more finicky when it comes to evolutionary taxonomy, as indicated earlier with that quote about “Tattersall’s Law.” The result in recent years has been a shift back to regarding Neanderthal as a very close, but nonetheless separate species in our genus *Homo*.¹⁸³

This process has been helped along by advances in genetic sampling technology, which in 1997 permitted mitochondrial DNA to be extracted from a Neanderthal skeleton for the first time (yes, they had those “midi-chlorians” too!). The result suggested that the cladistic doubts about Neanderthal were well founded: along the stretch of 378 base-pairs studied, among all our modern human population that mtDNA varies by only 8 base-pairs. Yet the Neanderthal sample sported 27 differences, whose placement was consistent with a common ancestral divergence from the line leading to our *H. sapiens* occurring sometime around 550,000-690,000 years ago. Incidentally, that is a few hundred thousand years before Neanderthals appeared on the scene as an identifiable taxonomic group. Coupled with their morphological and behavioral variety, it has thus become more difficult at the turn of the 21st century to imagine Neanderthals as simply an especially robust subspecies of *Homo sapiens*.¹⁸⁴

It is that “behavioral variety” that sets Neanderthal just askew from man, not quite fitting either the “as human as you and I” Creation Science pigeonhole or Hugh Ross’ curious alternative of a non-Adamic limbo.¹⁸⁵

We know from their anatomy that Neanderthals were tremendously strong—indeed, much of their larger brain may have been devoted to a handling package for that increased musculature.¹⁸⁶ They innovated the technique of hafting points to spears (something *erectus* never managed), and by that means concentrated on the dangerous close pursuit of small and medium herd animals, particularly the bovine aurochs. That led to a recurrent suite of personal injuries comparable to rodeo bull riders, and a life span that rarely exceeded forty.¹⁸⁷ This clearly speaks of personal bravery and social cooperation . . . and perhaps even of an existential angst over their hard life. We do know that at least one crippled old Neanderthal had to have been cared for, since he “would have been unable to move far to find his own food.”¹⁸⁸

Neanderthal hunting did not involve mass slaughter, though, or even the pursuit of really big game like mammoths, but rather concentrated on individuals in a classic “hit the stragglers” strategy understandably common among predators. But part of the Neanderthal version may have been born of technological necessity. While they made fine spears, Neanderthals never hit on the improvement of using another stick as a launch platform—the *atlatl* spear-chucking later *Homo sapiens* would employ to ambush significantly larger prey from much safer distances. Nor is there any evidence from their encampment debris for activity at the opposite end of the food chain: as cognitive theorist Steven Mithen reminded, Neanderthals did not appear to have “systematically exploited small game, birds and fish.”¹⁸⁹

Like a detective story, that datum turns the tale into an intriguing forensic procedural. For hunting small game in the more intricate human way would have required Neanderthals to have

fashioned snares, nets, or fishhooks ... which in turn would have required small precision tools ... and thus the mental tool kit necessary to envisage and fabricate those implements in the first place.¹⁹⁰ Because *Homo sapiens* would master working in bone in exactly that fashion, Mithen suggests Neanderthals lacked our skills for the complete integration of information across categories. If a bone was conceptually part of an animal, something thought of as either “food” or “sacred beast,” the idea of nipping off tiny bits for tools might have seemed as peculiar as seeking nourishment by gnawing on one of the flint cores they used for flaking spear points.¹⁹¹

At this stage an especially caustic observer might venture that this proposed “Neanderthal” way of thinking sounds all too much like how creationists have approached the evidence: a fundamental inability to connect things up across conceptual boundaries. Though that was hardly Henry Morris’ prime oversight in *Scientific Creationism* when he stitched together this misleadingly inflated catalog of Neanderthal accomplishment: “It is known that Neanderthal man raised flowers, fashioned elegant tools, painted pictures, and practiced some kind of religion, burying his dead.”¹⁹²

Like the transient stupidity of Morris’ prehistoric “giant ants,” wherever did he get the idea that Neanderthals *raised flowers*? That hilarious claim could only have come from a complete misunderstanding of one particular Neanderthal burial, where fresh blooms may have been laid with the dead body. Unfortunately, it was equally possible that pollen grains had simply infiltrated the soil. But even accepting that evidence at face value, as a touching esthetic gesture of nascent grief at the death of a loved one, this could hardly justify Morris’ harebrained extrapolation that Neanderthals actively engaged in *horticulture*. And as for burying their dead, this practice too has something odd about it: the glaring absence of associated artifacts such as bead necklaces or personal possessions that characterize the more elaborate interments of early humans.¹⁹³

And look closer still ... as Randy White of New York University did at the content of the Aurignacian beadwork and body ornaments so popular among those early humans. As James Shreeve summarized in *The Neanderthal Enigma*, “Most are manufactured on materials imported from elsewhere. People with access to shells did not wear shells but instead traveled or traded to obtain mammoth ivory, while those who lived near mammoth disdained ivory and chose exotic shells. Rarity enhanced value in an ornamental object, just as it does today. White even has examples of ivory carved to look like shell, and deer teeth faked from limestone.”¹⁹⁴

Now pause a moment to think this through one more step: adornment is part of a broader cultural matrix, one related to the seemingly superfluous production of nonfunctional artifacts. That level of abstraction (and enthusiasm!) stands in marked contrast to the straightforward handiwork of the Neanderthal mind—and brings us to the most egregious “giant ant” mistake of the ICR version of their culture: the notion that Neanderthals *painted pictures*.

There Henry Morris has summarily merged the artistic creations of Cro-Magnon man with the Neanderthals, who are not known to have fashioned representational art in any form whatsoever. But things are even more interesting than that, since for a very long while *we* didn’t make representational art either. Anatomically modern humans had been on the scene for around a hundred thousand years before the first signs of artistic expression show up, about 40,000 years ago.¹⁹⁵

Here is a “Cultural Big Bang” ... a “Great Leap Forward.” Call it what you will, but the extended failure of the earliest humans to do something so characteristically “human” as making ornaments and art is a singular mystery of our cultural ancestry that cries out for at least thought, if not explanation.¹⁹⁶

If a hundred thousand years ago you had handed a sculpture of a horse to a Neanderthal, would they have recognized it as a *horse*? Would a Cro-Magnon contemporary have done any better? And if either had been shown one of those pudgy “Venus” statues from forty score centuries in the future, would one have caught on to the idea of it faster? We have no living Neanderthal or early Cro-Magnon to interview on esthetics ... or slide under CAT scanners to compare their brain functions with our own, when thinking about horses or gods of fertility. Yet the parsimonious position is to suspect that the brains of our direct ancestors were primed to accept art when it came along in a way our Neanderthal cousins were not. Under that working hypothesis,

we'd be looking for *trigger mechanisms*, cultural exaptations drawing on already existing brain chemistry that simply hadn't thought of that particular combination before.

Many possible influences spring to mind. Environmental factors must have contributed to the ebb and flow of cultural evolution in ways just as surprising as the Panamanian Isthmus suggested for the australopithecines millions of years earlier.¹⁹⁷ Amid fluctuating glaciers and faunal distribution, there is no reason to suppose that human population shifts could not be just as disruptive as those characterizing the post-Roman "Dark Ages." Yet such pejorative terminology partly reflects our own lack of information. Those centuries were obviously less shadowy to the people living in them, so we might expect an equally clearer picture of the millennia preceding the flowering at Lascaux if only we had written records of what was going on—or better, our trusty Wayback Machine to study matters directly.¹⁹⁸

And while we're on the subject of Mr. Peabody ... let us not forget the wild card of genius, the interplay of individual talents and aspirations that punctuate the status quo of cultural lethargy. By whatever means modern *Homo sapiens* came to be, by divine spark or natural selection, we cannot help but wonder how many "da Vinci-class" temperaments there were along the way to spur innovation.¹⁹⁹ As our own history all too amply demonstrates, not all cultures are equally open to boat-rockers. Some of the especially clever must have fallen through the social cracks, ending up in the Paleolithic equivalent of a dead-end job, the best local spear-maker in a society on the skids. Still others will never have made it past the bludgeon of a jealous rival ... or the more organized fatality of human warfare that tends to grind people up independent of talent or virtue.²⁰⁰

Serious issues and fascinating questions. Yet there is no creationist anthropology to address them. Creation Science certainly pays no attention, except to mush up the facts as have Henry Morris or Duane Gish. That may be because the archaeological chronology is all too wrong, at least from a strict Genesis point of view. This burst of human creativity falls nowhere near the proposed time for Eden, nor does it indicate that grim "fall from perfection" that Phillip Johnson alluded to. Indeed, insofar as Old Earth creationists have tried to manhandle the facts to fit a Biblical perspective, they have only dug their interpretative hole even deeper. Consider the view of Hugh Ross:

Bipedal, tool-using, comparatively large-brained primates (called hominids by anthropologists) may have roamed Earth as long ago as 1.5 million years, but religious relics and altars date back only as far as twenty-four thousand years, at most, and art containing indisputable spiritual content just five thousand years. Thus the archaeological date for the beginning of spirit expression agrees with the biblical date.²⁰¹

Ironically, Ross ended up staking out the opposite position from the Morris when it came to human culture. "Burial of dead, use of tools, or even painting do not qualify as evidence of the spirit, for non-spirit beings such as bower birds, elephants, and chimpanzees engage in such activities to a limited extent."²⁰²

But Ross was being positively gracious compared to kabalistic physicist Gerald Schroeder, who flatly straightjackets the human "soul" to the traditional timeframe. With all the cheery deductive certainty of Henry Morris at full tilt, Schroeder declared: "Since the Bible defines a human as an animal with a *neshama*—the spiritual soul of humanity (Gen. 2:7)—there is no biblical problem with human-looking creatures predating Adam. As Talmudic and ancient commentaries point out, they were animals with human shapes but lacking the *neshama*."²⁰³

An animal *in a human shape* ... is that what the Cro-Magnon painters of Lascaux were supposed to be? And is that any more preposterous than the idea of a demon taking on the form of a lettuce?²⁰⁴

On this point, Ross or Schroeder should have consulted philosopher Mortimer Adler, who laid out some important ground rules here in his own critique of evolution nearly half a century ago.²⁰⁵ Interestingly, Adler did not stress our self-awareness as a unique property (a consequential shift in emphasis, as we'll see). Instead, Adler focused on what we, as conscious beings, are capable of. The first of "Three Things Only Humans Can Do" is that we contrive objects *esthetically*. Bower

birds arranging seeds or beetle carapaces to attract a mate is one thing ... but if the stunning murals of Lascaux don't qualify as a singularly human activity, what would? To make art of that caliber is to express our very essence, so if we have "souls," so too did the ancient artisans of Lascaux, Cosquer, or Chauvet.²⁰⁶

Adler's remaining two benchmarks plunge us deeper into the mystery of the human condition: we alone think discursively through syntactic language, and associate politically (rather than instinctively, as in insect societies).²⁰⁷ Adler was a little off on that third point, since it turns out that primate societies have quite elaborate personal coalitions that can best be understood under the general rubric of "political association."²⁰⁸ But there is still a visible gulf between the power plays of chimpanzee cliques and the sentiments expressed in the Declaration of American Independence, a package that neatly illustrates Adler's "Three Things." Humans create level on level of abstraction, such as *Liberty* being among those *Rights endowed by a Creator* ... and we can communicate these concepts to one another (and posterity) via verbal and written media that in turn rise to the level of artistic expression. The extent to which the abstractions being proposed are "true" is another more debatable matter, which is why brilliant thinkers from Plato and Aquinas to Kant and Adler have had a field day ... and artists like Shakespeare or Picasso can add their sundry commentary via drama or the canvas.

That we engage in such thought and expression at all—and at the drop of a hat—is surely at the very core of our humanity. So it is a fair statement of objective reality that no known animal except us can do Adler's "Three Things" in quite the way we can.²⁰⁹

But does this state of affairs rule out the naturalistic origin for these extraordinary faculties? Adler certainly thought so, though much of his reasoning depended on the validity of a flawed typological way of thinking, where the human intellect was taken to be as fundamentally different from animal minds as triangles are from squares. One cannot even imagine something intermediate between those two idealized plane figures, or so the logic runs.²¹⁰

The snag in this reasoning concerns the nature of biological systems, which never start out as tiny Platonic *eidola*, but rather are self-assembled bit by bit from elements that only become that system in the process of aggregation. That is a crucial difference. By failing to think developmentally, typological essentialists like Adler never hit on the ways in which one biological state might transform into another. Put in his geometric terms, an equilateral triangle may be thought of as the end product of a simple rule: "equalize all sides and angles." If a starting switch selects three sides, you get a triangle—and a square if the switch were set to four. From a typological perspective those initial switching conditions isolate the end products as unique. But in the biological realm matters are not quite so clear-cut. Whether a triangle or a square, the actual sides for both would be drawn from raw material by an assembler, which would do its thing independently according to its own simple operating rules. There might even be another player, such as a coupler unit that sees to it the sides are plugged together properly. All of these governing operations would be totally automatic ... indeed, thoroughly *mechanistic*.

And that very mindlessness opens the way to naturalistic change.

For under such an arrangement you can get from a triangle to a square *without* resetting the "essential" switch for side numbers directly. Imagine an equilateral triangle hit with a mutation that slightly bends one side out. Though not the right length, you now have four sides to work with. If the developmental process is still in the growth stage (the geometrical analog of producing neural crest cells) the equalizer rule will have no way of knowing that it's supposed to be making a triangle. It would encounter those four unequal sides and angles, and proceed to tidy everything up. The result: a square.

To figure out whether the real "squares" and "triangles" of animal minds can have evolved in such a manner would seem to require at the minimum investigating all the little neural mechanisms, and how they interact. But that hardly seems a promising idea to Phillip Johnson. For him the "materialist theory of the mind" is as unbridgeable a chasm as Adler's plane geometry. "It is that biochemists who are materialist reductionists fiercely want to believe that real progress toward understanding the mind comes only from learning the principles of biochemistry and not from listening to priests or philosophers."²¹¹

And here is where the philosophy of Theistic Realism (let alone its priestly aspects) plays a pivotal retarding role when it comes to identifying possible materialistic processes relating to the nature of the human mind.

It is the end product of a long and consistent pattern of methodological insolency, represented in all the many evolutionary firefights creationists have drawn on. From the Dawkins/Dennett/Wilson and Gould/Eldredge/Lewontin camps on the rate and pattern of evolution ... to how morphological taxonomists have been arrayed against cladists, even though neither side offered any comfort to a non-Darwinian typology.²¹² Coming closer to home, the examples become a glut: brains first or bipedality, australopithecines as distant cousins or direct ancestors, the Single Species hypothesis giving way to a diverse hominid shrubbery, and Multiregionalism versus Out of Africa. All of these disciplinary controversies involved which *theoretical model* better explained the available facts. But the creationist Tortoise does not do “theoretical models” ... nor do they actively participate in the datum-generating end of the enterprise. The practical task of “defeating Darwinism by opening minds,” as Phillip Johnson puts it, has consisted solely of prying open those minds with his handy Wedge until all the facts drop out.²¹³

Had antievolutionists a good case to make, it would seem easier simply to offer their Darwin-free theory of the mind, along with a few neurological facts in support of it. But so far creationists have shown nothing but timidity in this area. Indeed, when Henry and John Morris touched briefly on the subject in *The Modern Creation Trilogy* they summarily corralled everything under the sort of “meaningless concession” more typical of Phillip Johnson:

Man understands very little yet about the physiologic mechanisms associated with his spiritual decisions, though there undoubtedly is some relation. The intensely sophisticated electric circuitry built into man’s brain and nervous system does have a bearing on his memory, his ability to assimilate knowledge and to make choices. Everyone is aware that his physical condition may affect his emotions, and vice versa. Furthermore, damage to the brain or to the nervous system may result in a complete change in personality, usually for the worse. Genetic studies have demonstrated that hereditary factors influence not only physical characteristics but also the ability to learn and reason.

Though much remains to be discovered about these interesting subjects, there appears to be no doubt that physical mechanisms exert some kind of control over our attitudes and decisions, just as they do over biological processes. If this is so, since all such mechanisms are ultimately powered by the sun’s energy, then the sun may even be the indirect source of the energy for our mental activity. And, of course, this finally comes from the Lord Jesus Christ! “In Him we live and move, and have our being,” (Acts 17:28), so that he is “not far from every one of us” (Acts 17:27). When He said, “I am the light of the world” (John 8:12), this was more than a statement of a spiritual truth—though it certainly includes that. In the fullest and most ultimate sense, He is the source, through the sun, which reflects His glory, of all physical, biological and mental power.²¹⁴

The revelation that brain chemistry is a subset of spiritual cosmology might seem a peculiarly strained way of looking at things ... but all you have to do is substitute “information” for the glory of the Lord and you can have the Intelligent Design version instead. For Phillip Johnson also recognizes the longstanding controversy over the choice “between material factors that can be investigated and ghostly, supernatural factors that bring scientific advance to a standstill,” but prefers to define the problem out of existence:

This is a false duality. The real duality at every level of biology is the duality of matter and information. The philosophers of mind-science fail to understand the true character of information because they assume that it is produced by a material (i.e., Darwinian) process and hence is not something fundamentally different from matter. But this is merely a prejudice that would be swept away

by unbiased thinking. *There is no scientific evidence that the brain, or any individual cell within the brain, either was or could have been created by matter unassisted by preexisting intelligence. The scientists who believe that natural selection made the brain do so not because of the evidence but in spite of the evidence.*

Once the materialist prejudice is put aside, a new way of understanding the subject emerges. What makes the mind from the brain is not the neurons but the information that coordinates the neurons and uses them (and perhaps other entities as yet unknown) to produce the phenomena of our mental life. To say that is not to offer a solution but rather to offer a way to take the first steps out of an impasse. Information is not matter, although it is imprinted in matter. It comes from elsewhere, from an intelligence that is so far (and perhaps forever) outside the ken of a science that examines only material entities and effects. The task of neuroscience is not to deny the reality of information or to insist in the teeth of the evidence that all information is the creation of some combination of physical law and chance, but to learn as much as possible about how the information interacts with matter to produce mental phenomena. Putting aside the overweening ambitions of mind-science is the first step toward a realistic science that recognizes its inherent limitations, and this brings us to the second step.²¹⁵

By which Johnson means his redoubtable Wedge of Truth ... though in this instance it has a sharp edge only on one side. For if any Darwinist had proposed a working hypothesis as fatuously vague as this one, Johnson would have pounced on it at once. But evidently Intelligent Design operates under a different set of constraints.²¹⁶

Much like Behe's mega-cell, Johnson hasn't thought this one through.

When Johnson speaks of "information," it sounds as though he is suggesting that the sequence of genes that govern the construction and operation of the human brain could only have been an object of design. OK ... but he offered no particulars here—though it's not difficult to see why. As noted by linguistic theorist Steven Pinker, someone whose work Johnson is familiar with, "Neuroscientists estimate that about thirty thousand genes, the majority of the human genome, are used to build the brain and nervous system."²¹⁷ Trying to untangle that level of complexity is a daunting enterprise right up Michael Behe's obstructionist alley, especially since this involves the brain function of human beings (where excessive experimental poking is justifiably discouraged). Pinker duly located students of the mind and brain at work on opposite sides of a massive technical obstacle: "Psychology, the analysis of mental software, will have to burrow a considerable way into the mountain before meeting the neurobiologists tunneling through from the other side."²¹⁸

But Johnson's proposed "first steps" here do not evade the "impasse"—they only detour slightly around the mental mountain, only to end up right back where he doesn't want to be. For however the relevant DNA coding came about, by natural process or divine design, if the human mind is the outcome of the elaboration of that sequence, then you would still have to explain how it is possible for a mass of DNA-specified neurons to *be* a mind. Maybe that's why Johnson hinted at "perhaps other entities as yet unknown" to let himself off the materialist hook he has seemingly impaled himself on.²¹⁹

Or "perhaps" Johnson doesn't really mean to suggest that he accepts any aspect of Steven Pinker's view "that the mind is what the brain does," once all that "information" has been knitted together into a neural net.

That Johnson's conception of mental "information" may turn into another of his tactical "meaningless concessions" is supported by what he'd written some pages earlier in *The Wedge of Truth*. When he approached the mind/body duality question, the niggling details of neurobiology were the farthest thing from his mind. Instead, Johnson embarked on an unabridged equation of Darwinian logic with a dangerously amoral nihilism:

Like other reductionists, Dawkins does not believe that there is a single, central self that utilizes the machinery of the brain for its own purposes. The central self that makes choices and then orders the body to act upon them is fundamentally a creationist notion, which reductionists ridicule as the “ghost in the machine,” or the homunculus (little person) in the brain. Selfish genes would produce not a free-acting self but a set of mental reactions that compete with each other in the brain before a winner emerges to produce a bodily reaction that serves the overall interests of the genes. In the currently fashionable “computational” theory of the mind, as explicated by mind scientists like Steven Pinker, the mind is a set of computers that solve specific problems forwarded by the senses. The “self” is at most a kind of coordinating function that prevents the parts from heading off in a different direction.

At a joint lecture in 1999 Dawkins asked Pinker, “Am I right to think that the feeling that I have that I’m a single entity, who makes decisions, and loves and hates and has political views and things[, that this] is a kind of illusion that has come about because Darwinian selection found it expedient to create that illusion of unitariness rather than let us be a [kind of] society of mind?” Pinker answered affirmatively that “the fact that the brain ultimately controls a body that has to be in one place at one time may impose the need for some kind of circuit ... that coordinates the different agendas of the different parts of the brain to ensure that the whole body goes in one direction.” That hypothetical circuit is all that remains of the illusion of a free-acting self.

Susan Blackmore takes this logic even further in her book *The Meme Machine*, which comes with an introduction by Dawkins himself. Dawkins invented the concept of memes to extend Darwinism into the realm of ideas and expression. Memes are analogous to genes because they reproduce by being copied in brains and are altered by copying errors. As Blackmore describes it, “Everything you have learnt by copying it from someone else is a meme. This includes your habit of driving on the left or right, eating beans on toast, wearing jeans, or going on holiday.... Memes are ‘inherited’ when we copy someone else’s actions, when we pass on an idea or a story, when a book is printed, or when a radio program[me] is broadcast. Memes vary because human imitation is far from perfect.... Finally, there is memetic selection. Think of how many things you hear in a day, and how few you pass on to anyone else.”

Dawkins originally proposed the meme idea cautiously, but his followers have made it the basis for a complete philosophy of mind. Just as the selfish genes (supposedly) make the body, selfish memes (supposedly also) make the mind. And just as genes explain (ultimately) everything about the body, memes explain (ultimately also) everything about the mind. Blackmore speculates that the brain evolved as a vehicle for spreading useful memes. As the selfish memes coevolve with each other, they form complex memetic systems like languages, religions, scientific theories and political ideologies. Their most powerful creation, however, is the illusion of the self. “We may feel as though we have a special little ‘me’ inside, who has sensations and consciousness, who lives my life, and makes my decisions. Yet[,] this does not fit with what we know about the brain.” The self cannot rebel against the genes because *there is no self*. Blackmore puts the conclusion with crushing finality:

Dawkins ends *The Selfish Gene* with his famous claim that[:] “We, alone on earth, can rebel against the tyranny of the selfish replicators.’ Yet, if we take his idea of memes seriously, and push it to its logical conclusion, we find that there is no one left to rebel.

The potentially rebellious self is not the only casualty of memetic theory, however. By the same logic Darwinism itself is merely another of those memes. Memes propagate not because they are true but because brains have some

tendency to copy them, in the way they copy commercial jingles or jokes. Quality has no necessary connection with copying power. “Mary had a little lamb” is a more potent meme than Keats’s “Ode on a Grecian Urn.”

Dawkins likes to dismiss religion as a “computer virus of the mind,” because he thinks it appeals to shallow thinkers who welcome a certain amount of self-deception. One could offer the same diagnosis of Darwinism. Certainly Dawkins himself has found it profitable to propound the theory to uncritical audiences. But one must be careful in broadcasting the Darwin meme because when pushed too far it leads to conclusions that even the most ardent Darwinists hesitate to defend in public, and to logical contradictions that undermine Darwinism itself. By failing to perceive these dangers Steven Pinker got himself into a mess when he tried to convince the public that there is a genetic basis for infanticide.²²⁰

How much of a “mess” Pinker really got into, and whether Johnson was willing to apply such “slippery slope” thinking to his own position, will be examined next chapter.

But the issue here is the nature of the human mind, and by lurching abruptly to the extremes Johnson has indulged in a sweeping arc of “greedy irreductionism” that leaves several considerable questions dangling. Supposing that the views of Pinker on brain circuits or Dawkins and Blackmore on memes are inappropriate extrapolations on the data ... what *are* the data being misinterpreted? Are there more reliable conclusions to be drawn from them? And are these inferences consistent with the notion of “self” as Johnson might conceive of it?²²¹

Johnson skipped that part.

Actually, neither Dawkins nor Pinker had been anywhere near so conclusive as Johnson made out. When a questioner asked about free will a bit later, Dawkins didn’t reply at all (a rather characteristic dodge for him, as again will be explored next chapter). Pinker was more forthcoming, repeating his restrictive distinction that the “free will” of a totally autonomous ghost in the machine “has evaporated” along with that agent. Whether this means a decision to make toast in the morning—or not murder your neighbor—is a “free” act of volition independent of prior brain states is a more complicated question. But not an entirely insoluble one, as we’ll see once we get to some of the data that Johnson paid no attention to.

Seeing how Johnson floated over this subject, I am reminded of Duane Gish and the dinosaurs ... or Luther Sunderland with ichthyology. If you rely only on a restricted range of opinion (accelerated by the ability to surf the net for quick articles), and don’t take the trouble to work through all the issues your sources may not have mentioned, you can indeed get into an awful “mess.”²²² When it comes to the consciousness question, there is more than the usual dose of contentious muddle on the part of materialist reductionism—think B. F. Skinner here—and this element has been far from properly appreciated as it relates to the antievolutionary debate. It goes a long way to explain how critics whose idea of “research” is to riff off evolutionary controversy only end up even farther out on the conceptual limb than usual.²²³

Concerning Johnson’s part of the saga, we may start with that conveniently telltale *ellipsis* in his quotation from Pinker. As he had with another Steven (Weinberg), Johnson had excised only a short text string. This time, it was a phrase where Pinker suggested that the proposed circuit was “presumably in the frontal lobes.” Now why remove that reference? Unless it was to keep the reader from thinking too much about why Pinker had identified a specific region of the brain. Which in turn would only put neon lights around the issue of whether there are indeed computational modules in the brain that function independently of the “fundamentally creationist notion” of a “central self that makes choices and then orders the body to act upon them.”

What Johnson tiptoed around is a problem that generations of materialists and mystics have thrashed over. But without a way to obtain precise neuroanatomical information to work on, for centuries deductive philosophy was the only way to go. One of the top players in this department lived back in the seventeenth century, the brilliant René Descartes. He began with a justly-famous initial assumption: *Cogito, ergo sum* ... “I think, therefore I am.” But the founder of analytical geometry and Cartesian coordinates ultimately slipped off the spindle by deciding that the mind was completely separate from the body.²²⁴ Ironically enough, Descartes’ influential dualism mixed the

Christian concept of “soul” with a notion of our physical nature as absurdly reductionist as anything B. F. Skinner ever trotted out. As Dorion Sagan, Lynn Margulis, and Ricardo Guerrero pithily put it in one essay, Descartes considered man literally a mechanism, with the pineal gland “as a valve through which God was connected to the free human soul.”²²⁵ Since Descartes thought only we had a soul to work through our pineal valve, his view of animals as inherently machines led him to deduce that they couldn’t experience things in the way we do. For example, despite appearances, a dog was only an exceptionally gregarious automaton that couldn’t really “feel” pain if you hit it with a truncheon. Few pet owners would agree.²²⁶

The solution to the Cartesian dilemma has only come along in the last few decades, as cognitive science has cleared the philosophical bog and started looking at what actually goes on in the brain. That grounding has enabled neurologists, psychologists and anthropologists to make some headway toward understanding how our own human mind fits into the grander scheme of things.²²⁷ Although the Morris and Johnson didn’t spill any ink over this, such research has brought a bevy of surprises. To quote Sagan, Margulis & Guerrero again: “the universe is neither the dead mausoleum investigated by the Cartesian license, nor an enchanted fairyland of invisible spirits.”²²⁸

Though with a nod to dear old Descartes, we still need to kick off with his aphorism, *Cogito, ergo sum*. For there’s no getting around the obstinate fact that we possess a unitary sense of self. Canadian psychologist Merlin Donald put the issue squarely:

Fear of the homunculus begets irrational behavior in cognitive scientists. They dread the truth: in a tiny slab of brain there resides a consciousness capable of all we have achieved and experienced; and obviously, on one level, *there is a homunculus*. The homunculus is synonymous with the reflective, conscious mind, and somehow, somewhere in the protean parenchyma of mind, it must reside. *It cannot be explained away as an epiphenomenon, “reduced” to algorithms or neuronal nets, or simply denied existence.* It is the mainstream problem, the principle phenomenon under investigation.²²⁹

And that applies to creationist theories, too. Though Donald wasn’t talking about the Morris or Phillip Johnson, he could have been when he specified that “no account of human thinking skill that ignores the symbiosis of biology and external memory can be considered satisfactory. Nor can any account be accepted that could not successfully account for the historical order in which symbolic invention unfolded.”²³⁰

Which translates, of course, into the “historical order” that we have traced from australopithecines to tool-making *habilis* and *erectus*, to almost-human Neanderthal, and finally to *Homo sapiens* ... with that long delayed fuse before our artistic expression blew on the scene around 40,000 years ago. So far no creationist has been eager to propose an explanation that accounts for that sequence. Creation Scientists try to drown it in Flood Geology, physicists like Ross or Schroeder shave off whatever facts won’t fit in the Adamic cubbyhole, and Intelligent Design theorists like Phillip Johnson jack the problem up into the stratosphere of information theory.

All of these approaches share a basic flaw. They proceed as though they had answered the central question: is the “homunculus” really synonymous with the soul? The problem is hardly academic. Besides the obvious point that “an idea worth having is one worth defending,” the fact remains that Adler’s trio of uniquely human skills depends on a conscious mind to work, not the other way around. So the nature of our self-awareness should have been the first link in their chain of reasoning.²³¹ That it wasn’t tells us something important about the inverted logic of creationist analysis, just as their failure to address biogeography reflected an abiding disinterest in the actual patterns of fossil history—or the absence of homeobox genes a lack of curiosity about the mechanisms of developmental evolution.²³²

The problem comes into focus the moment you perform a thought experiment.

It is not difficult to imagine an incorporeal spirit that interacts with the senses. Sitting in what Daniel Dennett calls the “Cartesian Theater,” a place in the brain where all the sensory input

somehow comes together, the spirit would take in the show. But how does it do that? Does the spirit “read” neuron states, or what? If the spirit can interact with physical properties in this way, why then do we need the intervening step of eyes to see with at all? More technically, why would the soul be dependent on a localized set of chemical squirts from certain clusters of neurons, linked by paths through the brain to a battery of sensory organs, in order to perceive the world? The acceptance of an extra-physical Cartesian entity naturally opens the philosophical doorway to the idea that the spirit might be able to ascertain things *without* using the senses—or even exist without a brain at all.²³³

Which is why it was so amusing to read Johnson’s misgivings about William Fix in *Darwin on Trial*. It clearly didn’t occur to Johnson that Fix’s “devastating” critique of anthropology might have relied on the same method Fix used to endorse those questionable parapsychological claims. But then, Johnson has not focused on examining basic epistemology in any venue, least of all apropos his own pet of Theistic Realism.²³⁴ That Johnson was selectively unwilling to follow Fix’s lead on psychic phenomena is more probably due to the Berkeley lawyer’s conservative Presbyterian philosophy acting as a brake on what he will allow as acceptable conclusions. It certainly hasn’t been due to any consistent application of skeptical doubts to controversial observations.²³⁵

What can happen when that brake is removed, and the method let to run freewheel, will be seen next chapter concerning the merry world of scholarship Richard Milton style.

As for the evolutionary implications, it is interesting that a philosophical split over the paranormal occurred right at the start, with Darwin and Wallace. The landed conservative Darwin thought the human mind had evolved along with everything else in the natural world, and so regarded spiritualism with the same wry skepticism he applied to religion and the quack remedies he frequently took to ameliorate his persistent poor health. The egalitarian socialist Alfred Wallace, on the other hand, couldn’t accept that man’s soul had so mundane a basis, and his open-mindedness about the era’s proliferating spirit mediums easily overflowed into the more cockeyed crannies of psychical research and astrology.²³⁶

These counterpoised forces of skepticism and belief have not diminished in the years since, reinforced at every turn by the culture, from religion to the arts.²³⁷ Little wonder then that generations of scientific investigators, including many an evolutionist, have sought “objective” proof for something beyond the nagging materialism of Freud or Skinner. The only thing that has changed on this long and fruitless garden path has been the terminology: the nineteenth-century terms “telepathy” and “clairvoyance” giving way to “ESP” (for Extra-Sensory Perception, coined by J. B. Rhine during the acronym-happy New Deal era).²³⁸ If you then add the flip side of the extrasensory hypothesis—telekinesis, where the spirit might interact with the world in the other direction, by moving objects without the intervention of physical instrumentality—you have all the underpinnings of a “psi” force that might survive bodily death. And thus have some parapsychological researchers ventured beyond the mystic divide into studies of the Hereafter.²³⁹

But the implausibility of circumventing the physical senses, whether by human clairvoyance or ghostly table turning, isn’t the really big speed bump confronting the Spirit Hypothesis. The obstacle is far more fundamental, involving memory and consciousness itself.

Dr. Doolittle in the Cartesian Theater: Human consciousness and language

For starters, we are who we *remember* we are. The idea that we would be significantly different people were only our memories changed has been a staple of science fiction and fantasy.²⁴⁰ But the specter of it also comes from illnesses like Alzheimer’s disease, which relentlessly eats away at the memory until very little of “us” is left. And that hits on a rather important point ... how is it possible for an incorporeal experiencing agent ever to *forget* anything? There we are, sitting in the Cartesian Theater experiencing the sensory movie—then, snap! And we’ve skipped to another reel, losing the one we were watching ... and we didn’t notice? Something is seriously wrong here with the model. Unless our memories are stored *in the brain* exclusively, as objective physical neuron states, and not as an indelible property of an external experiencing agent, there is no good way to account for *forgetfulness*.²⁴¹

But that's small potatoes compared to consciousness.

Returning to the Cartesian Theater, what happens when a clunk on the head brings down the curtain? When that occurs, it is not the case that the soul presses on, hovering in the darkened mental theater, imaginary popcorn at hand, twiddling its metaphysical thumbs waiting for the entertainment to resume. Under such conditions we do *not* float around in a void absent of sensory input, yet still tracking the passage of time until the curtain is rung back up again. Instead, unconsciousness means exactly that—we're not "on" at all. And that state of affairs is a mighty peculiar thing to be in for a spirit supposedly not dependent on physical states for its *existence*.²⁴²

And that's hardly the half of it, since this seesaw is one we experience for a goodly chunk of our lives. Indeed, we go through the process of unconsciousness and repeated memory erasures so often that it hardly raises a yawn. Though Bill Shakespeare had in mind a different issue (the perils of a procrastinating suicide fearing an afterlife troubled by continued awareness), his famous line from *Hamlet* is particularly apt here:

*To sleep, perchance to **dream** ... aye, there's the rub!*

That's because for most of us every single night of our lives our conscious self is shut down temporarily by the hypothalamus as a flood of acetylcholine suppresses the waking sensory and motor activity normally promoted by amine neurotransmitters like norepinephrine and serotonin. The brain first kicks into "deep sleep," a busy housekeeping stage related to the immune system, during which we are not "on" at all. But after awhile the brain evidently requires our assistance for something ... or is our awareness triggered *accidentally*? (Yipes!) In any event, features of us come back online during REM sleep (so-called for its Rapid Eye Movement) when a wild firing of acetylcholine generates "PGO" waves that ripple through the brain. These run from the pons (P) at the top of the brain stem to the geniculate nuclei (G) of the thalamus, and then back to the occipital cortex (O) at the rear of the brain, where visual integration takes place. We call this part of the game "dreaming."²⁴³

During REM sleep we experience a fantastically vivid but often decidedly surreal universe, constructed down to the tiniest detail by our own brains. This really shouldn't come as much of a surprise, for the brain does that job of "constructing reality" for us all the time, even when we're awake—one might say, *especially* when we're awake. For what is happening in the brain when we "sense" the outer world is quite a feat of information collation. The most obvious wonder is that the brain pulls this off even though none of our senses arrive as simple data streams. Take sight, for example, whose neurological circuits have been identified with some precision. Color, contrast, movement, spatial orientation ... all these are handled *independently* in the visual cortex. Which means what we end up "seeing" when we're awake isn't exactly *reality*. Think about it ... where's the blind spot? There aren't any big black splotches hovering in our vision, which would be the case if we were simply getting a camera shot of the outer world via our retina. The brain *fills all that in* as though there were no blind spot.²⁴⁴

In fact, *everything* we see and hear and feel is an "illusion" in just that sense, a *simulation*—probably a quite accurate one, but a product of purely physical brain chemistry nonetheless.²⁴⁵ And all this "filling in" takes place prior to our conscious experience. That's why sensory illusions work at all, because our conscious mind is handed prepackaged bundles of perception, already weighted with judgments about what we are experiencing. The rising "moon illusion" (enormous compared to when higher in the sky) and the McGurk Effect (where what you "hear" depends on what visual cues accompany the sound) illustrate an important cognitive lesson. Even after we realize consciously what's going on, we still cannot help but see or hear what our brains provide us. In at least this way we are the captives of our sensory machinery.²⁴⁶

Now what happens during REM sleep is that we are supplied with a "movie-in-the-brain" just as well-crafted as the one we're used to when we're awake, only this one isn't based directly on any sensory input. Why then is the brain going through this charade? If the brain is simply consulting our opinion about the day's events, why not just ask us? Send us the mental equivalent of a postcard, perhaps. Unless ... that's not how the brain can do whatever it is that it's doing. The unconscious brain may be unable to marshal language directly, or any other functions of the conscious mind, without dragging at least pieces of our "self" along with it. That we find the

experience so strange is hardly surprising—we are taking for “reality” a temporary construct that is anything but.²⁴⁷

But whatever the reason for REM activity, the fact that we go through this odd masque on a regular basis is telling us something fantastically important about the nature of the human mind. As neurologist Antonio Damasio reminded, “We are obviously not awake during dream sleep and yet we have some consciousness of the events taking place in the mind. The memory we form of the last dream fragments before we wake up indicates that some consciousness was ‘on.’”²⁴⁸ That’s a revealing point. We remember only what we were dreaming when we woke up, not the entire dream sequence. But since we know via dream research that we go through repeated REM cycles if not interrupted, even though we were probably experiencing them too, we don’t remember any of those earlier dreams. The brain simply erases our experience, and moves onto the next one.²⁴⁹

That should be disconcerting enough for the Spirit Hypothesis, since it makes our consciousness dance along as though we were puppets in a scene from *Dark City*. That was a science fiction film where genetically failing aliens were experimenting on a population of humans by implanting memories in them to watch their behavior, then replacing them with new experiences using the same cast of characters. Since they all had fresh memories, the humans didn’t know how they were being manipulated until they started to compare notes—how they could never remember a previous day, or that no one had ever been outside the “city” (which was actually a spacecraft already a long way from earth).

This *comparing notes* bit may be crucial.

One night I dreamt I was visiting France, and was about to take a train trip to Lyons. Why that particular dream is a mystery—I’d never been to France, and wasn’t planning to. A Freudian might probe for possible hidden psychological import (though to crib the founder of psychoanalysis, sometimes a train is just a train). It was probably the brain filing away a stray memory of the French TGV. But what is of interest about this dream itinerary is how, when I wanted to check where Lyons was on a map, the brain had no problem supplying me with an absolutely convincing map of France, full of every detail maps are supposed to have. Only when I happened to awake immediately thereafter did it dawn on me that the map in my dream wasn’t even remotely correct, since Lyons ended up on the Atlantic coast, roughly where La Havre is (rather than inland southeast of Paris, where it actually is).

The moral: during dreams we don’t notice certain things. Walls can move around, or we can turn and find ourselves in a completely different place, and by and large we pay no attention at all. This suggests that our waking mind normally runs along with a compelling “pay attention” routine ... a software loop that is obviously turned off during sleep. It is possible that this aspect of our full consciousness is a bother when the brain goes about its nightly “mode program updating” (to use a term used on a James Burke show on the brain some years ago). To keep that reflective subroutine from thinking about its dream experiences *too much*, and thus getting in the way, the analytical module gets shut off for the duration, and we are none the wiser until the alarm clock rings.²⁵⁰

Add to that the fact that we can talk to people in our dreams, and think about things. This suggests that if such an anomaly detector exists in our mental software, it might be operating at a higher level than even our vaunted gift for syntactic language.²⁵¹

And this raises an intriguing possibility. Since we can operate with language and limited volition in our dreams, could this be a clue as to what the pre-*sapiens* mind was capable of? Could *erectus* have done all sorts of active things, yet never quite “get it” in some areas because that upper level processing hadn’t yet emerged in their brains? Was the “special something” that has made us fully human the seemingly peripheral ability to compare notes ... with ourselves, in this case? You could do a lot without that program ... but maybe not art ... and maybe not ethics ... or religion. If so, might we be experiencing something of the mind of *Homo erectus* every night, as we react to the simulated REM life without our final defining character running?²⁵²

There’s one more evolutionary notion for Phillip Johnson to make faces at!

But before he has a chance to do so, it’s time *not* to return to the Cartesian Theater. That’s because, as annoying as it may seem to our self-esteem, there doesn’t appear to be any analog of Descartes’ pineal conduit where all our sensory input gets shuffled together into our conscious

experience. As Daniel Dennett likes to remind us, there is no localized “Cartesian Theater” anywhere in the brain, which thus leaves no place for the incorporeal spirit to sit back and experience the mental show.²⁵³

Now if there is no “central processor” does this also mean that there is no *self*? Although Dennett skirted the problem, Donald’s point above remains in force. Since we do have a “self” the solution seems ridiculously obvious: the whole brain, or at least most of it, is the “central processor.” Thus we don’t sit in the Cartesian Theater ... we *are* the Theater. Or perhaps a better analogy would be a Hall of Mirrors. For like the infinite regression that comes when two mirrors are set in parallel, the mind, our self, is quite literally a machine peculiarly suited to self-reference ... to *reflection*. As Douglas Hofstadter put it, “The self comes into being the moment it has the power to reflect itself.”²⁵⁴

In this respect the human mind may well be what it feels like to ride atop an unconstrained feedback loop, to lasso the chaos of iterative nonlinear equations racing along the trillions of synapses that make up the human brain. Ye-haw!²⁵⁵

In any event, our self is not about mental imagery directly (how we create the “movie-in-the-brain”) but what happens in the brain when “Me” becomes itself an object. Antonio Damasio contends that the self occurs because the brain is portraying the living organism in the act of relating to things—and this is a feature of how we regulate our lives.²⁵⁶

Since all this basement process is indisputably happening in the brain, the question of how everything gets integrated into the “self” is clearly one where the materialistic theory of the mind has a technical edge. Perhaps most interesting is that experiments indicate that our brain has only about half a second to edit the flood of perceptual signals down into our conscious “reality.” Danish science writer Tor Nørretranders relates this “binding problem” to the mismatch of data bandwidths in the brain. “We have a thousand billion neurons and half a second, and the task is to reduce eleven million bits to sixteen bits so that the sixteen bits can be used as a map of the eleven million.”²⁵⁷

This drastic conversion ratio can have some fascinating consequences, as the intriguing experiments of Benjamin Libet suggest regarding our perception of *time*. It is possible to test when our conscious mind reacts to stimuli, as compared to when the brain first became aware of it—and how much of that gets bumped upstairs for the conscious mind to pay attention to. It appears that our minds can literally rewrite our memory so that we think we had consciously reacted earlier than we did. Nørretranders noted the spooky implications of this:

The delay of consciousness Libet has demonstrated *gives us time* to solve this problem: It takes a little time before we experience the outside world, but we just relocate the experience backward in time, so we experience the world at the right moment. Mammals have a method of transporting signals from the outside of the body to the “experiencer” so they know when things happen, even though they actually experience them a little later.

It is like the blind spot in the eye: There may be flaws in the way we sense the world, but we do not experience them. Our consciousness lags behind and does what it can to hide the fact—from itself. Consciousness deceives. Consciousness is self-delusion. Which is very expedient. Where there is time, anyway.

Anyone who has ever sat on a thumbtack knows that we do not take half a second to react. But then most of us get up from the tack before we have had much time to think it over. Consciousness is not something people use as much as they think—and certainly not when they are sitting uncomfortably.²⁵⁸

Once you realize how much is involved as the brain’s various modules make sense of the internal firing sequences pouring in from the nervous system, it shouldn’t be particularly surprising to learn that our consciousness operates well clear of the maelstrom. Conceiving of consciousness as a searchlight, picking out things to notice on a far busier nonconscious stage, Nørretranders observed that “things that need to happen quickly happen subconsciously. Consciousness cannot

do them a little more slowly. Only a lot more slowly; for consciousness is something we use when there is not such a hurry.”²⁵⁹

The available neurological evidence prompted Nørretranders to build on an insight first fielded by pragmatist philosopher and psychologist William James back in the nineteenth century: the conscious “I” is not the same as the “Me” that is running deeper in the brain. This distinction sheds light on why earlier models of human nature that relied on nonconscious activities and motivations had their heyday. The Freudians were partly right in realizing that parts of our “self” were actually a mixed bag of unconscious motivations, just as were the behaviorists who detected conditioned responses in at least some of our behavior. But both camps slipped overboard in dwelling too much on the unconscious “Me” rather than thinking through why the “Me” was devoted to these activities in the first place.²⁶⁰

Which brings us to edge of the precipice, and Susan Blackmore’s uncompromising attribution of our “selfplex” to those replicating memes.²⁶¹ You will notice that Phillip Johnson wrote as though Blackmore had offered no evidence at all for her position. But this is as untrue as when Creation Scientists pretend that Hutton and Lyell were practicing philosophy instead of geology. In fact, Blackmore had started out her *New Scientist* piece with technical guns blazing, firing what she considered her strongest shot:

Hold out your arm in front of you. Whenever you feel like it, of your own free will, flex your wrist. Repeat this a few times, making sure you do it as consciously as you can. You’ll probably experience some kind of decision process, in which you hold back from doing anything and then decide to act. Now ask yourself, what began the process that led to the action? Was it you?

Neuroscientist Benjamin Libet of the University of California in San Francisco asked volunteers to do exactly that. A clock allowed the subjects to note exactly when they decided to act, and by fitting electrodes to their wrists, Libet could time the start of the action. More electrodes on their scalps recorded a particular brain wave pattern called the readiness potential, which occurs just before any complex action and is associated with the brain planning its next move.

Libet’s controversial finding was that the decision to act came after the readiness potential. It looks as though there is no conscious “self” jumping into the synapses and starting things off.²⁶²

Since Johnson quoted freely from Blackmore’s article, we can only assume that he had read this passage at the beginning. That he did not think even to comment on it either shows the absolute irrelevance of technical evidence for Intelligent Design argument—or a disingenuous effort to paper over any material that might distract the reader from the apologetic aims of his *Wedge*. Neither approach qualifies very highly on the “rigorous thinking” index.²⁶³

Now Blackmore was being quite accurate when she described Libet’s experiments as “controversial,” for quite a few cognitive theorists have kept their distance. Some who have ventured closer have picked up on the “time displacement” aspect of his work to conclude that Libet had documented the existence of a parapsychical ghost in the machine that could literally slide through time. Daniel Dennett snuffed at that interpretation, but was unwilling to jump quite so far as Blackmore did in taking the readiness potential mismatch as the death knell for the self.²⁶⁴

Which is where Nørretranders comes in again. His coverage of the background controversy included European replication of the experiments, as well as reporting Libet’s own views on what his findings meant. The result was a much subtler (and richer) picture than either Dennett or Blackmore accepted. “Consciousness may occur after the *brain* has gone into action, but it also occurs before our *hand* does so.”²⁶⁵ After the readiness potential is set, our consciousness registers its neurological vote about a fifth of a second before the actual movement, in a sort of veto phase. The dance between “I” and “Me” thus runs something like this: “I” plan on moving my wrist ... but “I” don’t pull any of those levers directly, since the conscious processing speed is woefully inadequate to the task. Besides, only the subconscious “Me” is capable of activating physical

motion—honed by the experience of millions of years of vertebrate evolution. So ... once “Me” has everything wired up for action, the signal is sent upstairs to the front office, where “I” become aware of *our* decision. At this stage, “I” can either pass the plan on into action, or stop the motion volitionally.²⁶⁶

The upshot is: free will is very much alive, for the “Me” has no sense of priorities at all, and requires the “I” to funnel directives downstairs for the unimaginative “Me” to carry out. The result is a rippling of reinforcing functions. As Nørretranders summarized it, “The role of the *I* in learning is precisely to force the nonconscious, the *Me*, to practice, rehearse, or just attend. The *I* is a kind of boss who tells the *Me* what it must practice. The *I* is the *Me*’s secretary.” And this leads to an inevitable hierarchy of command: “The *I* unavoidably gains control, for it is only the *I* that can imagine what other people might be thinking: the *Me* knows only its own impulses.”²⁶⁷

Were it not for the obstacles of consciousness and memory, all this might have given Phillip Johnson some comfort, or at least wiggle room, since it rescues something of a “central self that makes choices and then orders the body to act upon them.” Unfortunately, Johnson wants that “fundamentally creationist” soul hovering in the spiritual attic, not a more complicated silent partner running the machinery down in the neurological cellar. And that difference of perspective heralds yet another missed opportunity for scientific inquiry by creationists.

For while the “Me” is certainly a busy machine, it is not a *conscious* one. Only the “I” shows true self-awareness. And this realization immediately drops us into another fascinating question: since lions, and tigers, and bears (oh, my!) all are capable of moving their wrists, do they do so with or without a conscious “I” to participate?²⁶⁸

You can see why the matter inevitably surfaces for Darwinists. If the things that make us “unique” ultimately derive from an identifiable sequence of natural evolutionary steps, there is no reason in principle to exclude other animals from hitting a few of them on their own. And this goes a long way to explain why philosophers of the essentialist persuasion have not focused too much on the consciousness issue, since it threatens to blur the sharp typological divide non-evolutionists require to keep humans separate from the lowly beasts.²⁶⁹

And that blurring starts well down on the “Great Chain of Being.” Insects appear to get along quite well without an “I”—and even without much of a “Me,” since they lack a “brain” in the organized sense we vertebrates are used to.²⁷⁰ Yet for all that, they manage to accomplish some pretty sophisticated behavior, and even a bit of learning, apparently using only the simplest of governing behavioral premises. Because insect activity is rudimentary enough to be reducible to an algorithmic program, Artificial Intelligence (AI) research has been able to make fairly steady progress over the last decade in creating robots that can amble along on their own recognizance about as well as a hesitant bug.²⁷¹

From there on up, though, living brains have accumulated a myriad of skills whose replication has given AI pioneers migraines. Steven Pinker put the matter nicely regarding our own attributes:

The main lesson of thirty-five years of AI research is that the hard problems are easy and the easy problems are hard. The mental abilities of a four-year-old that we take for granted—recognizing a face, lifting a pencil, walking across a room, answering a question—in fact solve some of the hardest engineering problems ever conceived. Do not be fooled by the assembly-line robots in the automobile commercials; all they do is weld and spray-paint, tasks that do not require these clumsy Mr. Magoo’s to see or hold or place anything. And if you want to stump an artificial intelligence system, ask it questions like, Which is bigger, Chicago or a breadbox? Do zebras wear underwear? Is the floor likely to rise up and bite you? If Susan goes to the store, does her head go with her? Most fears of automation are misplaced. As the new generation of intelligent devices appears, it will be the stock analysts and petrochemical engineers and patrol board members who are in danger of being replaced by machines. The gardeners, receptionists, and cooks are secure in their jobs for decades to come.²⁷²

Getting to the level of such really complex behavior—things like effectively re-orchestrating a Bach Brandenburg Concerto for kazoo band and vacuum cleaner, or making a satisfactory Reuben sandwich—may very well require AI to literally retrace the steps of our own mental evolution.²⁷³ And that's a kicker. For it means that insofar as the goal is to engineer increasingly intelligent machines, computer scientists will have to pay considerable attention to what *evolutionary theory* has to say about how living brains got to be where they are today. And that means yet another discipline we may chalk off on an inverse-Adler list of “Things That Creationists Don't Do.”²⁷⁴

That animal minds are capable of extraordinary things on their own is a lesson evolutionist Stephen Budiansky wants to emphasize. Animals aren't “just like us” only stupider. They are the product of their own unique evolutionary histories, and so have followed paths of intelligence no less distinctive than our own. “The conclusion is in a sense one we have known all along: We are both the same and profoundly different.”²⁷⁵ It is often hard for us to accept that not every action of an animal reflects the sort of “intelligence” we are used to. When dogs bond with their owners it is because they regard people as the top hound in a very small pack—not that the dog has become a human and is making a friend as one person does another. Which is why “Darwin's breakthrough was not in fact a license for anthropomorphism, but on the contrary a caution against assuming that the organism must itself possess the intent or purpose that it displays.”²⁷⁶

Only through especially careful research can the animal mind be understood—if but a little, since we can't slide into the animal's head to know if they are experiencing what we think they are.²⁷⁷ The difficulty concerning animal consciousness is how intelligent insight may be differentiated scientifically from associative learning, and plain unreasoning evolutionary selection. Which once again lands us slam-bang in the midst of a debate about sound methodology. There are reams of anecdotal observations relevant to animal intelligence, and given our anthropomorphic tendencies the character of animal minds is easily exaggerated. But Budiansky rightly recommends the critical credo that “The plural of anecdote is not data.”²⁷⁸

Though considering how little attention has been paid to these intriguing issues by creationists, it would seem that for them the singular of data is *disinterest*.²⁷⁹

One of the more common objects of animal study has been their mathematical aptitude, if only because we're tolerably good at it ourselves and would like to know if any other beings can do it as well.²⁸⁰ It's also the case that such work can be quantified in a way more appropriate to a psychological discipline enamored of “physics envy.” So far the research has shown that our level of abstract numeracy is not something we share with the animals, though birds and primates are able to do simple counting and accomplish some features of comparison.²⁸¹ This matters to cognitive theorists because infants can speak before they can count. Although verbalization and counting are carried out independently in our brains, if something so basic as numerical aptitude kicks in *after* language, the suspicion is that the combinatorial element of higher human math skills may have built on the same neurological substrate as the combinatorial grammar of our language.²⁸²

Whether animals have an “I” in the same sense we do is a far more difficult thing to pin down. The ability to recognize oneself in a mirror is suggestive of consciousness, and work in this area indicates the great apes and dolphins are capable of self-recognition.²⁸³ Some of that dreaded anecdotal evidence also suggests a few animals may have the sort of emotions that go along with consciousness, such as grief over the passing of a loved one. To the extent that is true, just as with Neanderthal burials, we need to wonder whether that means they possess an awareness of their own individual mortality.²⁸⁴

Perhaps even more interesting is the knack to *deceive*, since it presupposes a conception of what other critters have in their minds ... and thus that the would-be deceiver understands that other beings have minds too, as well as that their experiences might be manipulated to serve the deceivers' own ends. The evidence here is also suggestive, particularly for the primates.²⁸⁵ But possibly an even more reliable indicator of “intelligence” is the unwillingness to be *bored*, for that entails the parallel property of being able to imagine doing something else. Something presumably *better* ... which means a whole caboose of philosophical angst about “the meaning of it all.” If an animal can plug away at the same monotonous task like a factory robot without ever asking, “Why am I doing this?” it probably means there is no “I” there to ask the question. And it appears that

the same cast of animal characters that can do some levels of rudimentary math can also get mighty bored while doing it.²⁸⁶

At the very least, there are social repercussions to the existence of animal consciousness, as again Mortimer Adler recognized. “Now I say that if man is not superior in kind to other animals, then the rules of justice in terms of which we treat men one way and animals another way would be all wrong. We would have to revise all our standards in the treatment of humans and animals.”²⁸⁷

One of the more agonizing issues here is whether experimenting on animals for medical purposes should be curtailed. That debate has grown increasingly acrimonious, and shows no sign of letting up.²⁸⁸ So too has the long-standing argument over whether we ought to go on eating animals (as a great many carnivores certainly do in the wild). If barnyard fowl were able to plot their “Great Escape” from our farms as in the charming (and often biting) social satire *Chicken Run*, it would be positively immoral to treat them as we do. But chickens don’t knit comforters or make airplanes to compensate for their limited flying skills. Which is why our own ethical calipers have to be adjusted very carefully when deciding whether one particular omnivore (us) is justified in keeping up the species tradition of bringing home some of their fellow metazoans for dinner.²⁸⁹

Now it would simplify things no end were animals capable of saying “Hold on there!” Or, in lieu of that, a “Dr. Doolittle” breakthrough whereby we learned the animal’s language (should they have one) or they succeeded in getting the gist of some of ours. But efforts to “talk to the animals” in this way run up against the stumbling block of syntax: we string concepts like nouns and verbs together to form open-ended sentences, and it doesn’t appear that any other living animal can do that.²⁹⁰ That even pertains to our closest living relatives, the chimpanzees.²⁹¹ Though if you think about it, there isn’t any overriding evolutionary reason to have expected them to. After all, the lineages leading to chimps and humans have been going their separate ways for at least five million years. So it was at best a long shot to think chimpanzees might have hit on the same combination of factors that led to syntactical language in our species.²⁹²

From his essentialist perspective Mortimer Adler drew a line in the grammatical sand half a century ago: “And, believe me, the day the first monkey or chimpanzee utters a single sentence, one single sentence, I’ll be quite willing to believe that there is only a difference in degree between man and ape.”²⁹³

But what exactly constitutes “a single sentence” that would impress essentialist sensibilities? As it turns out, this isn’t quite so cut-and-dried a matter as one might think.

Back when Adler was speaking in the 1950s, MIT linguist Noam Chomsky was just starting to work out just how critical “universal grammar” and syntax are to the structure of human language. Chomsky’s studies have led to the influential realization that our facility for language is probably an *innate* function of our brains, like seeing or walking—not something we learn simply by imitation. While the specific languages we first adopt depend on our local exposure during childhood, the structure and continuity of human speech are sufficiently uniform to suggest that its governing principles are virtually hardwired into the brain.²⁹⁴

For those scattered creationists who have drawn on Chomsky’s work, this is translated into another mystery to front for divine creation.²⁹⁵ In *The Modern Creation Trilogy* the Morrises spun the antievolutionary version of language thus:

Chomsky and many other modern linguists have found, not only that there is no connection between animal sounds and human speech, but also that there is a deep commonality between the basic thought patterns of all man, regardless of how diverse their individual languages may be. That is, there is a fundamental connection between all human languages, but *no connection at all* between human language and animal “language.”²⁹⁶

Only that isn’t entirely true. Computer scientist Roger Schank touched on this point when he criticized Chomsky for ignoring “any models indicating that syntax is only an accessory to language. For example, no one has any trouble in understanding the story implied by the three-word utterance, ‘thief, careless, prison,’ although it uses no syntax at all.”²⁹⁷ For Sue Savage-Rumbaugh, one of the pioneers in exploring the linguistic capabilities of chimpanzees,

“comprehension, not production, was the central cognitive feature of language, particularly language acquisition.”²⁹⁸

In other words, language works for us because our “I” *understands* what is being said, though how we express that comprehension is significantly tempered by the way in which we construct our sentences. Consider an old diction drill: “Adolph bade Inga adieu, kissing her ornate ear with eccentric enthusiasm.” A lot of the grammar of this florid prose can be chucked without losing much of the sense, simply by conveying the meaning in less elegant blocks: “Adolph kiss Inga. Inga ears big. Adolph happy.” And this far simpler structure is just the sort of proto-language that children start jabbering in around age two ... while Chomsky’s universal grammar doesn’t kick in until about a year later.²⁹⁹ The realization that full syntax is a developmental process, a function of our neurological maturity, is especially relevant because apes and dolphins (and maybe even sea lions and African gray parrots) seem able to communicate at this basic “me listen” level.³⁰⁰

The critical dismissal of animal language research on the grounds that they can’t manage our complex grammar reminds me of the old joke about a chess-playing dog. “Well, that’s nothing to brag about ... he only wins a quarter of his games!” What should spark our scientific curiosity about non-human language is that any animal could be taught symbolic communication in any form, not that they failed to “get” higher grammar. The issue is really one of determining the nature of the necessary connective modules involved in our syntactical revolution, not in playing “whose got the syntax” as a way of bypassing the harder questions about the commonality of animal consciousness.³⁰¹

The importance of getting this matter right cannot be overstated. While consciousness and language are not identical, language is essential to human cognition. An animal lacking grammatical language might wonder why it is alive, but won’t be able to have any myths about that condition (and certainly no scientific answers). Language is the glaze on our mirror of reflection, allowing us to interact with any other similarly reflecting “I” ... and once a society of individual minds can do that, *everything* changes. Budiansky likened language to “a rocket that has escaped the gravitational pull of biological adaptation.”³⁰²

So making sense of the bumps and lurches of our own physical history (australopithecines to *erectus* to us) very probably depends on getting a sound grip on the exact mechanism of language acquisition in that evolutionary process.

As for the creationist alternative ... they have no call to think even momentarily about these issues. As far as they’re concerned language is a miraculous gift from God—period. That was the gist of the contribution to the 1994 Moreland anthology by linguist John Oller and chemist John Omdahl.³⁰³ That mixture of disciplines (linguistics and chemistry, rather than anthropology or cognitive psychology) resulted in a fatal misalignment of their argument:

To begin with, we may ask just what are the mental powers of present-day modern human beings that would have had to be invented by a long and lucky series of bootstrap operations, according to the Darwinian outlook. What steps would have had to be followed to get from some protozoanlike organism (or perhaps a bacterium or yeast) to a human being? What capacities would the hypothesized manlike ape that supposedly preceded *Homo sapiens* have had to invent in order to become, after many generations, a modern human being?³⁰⁴

But does one really need to account for the origin of complex organisms in order to understand how human language developed? Bacteria and yeast have even less in the way of a nervous system than insects—but higher primates are quite another matter. Which would seem to suggest that any investigation of the origin of language would need to assess what neurological factors contribute to articulate human speech, and relate them to whatever evidence might exist from living apes as well as from those real-enough hominids “hypothesized” in the evolutionary model.

This Oller & Omdahl did not even try to do. There was no discussion of any fossil taxa, hominid or otherwise—nor any evaluation of the relevant brain chemistry, our own or primate.³⁰⁵ In this approach they are not alone. Without investigating either the neurology or the paleontology Duane Gish concluded, “Neither the fossil record nor a comparative study of man and the apes

provides any information that would allow the construction of a theoretical pathway for the acquisition of speech by man.”³⁰⁶ The excursion on “The Uniqueness of Human Language” by Henry and John Morris in *The Modern Creation Trilogy* was just as flyweight.³⁰⁷ And joining the parade rather late in the game, Phillip Johnson took the same position in what may be thought of as “volume four” in his anti-Darwinian trilogy, *The Wedge of Truth*.³⁰⁸

Such are the hollow fruits purveyed in the Creationist Garden of Scientific Delights.

Going only by the creationist version of the inadequacies of Darwinian thinking, figuring out the origin of language might seem a lot for even fleet Achilles to manage. Since we are the only animals presently using our form of syntactical language, researchers are obviously facing an epistemological roadblock.³⁰⁹ Had they the old Wayback Machine to zip half a million years or so into the past, when what would become Neanderthal mtDNA was just starting on its separate course, they could take a close look at the new kids on the block, such as the archaic *H. heidelbergensis*.

This would be a long way from Noah or Utnapishtim, of course, let alone the Tower of Babel. No civilization ... no agriculture ... no art ... but would they hear *language*?

Well, there are clues. And with that delightful serendipity that seems to dog the antievolutionary Tortoise, in the same year Oller & Omdahl weren’t paying attention to any of the relevant signposts, cognitive theorist Steven Pinker’s massive work on *The Language Instinct* appeared. Here was an unabashedly evolutionary approach to the same problem by someone who relied just as directly on Noam Chomsky’s view of universal grammar and the innate character of human speech. But unlike the cursory treatments in *The Creation Hypothesis* or *Evolution: The Fossils STILL Say No!* ... or *The Modern Creation Trilogy* ... or *The Wedge of Truth*, Pinker avidly tackled all that cornucopia of observation these creationist tomes somehow managed to miss.³¹⁰

We may start again with the hardware.

It took decades of painstakingly difficult research to discover that the human language center lies in the cerebral cortex—that wrinkly bit comprising the outer layers of our brain that give it the appearance of a gooey oversized walnut. For right-handed people, language originates primarily in the “left perisylvian” region, while human vocalizations apart from language (such as laughing or crying) are controlled by older neural structures in the brain stem and limbic system. That more ancient circuitry is what governs the vocal calls of primates—a point to which we shall return momentarily.³¹¹

Many human brain functions are distributed just as asymmetrically (though, interestingly, left-handed people are somewhat less uniform in having their language focused in the right hemisphere).³¹² The front of our “linguistic organ” is known as *Broca’s area*, and is related to processing grammar. The rear—which includes *Wernicke’s area* and the “*three-lobe junction*”—manages word sounds (especially nouns) and some of their meaning. Disruptions to these areas can have “startlingly specific” linguistic effects. For instance, Pinker noted how “One patient could not name fruits or vegetables: he could name an abacus and a sphinx but not an apple or a peach.”³¹³

Now since cognitive scientists do not have the Wayback Machine, in order to work out how and when syntactic language originated they must fall back on a twin track of subtle detective reasoning. For the psychologically inclined, Inspector Maigret could follow the fossil evidence as we have done above, to see some of the things our ancestors were doing in their physical environment, such as their tools and hunting. That in turn could be compared to what humans think under comparable circumstances, when *teaching* toolmaking skills or *planning* their next hunt.

To crack the same nut from the physiological end, Sherlock Holmes might spin a trenchant forensic monograph on brain morphology. An endocranial cast of an especially well preserved hominid skull can reveal the configuration of the specific brain areas, and therefore indicate something about the behaviors associated with them. After all, animal and human brains are not undifferentiated blobs of neurons, but intricately connected networks used for specialized activities. So when components like Broca’s Area start turning up in the ancestral noggin (which indeed they do from *Homo habilis* on) ... well, it would be difficult to avoid concluding that those areas were used for things closely related to our acquisition of language.³¹⁴

Moving on from there to inferring what level of linguistic or proto-linguistic skills those brain areas were capable of is understandably a trickier question. It requires assessing more physiological information, including the vocal tract and diaphragm, whose coordinated functions are as much a part of our language skills as verb conjugation. Unfortunately, those features are not easy to detect from the fossils alone. Circumstantial evidence suggests *Homo erectus* had only a limited vocal range, with Neanderthal doing much better—though (surprise!) only with anatomically modern humans do we find the full suite of hardware that allows us to discourse on evolution and intelligent design.³¹⁵

Much like thundercloud dynamics, though, there is still a lot to be discovered about how the brain performs language. Chief among the hot mysteries are how neurons manage such linguistically critical functions as inflections and “tracing” (the element of sentence parsing first delineated by Chomsky, wherein internal clauses are related on the fly to earlier sentence subjects).³¹⁶ Mathematical modeling of how the variables employed by syntactical language interact in an adaptive setting suggests there is a “syntax threshold” related to the number of events a brain needs to deal with in order to get by. Below that threshold there is no advantage to the combinatorial features of syntax—and a positive disadvantage from an increased possibility of miscommunication during the early stages of linguistic evolution.³¹⁷

That a threshold factor is indeed involved is suggested by the very nature of the mind/brain relationship. The grand unresolved conundrum of the human mind consists of how such generalized properties as language or our unified “movie-in-the-brain” arise even though individual neurons “talk” to only a few others, and usually only to those quite close.³¹⁸ This makes the problem something like comparing two city atlases: both maps will have streets and intersections, but not exactly the same ones. It’s only the overall structure that shows comparable sections devoted to parkland or light industry. Such variety in how individual brains carry out common functions brings to mind a cybernetic image of an organic hard drive that has run along unattended, self-programming over the millennia without any benefit of subsequent designer defragmentation.³¹⁹

The solution to where grammar comes from in the brain may turn on how the sensory address book is organized.

One clue relates to the “scandal of induction.” This is a counterpart to the bandwidth compression problem Nørretranders highlighted concerning our sensory experience. For linguistics, it is trying to select the exact “meaning” of a word from *literately* an infinity of possibilities—a task so daunting that, as Steven Pinker put it, “we should stand in awe of the simple act of learning a word.” Here’s why:

The logician W. V. O. Quine asks us to imagine a linguist studying a newly discovered tribe. A rabbit scurries by, and a native shouts, “Gavagai!” What does *gavagai* mean? Logically speaking, it needn’t be “rabbit.” It could refer to that particular rabbit (Flopsy, for example). It could mean any furry thing, any mammal, or any member of that species of rabbit (say, *Oryctolagus cuniculus*), or any member of that variety of that species (say, chinchilla rabbit). It could mean scurrying rabbit, scurrying thing, rabbit plus the ground it scurries upon, or scurrying in general. It could mean footprint-maker, or habitat for rabbit-fleas. It could mean the top half of a rabbit, or rabbit-meat-on-the-hoof, or possessor of at least one rabbit’s foot. It could mean anything that is either a rabbit or a Buick. It could mean collection of undetached rabbit parts, or “Lo! Rabbithood again!,” or “It rabbiteth,” analogous to “It raineth.”³²⁰

But remember the *moon illusion*, where the brain’s prior processing routes our final perception along particular paths in spite of even our conscious understanding. Something like that appears to be happening when we relate objects (nouns) and actions (verbs) grammatically. The result is a restricted working address list. For example, Pinker described how a child acquires new vocabulary:

Figuring out which word to attach to which concept is the *gavagai* problem, and if infants start out with concepts corresponding to the kinds of meanings that languages use, the problem is partly solved. Laboratory studies confirm that young children assume that certain kinds of concepts get certain types of words, and other kinds of concepts cannot be the meaning of a word at all. The developmental psychologists Ellen Markman and Jeanne Hutchinson gave two- and three-year-old children a set of pictures, and for each picture asked them to “find another one that is the same as this.” Children are intrigued by objects that interact, and when faced with these instructions they tend to select pictures that make groups of role-players like a blue jay and a nest or a dog and a bone. But when Markman and Hutchinson told them to “find another *dax* that is the same as this *dax*,” the children’s criterion shifted. A word must label a *kind* of thing, they seemed to be reasoning, so they put together a bird with another type of bird, a dog with another type of dog. For a child, a *dax* simply cannot mean “a dog or its bone,” interesting though that combination may be.

Of course, more than one word can be applied to a thing: Peter Cottontail is not only a *rabbit* but an *animal* and a *cottontail*. Children have a bias to interpret nouns as middle-level kinds of objects like “rabbit,” but they also must overcome that bias, to learn other types of words like *animal*. Children seem to manage this by being in sync with a striking feature of language. Though most common words have many meanings, few meanings have more than one word. That is, homonyms are plentiful, synonyms are rare. (Virtually all supposed synonyms have some difference in meaning, however small. For example, *skinny* and *slim* differ in their connotation of desirability; *policeman* and *cop* differ in formality.) No one really knows why languages are so stingy with words and profligate with meanings, but children seem to expect it (or perhaps it is this expectation that causes it!), and that helps them further with the *gavagai* problem. If a child already knows a word for a kind of thing, then when another word is used for it, he or she does not take the easy but wrong way and treat it as a synonym. Instead, the child tries out some other possible concept. For example, Markman found that if you show a child a pair of pewter tongs and call it a *biff*, the child interprets *biff* as meaning tongs in general, showing the usual bias for middle-level objects, so when asked for “more biffs,” the child picks out a pair of plastic tongs. But if you show the child a pewter cup and call it a *biff*, the child does not interpret *biff* as meaning “cup,” because most children already know a word that means “cup,” namely, *cup*. Loathing synonyms, the children guess that *biff* must mean something else, and the stuff the cup is made of is the next most readily available concept. When asked for more *biffs*, the child chooses a pewter spoon or pewter tongs.

Many other ingenious studies have shown how children home in on the correct meanings for different kinds of words. Once children know some syntax, they can use it to sort out different kinds of meaning. For example, the psychologist Roger Brown showed children a picture of hands kneading a mass of little squares in a bowl. If he asked them, “Can you see any sibbing?,” the children pointed to the hands. If instead he asked them, “Can you see a sib?,” they point to the bowl. And if asked, “Can you see any sib?,” they point to the stuff inside the bowl. Other experiments have uncovered great sophistication in children’s understanding of how classes and words fit into sentence structures and how they relate to concepts and kinds.³²¹

Not to confuse any of this with the sort of “kinds” creationists are prone to think about, of course. Here we’re seeing the outlines of the underlying architecture of linguistic thought, and if one more step is taken, it leads to some intriguing possibilities. A child first learning language will naturally arrange modifiers in a distinctive way. They will talk about a “big red ball” ... but

generally not a “red big ball.” Why ever not? Taken individually, “big” and “red” are perfectly interchangeable adjectives, yet there seems a natural pecking order for how they are concatenated grammatically.³²² Is that because the sensory hierarchy assesses *size* at a different stage than *color*, so that their syntactical analogs sound “odd” if the properties are matched the other way? There is some evidence favoring this approach.³²³

One result of syntax arising from the organizational inertia of how our “movie-in-the-brain” gets put together is that non-human languages might very well utilize a radically different “grammar.”³²⁴ That could be the situation for dolphins, those social mammals of apparently high intelligence who live in a sensory world of truly alien character, as Carl Zimmer evocatively explained:

As dolphins travel together in tight bands, the shriek of one member echoes back with its information to them all. No individual has any perception that another dolphin doesn't share. It's also possible that dolphins may communicate by manufacturing echolocated visions. If dolphins are in fact continually sharing and exchanging interior and exterior worlds with one another, our notion of self would be meaningless to them. Certainly dolphin societies have hierarchies, conflicts over mates, and other marks of the societies in which individuals struggle. Dolphins may even be able to name each other with signature whistles. But their society may nevertheless be one of an overlapping network of minds, wandering linked through a transparent ocean.³²⁵

All of which means that “translating” dolphin into human might be a very difficult task, since there would be few analogous elements other than concrete objects and actions (the “me listen” level) that would be common to both.³²⁶ As Stephen Budiansky put it, “The philosopher Ludwig Wittgenstein made the famous observation, ‘If a lion could talk, we would not understand him.’ But that begs the question: if a lion could talk, we probably could understand him. He just would not be a lion anymore; or rather, his mind would no longer be a lion's mind.”³²⁷

Clearly there is more to the detective story of consciousness and language than simply blanketing the problem with doses of Noam Chomsky. Quite a body of information has to be explored and connected to discover the truth of the matter, as useful analogies are generated to spur further investigation.³²⁸ But connecting things up in this way is just what the reactive Zeno-slicing of the creationist camp is least disposed to do. It is difficult to spot any of the patterns and relationships of nature if the facts underlying them are invariably kept at arm's length.³²⁹

Phillip Johnson obligingly illustrated this creationist myopia once more in *The Wedge of Truth* when he repeated his familiar rhetorical mantra on the nature of evolutionary inadequacy. “Is the ‘evolution’ that biologists observe merely a matter of variation within preexisting species or types, or is it a genuine creative process that over time can produce new complex organs and new kinds of organisms?”³³⁰

Ah ... but what about doing new things with *old* complex organs? Couldn't novel “kinds” of organisms come about through a process of rearranging existing parts? And if those parts were deemed to be the attributes of a created type, wouldn't that throw a monkey wrench into the whole essentialist idea that new forms could not emerge naturally from ancestral material? For an antievolutionist to answer such questions would require pressing beyond diaphanous allusions to “species or types” and actually apply their (nonexistent) typological taxonomy somewhere.

Which is where *The Wedge of Truth* proved so delightful a revelation.

For as it happens, Phillip Johnson unknowingly did exactly that, acknowledging the boundaries of natural speciation in such a way that he implicitly incorporated the very sort of macroevolutionary change he has been so unwilling to accept in any other circumstances. And completing this delightful short-circuit, the topic before the house involved a feature of anatomy that Steven Pinker had explicitly invoked as a potent analogy for clues regarding the origin of human language.

As there are several steps in this logic chain, do bear with me.

It all started in a chapter entitled “The Empire Strikes Back,” devoted to responding to the fresh criticism of Intelligent Design fired by Kenneth Miller’s *Finding Darwin’s God* and Robert Pennock’s *Tower of Babel*. Seen as “Intelligent Designers Answer Their Critics,” Johnson showed he was able to elbow through criticism with no less ambidexterity than Duane Gish in *Creation Scientists Answer Their Critics*.³³¹

Johnson set up his counter-play this way:

Both books simply refuse to take seriously any arguments against the strong negative implications of the term *creationism*. The basic line of attack is that any dissent from evolutionary naturalism is founded not on scientific evidence but on religious prejudice. Pennock and Miller also make specific arguments that deserve to be taken seriously, however. I’ll respond to these after first briefly restating the case for intelligent design in biology, so readers will have clearly in mind just what Pennock and Miller are supposed to be refuting.³³²

After informing his readers about the scientific essence of Intelligent Design, Johnson picked daintily through some of the things Miller and Pennock had to say on the logic of empirical naturalistic inference, which as we’ve seen leads to evolutionary conclusions Johnson finds both methodologically unjustified and philosophically unacceptable.³³³ He then concluded that “Miller and Pennock make various other points based on similar confusions, but to go into more detail would exhaust the reader’s patience without making any real contribution to understanding what the dispute is all about.”³³⁴

It is always wise to pause whenever Johnson starts sounding too solicitous of his readers’ welfare. For what Johnson elected not to comment on at this point turned out to consist of all the specific technical criticisms leveled at Intelligent Design theory by Miller and Pennock. Such as how new genetic information may emerge through processes like gene duplication . . . as well as the various analytical eccentricities plaguing their primary witness on biochemical design, Michael Behe.³³⁵ Evidently such matters—the very heart of Miller and Pennock’s critical argument, remember—were not ones “that deserve to be taken seriously.”³³⁶

Now just as Duane Gish had blundered so far into dinosaur paleontology only after being prodded on *Triceratops*, Phillip Johnson was sucked into his own typological cul-de-sac by something Ken Miller brought up:

Miller makes his fossil case by using the example of elephants. He begins by noting that “The skulls, teeth and jaws of elephants are distinctly different from other mammals, which makes extinct elephantlike organisms easily recognizable from fossils.” Passing over the mystery of how this basic elephant type came into existence in the first place, Miller reports that there are two living elephant species—the African and Indian elephants—and a number of extinct variations on the basic form. He then says, “I can imagine Phillip Johnson . . . telling me with a straight face” that each of these variations was separately designed, and that “the sequence of their appearances is a misleading coincidence.” The argument embodies Miller’s typical methodology: first he creates a straw man, then he ridicules it. The real Phillip Johnson would say that elephant variation is yet another example of the pervasive pattern that we see both in the fossil record and in the living world. Variation and diversification occur, probably to a greater extent in the remote past than in the present, but only within the confines of the basic type. There is no scientific explanation for the origin of that easily recognizable elephant type other than speculation based on unjustified extrapolation. Even if the basic type did “evolve” (in some sense of that vague term) from some very different predecessor, and ultimately from a single-celled organism like a bacterium, we do not know any such mechanism capable of producing such an amazing set of transformations.

Exactly how much natural variation and diversification *has* occurred would be a fruitful question for scientists to address if they were able to do so. Such investigation cannot occur, however, if scientists are incapable of anything more sophisticated than Miller's "all or nothing" way of defining the issue. Miller insists that "If evolution is genuinely wrong, then we should not be able to find *any* examples of evolutionary change *anywhere* in the fossil record." To say that a proposition as broad and vague as "evolution" must be either completely right or completely wrong is to rule out any intelligent discussion of the subject. Of course evolution has occurred, if evolution simply means *change of any degree or kind*, and so in that trivial sense evolution is necessarily "right." But evolution is a much more dubious concept if it means *massive increases in genetic information produced by chance variation and differential reproductive success*. By that definition, evolution is very wrong.³³⁷

Evidently Johnson's working assumption was that the elephant variations Miller described were merely "trivial" ones that did not involve "massive increases in genetic information" (without, of course, ever indicating what "massive" was supposed to mean).³³⁸ Thus "passing over the mystery" of elephant origins was a snap for Johnson, since all the "mystery" of animal origins has been due to his attending a different parade.³³⁹ From atop the Intelligent Design Millennium float, parked with the brakes locked on a side street behind a sturdy barricade, Johnson freely flung such rhetorical challenges like so many trinkets at Mardi Gras.³⁴⁰

The problem is that Johnson has apparently not realized he's just decided "how much natural variation and diversification *has* occurred" among the "elephant type."³⁴¹ Comprising an entire *order*, the proboscideans show extraordinary range in their skulls, with dental and tusk configurations outstripping anything found in finch beaks (the Miocene mastodont *Platybelodon*, for example, had enormous teeth extending from its lower jaw, like a snow shovel).³⁴² If all that is deemed merely "variation within a type" ... well, to be especially crude, Johnson has just flushed his own argument about "species stasis" down the taxonomical toilet.³⁴³

But there's more. Miller had been quite repetitive about the elephantine feature that caught his macroevolutionary eye. It was, to pardon one further flaming pun, something right under one's nose:

Like it or not, intelligent design must face these data by arguing that each and every one of these species was designed from scratch. For some reason, then, that great designer first engineered a small trunk into a little critter called *Paleomastodon* at the beginning of the Oligocene some 35 million years ago. Ten million years later, the trunk design was used again in the larger *Gomphotherium*, along with a set of protruding tusks. Evidently the designer now thought that the trunk was a good idea, because he used it again in *Deinotherium* and *Platybelodon* in North America, and for *Gomphotherium* in Africa, all at the beginning of the Miocene. By the end of the Miocene, *Primelephas*, whose well-developed trunk and tusks are unmistakably similar to the larger species of modern elephants, would also appear in Africa.³⁴⁴

Johnson evidenced such haste in disposing of Miller's argument on the elephants, truncating them (so to speak) as a type, that he didn't realize he was consequently accepting the gradual development over millions of years of their noteworthy *trunks*.³⁴⁵ That is a circus procession that perforce includes all the genetic coding responsible for the extraordinarily intricate array of muscles and blood vessels that allow the two surviving elephant species to pick up small objects or swing telephone poles.

Now I am quite certain that Johnson intends no such thing—indeed, that once the implication of this has a chance to sink in, the "elephant type" will turn out to be as meaningless a concession as *Aves* and *Mammalia*. But until that particular light bulb flickers on in a future Johnsonian

oeuvre, let's follow through on what it means for elephants to rampage through the creationist bramble.

Time to return to the problem of language, and how scientists in the real world productively use *analogies*.

Given the apologetic utility of Noam Chomsky as a linguistic authority figure for creationists, it is relevant to point out now that Chomsky argues particularly that language is a *modular array*. And that is an insight which Steven Pinker has in turn directly related to, interestingly enough, Gould and Lewontin's notion of spandrels: "An example of a module growing out of bits that were not originally a module is the elephant's trunk. It is a brand-new organ, but homologies suggest that it evolved from a fusion of the nostrils and some of the upper lip muscles of the extinct elephant-hyrax common ancestor, followed by radical complications and refinements."³⁴⁶

Since we know (courtesy of Phillip Johnson!) that such "radical complications and refinements" are among the allowed natural variations within the elephant "type," we may well wonder how the brains of humans and apes stack up within the primate order (the same taxonomical ranking as Proboscidea, one might add). And Steven Pinker was fairly verbose on this point, describing comparable modules aplenty:

Language could have arisen, and probably did arise, in a similar way: by a revamping of the primate brain circuits that originally had no role in vocal communication, and by the addition of some new ones. The neuroanatomists Al Gakaburda and Terrence Deacon have discovered areas in monkey brains that correspond in location, input-output cabling, and cellular composition to the human language areas. For example, there are homologues to Wernicke's and Broca's areas and a band of fibers connecting the two, just as in humans. The regions are not involved in producing the monkeys' calls, nor are they involved in producing their gestures. The monkey seems to use the regions corresponding to Wernicke's area and its neighbors to recognize sound sequences and to discriminate the calls of other monkeys from its own calls. The Broca's homologues are involved in control over the muscles of the face, mouth, tongue, and larynx, and various subregions of these homologues receive inputs from the parts of the brain dedicated to hearing, the sense of touch in the mouth, tongue, and larynx, and areas in which streams of information from all the senses converge. No one knows exactly why this arrangement is found in monkeys and, presumably, their common ancestor with humans, but the arrangement would have given evolution some parts it could tinker with to produce the human language circuitry, perhaps exploiting the confluence of vocal, auditory, and other signals there.

Brand-new circuits in this general territory could have arisen, too. Neuroscientists charting the cortex with electrodes have occasionally found mutant monkeys who have one extra visual map in their brains compared to standard monkeys (visual maps are the postage-stamp-sized brain areas that are a bit like internal graphics buffers, registering the contours and motions of the visible world in a distorted picture). A sequence of genetic changes that duplicate a brain map or circuit, reroute its inputs and outputs, and frob [*sic*], twiddle, and tweak its internal connections could manufacture a genuinely new brain module.³⁴⁷

But naturalistic evolution may involve more than simply gaining new properties, or even rearranging existing modules. There is good reason to suspect that some quite profound macroevolutionary changes may turn on *losing* things.³⁴⁸

Concerning human origins, John Maddox recently highlighted some chromosomal clues:

Yet the most striking genetic difference between humans and the great apes is that humans have 46 chromosomes (23 pairs), whereas our nearest relatives have

48. (Much of the missing ape chromosome seems to be at the long end of human chromosome 2, but other fragments appear elsewhere in the human genome, notably on the X chromosome.) It will be important for biology generally to know whether this rearrangement of the chromosomes was the prime cause of human evolution or whether it is merely a secondary consequence of genetic mutation.³⁴⁹

Certainly our hemispherical cortical specialization has come at a price, sacrificing the redundancy of general functions like sensory processing found in the brains of other animals. That's because there's only so much systems space available, so adding on new routines sometimes requires giving up the old. This tradeoff may have begun quite early in the hominid line, reflected in a seemingly modest frameshift mutation that inactivated the gene producing the myosin heavy chain (*MYH*) used in masticatory muscles. The "gracilization" of the hominid eating apparatus may have contributed to a feedback loop whereby the energy and behavior devoted to a strong bite could be channeled into increased brain size that achieved dietary survival along a fresh path.³⁵⁰

So losing a feature is not necessarily a problem. Indeed, some of our consciousness may actually be due to the freedom that results when our mind is able to *wander* ... to daydream while making tools, connecting and flowing from one idea to the next instead of staying stuck in mental focus and so never making truly fresh connections.³⁵¹

A particularly fascinating item in this department concerns experiments conducted in the mid-1990s by psychologist Sarah Boysen at Ohio State University on how apes deal with number concepts. Presented with two stacks of treats, one containing more than the other, chimpanzees will instinctively reach for the larger amount—and will do that, even when the game being played gives the stack first chosen to the other chimpanzee. Although it would obviously be in their own interest to grab the smaller amount, their instinct evidently takes command. But chimps are also capable of some comprehension of abstract symbols. And when the game is played with the corresponding *numbers* in the bowls instead of the physical treats, the chimps are able to suppress that instinct and reach for the smaller label first, thus guaranteeing they get the bigger set the numbers represent. Go back to the real thing, though, and on pops the instinct again. All this sounds a lot like the moon illusion ... some things you can't change even when you know what's going on.³⁵²

But Boysen's experiment also supplies us with yet another intriguing *analogy*. Could it be that some of our "advanced" behavior has come about from losing (or at least suppressing) ancestral instinctive drives? Those areas of the primate brain devoted to overriding instinct happen to be greatly enlarged in humans, and research is proceeding to determine their underlying neurology and chemistry, and how these interact.³⁵³

This notion of "less as more" is one further thread in the tapestry of evidence that might have been appreciated by creationists if the idea had been to identify which are the right questions to ask regarding the origin and nature of the human mind. Yet even in cases like Phillip Johnson, who had all of Steven Pinker's material available to him, the course of "Creationism Lite" has consistently skipped the heavy lifting.

As for the more orthodox approach of Creation Science ... they have pursued a very different trail of humanity's mental development. Consider, for example, what Donald Chittick had to say about the "Capability of Early Man." He did not mean this as a joke:

Mentally, early man was extremely alert and intelligent. Mental powers have also decreased since the days of Adam and Eve. Adam, for example, named all the land-dwelling animals and birds. "Out of the ground the Lord God formed every beast of the field and every bird of the air, and brought them to Adam to see what he would call them. And whatever Adam called each living creature, that was his name. So Adam gave names to all cattle, to the birds of the air, and to every beast of the field. But for Adam there was not found a helper comparable to him" (Genesis 2:19-20, NKJV). The implication here is that Adam sized up the characteristics of each animal and, on the basis of its

characteristics, gave it a name. The name was so fitting that people continued to call it by that name.

This naming of the animals on the basis of their characteristics implies high mental capability. It is difficult even for one who has studied animals to be able to name from memory all the animals in the United States, let alone the entire world. Adam, however, thought the names up on the spot. This suggests high mental capabilities and keen observational powers.³⁵⁴

I suppose it would be expecting a bit too much to wonder exactly what Adam called echidnas or *Archaeopteryx* ... let alone brachiosaurs and *Probainognathus*? And just how many of the three hundred thousand species of beetles did the sage pre-Fall Adam manage to tag on this momentous occasion?

We're faced here with the same problem confronting the loading of Noah's Ark.³⁵⁵ There are only so many hours in a day, and altogether too many critters the author(s) of Genesis knew not of. The picture of Adam rattling off names with the haste of the deadpan chatterbox in the old Federal Express commercials makes for a hilarious garden party, to be sure. Though his audience presumably would have consisted only of God and Satan (presumably polishing apples for use once Eve came on the scene).

Such dramatic considerations were disposed of backhanded by Henry and John Morris in *The Modern Creation Trilogy*. Contending that Adam may only have named the common animals around him—not necessarily all the fish or “creeping things” outside of Eden—they opened their all-purpose escape valve to reveal once again how utterly arbitrary creationist taxonomy is in practice:

Furthermore, Adam did not have to name all the *species* of even this limited number of animals, but only the *kinds*—which is a much broader term, possibly comparable, in many cases, to our modern taxonomic “family” (for example, there are some 600 “species” of hummingbird, with only slight differences in that “family”). Although we may not be able to determine the actual number of animals involved, it was *not* inordinately large, and Adam, with his vast innate mental abilities, still unimpaired by sin, could surely have named them all in a reasonable part of one day's time.³⁵⁶

Just as “types” have been for Intelligent Design, “kinds” continue to have no conceptual consistency for the creationist. But even more deadening is the fact that the wonders of the living world represented by those “types” and “kinds” are not approached for their own intrinsic scientific interest. Just as Johnson only hit on elephants because Miller brought them up, the Creation Scientist shoves hummingbirds onstage for no other purpose than to extricate the believer from some taxonomical hole their Biblical exegesis has forced them into.³⁵⁷

Now if taking Adam's nominative fairytale seriously counts as farce, what are we to make of the broader pseudoscientific fringe that mush up creationist sources for their own disparate ends, just as Creation Scientists scavenge Michael Behe?³⁵⁸ Not only have Intelligent Design academics from Phillip Johnson on down failed to think about this eventuality—Creation Science hasn't bothered much about it either.³⁵⁹ It simply never occurs to the self-absorbed ideologue that the Wedge they hammer at so enthusiastically might be contributing to an environment congenial to people even less credible than they are (as unnerving a prospect as that may be to imagine). But that is exactly what is going on in the bigger world outside the confident glee clubs of Intelligent Design and Creation Science. People with no more of a grip on the technical arguments than Duane Gish or Phillip Johnson freely sample a phantasmagoric smorgasbord of humbug, and trade their insights like game cards, with little attention to doctrinal purity.³⁶⁰

Mystery Creation Scientist Theater 1996: *The Mysterious Origins of Man*

Sometimes this crowd shows up on the public media. And when they do, the picture isn't pretty. Probably the gaudiest picture window on this Brave New World of post-natural pseudoscience opened on NBC television in February of 1996 with the airing of "The Mysterious Origins of Man" special. Here the New Age tangoed with Creation Science to a crossover tune of highly strained credulity. The introductory voice-over introduced their play list:

Did man live with dinosaurs? The theory of evolution says "impossible," but footprints resembling modern man's have been uncovered side by side with dinosaurs. For centuries explorers have searched in vain for the lost continent of Atlantis—an ancient map reveals that it may be buried under two miles of ice at the South Pole. Tonight, this and other evidence will be presented which suggests that man made the climb from stone age to civilization more than once, and that our present humanity is just the latest in this cycle.³⁶¹

Cut now to a pleasant stage set, dressed with maps and other suitable scientific props, for the appearance of the main narrator ... none other than Charlton Heston. Delivering his new material with all the *gravitas* of Moses importuning Pharaoh in *The Ten Commandments*, Heston took on a curious role-reversal, defending a conception of prehistory far closer to that of Dr. Zaius than anything Cornelius or Zira might have welcomed.³⁶²

Only this time, there would be no Sacred Scrolls to get in the way.

That's because MOM was dedicated to the furtherance of sound education and spirited scientific inquiry. "Tonight we'll examine these and other controversial findings to see if what we're being taught about the origins of man is supported by the evidence," Heston promised. "We'll meet a new breed of scientific investigators who claim that the history of man on this planet may be radically different than what is accepted today."

And what a radical "new breed" it was, running the gamut from the secular Richard Milton to that noted "archaeologist" and "anthropologist" Carl Baugh.³⁶³ That duo neatly defined the limits of MOM's soggy standards, which weren't so "radically different" from that pioneered by generations of antievolutionists, from Creation Science through to Intelligent Design. The overtly silly side of the "new breed" cropped up in guests like David Hatcher Childress. Described innocuously as an "author/researcher," Childress was on hand for his "numerous articles on the coexistence of humans and dinosaurs."³⁶⁴ Mixing equal parts Milton and Baugh, Childress plunged into the heady world of catastrophic geochronology with the supposed survival of a prehistoric "pleliosaur."³⁶⁵ Which was, of course, the same misidentified basking shark Young Earth creationists like Paul Taylor and Duane Gish had been hawking for years.³⁶⁶

While MOM flirted with imaginary sea monsters, the opposite verdict was applied to the decidedly real paleontology of human origins. Disporting on the supposed "missing links" in the human family tree, Richard Milton sounded pretty much like Phillip Johnson in Von Däniken Defense mode: "Darwinists have promised us a missing link and so they've got to deliver—they've got to come up with one. Uh, any missing link will do, it seems. Every so often a skeleton is found in Africa, it's discoverers describe it as being the missing link, the headlines come and go, and then later on that skeleton, those bones, are reclassified either as human or as ape. And so far the missing link is still missing."³⁶⁷

Not that MOM looked very hard.

Like some inept high school term paper, they missed even the connection between Java Man and *Homo erectus*—more than casually surprising, given that *erectus* was there big as life on a graphic of the evolutionary position flashed briefly onscreen early in the show. But was this any worse than Phillip Johnson's epiphany on "Java Man and Peking Man" ... as filtered through the redoubtable Malcolm Bowden?

What we're seeing with MOM (or Phillip Johnson) is only what awaits a methodology inured to Zeno-slicing. Once you become acclimated to carving up evidence thinly enough so that even the plainest of evolutionary patterns cannot be seen, relevant information in any category runs the risk of getting shredded into functional invisibility. Thus Heston's narration homed in on the historical margins of the *erectus* story and smugly dismissed them as though they were the

contemporary center: “At the end of his life, Dubois realized that the skullcap belonged to a large ape and the leg bone was from a man. Nevertheless, Java Man was prominently displayed at the Museum of Natural History in New York until 1984. Since then it *has* been removed.”³⁶⁸

By then, of course, the Nariokotome Boy had come along to provide a fuller skeleton for *erectus*, meaning an antiquated reconstruction of the fragmentary Dubois finds could be retired in favor of newer forensics. That’s how science is supposed to work.³⁶⁹

But that’s not how the antievolution game plays out in the bargain-basement creationism of MOM. Leaving Java Man floating in limbo at New York’s AMNH, the show hurried on to the earlier australopithecines as interpreted by the authoritative Michael Cremo: “Lucy, the famous australopithecine, uh, discovered by Donald Johanson. He says she was very human-like, but I was at a conference of anthropologists where many of them were making the case she was hardly distinguishable from an ape or a monkey.”³⁷⁰

Now a conventional scientific program—say, one of those benighted PBS evolution specials Phillip Johnson gets so riled about—might have paused to identify some of these “many” anthropologists. Or, better still, chuck the middleman Cremo and interview a few of *them* instead, since they were the ones supposedly providing the adverse interpretation. But no such luck . . . MOM ricocheted back to home court, with Richard Milton: “These bones have been restored to resemble a missing link, part human, part ape, and Lucy is now thought of as being our long lost ancestor. But this is merely an interpretation, an interpretation of one group. Those same bones can be, and they have been taken by scientists and identified as simply an extinct ape—nothing to do with us at all.”³⁷¹

And thus did the ghost of Solly Zuckerman hover over the proceedings, without even getting his name dropped.

Sometimes the process of deconstructing fossil evidence can get pretty funny. For example, in the 1988 creationist film “The Evolution Conspiracy,” John Morris offered sheepishly that “the only features of Lucy that even hint at erect posture are the knee and hip joints.” In other words, the parts of its body most directly used to walk with!³⁷² But MOM took the Zeno-slicing option to the limit by not only ignoring the fossils available in 1996 . . . they even overlooked the Laetoli trackways in Africa, where a family of australopithecines evidently strolled across a fresh fall of volcanic ash one day about 3.5 million years ago. This was an ironic omission, since MOM saw fit to rely on Carl Baugh and the Burdick Print as “evidence” that dinosaurs and people walked together.³⁷³

Here again knowing the scholarly trail is useful, as the believer may be seen to feed off the secondary opinions of others without bothering to check things out for themselves. In leaving Laetoli out of the proceedings, MOM may have thought their oracle Cremo & Thompson had already disposed of this issue at the very beginning of *Forbidden Archaeology*:

In 1979, researchers at the Laetoli, Tanzania, site in East Africa discovered footprints in volcanic ash deposits over 3.6 million years old. Mary Leakey and others said the prints were indistinguishable from those of modern humans. To these scientists, this meant only that the human ancestors of 3.6 million years ago had remarkably modern feet. But according to other scientists, such as physical anthropologist R. H. Tuttle of the University of Chicago, fossil bones of the known australopithecines of 3.6 million years ago show they had feet that were distinctly apelike. Hence, they were incompatible with the Laetoli prints. In an article in the March 1990 issue of *Natural History*, Tuttle confessed that “we are left with somewhat of a mystery.” It seems permissible, therefore, to consider a possibility neither Tuttle nor Leakey mentioned—that creatures with anatomically modern human bodies to match their anatomically modern human feet existed some 3.6 million years ago in East Africa.³⁷⁴

Or another possibility: that Cremo & Thompson were leaving a few things out.

As they had with hominid anatomy generally (the foramen magnum, etc.) Cremo & Thompson sauntered right past any important qualifiers in the matter of the Laetoli prints and the degree to

which australopithecine feet might have been capable of making them.³⁷⁵ Resting their case on Russell Tuttle's *Natural History* piece ingenuously glossed over the fact that only limited fossils of australopithecine feet were available in 1990 to evaluate.³⁷⁶ What most of Tuttle's article had been about was a comparison of the Laetoli prints with the trackways of living primates. And at least in respect of their spacing and orientation, the Laetoli tracks do indeed look "human"—meaning that the walkers were fully erect, not legs splayed out in the manner of other primates when they spurt upright for any length of time.³⁷⁷

But do these "human" characteristics mean only *humans* could have made the Laetoli prints? Cremo & Thompson obviously thought so, as have quite a few Biblical creationists. But while we know bipedal hominids existed in East Africa 3.8 million years ago, there is no corroboration for any humans that far back, be they Cremo & Thompson's Vedic Man or Creation Science's antediluvian pedestrians. So why should anyone jump to their conclusion that the tracks were made by our own species?³⁷⁸

The prime difficulty for their argument is that they make no distinction between "human-like" and "human"—that *comparison* game that antievolutionists are so consistently bad at. Tuttle himself had called attention to one item that all those who relied on him somehow managed to miss. "Another noticeable feature of the Laetoli G bipeds is a gap between the first and second toes, nothing like that of apes but certainly different than the human feet I am used to. I was interested to observe that the Machinguenga [Indian tribe] consistently sport such a gap, probably reflecting their unshod histories."³⁷⁹ You'd hardly expect hominids to be running around in shoes or sandals, so it should come as no surprise that the tracks suggest bare feet. But that should have prompted the creationists to think more about the trackways *as a whole*. Tim White had done that all the way back in 1980, showing that those Pleistocene pedestrians were *small* (the tallest being under five feet). Adult humans can fall within that range, of course ... but the prints are also just right for the sexually dimorphic australopithecines.³⁸⁰

The Laetoli tracks are perfectly consistent with the bipedal stride of an australopithecine whose large toe was more opposable than our own, but which could be tucked in fairly close when on the flat. Especially if they were in something of a hurry ... such as while toddling apprehensively across an open field in plain view of potential predators, before the nearby fire mountain had a chance to erupt again.³⁸¹

The fact that Cremo & Thompson's non-Biblical treatment of Laetoli missed all this tells us a lot about how Phillip Johnson's Theistic Realism might be applied beyond the confines of Judeo-Christian Intelligent Design. That's because, like Johnson, Cremo & Thompson did more than explicitly question scientific openness to data that conflict with the dominant paradigm—they elevated it to a philosophy of investigation. On the MOM special Cremo spoke of "knowledge filters" that prevented recognition of discordant discoveries by conventional science. Thompson was even blunter: claiming there had been a vast cover-up. This suppression turned out to involve 19th century finds of questionable provenance, such as the Table Mountain artifacts (mortars and pestles and such) found three hundred feet into a California gold mine in 1880. MOM assuredly dated these to "as early as 55 million years ago."³⁸²

It was apparently this methodological facet of *Forbidden Archaeology* that attracted the notice of none other than Phillip Johnson, whose considered opinion graced the back cover:

Forbidden Archaeology is a remarkably complete review of the scientific evidence concerning human origins. It carefully evaluates *all* the evidence, including the evidence that has been ignored because it does not fit the dominant paradigm. Anyone can learn a great deal from the authors' meticulous research and analysis, whatever one concludes about their thesis regarding the antiquity of human beings.³⁸³

And indeed, a great deal may be learned about scholarly standards (and Johnson's appreciation of them) by studying the "meticulous research and analysis" on display in *Forbidden Archaeology*.

One might start with questionable secondary sources, such as Brad Steiger and Jeffrey Goodman.³⁸⁴ Or the outright bottom feeding represented by some mysterious Precambrian

grooved spheres that Cremo & Thompson (and MOM) claimed could only have been of artificial manufacture. The original source for this news flash turned out to be the supermarket tabloid *Weekly World News*.³⁸⁵ And then there was that sizable chapter *Forbidden Archaeology* devoted to “Living Ape Men?” like Sasquatch, Yeti, and the assorted “wild men” of Asia.³⁸⁶ Their interest here was chiefly tactical, however: “The existence of living ape-men also calls into question the reliability of the scientific information processing system in zoology and anthropology.”³⁸⁷

Would Johnson care to pick his way through any of that?³⁸⁸

Such froth aside, it is easy to see how the methodological character of *Forbidden Archaeology* dovetailed with Phillip Johnson’s proprietary conception of science. For what Cremo & Thompson were angling to establish is a fair play rule for facts. Accept *all* ... or reject *all*. No middle ground, and no double standards. That sounds ever so legalistically reasonable until you realize that treating all evidence *equally* is not exactly what Cremo & Thompson have in mind. What they want is a Zeno-sliced version, where all “facts” are given equivalent weight *in spite of their contextual pattern*.³⁸⁹

This is where the Piltdown lesson comes back to bite.

There is little incentive (or perverse fun) for anyone to plant 10,000-year-old artifacts in 10,000-year-old strata. For that reason, finding typical material in an expected spot is no news, and a presumption of authenticity accrues that in some cases may not be justified. The logic of both scientific revolution and fraud works on upsetting expectation—finding (or placing) something anomalous in the 10,000-year-old gravel ... or a 10,000-year-old artifact in million-year-old strata. Trying to ferret out the truth in those instances when all the relevant witnesses are long gone is simply impossible, and suffers from the same fate as the intractable debates over whether Shakespeare really wrote the “Shakespeare” plays.³⁹⁰

As with the hypothetical Ford radiator in the Minoan deposit mentioned in chapter three, finding out-of-place items puts the investigator on alert, and shifts the matter to the pattern of discovery. If no further australopithecine or *erectus* fossils had ever turned up to expand the database, Cremo & Thompson (or those creationists who reason like them) might have had a point. But whereas subsequent examples of unquestioned provenance have confirmed earlier human fossil material, no Tertiary artifacts have shown up since to buttress the authenticity of Cremo & Thompson’s isolated Victorian curiosities. The pattern of evidence thus plays an important role in flagging problematic spots.³⁹¹

When it comes to resolving such controversies in historical disciplines like archaeology or paleontology, the governing rule should not (and cannot) be Cremo & Thompson’s “accept both or neither” ... but rather, *find more*.³⁹²

But what if we let Cremo & Thompson’s standard of evidence be our guide? Aren’t the hijinks of MOM exactly what we should expect? If Phillip Johnson can recommend Cremo & Thompson with a straight face, is there any wonder that a pop TV producer should have pressed on to include the likes of Childress and Carl Baugh?³⁹³

What makes MOM so revealing (and ultimately disturbing) as a case study in popular credulity is how far afield antievolutionists can get when they *don’t* have a prepackaged religious axe to grind—or have a different one from that being swung by Phillip Johnson or Duane Gish. Left to their own devices, the “experts” populating the rest of MOM were as dedicated to rearranging the more recent history of mankind as the first half had been to expunging Darwinism. That’s where Atlantis and advanced ancient civilizations came in, exactly as promised in their introduction. Seen methodologically, it is no coincidence that the pseudoscientific anthropology and geology of the first half of MOM was accompanied by an equally suspect archaeology rounding out the second.³⁹⁴

Just as the majority of Intelligent Design practitioners may be found among the fellows of the conservative Seattle-based *Discovery Institute* think tank, the MOM crowd has its own distinctive membership. Like Johnson, Behe, Dembski, Wells, and Berlinski over in ID land, they rely on one another’s work with insular regularity. If Phillip Johnson is the titular front man for the Wedge, Graham Hancock is the Lost Civilization equivalent. The technical “Michael Behe” stuff is contributed by Robert Bauval, who popularized a revised revisionist view of the Giza pyramid complex as embodying lost religious and scientific knowledge.³⁹⁵ By the time Hancock and Bauval hooked up, the idea had expanded into the theory that a vast geodetic network had been set up by

the superior Atlanteans some 12,500 years ago, and commemorated by landmarks not only sprinkled around the world ... but built many thousands of years later. These include the obligatory mystery sites of Easter Island, Stonehenge, and (of course) the Great Pyramid in Egypt.³⁹⁶

The Lost Civilization argument also shares with Young Earth Flood Geology a certain indulgence in temporal compression. The Hancock cluster holds that monuments built millennia and continents apart were located at sacred sites deliberately arranged to commemorate an astronomical snapshot of 10,500 BC ... like so many delayed fossil exhibits at some prehistoric cosmological theme park. This approach has led them to disconnect themselves from the archaeology of the sites in question.³⁹⁷ Thus builders of the future Stonehenge weren't just paying attention to the solstices (which remain virtually constant century after century)—they had to have been pegging their design to the skies on that particular prehistoric date. Which requires quite a stretch: an early sighting posthole at Stonehenge has been radiocarbon dated as 10,000 years old, which was good enough for Hancock in his recent TLC special, "Quest for the Lost Civilization." But 10,000 years *ago* is only 8000 BC—still as far removed from their target date as the Las Vegas Luxor casino is from Plato.³⁹⁸

Whether or not Charlton Heston had a clue about the scientific validity of the beliefs he was fronting back in "The Mysterious Origins of Man," his closing remarks came to rest on a tone of studied open-mindedness:

We have met the experts and looked at the evidence that seems to contradict our conventional theories about the human race. Numerous artifacts indicate to some scientists that man could be millions of years old, throwing into question our descent from the apes. Ancient maps and megalithic architecture suggest that an advanced culture may have existed 12,000 years ago, and their homeland wiped out by a cataclysm that rearranged the entire face of the planet. It's been said that man has made the climb from Stone Age to civilization more than once, and that our present time is just the latest in this cycle. But only if the evidence is allowed to speak for itself will we ever learn the truth about the mysterious origins of man.³⁹⁹

And isn't that exactly the same plea for free inquiry that both Intelligent Design and Creation Scientists have recommended? Except this time we have a very different cast of characters ... less a scholarly lineup than a crib from the guest list of the Laura Lee Show.⁴⁰⁰

Which brings us to the educational implications of fringe subcultures like creationism and MOM's Lost Civilization. The timeframe they are most involved in haggling over is the same. It happens to fall before the existence of the universe, if you take your Creation Science at full strength; it certainly overlaps the mythology of Adam and Eve in Eden. But it also spans that period of post-glacial adjustment explored by climatologists and Ryan & Pitman regarding the Black Sea Flood. Which means that the Lost Civilization of Graham Hancock is yet one more alternate reality to be put on the educational block, if the idea is to include all options "fairly" in the spirit of Theistic Realism.⁴⁰¹

You can imagine the consternation in store for hapless high school history teachers around the country, trying to make sense of all this without stepping on the philosophical or theological toes of any of their disparate (and potentially litigious) constituents.⁴⁰²

And still we're not done. Just as Creation Science and the Lost Civilization have their competing glosses on Egyptian history, can the pre-Columbian record be approached in the Theistic Realism Age without paying suitable deference to the Red Creationism of Vine Deloria?

Perhaps because its activism hasn't hit the Ivy League or the church lecture hall, the Red Creationism approach to science hasn't been as closely followed as the more prominent antievolutionary potshots of Duane Gish or Phillip Johnson.⁴⁰³ But that doesn't mean there aren't lessons to be learned from plumbing the methodological depths of *Red Earth, White Lies*. For Deloria's approach to science and history turns out to combine features seen in these other antievolutionists. And not the *best* features either.⁴⁰⁴

First, there was a fateful epiphany. Like Phillip Johnson seeing the light when he bumped into Dawkins and Gould during a reading lull in the late 1980s, Deloria's bulb lit a couple of decades earlier: "My dissatisfaction with orthodox science began after reading *Worlds in Collision* by Immanuel Velikovsky."⁴⁰⁵ His skepticism thus sparked, Deloria has followed a trajectory tightly parallel to the Hancock course of global civilization swept away by ancient cataclysm. Except in Deloria's case, he has seemed stuck in a mid-1970s scholarly time warp, mixing Velikovskian catastrophism with dated mysteries that have long since been buried by the advancing technical tide.⁴⁰⁶

This is not to say that Deloria has no limits, at least for rhetorical purposes: "How, the layperson will ask, does archaeological speculation differ from Erich Von Daniken's citation of the Nazca lines as evidence of early spacemen?"⁴⁰⁷

And there's the rub—Deloria can't seem to tell the difference.

For like Clifford Wilson appropriating Biblical archaeology, Vine Deloria's pre-Columbian measuring rod is calibrated by its theological congeniality. Deloria can accept any "science" that may be integrated with his religious perspective, but digs his heels in on anything that contradicts it.⁴⁰⁸ And topping Deloria's list of objectionable findings is the view that the ancestors of Native Americans (like himself) migrated in several waves along the Bering Strait from Asia many thousands of years ago. In that case, much as Phillip Johnson does regarding the "testing" of the fossil record, up goes the standard of evidence. "I still wait in vain for an anthro to send me a book or an article that offers full and convincing proof of the validity of the Bering Strait theory—and of course there is none."⁴⁰⁹

Deloria mirrors Johnson in never quite getting around to specifying what "proof" would convince him that his ancestors might have been descended from people living outside America. That involves genetics and linguistics, of course.⁴¹⁰ But the main thrust turns on plain old physical anthropology and the evidence of archaeological digs, which have yet to yield any tremendously firm dates for pre-Clovis cultures prior to about 14,000 years ago.⁴¹¹ Part of the difficulty concerns where the evidence would be found: during the glacial maximum sea levels were much lower, meaning people could have strolled along the coast, or even used boats—with proof of their passage now well under water once the ice started melting.⁴¹²

Now you would think that having at the very least fourteen thousand years of undisputed Clovis tenancy in the Americas would be nothing to look down your nose at. How many people can reliably trace their bunch back even a few centuries, before they get lost in the ebb and flow of human migrations?⁴¹³ But for strict Red Creationism any moving date is unacceptable. As Deloria put it, "Most American Indians, I believe, were here 'at the beginning' and have preserved the memory of traumatic continental and planetary catastrophes, keeping the information sometimes in tales deliberately constructed to preserve as well as entertain."⁴¹⁴

However deliberately constructed or entertaining they may be, that tradition also serves to put the theological brakes on Red Creationism just as thoroughly as the poetry of Genesis does Duane Gish. Having followed how Deloria has carped over the years at the conclusions and methods of his fellow "anthros," David Hurst Thomas of the American Museum of Natural History legitimately wondered: "Is Deloria willing to turn his searing criticisms of science on his own historical reconstructions from Native traditions?"⁴¹⁵

Alas, there is no reason to think so. And such a double standard hovers analogously over all antievolutionism.

Operating from their isolated (and potentially contentious) camps, in one way or another Henry Morris, Phillip Johnson, Michael Cremo, Graham Hancock and Vine Deloria all are pining for the Lost Eden. Red Creationism at least has an edge in that the beliefs of Indian theology rest on their supposedly having maintained an uninterrupted residency on their particular chunk of it. But underlying all these conceptions is the wistful theme of an abandoned (or suppressed) Truth. Graham Hancock's idea of fallen man may not be quite what Phillip Johnson or William Dembski have in mind, but the view he expressed in "The Mysterious Origins of Man" shares their pervasive angst over the secular accomplishments of contemporary science and society:

I am convinced by the evidence that we *are* a species with amnesia. We have forgotten something of great importance from our own past. When we recover it we'll realize for a start that our civilization isn't the apex of creation. It isn't the pinnacle towards which everything has been building throughout all of geological time. Rather, it's part of an up and down, a flow, that it's possible for a civilization to reach a very high level of advancement and be wiped out. This is something we've never really confronted, and we need to confront it.

And make no mistake about it—antievolutionists of every stripe are more than happy to undertake the task of confronting the unenlightened with their particular versions of Eden (lost or mislaid). The only problem is that all of these pasts are imaginary ... and can only be supported at the expense of jettisoning rigorous scientific method. That suggests the results are more likely to be amnesia (or blinders) should historical education be forced to incorporate that bewildering smorgasbord of "evidence" in such a way that no one plying the anti-Darwinian waters will be offended.⁴¹⁶

Yes ... ideas *definitely* have consequences.

NOTES to Chapter 5

¹ The film quotation was taken from the original soundtrack, so the grammatical parsing is my own. Rod Serling had contributed to Michael Wilson's credited screenplay, which was based only loosely on the novel by Pierre Boulle (in which astronauts had landed on an alien world dominated by apes). Indeed, if the film version Taylor had been an informed evolutionist he would have known he was on earth the moment the apes started speaking English—or riding horses through a cornfield (such linguistic and biological combinations being inconceivably unlikely on any planet other than our own). But *Planet of the Apes* shouldn't be judged too harshly here; screenwriters regularly ignore the problems of translation. What audience would tolerate a linguistically accurate Robin Hood film with the characters emoting either in Norman French or incomprehensible medieval English? Cf. also note 324 below on a relevant Star Trek episode.

² Johnson "Weekly Wedge Update" (February 25, 2002) takes credit for having "influenced" the recent PBS "Monkey Trial" documentary. Cf. notes 22 (Introduction), 251 (chapter four) and 367 (six) apropos *Inherit the Wind*, Star Trek, and spiraling conceits. As for *Planet of the Apes*, it was still able to stir up controversy thirty years later. The religious angle was given a messianic twist in Tim Burton's 2001 remake through a time travel subplot involving apes used as space exploring vanguards. But it was the modified "surprise" ending (with the new regime replacing the head in the Lincoln Memorial with that of an ape lord) which drew the interest of conservative commentator Matt Drudge. In particular he noted how some at the preview perceived this as disrespect for the 16th President, forgetting that the plot point was to shock both the heroic astronaut and the audience about what had happened to the world because of his inadvertent meddling. Drudge's grumping aside, science fiction is a natural venue for social commentary, as Rod Serling repeatedly showed in *The Twilight Zone*. What often gets lost in the shuffle, though, is that unless the "science" is firmly grounded in reality, the "fiction" part may drift off into implausible dyspepsia, or even pseudoscience. Let's not forget that L. Ron Hubbard started out a science fiction writer, launching his "Dianetics" in John W. Campbell's *Astounding Science Fiction Magazine* in 1950, Gardner (1957, 60-61, 264-265) or Robinson (1999, 40-41, 78-79, 129, 131). See Reginald Bretnor, "Science Fiction in the Age of Space," in Bretnor (1974, 156-160) or Nicholls (1983) for the impact of the "science in science fiction."

³ The actual situation prevailing in the Britain of Charles Darwin's collegiate years was not dissimilar to that facing Taylor. Desmond & Moore (1991, 32): "The Established Churches of Scotland and England ruled all aspects of life, monopolizing political offices, regulating hospital, university, and legal posts, prescribing the rites surrounding birth, marriage and death, restricting civil liberties, and suppressing other religious groups." Indeed, Darwin was trundled off to Cambridge in 1828 to prepare himself as a naturalist by studying *theology*—"since virtually all the

naturalists in England at that time were ordained ministers, as were the professors at Cambridge who taught botany (J. S. Henslow) and geology (Adam Sedgwick),” Mayr (1991, 3). The effect of challenging such entrenched power was not lost on thinkers of the time, either, as Desmond & Moore (1991, 34) noted: “The logic was stark—even if it was rarely spelled out. The day people accepted that nature and society evolved unaided, the Church would crash, the moral fabric of society would be torn apart, and civilized man would return to savagery.” Or worse, start questioning the inequalities of life. One of the works Darwin studied was William Paley’s *Evidences of Christianity*, which argued that the downtrodden were more apt to put up with their meager lot when they thought earthly injustices would be redressed in the afterlife, Desmond & Moore (1991, 78).

⁴ See Krauss & Starkman (1999) on the implications of a temporally finite universe. Many religions incorporate “rescue ships” of one form or another to get around the problem of mortality (personal or cosmic). Buddhism turns reincarnation into a way to float free of the worldly game altogether, while Christian millennialist theology à la Morris & Morris (1996c, 139-140) anticipates Jesus restarting with a glossy new play set after the Second Coming. As for the cosmological lessons of thermodynamics, Scientific Creationism has applied that to a strained Biblical equation involving original sin—that song and dance will be explored in chapter seven.

⁵ Hellman (1998, 112), citing an 1861 letter (thus a decade before Darwin got around to filling in a few of the details in *The Descent of Man*). Interestingly, Herbert Thomas (1994, 17-18) pointed out that the 2nd century AD Greek anatomist Galen considered monkeys “comical copies” of humans, and up until the later 18th century the question was not whether humans were descended from apes, but to what extent apes were some degenerate form of man. (Dr. Zaius, be warned!) Belief that some apes might have been the result of ape-human miscegenation persisted even into the late 18th century, Ritvo (1997, 92). The similarities between apes and man had been spotted long before Darwin and Wallace came on the scene, Schwartz (1999, 56-60). Indeed, Linnaeus first grouped humans, apes, monkeys, tarsiers, lemurs, and lorises in the Primate order in 1747, though naturally failing to see any evolutionary implications due to the creationist sentiment of the period, Futuyma (1982, 99) or C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 246). Apropos Brace’s reference, Gish (1993, 345) harrumphed that this only showed “that the theory of evolution was not derived from the data, but the theory was *imposed* on the data, and then these data are submitted as proof of the theory—circularity, if there ever is such a thing.” Of course, Linnaeus did his taxonomy before Neanderthal or australopithecines showed up to complicate the (mythical) creationist typology. Attempts to cordon off man from the apes anatomically have never proven sturdy. For example, it was believed humans did not possess the *intermaxilla* bone found in the monkey palate, but poet and polymath Goethe settled that point in the 1780s by showing humans had one too, Coen (1999, 55-56) and Schwartz (1999, 69). See also note 14 below on the hippocampus. One factor in the development of the 19th century evolutionary view of man’s relationship to the primates turned on the European zoological gardens that began to bring living apes back for display, allowing both anatomy and behavior to be observed. Desmond & Moore (1991, 243-244) described Darwin’s fascination when he saw an ape in the flesh in 1838 (Jenny the Orang, the first of the great apes prominently shown in Britain, which caused a most extraordinary sensation—especially when dolled up in human clothing for presentation to royalty). Beyond that sideshow aspect, however, there was considerable philosophical resistance: “To judge from contemporary cartoons, no Darwinian idea was less acceptable to the Victorians than the derivation of man from a primate ancestor,” Mayr (1991, 25). See Jennifer Lindsey (1999, 17-19) or Anne E. Pusey, “Of Genes and Apes: Chimpanzee Social Organization and Reproduction,” in de Waal (2001a, 11-12) for short surveys of ape discoveries. Serious scientific study of the apes only began in the 1950s, spurred on in recent years by the fieldwork of that gifted trio of protégées of Louis Leakey: Jane Goodall, the late Diane Fossey (murdered in 1985), and Birute Galdikas. Jahme (2000) explores the substantial contribution of these and other women to the field of primate research.

⁶ Johnson (1998a, 20). His remark occurred in a 1993 speech at Hillsdale College that, according to the preface paragraph, “predictably drew the wrath of theistic evolutionists” for its unstinting

equation of Darwinian thinking with atheistic methodological naturalism. “I particularly recommend this essay for beginning students of the creation-evolution conflict, because it explains the all-important Darwinian vocabulary. As long as Darwinists control the definitions of the key terms, their system is unbeatable regardless of the evidence,” Johnson (1998a, 19)—as though Johnson’s essays have been exemplars when it comes to discussing “the evidence.” (This discourse contained his typologically spare listing of the sort of microevolutionary changes creationists accept, per note 226 of chapter four.) Johnson (1998a, 21) went on to harrumph: “I should warn at the outset, however, that using words clearly is not the innocent and peaceful activity most of us may have thought it to be. There are powerful vested interests in this area which can thrive only in the midst of ambiguity and confusion. Those who insist on defining terms precisely and using them consistently may find themselves regarded with suspicion and hostility and even accused of being enemies of science.”

⁷ Zimmer (2001g, 260-262). Huxley (1863) entered the fray before Darwin’s *The Descent of Man* (1871). See Schwartz (1999, 79-85, 126-127) on the often murky theoretical presumptions underlying Huxley and Darwin’s African scenario (notably that the supposedly harsher southern African environment would have been more conducive to human evolution than the verdant jungles of Asia). Their irrepressible (and frequently irresponsible) German follower Ernst Haeckel veered off here by arguing in 1868 that Papuans and Melanesians were the closest living examples of his proposed ancestral *Homo primigenius*. The “mythic” aspects of their respective views on human origins are explored by Landau (1991, 19-60). Haeckel decided mankind had evolved from some form of Southeast Asian gibbon, living among the “Gardens of Paradise” that even included the sunken land of Lemuria (!). See Herbert Thomas (1994, 40-41, 50-51), along with note 166 (chapter three) on the Lost Continent connection. That grassroots creationists haven’t a clue as to the actual historical background of Darwin’s theories on human descent was reinforced in March 2000 on “Politically Incorrect,” courtesy of Bob Enyart (whose Biblical dinosaur views were mentioned in note 49, chapter four). During a discussion on interracial dating, Enyart explicitly claimed that Darwin believed the different human races weren’t the same species. That Darwin held exactly the opposite opinion from a very early stage in his thinking is reflected by Desmond & Moore (1991, 267) regarding a speculation in Darwin’s journal on what might have happened had white Europeans not settled in South Africa. Darwin figured such an isolation of the native black population might eventually result in their divergence into a separate species ... after maybe *10,000 years*.

⁸ Incidentally, the short discussion of the African origin of man in Chapter VI of Darwin (1871, 520) was followed by a remark on the morphological breaks separating modern “civilised” man from those in the more native state, and the known living apes. This resolved into an observation guaranteed to raise the hackles of 20th century sensibilities (particularly if they don’t read the fine print): “At some future period, not very distant as measured by centuries, the civilised races of man will almost certainly exterminate, and replace the savage races throughout the world. At the same time, the anthropomorphous apes, as Professor Schaaffhausen has remarked, will no doubt be exterminated. The break between man and his nearest allies will then be wider, for it will intervene between man in a more civilised state, as we may hope, even than the Caucasian, and some ape as low as a baboon, instead of as now between the negro or Australian and the gorilla.” The allusion to “even than the Caucasian” should tip the reader off to the use of verbose Victorian irony, since Darwin did not especially approve of the violence of European society (from wars of dynastic conquest to international slavery). In offering this spectrum Darwin was making absolutely no claim that blacks or Australian aborigines were more apelike than other members of the human species, though he certainly looked down on their native cultures (as, I submit, would many conservative creationists today). Ironically, the yardstick Darwin used to judge the peoples he encountered during his voyage on the *Beagle* would be pegged today as promoting laudable neo-conservative virtues: “Darwin ranked people by their willingness to work, to better themselves, to befriend settlers, and to adopt Christian morality,” Desmond & Moore (1991, 191). Nor did Darwin express any approving delight at the prospect of native populations being obliterated—and

he did have personal experience that this was indeed the outcome of European colonization (a point that will be explored in further chapters).

⁹ Agassiz couldn't abide being served by black waiters when he first came to America in 1846, complaining to his mother back home in Switzerland how upset he was by the close proximity of their "hideous" hands, Gould (1980, 169-176; 1981, 44-45) or Wolpoff & Caspari (1997, 85-92). Gould noted how Agassiz's wife edited his writings for more favorable posthumous public consumption. As Johnson (1991, 164) alluded to *The Panda's Thumb* regarding Goldschmidt's saltationism, he could theoretically have been aware of Gould's account; Livingstone (1987, 58-60) presents a shorter summary of Agassiz's racial views also available when Johnson compiled *Darwin on Trial*. Numbers (1992, 7) noted that Agassiz's creationism "bore little resemblance to the narrative found in Genesis," and angered some American Christians for its unbiblical advocacy of multiple origins for man—cf. Gould (1981, 42-50) and Turner (1985, 96-98, 144-145). Indeed, decades later G. M. Price grumped that Agassiz's glacial theories were devised "under the hypnotic suggestion of the devil," Numbers (1992, 124).

Another important figure in American polygenism was Philadelphia physician Samuel George Morton, Wolpoff & Caspari (1997, 94-95) and David Hurst Thomas (1999, 38-43). Gould (1981, 42-50) examined how Morgan unconsciously fudged his "objective" data. Morton provided a conduit through which brilliant French anatomist (and non-evolutionist) Paul Broca (1824-1880) filtered his own ideas about the racial superiority of whites like himself. See Finger (2000, 137-154) for an excursion into Broca's contribution to neuroscience, and Gould (1981, 82-107) for a far less sympathetic treatment.

The grassroots beliefs of 19th century animal breeders contributed to miscegenation fears, animal and human. Edey & Johanson (1989, 124-125) and Ritvo (1997, 104-113, 133-144) covered some of the stranger ideas then current, such as *telegony*, which held that the father of a female's first child could somehow imprint later progeny—including those from other males! Even Darwin flirted with that myth for a time; though cf. Hrdy (2001, 54) on its cultural persistence. There was also *teratology*, the study of natural "monstrosities" (animals with extra limbs or mixed sexual organs), which attracted specialists all the way up to Richard Owen. 19th century naturalists were genuinely interested in what caused deviations from the developmental norm, though this was attended by the more macabre public fascination that kept "freak shows" a popular entertainment enterprise well into the 20th century. Pulling up the rear here is Flindt & Binder (1974, 213-215), who claimed that according to "conventional Evolution" ugly people (like Abraham Lincoln!) could not be highly intelligent.

¹⁰ *The Origin of Species* appeared just when the United States was on the brink of the Civil War. Gruber (1974, 65-68) and Desmond & Moore (1991, 442-443, 521) describe the background of Darwinian thinking and how such issues as American slavery spilled over into the British scientific arena, as in the rivalry between the white supremacist Anthropological Society and the abolitionist Ethnological Society. The leading lights of the British evolutionary camp (Darwin, Wallace, Huxley, etc.) were resolutely antislavery, while antievolutionists like Owen (and, to some extent, even Lyell) tended to gravitate toward the Southern cause along with much of the British aristocracy. Across the Channel in Second Empire France, Napoleon III "was using his despotic authority to uphold the highly popular creationist views that Cuvier championed," Herbert Thompson (1994, 43). Many abolitionists (including Abraham Lincoln—born on the same day as Darwin, ironically enough) were not "egalitarian" by modern standards, and Darwin was no exception. He could abhor the dehumanizing institution of slavery without quite being able to get over the ingrained prejudice that classified non-white societies as unacceptably backward. For example, although "Darwin's Whig abolitionist morals" were affronted when "The *Beagle's* aristocratic captain, Robert FitzRoy (1805-65)" defended "slave-owning colonial Catholics," this didn't prevent the two of them publishing in 1836 "an article vindicating the moral influence of missionaries in Tahiti," James Moore, "Charles Darwin," in Ferngren (2002, 210). At first glance this might be seen as falling short of the more overtly egalitarian Alfred Wallace, whom Gould (1980, 54) rightly applauded for holding "an extremely uncommon position for his time, one that commands our highest praise in retrospect." But Gould also acknowledged that, "in calling

Wallace a nonracist, I do not mean to imply that he regarded the cultural practices of all peoples as equal in intrinsic worth. Wallace, like most of his contemporaries, was a cultural chauvinist who did not doubt the evident superiority of European ways.” Which in practical terms was not that far removed from Darwin’s attitude, where no overarching *evolutionary* doctrine of racial inferiority or superiority was proposed, let alone defended. Indeed, the idea that nothing prevented members of any race from becoming suitably “civilised” was reinforced by Darwin’s own experience while learning taxidermy, Gruber (1974, 80) and Desmond & Moore (1991, 28). His teacher was a former slave, John Edmonstone, whom Darwin freely described as “a very pleasant and intelligent man”—an undramatic reaction which may be contrasted with the twitchy dread of a true racist like Louis Agassiz when merely being served by a black waiter in antebellum Philadelphia. This background may be compared to Pamela R. Winnick’s remarks in a September 23, 2001 review (“PBS series on evolution tiptoes over tough issues, ignores others”) for the *Pittsburgh Post-Gazette* (linked online via ARN’s critical coverage of the *Evolution* series). A 2001 fellow of the Phillips Foundation (“currently on a leave of absence to write about the controversy over the teaching of evolution in the public schools”), Winnick asked why the show’s producers did not “speak of Darwin’s vicious racism, so amply set out in his book, ‘The Descent of Man,’ in which he plainly states that blacks are inferior to whites? Why not also tell us about the influence he exerted, however unintentionally, on the eugenics movement and on Marx and Hitler?” Cf. notes 20 & 54 below.

¹¹ Johnson (1991, 71-72). The “prestigious” remark occurred in Johnson (1991, 48): “Suppose that the tide was so irresistible that even the most prestigious of scientists—Harvard’s Louis Agassiz, for example—became an instant has-been for failing to join the movement.” The historical reality of antievolutionary racists like Agassiz makes mincemeat of the claim in Morris & Morris (1996a, 31-32) that, “The idea of race is strictly a category of evolutionary theory, not of Scripture at all.” Ideologues of all stripes have managed to dress up their prejudices in whatever fashion is popular—in a more overtly religious climate, the Bible will be used as justification, just as “science” will be invoked if that is the cliché standard for deciding “truth.” This process will be seen to play out again next chapter concerning the Biblical position on human slavery.

¹² The factual mismatch of the first line of Johnson’s passage was remarked on in note 227 of chapter two, but the “Erich von Däniken of Modern Creationism” is by no means alone in this respect. Denton (1985, 20, 94, 132, 139) invoked Agassiz’s ghost on nature, God, and the typological discontinuities of fossil life as though Agassiz were aware of intermediates like the therapsids that Denton tried so sweep under the taxonomic rug a century later. Likewise, Agassiz’s name floated meretriciously all through the twin volumes of Wendell Bird (1989) without once snagging on the known details of paleontological discovery. Bird (1989, Vol. 1, 106n) did ingenuously acknowledge that “the specific theories of genetics and information content were developed subsequently.” Parenthetically, Bird’s occasionally leaky conception of chronology showed in Vol. 2 when he wrote of Old Earth creationists including Harry Rimmer (1890-1952), Douglas Dewar (1875-1957), and George McCready Price (1870-1963) as coming from “the early nineteenth century.” Creationist dates per Numbers (1992, 60, 73, 94, 141). Price, of course, was a prickly defender of *Young Earth* creationism through most of his career. Evidently caught in his own temporal backwash, Bird (1989, Vol. 2, 334-335) went on to drag Lord Kelvin (1824-1907) and Philip Henry Gosse (1810-1888) into the *eighteenth* century!

¹³ Johnson (1991, 166). For once, there should have been an *ellipsis* in the Futuyama (1982, 38) text, since sandwiched between the two quoted sentences was this one: “He chose the birds as a group that showed the sharpest of boundaries.” It may have slipped Johnson’s Aristotelian sensibilities that, were one trying to falsify the logical proposition that all crows are black, it is quite sufficient to produce a single white crow (or archaeopterygid). Meanwhile, Gould (1983, 107-119) had painted a picture of Agassiz’s mindset that went beyond Johnson’s cloudy description of it as “idealist philosophical bias.” The phrase was evidently nipped from the first part of a sentence that had noted Agassiz’s “mind was indentured to the creationist worldview and the idealist philosophy that he had learned from Europe’s great scientists,” Gould (1983, 108). Cf. Gould (2002a, 271-278). The point of Gould’s chapter concerned Agassiz’s visit to the Galápagos in the year before

his death, and how the physical evidence on those islands failed to penetrate his antievolutionary defenses; cf. Larson (2001, 95-102). References to Agassiz by critics of creationism tended to be just as general and flattering as Gould's in *Hen's Teeth*—for example, Kitcher (1982, 125): “Moreover, *variants* of Creationism were supported by a number of eminent nineteenth-century scientists—William Buckland, Adam Sedgwick, and Louis Agassiz, for example.” Or Steven D. Schafersman, “Fossils, Stratigraphy, and Evolution: Consideration of a Creationist Argument,” in Godfrey (1983, 220): “Louis Agassiz, one of the last great scientific creationists, wisely admonished his fellow students to ‘study nature, not books.’” Interestingly, Gould critic E. O. Wilson glances just as lightly past Agassiz in *Consilience*, referring briefly to Agassiz as a “great man” and a “supremely gifted lecturer” who nonetheless balked at accepting evolution, Edward Wilson (1998, 37). And sociologist Stark (2003, 174) highlighted Agassiz's efforts to unite science and religion without noting his racism (though his bibliography did include *The Panda's Thumb*). Returning to the scholarly trail, if Phillip Johnson had skimmed past Gould's discussion of Agassiz's racism in *The Panda's Thumb*, such secondary praise could have contributed to Johnson's not bothering to investigate what Agassiz actually believed. More ironically, that Agassiz's creationism owed more to racism than the Bible would have been an interesting sidebar had Gould (1983, 303-309) wanted to include it in his discourse on the racial biases of American census data on blacks.

¹⁴ See Livingstone (1987, 59-64, 91, 120-121, 170-174) on the 19th century *dramatis personae*, Gould (1981, 49-50, 105, 115-117) on Cope's racism, and Larson (1997, 18-21) on Cope and Warfield related to opposition to Darwinian notions of the primacy of natural selection. Gould (1991, 309-321) covers a parallel situation concerning Agassiz's obsequious student and successor, Nathaniel Southgate Shaler, who eased gradually into the neo-Lamarckian evolution fashionable in turn-of-the-century America, while retaining racial polygenism and advocating restrictive immigration laws to keep out riffraff like Catholics and Jews. But 19th century racist theorizing covered a broad political spectrum. There were traditional elitists like the French poet and diplomat Joseph Arthur Count de Gobineau (1816-1882), “one of the world's most notorious racists” according to Wolpoff & Caspari (1997, 95). Off on the radical left, pioneer German pathologist Rudolf Virchow looked forward to Marxist-style revolutions while being a confirmed polygenist who opposed all evidence for human evolution (reflected in his diagnosis of Neanderthals as merely deformed people), Trinkaus & Shipman (1993, 56-62). Personality clashes melded with social conservatism in Richard Owen, a “borderline case because he really did believe in evolution of some sort, but he thought he needed to attack Darwin's theories uncompromisingly, in part owing to his enmity with Huxley,” Mayr (1991, 100-101). Cf. Edey & Johanson (1989, 86-88), Michael White (2001, 128-130) and Zimmer (2001g, 44, 50-52). Owen's penchant for acrimonious debate long preceded his run-in with Huxley over *Archaeopteryx* (note 105, chapter two): back in the 1830s, “the brilliant and irascible” Owen adamantly refused to believe that the platypus laid eggs, Ritvo (1997, 14). Agassiz had a similar foil in American William Rogers, Witham (2002, 16-17, 214). Which brings to mind William Flower, the skilled zoologist Huxley relied on for his mammal ammo in his jousts with Owen. A self-effacing Christian evolutionist with distinct animal-rights leanings, Flower went farther than Darwin by holding that “Caucasians such as himself were biologically superior to other ‘non-adaptive’ peoples, which would ultimately become extinct,” Zimmer (1998, 146). Flower offers one of the great toss-off lines in paleontological history. “At a scientific meeting in 1862 Owen claimed, as he had many times before, that humans had a structure in their brain called the hippocampus that no animal (including gorillas) possessed. Huxley said he was wrong and referred the audience to Flower's discovery of a hippocampus in some primates. There the two men were deadlocked until Flower stood from his seat. ‘I happen to have in my pocket a monkey's brain,’ he announced. One look and the matter was settled,” Zimmer (1998, 145). (Cf. notes 241 & 318 below on hippocampus function.) For the most convoluted creationist treatment of the religious reaction to evolution, Wendell Bird (1989, Vol. 2, 313-337) takes signal honors. No mention was made of the profound abolitionist aspect—instead, Bird's presentation consisted of laundry lists of historical proponents and opponents, in which liberal theologians alone were seen as supporting evolution, but where it was

denied that conservative fundamentalism played a dominant role in the genesis of modern Creation Science!

¹⁵ Morris & Parker (1987, 20). Also Morris (1985, 14), Morris & Morris (1996a, 118), Chittick (1984, 15, 18), Wendell Bird (1989, Vol. 2, 218-219), Paul Taylor (1995, 49), Hanegraaff (1998, 77-78), LaHaye & Noebel (2000, 295-301) and Jonathan Sarfati (source per note 72, chapter four). Most of Morris & Parker's characters were quoted in Federer (1999, 61-62, 73, 231-232, 255, 291, 344-345, 350-351, 394, 473-474, 493-494, 722n, 724n, 749n, 753n, 759n, 769-770n, 790-791n, 794n), drawing chiefly on only a few secondary redactors (including Henry Morris). Cf. Colin A. Russell, "The Conflict of Science and Religion," in Ferngren (2002, 8) on the famous Christian scientists theme. Although Kelvin played a role in the anti-Darwinian reaction (note 256, chapter three), Brush (1982) noted he favored a Hoyle-style theistic panspermia theory for life, and so wouldn't exactly fit the cut of clothes contemporary Biblical creationists have him fitted for. Taylor included in his list "award-winning biochemist" Dmitri Kouznetsov, a Russian lecturer of questionable scholarly qualifications, per Laurence Moran and Richard Trott in "Creationist Dmitri Kouznetsov: Scientist?" at Talk.Origins. Farther down the apologetic food chain, Colson & Pearcey (1999, 424-426) lauded the proper Christian credentials of Galileo, Kepler, and Newton in a chapter on "THE BASIS FOR TRUE SCIENCE." And Canadian apocalyptic Grant Jeffrey voiced comparable sentiments in a lecture series on "The Signature of God" shown on TBN Christian cable in October 2000.

¹⁶ Morris' plopping Agassiz under "Geology" was a bold slice of scholarly cynicism. First, because the founders of non-Flood geology (just as much "creationists" as Newton or Boyle) were conspicuously absent from the Creation Science cavalcade—we saw in chapter three how far that bit of historical awareness goes in CRS/ICR circles. But the delicious part concerns how Agassiz's expertise in fossil fishes helped correlate deposits under the uniformitarian model Creation Scientists now deplore, such as Morris & Morris (1996c, 65). Agassiz's lasting contribution to geology stemmed from his recognition that there had once been an Ice Age, a conceptual leap he had been able to make only by junking the traditional Biblical chronology and Noachian Flood literal creationists are out to resurrect. Bolles (1999) vividly traces the circuitous genesis of glacial theory, with a cast of characters including the polar explorer and poet Elisha Kent Kane and early advocates of more localized glaciation like Ignace Venetz and Jean de Charpentier. The culmination of the acceptance of ice ages was Lyell's somewhat grudging incorporation of the idea mid-century, albeit shorn of Agassiz's cataclysmic vision of life being obliterated Cuvier-style. Indeed, in later years Agassiz overlooked all indications that more than one glacial episode might have taken place under decidedly less drastic circumstances. Much the same failing afflicts Henry Morris (1985, 126-127) when he allows only one cold snap to hitchhike along with the Flood. The sour irony here is Agassiz's catchall Ice Age was considered particularly harebrained by 19th century standards, not his racist conception of man!

¹⁷ See Cohn (1996, 73-86) on Steno and Woodward—though cf. Gould (2003, 21-32) for a sympathetic treatment of Woodward.

¹⁸ Skeptics anxious to isolate astrology from astronomy and believers who would like to adopt Kepler as a patron saint have wrangled over whether Kepler's astrological practice was just a way to make a living in superstitious times (Galileo appears to have cast horoscopes for purely financial reasons). Lynn Thorndike (1958, 17-28) related Kepler's astronomy (particularly his fascination with the harmonics of aspects) to his astrological beliefs. See Moy (2001), reprised in Kurtz *et al.* (2003, 139-143), or Richard J. Blackwell, "Galileo Galilei," in Ferngren (2002, 105-116) for concise accounts of the scientific and religious issues orbiting Galileo's infamous run-in with the Church, and George Sim Johnston (hoseweb.com/religion/galileo.asp, a 1994 Catholic website posting) or Stark (2003, 163-166) for apologia. Duane Gish (1978, 23) takes the cake for sheer chutzpah when he intimated that Galileo had been persecuted by the *scientists* of his day. Futuyama (1982, 195-196) drew attention to this blatant exercise in historical revisionism, which naturally Gish did not cover in his tome, *Creation Scientists Answer Their Critics*—and simply removed the gaff from Gish (1995). Incidentally, Gish repeated the Galileo claim more explicitly in a debate

with biochemist Russell Doolittle (aired in March 1982), but the brief allusion in Gish (1993, 88-89) was only to characterize it as one that “went rather poorly for the evolutionist side.”

¹⁹ There are enough skeletons in Newton’s closet to give contemporary conservative Christians pause before invoking his legacy. On top of the circumstantial evidence that Newton may have been gay, his eccentric fusion of alchemy with Christian fundamentalism definitely championed a heretical non-Trinitarian view of God, Gardner (1996; 2000b, 237-245), Michael White (2001, 27-28), and Richard B. Westfall, “Isaac Newton,” in Ferngren (2002, 153-162)—cf. note 229, chapter six re Athanasius and the Arian heresy. Mary Heiman, “Christianity in Western Europe from the Enlightenment,” in Hastings (1999, 463-464) noted Newton’s prominence for European philosophers like Voltaire. But having made it through revolutions and a devastating civil war, the Britain of Sir Isaac Newton was also keen on End of Days millennial speculation—fueled by his compatriot Whiston’s cometary collision theories of Biblical wrath, Gould (1991, 367-381) and Boyer (1992, 62-67). While downplaying Newton’s “mildly heretical views of the Trinity” (!), Stark (2003, 167-172) rather matter-of-factly noted such extraordinary minutia as “Newton calculated, among many other things, that the Second Coming of Christ would occur in 1948, four years after the ‘end of the great tribulation of the Jews.’”

Sexual orientation aside, Newton’s thorny temperament and scientific rough spots manifested in his long-running feud with mathematician Leibniz over who invented calculus (Newton had priority, but Leibniz’s notation is the one we all use), Hellman (1998, 39-61) or Michael White (2001, 22-61). Newton also played a retarding role in the resolution of the “longitude problem.” In order for Britain to rule the waves it was necessary to avoid missing landfall or grounding on reefs. To do that longitude had somehow to be accurately reckoned, and the British government established a hefty cash prize as encouragement. In principle longitude could be determined astronomically, which is the method Newton and his fellow astronomers favored—sublimely oblivious to the practical difficulties of conducting the requisite precision observations aboard a rocking ship often sailing under cloudy skies. The alternative approach was to devise a portable clock of such numbing accuracy as to calibrate standard sextant readings to the Greenwich standard even though aboard said heaving ship. Although Newton insisted that such a mechanism was technically impossible, Sobel & Andrews (1998, 63-73) recounted the dogged perseverance of country clockmaker John Harrison (1693-1776) who went on to do exactly what the Olympian Newton decreed couldn’t be done. “Newton died in 1727, and therefore did not live to see the great longitude prize awarded at last, four decades later, to the self-educated maker of an oversized pocket watch,” Sobel & Andrews (1998, 73).

By the way, a quote from Newton on how accurate the Bible supposedly was popped up twice in the historical name-dropping of Muncaster (1997, 3, 10, 24), along with Galileo, Pasteur, Kelvin, and the more recent religious affirmations of Werner von Braun. That there is a huge difference between having a deep Christian faith and using the Bible as a technical resource for scientific judgments is a distinction Muncaster and his fellow literalist creationists have not been keen on exploring. Nor has Phillip Johnson (1998b) over on the Intelligent Design side, when he contrasted Newton’s open-mindedness about supernatural explanations with the *a priori* dismissals of modern “scientific materialists.”

²⁰ Morris & Parker (1987, 153). Morris & Morris (1996c, 66, 92, 99-104) similarly invoked Osborn on the way to asserting an inherent “Racism of Darwinism.” Osborn’s more odious philosophical views are hardly a secret, especially for attentive readers of *Natural History* and the assorted essays of Stephen Jay Gould reprised in his book editions. For instance, Gould (1991, 162) noted that Osborn had written “a glowing preface to the most influential tract of American scientific racism, *The Passion of the Great Race*, by his friend Madison Grant.” Indeed, the Morris and Hanegraaff (1998, 26-27, 169n) secondarily relied on an April 1980 reprint in *Natural History* of Osborn’s racist vaporings in that same magazine from 1926—were only creationists as forthright about exploring their own historical excesses! See also note 49 below, on the ironic role of Osborn and anthropological racism in the Piltdown affair.

²¹ Huse (1997, 184-185) recruited all Morris’ merry band in an Appendix C, including such problematic characters as Pasteur (whose position on the French antievolutionary landscape was

mentioned in note 190 of chapter two). Cf. Hellman (2001, 71-89). Francis Bacon was pegged for the “Scientific Method,” though not all conservative evangelicals are so happy with Bacon’s inductivism (which functionally divorced faith from science)—for example, F. David Farrell, “Philosophical and Theological Bent of Historical Criticism,” in Thomas & Farrell (1998, 86-87). Huse added some obtuse examples from his own field of mathematics and computer programming. Lord John Rayleigh (1842-1919) was listed for “Dimensional Analysis”—but not for his avid work with the Society for Psychical Research on behalf of mediums and spiritualism (alluded to in note 113 of chapter one). Likewise Charles Babbage (1792-1871) was double-dipped for “Calculating Machine” and “Computer Science.” But Babbage’s idea of “creationism” fell as far from Huse’s Creation Science tree as Agassiz’s multiple creations. Babbage envisaged God as the ultimate programmer, who devised a master system long ago in the geological past that was allowed to run unattended to transform into the present collection of living things—see Desmond & Moore (1991, 213) or the remarks by Dennett (1995, 208). Depending on one’s mood, Babbage’s views may be likened either to Michael Behe’s archetypal mega-cell or the “fully gifted creation principle” of Howard Van Till’s brand of theistic evolution. Incidentally, Huse’s Appendix A (“Scientific Facts That Prove Evolution”) fired one of the cheapest of creationist shots. Huse (1997, 173): “Listed on this page are all of the known scientific facts that can be used to prove evolution is an established fact of science, as commonly taught.” The page was left blank. Similar witticism appears at geocities.com/Heartland/7547 and “The Ten Strongest Evidences for Evolution” at cs.unc.edu/~plaisted/ce/evidences.html.

²² Gould (1983, 360). The essay sources were Gould (1977a, 179-185; 1980, 259-266). The skull comparison of *Australopithecus robustus* with *A. africanus* in Leakey & Lewin (1992, 107) clearly illustrates the sagittal crest on the former.

²³ McGowan (1984, 161-185), cataloging along the way fourteen skull and four postcranial features that differ between apes and man, which Strahler (1987, 480-481) drew on along with other material for his discussion. *Past Worlds* (1988, 52) touched on similar points when contrasting the skeleton and musculature of a gorilla with that of a human, just as Meave Leakey (1995, 44-47) did in explaining the telltale clues relating the hominids to our anatomy as distinguished from those of chimpanzees. Schwartz (1999, 65-70) and Tattersall & Schwartz (2000, 96-97) note additional human skeletal adaptations and how they differ from the apes—observations originally made in the late 18th century by pioneer paleoanthropologist Johann Friedrich Blumenbach. Cf. Burke (1996, 123-124) and Tattersall & Schwartz (2000, 34-41) on Blumenbach’s mixed anthropological legacy. Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 250) chart nine anatomical features acquired by our ancestors. Five occurred among the primates, and the rest among the hominids. Running chronologically: the post-orbital closure in the cheek (40 mya), modern ape tooth pattern (35 mya), loss of tail (25 mya), full thumb rotation (18 mya), stable elbow (15 mya), broad sacrum (3.5 mya), the “human” foot and knee joint (1.8 mya), and our high forehead (0.1 mya).

²⁴ McGowan (1984, 166, 172). Strahler (1987, 480) drew on McGowan secondarily here, being particularly impressed with the (mistaken) observation that the australopithecine Taung Child’s deciduous canines were actually its permanent ones. Stanley (1996, 37) made a similar error.

²⁵ Avise (1998, 18). Similarly, Berra (1990, 68-69) on the human spine: “It is a compromise between the needs of our four-footed ancestry and those of our bipedal nature. An engineer could certainly design from scratch a more efficient and more pain-free backbone, but given our primate starting point, natural selection did the best it could to achieve a workable compromise. *Natural selection never starts from scratch.*” See also Lambert & The Diagram Group (1987, 38-39). Jordan (1999, 141) has a nice comparative illustration of the ape and human skull placement on the spinal column.

²⁶ Avise (1998, 17). While Tudge (1996, 249-250), Kenneth Miller (1999, 101), and McKee (2000, 169-181) make similar observations about the design flaws in human anatomy, Olshanky *et al.* (2001) dryly suggest a few alternatives that might have circumvented them, had evolution not been calling the engineering shots. Another “maladaptive legacy” Avise called attention to was the appendix: “This troublesome outpocket of the large intestine is the vestige of a digestive organ, the

caecum, that in other mammals such as rabbits serves to process low-nutritional plant substances that became less prominent in the diets of our primate ancestors.” Cf. also note 111, chapter four.
²⁷ Paul Ehrlich (2000, 152) illustrates the throat anatomy of chimp and human adults. Pinker (1994, 354) noted Darwin pointed out this dangerous aspect of human vocal anatomy in *The Origin of Species* ... a century and a half later, design advocates like Behe (1996) didn't think the leaky human glottis worthy of attention as an exemplar of biological engineering (spiffy or otherwise). For contrast, creationist Ashby Camp (at trueorigins/theobald1d.asp) ups the biological ante in much the same way Ken Ham does pre-Flood carnivory: “the intersecting of the trachea and esophagus is problematical only if the epiglottis fails to close during swallowing. If that would not occur in a pre-Fall world, the original design could not even be accused of being suboptimal.” This postulated condition applying only to Adam & Eve makes it somewhat difficult to verify. But since the tracheal twist that causes the glottis not to seat properly is related to human speech, might one infer the primal couple were *mute*? Of course, that would put rather a crimp on the animal naming episode covered re note 354 below.

²⁸ The most obvious corroborative category unknown to Darwin or Agassiz would be the molecular evidence linking us with the primates. By whatever criterion one may choose (or even creationists might choose, should they get to that point), humans and apes are a closely related bunch. Lambert & The Diagram Group (1987, 40-41) summarized matters as they stood in the mid-1980s. Futuyma (1982, 104), Frank T. Awbrey, “Defining ‘Kinds’—Do Creationists Apply a Double Standard,” in Zetterberg (1983, 278-284), or Strahler (1987, 49-50) surveyed such molecular clues as they relate to the creationism debate. See Li (1997, 149-155) on genetic studies concerning primate relatedness, Pilbeam (2000) on the soft tissue analysis of Gibbs *et al.* (2000), and Gibbs & Nelson (2003) on the new “phylogenetic shadowing” technique of Boffelli *et al.* (2003). Off in creationism land, Paul Taylor (1995, 37) blithely dismissed as “only circumstantial” that “some of the blood proteins of humans and chimpanzees are quite similar.” But the situation goes way beyond that. Avise (1998, 33-34): “Protein electrophoretic assays have shown that humans and chimpanzees are about as similar to one another genetically as are morphologically similar species of fruit flies (genus *Drosophila*), or sunfish (*Lepomis*).” Avise (1998, 226n) catalogued how often the proteins of humans and chimpanzees “are absolutely identical in amino acid sequence (numbers of amino acid sites shown in parentheses): fibrinopeptide (30); cytochrome *c* (104); lysozyme (130); hemoglobin α (141); hemoglobin β (146); and hemoglobin δ (146). Some other closely similar proteins fully sequenced include hemoglobin γ (1 amino acid substitution among 146 sites), myoglobin (1 substitution, 153 sites), carbonic anhydrase (3 substitutions, 264 sites), serum albumin (6 substitutions, 580 sites), and transferrin (8 substitutions, 647 sites). Thus, altogether for these eleven proteins, a total of 2,468 of the 2,487 amino acid sites (99.2 percent) are identical between humans and chimpanzees.” How creationists employ the cytochrome *c* evidence shall be explored in the last chapter, but one may note how Michael Behe flushes such information down the rabbit hole of meaningless concession. During a debate with Behe at the 1995 meeting of the American Scientific Affiliation, Kenneth Miller (1999, 164) “presented him with molecular evidence indicating that humans and the great apes shared a recent, common ancestor, wondering how he would refute the obvious. Without skipping a beat, he pronounced the evidence to be convincing, and stated categorically that he had absolutely no problem with the common ancestry of humans and the great apes. Creationists around the room—who had viewed him as their new champion—were dismayed.” That Behe has shown more skepticism over the evolution of whales than human beings is certainly atypical among opponents of Darwinism, though given how waffling Behe has been on “common descent” generally, creationists probably shouldn't have been too worried. A similar ambivalence attends the other whale-skeptic, David Berlinski, in his recent work on the role of mathematical algorithms in nature and scientific thought. One passage apparently accepts the evolutionary origin of man, but a bit later on Darwin's view is tagged as an “extravagant and silly claim,” Berlinski (2000, 254-255, 316). For those more enamored of Biblical proof texts than the skeptical Berlinski, another way around the problem is to retrofit it into the Biblical structure—thus a guest on Hugh Ross' TBN cable show (July 5, 2001) claimed the similarity of human and chimpanzee biology was *predicted* by the Bible.

²⁹ Herbert Thomas (1994, 26-32). 19th century researchers were just penetrating the edges of the fascinating hunter-gatherer society of the Upper Paleolithic (roughly 35,000 to 12,000 years ago). See *Past Worlds* (1988, 72-75) for a capsule view of sites, tool technology, and spectacular cave art, Lambert & The Diagram Group (1987, 152-173) for a more detailed survey, and Tattersall (1995a, 8-10, 24-28) for the context of the finds in 19th century science. McKie (2000, 190-201) offers fine illustrations of Cro-Magnon art, while Randall White (1993) focuses on some of the extraordinary carvings from this period, and Rigaud (1988) surveys the paintings at Lascaux Cave. Several spectacular examples of French cave art have only turned up recently: Cosquer in 1991, representing several phases (27,000 and 19,000 years ago), Clottes & Courtin (1993), and the even more extensive 32,000-year-old Chauvet found in 1994, Clottes (1995; 2001) and Packer & Clottes (2000). See also note 195 below.

³⁰ The initial Neanderthal finds were skull and jaw fragments in 1856 and 1866, and some limb bones, nicely illustrated in Jordan (1999, 2); cf. Schmitz *et al.* (2002) on recent work. Only in 1886 (after the death of Darwin and Agassiz) were the first fairly complete skeletons found at Spy, Belgium, Eldredge & Tattersall (1982, 68-71), Tattersall (1995a, 12-16, 20-24) or Herbert Thomas (1994, 46). Until well into the 20th century popular treatments of Neanderthals referred to them simply as “cave-man” or “Mousterian man” (for the tool form associated with them). See Schwartz (1999, 92-99) on early interpretations of Neanderthal. *Past Worlds* (1988, 64-65) surveys Neanderthal sites and culture, with more detail in Lambert & The Diagram Group (1987, 132-151). See Stringer & Gamble (1993), Trinkaus & Shipman (1993), Shreeve (1995), Tattersall (1995b), Jordan (1999) and Arsuaga (2001; 2002) for a spectrum of recent opinion on Neanderthal, with useful overviews by Gore (1996) and Wong (2000a). Johanson & Edgar (1996, 211-233) illustrate 11 Neanderthal specimens; Tattersall & Schwartz (2000, 171) include a range of juvenile and teenage skulls pertaining to Neanderthal diagnostics.

³¹ Except perhaps for Duane Gish, who has managed to combine both concerns in one package, by getting hung up on how closely *tree shrews* are related to man. In his criticism of Loring Brace’s piece in Godfrey’s anthology *Scientists Confront Creationism*, Gish (1993, 346-348) berated evolutionists for supposedly sticking with a 1920s notion that ancient tree shrews might have been direct human ancestors. Tracing back to early insectivores just as much as us primates, contemporary shrews would at best be very distant evolutionary cousins—and Gish could muster scientific critics of the old view so easily because the idea had long since been thoroughly outmoded by subsequent research. Although Strahler (1987, 474-476) examined Gish’s muddled analysis, Gish (1995, 214-216) persists in belaboring this straw man. See Lambert & The Diagram Group (1987, 46-47) on how tree shrew anatomy relates to early insectivores and thence to the primates.

³² See Eldredge & Tattersall (1982, 72-75), Herbert Thomas (1994, 51-55), Tattersall (1995a, 31-40, 24-28), Johanson & Edgar (1996, 187) or Schwartz (1999, 101-106) for tidy accounts of the “Java Man” find, and Shipman (2001) for a complete study. Dubois was “a keen reader and admirer” of Ernst Haeckel, who followed Alfred Wallace’s idea of Southeast Asian origin for man back to some primordial gibbon. Gibbons lived in Sumatra and Java, at that time both Dutch colonies to which Dubois sought posting in the Dutch army medical corps. Since in those days there were very few fossil primates to compare, it was possible for the German anatomist Rudolf Virchow to believe Dubois’ specimens were simply large gibbons. But then, Virchow also had trouble with Semmelweis’ pioneering advice that obstetricians ought to wash their hands before working, Hellman (2001, 43-44). Ironically, just as anthropologists were putting Java Man back on the human family tree as a specialized form of *Homo erectus*, Dubois appeared to adopt the gibbon theory (see note 138 below). Stringer & Gamble (1993, 65) compare the skull of *Homo sapiens* to the Java form of *Homo erectus* (with its noticeable bony brow, no chin, and a flatter braincase with a prominent ridge high at the back). See Lambert & The Diagram Group (1987, 124-125) or *Past Worlds* (1988, 60-61) on East Asian hominid sites and features, and Gore (1997b) for a general survey of current views on *erectus*. Recent fragmentary Chinese finds (Longgupo) covered by Pope (1993), Huang *et al.* (1995), Wood & Turner (1995), and Ciochon (1995) may push the Asiatic penetration of *erectus* back as far as perhaps even 2 mya, though there have been critics of

the hominid identification (explored at chineseprehistory.org). Thus the mix of available data is always being refined. As Tattersall (1995a, 187-190) noted, it was only in 1984 that an example of *H. erectus* turned up from Africa (KNM-WT 15000); Lambert & The Diagram Group (1987, 120-121) provides an overview. Found by Richard Leakey's team, the Nariokotome Boy (a.k.a. "Turkana Boy") was an adolescent who lived about 1.6 mya, and his skeleton was even more complete than the australopithecine "Lucy" (to be discussed below). Leakey & Lewin (1992, 3-64) vividly describe the discovery and interpretation of this extraordinary fossil; see Tattersall & Schwartz (2000, 133-138) for a current assessment. Tattersall (1995b, 61), McKie (2000, 74), and Tattersall & Schwartz (2000, 133) offer recent illustrations of the full skeleton. Further research suggests the Nariokotome Boy may have been a separate related species, *H. ergaster*, as noted by Johanson & Edgar (1996, 72, 78, 182-183) or Tattersall (2000a, 57)—and further wrinkles courtesy of Tattersall & Schwartz (2000, 143-144). See also Abbate *et al.* (1998) on a 1 million-year-old African *Homo* cranium of similar morphology. Tattersall (2000b, 62, 64) shows an evocative recent reconstruction of *Homo ergaster*, done by British artist John Holmes for the American Museum of Natural History. A paper on "Axial dysplasia in *Homo erectus*" presented by Bruce Latimer & James C. Ohman at the 2001 meeting of the Paleoanthropology Society (abstract at paleoanthro.org/abst2001.htm) suggests KNM-WT 15000 may have suffered from several pathologies. This would affect interpretations of *erectus* social arrangements (the survival of a diseased member—cf. note 149 below) as well as how the specimen's anatomy is interpreted regarding linguistic abilities (see note 315 below).

³³ The national rivalries even spilled over into taxonomy, as Ritvo (1997, 61-63) noted apropos the British Association plan to standardize nomenclature, and the reaction of their continental counterparts, particularly the French. Conceptions of Neanderthal were caught in this backwash. Eldredge & Tattersall (1982, 76) remarked of Marcellin Boule, "the premiere French anthropologist of his day," whose analysis of Neanderthal finds just before WWI promulgated "the shambling, brutish image of the Neanderthals immortalized in a thousand comic strips." The image has stuck ever since in the popular imagination via early film depictions of "primitive" man, where cave men shamble along like chimpanzees, brutishly dragging their mates by the hair. An ironic legacy of this misconception: like some anthropological *entente cordiale*, Boule's flawed interpretation of Neanderthal "was crucial to the eager acceptance of Piltdown as genuine," Roger Lewin (1987, 62). And the turnabout: "The Piltdown 'discovery' certainly hastened the demotion of the Neanderthals' significance that Boule had initiated with such vigor," Tattersall (1995b, 97). See Stringer & Gamble (1993, 18-24) or McKie (2000, 148, 150-151, 163) for the changing depictions of Neanderthals through the 20th century. Lubenow (1992, 36-39) naturally used such misrepresentations as grist for his creationist effort to peg the Neanderthals as merely slightly unusual human beings (more on that later). For pithy contrast, evolutionist Berra (1990, 115) described Neanderthal thus: "They were more muscular, more barrel-chested, and shorter than modern humans, but if cleaned up, shaved, and dressed in business suits, they could probably pass for television evangelists." Ouch!

³⁴ Gould (1977a, 207-213) covers some of the players in this curious philosophical saga of "cranial supremacy." Interestingly, two German opponents of the "brains first" model in the 19th century were Haeckel and Karl Marx's partner, Friedrich Engels (who had an interest in natural history in addition to an antipathy for bourgeois capitalism). Stanley (1996, 27-29) noted the retarding influence the "brains first" paradigm had on early 20th century anthropology.

³⁵ Evolutionary accounts of the origin of man routinely mention Piltdown as a cautionary tale about the need for proper scientific rigor, and I have been reliably informed that most any well-stocked physical anthropology lab will have a Piltdown cast in its collection. For short accounts of the Piltdown fraud see Johanson & Edey (1981, 77-83), Eldredge & Tattersall (1982, 78-80), Tattersall (1995a, 48-51), Schwartz (1999, 107-111), McKie (2000, 54-55) or Berger & Hilton-Barber (2000, 78-79), with Ecker (1990, 149-150) and Shermer (2001, 307-319) remarking specifically on how creationists have used the case. Lawson (1997, 11-14) illustrated how scientific and popular treatments of Piltdown Man contributed to attitudes preceding the Scopes trial. That Dawson cribbed others' work was noted as early as an addendum to Kohn (1986, 149-

150), but Dawson's record of faking antiquarian finds to further his entrée into the scientific limelight moved Walsh (1996) to conclude that Dawson was likely behind it all (see note 40 below for contrary opinions). The main excavations at Piltdown ran from 1908 to 1913. "Piltdown I" (1912) consisted of the lower jaw and skull fragment; "Piltdown II" (1913) added a chimpanzee-like eyetooth, along with a canine uncovered by young assistant Pierre Teilhard de Chardin. The Great War interrupted just about everything in Britain, though a few more pieces were found in 1915—when a most reverential painting was done memorializing the associated scientists, notably Sir Arthur Keith. See Roger Lewin (1988, 25) or Herbert Thomas (1994, 34-35)—Thomas including an inset of the infamous Piltdown reconstruction. Johanson & Edey (1981, 49) illustrated the Piltdown skull in relation to *Homo erectus* and modern humans, indicating how little Piltdown fit in to the developing evidence.

³⁶ "Peking Man" dribbled out in fragments (a tooth here, a jaw there, broken limb bones) from Zhoukoudian Cave from 1928 to 1937—which taphonomy suggests a hyena predation site, Boaz & Ciochon (2001). With the Japanese intent on gobbling up all of China, a platoon of Marines was dispatched to escort the finds to the United States for safekeeping, but they landed just after Pearl Harbor and were interned. The fate of the crated fossils remains a mystery to this day, and anthropologists have only their casts for analysis, but it and its contemporary Java Man are regarded as variants of *Homo erectus*, Tattersall & Schwartz (2000, 151-156). The "Taung Child" was found in 1924 in a South African quarry, and first examined by Raymond Dart; Tattersall (1995a, 54-58), Johanson & Edgar (1996, 142-143), Schwartz (1999, 114-122), McKee (2000, 82-86) and Berger & Hilton-Barber (2000, 68-82) cover its discovery and interpretation. See Eldredge & Tattersall (1982, 80-83) or Tattersall (1995a, 8-10, 69-70) for a survey of the African finds that followed in the 1930s. Unlike the fragmentary Piltdown, the Taung Child was a virtually complete juvenile skull (including an endocranial cast of the brain itself). Besides lacking the ape diastema and featuring reduced canines, the foramen magnum pointed downward, suggesting an upright gait. But the British mythos of Pliocene Man and its Piltdown exemplar worked against the acceptance of the "Southern Ape of Africa" as a human ancestor, especially when it came to the findings of a mere colonial like Raymond Dart, Phillip V. Tobias, "Conversion in Palaeo-Anthropology: The Role of Robert Broom, Sterkfontein and other Factors in Australopithecine Acceptance," in Tobias *et al.* (2001, 13-31). The religious and social context cannot be overlooked, either—Samantha Weinberg (2000, 32) noted some literally-minded Christians directed outraged letters to the editor and hate mail to the discoverers of both the Taung Child and the "living fossil" coelacanth later on in the 1930s. Larson (1997, 28-30) noted the role Dart's discovery played in the Scopes trial milieu, notably Dart's musings on the australopithecines as hunting apes corroborating Bryan's fears about Darwinism being a doctrine of hate and violence (see also note 200 below). The thrust of Dart's argument that *Australopithecus africanus* was a very early "man-like ape" rather than a more recent "ape-like man" certainly didn't go very far with Sir Arthur Keith, who relegated it to the anthropoids without permitting it "missing link" status. See Herbert Thomas (1994, 136-139) for excerpts from the 1925 scientific pieces by Dart and Keith on *A. africanus*. "Keith's lengthy dismissal of the Taung baby as an ape in the 1930 edition of his book *New Discoveries Relating to the Antiquity of Man* was regarded as the definitive word on the specimen," Eldredge & Tattersall (1982, 87). As Schwartz (1999, 147) put it, Keith's criticism of the Taung Child evidence was riddled with "inconsistencies and labored and contrite argumentation," which even Elliot Smith did not find especially convincing. Though in the end Keith was converted, based on newer fossils and studies of them undertaken after WWII, Tobias in Tobias *et al.* (2001, 21-23). Incidentally, Keith tended to humanize the European stock in a way he would not allow Dart's African specimen. His initial reconstruction of Piltdown was more humanlike than Woodward's, but had to be revised after the 1913 tooth find made it appear even more apelike than Keith expected—see illustrations in Spencer (1990, 47, 64). Meanwhile, Keith's conception of Neanderthal fell at the opposite extreme from Boule's hulking naked brute, so that a 1911 painting based on Keith's views ended up ironically looking quite similar to modern depictions, as indicated by Stringer & Gamble (1993, 18).

³⁷ Lubenow (1992, 39-44) gives one of the more extensive Biblical creationist summaries of the case before concluding: “The widespread myth is that science is self-correcting and because of this, it is a superior worldview. In reality, science is not adequately self-correcting, and for very practical reasons cannot be self-correcting in any meaningful way.” Off in the Hare Krishna hinterlands, Cremo & Thompson (1993, 501-525) devoted a whole chapter to the slow exposure of Piltdown Man. Shorter treatments appear via Gary Parker in Morris & Parker (1987, 153-154), Wendell Bird (1989, Vol. 1, 227), Johnson (1991, 186-187), Gish (1978, 120-121; 1993, 344; 1995, 328-329), Paul Taylor (1995, 36) and Muncaster (1997, 13). Interestingly, Henry Morris (1963; 1972; 1985) didn’t allude to it, though Morris & Morris (1996b, 84) briefly mentioned Piltdown and Nebraska Man. Piltdown remains a recurrent theme on contemporary Christian broadcasting. As recently as June of 2000, a Christian light rock music channel ran a blurb declaring how Piltdown was one of those facts against Darwinism that evolutionists will not tell you about (that, when the vast majority of ink on Piltdown has in fact been spilled by evolutionists). The announcer sounded very similar to the one on D. James Kennedy’s show, which has featured Piltdown among “Evolution’s Greatest Bloopers, Blunders and Hoaxes” (such as in a 1993 “Creation Week” broadcast). Wells (2000a, 217) claiming “most modern biology textbooks do not even mention Piltdown” vies with Hancock (2002, 390-391) that it “is little spoken of today.” Whether *biology* texts need dwell on Piltdown is debatable, but the claim is patently untrue for anthropology (re note 35 above). Cf. note 174 (chapter four) on Gish’s revisionist claims about who supposedly doesn’t pay attention to horse evolution.

³⁸ Huse (1997, 136-138). Re the dissertation noted in the first paragraph, Huse cited “Parker, Gary E., ‘Origin of Mankind,’ *Impact No. 101*, Institute for Creation Research, California, November 1981, p. 4” (available at the ICR website). Bichromate of potash came courtesy of “Criswell, W. A., *Did Man Just Happen?* p. 89,” a 1973 volume not listed in Huse’s Sunderland-friendly Bibliography. Nor was the source for the Teilhard reference: “Bowden, M., *Ape-Men—Fact or Fallacy?* Sovereign Publications, Bromley, Kent, Canada [*sic*], 1977, pp. 35, 46-47.” Criswell and Bowden are comparative asterisks on the creationism scene. The Rev. Criswell (of the Dallas First Baptist Church) was among the speakers at a major Jerusalem End Times prophecy conference sponsored in 1971 by Carl Henry, editor of the evangelical *Christianity Today*, Boyer (1992, 188). His present base is The Criswell College (a.k.a. Criswell Bible Institute) in Dallas. Harding (2000, 18) lists Criswell among prominent originators of the New Christian Right during the 1980s, which include Jerry Falwell, Pat Robinson, D. James Kennedy (whose initial Harding transposed to the middle), Tim & Beverly LaHaye, Louis Sheldon, Donald Wildmon, and Gary Bauer. Malcolm Bowden’s fascinating interests will be discussed shortly, though a different M. Bowden appears to have co-edited *The International Wildlife Encyclopedia* (1970), cited by Huse (1997, 208n) on the peppered moth.

³⁹ Johnson (1991, 186-187) and Lubenow (1992, 43). Cf. Teilhard de Chardin (1969) and the sympathetic McMenemy (1998, 255-272) or Haught (2001, 52, 64, 112, 129, 133-135). Starting with Albert Gaudrey and Henri Bergson in Teilhard’s formative years, the philosophical undertow of Teilhard’s “noösphere” (our thinking layer of life) run from the influential Russian materialist biogeochemist Vladimir Vernadsky to the Margulis-style endosymbiotic “neovitalism” McMenemy favors. Which is not to be confused with the diaphanous “vitalism” Michael Denton’s fielded in a 1998 symposium on Artificial Intelligence and consciousness sponsored by the Discovery Institute (available at kurzweilai.net)—cf. Denton in note 97, chapter four. Seeing humans as the object of progressive evolution was by no means a preserve of the Teilhard camp: Roger Lewin (1988, 26, 28) noted how Robert Broom was influenced by Alfred Wallace’s similar ideas (intersecting his paranormal interests, note 236 below).

⁴⁰ Gould (1980, 108-124; 1983, 201-240) amplified the suspicions of Louis Leakey about Teilhard de Chardin’s involvement. Based on several curious memory slips when Teilhard was questioned by Kenneth Oakley in the 1950s (such as remembering Dawson having shown him certain Piltdown finds in 1913 before their “discovery” in 1915), Gould wove an interesting if circumstantial case around the controversial cleric. Solving the “Piltdown Mystery” has provoked almost as much freewheeling speculation as trying to identify Jack the Ripper. Ronald Millar (1972) touched off

the latest spurt by arguing that Dawson didn't know enough to pull off the hoax and proposing the opinionated and arrogant neuroanatomist and paleontologist Grafton Elliot Smith as the culprit instead. Elliot Smith had the requisite anatomical knowledge and a snide sense of humor Millar believed was perfectly suited to the stunt, supposedly motivated by Elliot Smith's obsessive prehistoric migration theories that Piltdown would have supported. Actually, Piltdown played a less pivotal role in Elliot Smith's dispersalist thinking than all that, and Landau (1991, 128-129) found Millar's argument unpersuasive. Someone else who was even more annoyed by Millar's theory was Ian Langham, who devoted considerable effort to refuting it—cut short by Langham's untimely death in 1984, the anti-Millar argument was carried on by Spencer (1990). Their suspicion was that it was Arthur Keith who had conspired with Dawson as a scientific manipulation, rather than a prank. The view of Walsh (1996) on Dawson solo has already been noted—though Walsh thinks it plausible Teilhard suspected there was something fishy about Piltdown, hence his reluctance to make much of the find in later years. Martin A. C. Hinton (curator of zoology at the British Museum during the Piltdown era) has reentered the field of prime suspects after a trunk of his left at the museum turned up in the 1990s (Hinton died in 1961). Among a clutter of miscellaneous specimens were bones filed and stained with exactly the chemical signature of the Piltdown fossils—which led Andrew Carrant and Brian Gardiner to conclude these were Hinton's dry runs, Gee (1996; 1999, 242n). The tenuous alternative would have been that Hinton suspected a Piltdown fraud and had somehow managed to replicate the specimens—yet never drew on them even after the fakery was exposed. Hinton was prone to elaborate practical jokes, and purportedly bore a grudge against Woodward. Whether this lets Dawson off the hook as an accomplice remains murky. While Kohn (1986, 133-141) ranged through the rogues gallery of likely Piltdown culprits, Spencer (1990, xix-xxvi) remains a most comprehensive list.

⁴¹ Bowden's geocentrism is defended at his "Creation Page" website (available at ourworld.compuserve.com/homepages/bowdenmalcolm/homepage.htm): "there is evidence that the earth is NOT moving around the sun, but either the aether is moving around the earth carrying the planets with it, or the earth is spinning on its axis. The most likely model is that the aether is rotating around the earth as calculations show that if it did not, it would rapidly collapse upon itself." (Stephen Hawking, take note ... and Phillip Johnson too, as we'll see later.) Even without the geocentrism, Bowden falls on the nether fringe of Young Earth creationism: Huse's bibliography included an unused Creation Science Movement pamphlet by Bowden on "Decrease in the Speed of Light (Its Evidence for Creation)," Huse (1997, 209). Bowden serves on the Council of the CSM, which is the reincarnation of the moribund Evolution Protest Movement (re note 135, chapter four) under the influence of their literalist American counterparts. Henry Morris serves as Vice President of the CSM, though evidently in an honorific capacity, as noted by Numbers (1992, 327). Bowden's website rehashes the creationist "meteoric dust" and "shrinking sun" canards examined in chapters two and three respectively, as well as retaining belated confidence in the Paluxy River "man tracks." A belief that the Bible required Ptolemaic cosmology remained surprisingly popular among certain conservative American religious denominations into the 20th century, such as the Missouri, Wisconsin and Norwegian Lutheran synods. It also played a background role for members of G. M. Price's "Religion and Science Association" and Walter Lang's "Bible Science Association" (BSA) in the 1930s, Numbers (1992, 106, 237-238). Paul Ellwanger (who inspired the spurt of "equal time" creationist legislation a quarter century ago) and R. G. Elmendorf represent a retrograde band of Roman Catholic geocentrists (see users2.ev1.net/~origins/menu-helio.htm). Another Copernican doubter is Tom Willis of the Creation Science Association of Mid-America (figuring in the 1999 Kansas school board case covered in the last chapter). See Willis' 2000 piece "More Great *Proofs* of Evolution" at the CSA website (csama.org/200003nl.htm). Ohio college computer science teacher Gerardus Bouw (www2.baldwinw.edu/~gbouw/) has twin missions: the promotion of the truth of geocentrism via the Association for Biblical Astronomy, and the conservative political agenda of the Constitution Party (a.k.a. the "Taxpayers Party," with its recurrent presidential candidate Howard Phillips). Toumey (1994, 128-130) described how disconcertingly open-minded members of the Bible Science Association were even in the mid-1980s to lectures by Bouw and other geocentrists. Eve

& Harrold (1991, 129-130) plot Biblical geocentrism on the extreme right wing of the creationist movement, which allows Bouw entrée into a congenial political milieu. Thus Paul Taylor (1995, 34-35, 53, 90-94, 97-99) draws on Bouw and Bowden, though not mentioning their geocentrism. Other YEC ideologues are not so impressed, such as “TJ” (at answersingenesis.org/home/area/magazines/tj/docs/TJv15n2Geocentrism.asp) who complained (with considerable unintended irony) that “Bouw fails to apply the same rigorous standards that he applies to the heliocentric theory to his own pet model,” as though YEC believers weren’t loaded with their own double standards. Of sociological interest is Bouw’s data processing background, shared with Scott Huse as well as Glenn Miller (whose apologias for Biblical inerrancy will be explored next chapter) and the BSA’s James Hanson. Though not all computer programmers skeptical of Darwinism settle wacky right of center, of course. Attending a lecture by anti-capitalist biologist Brian Goodwin (cf. note 106, chapter four), Jolly (1999, 228) remarked that, “I glowered in the background, while his audience of computer programmers cheered.”

⁴² Bowden’s website contends the latest accused culprit, Hinton, was supplied with fossils to doctor by Teilhard, “the darling of the Establishment and the New Age Movement,” who “must be protected at all costs.” A datum in support of the “Teilhard acceptance” hypothesis comes from Cremo & Thompson (1993, 501-525), who decided that poor old Woodward was responsible for the hoax, not Dawson. Perhaps their tendency to credit out of favor evidence for the great antiquity of man got the better of them, and they adopted the Woodward scenario precisely because he had been let off the hook by virtually every serious investigator. In any event, residing well outside the Christian venue, Cremo & Thompson would have no hermeneutic axe to grind against heretical Catholic evolutionary proponents like Teilhard.

⁴³ A digression for the scholarly minded on the deep undercurrent of anti-Catholicism running on the fringes of the Christian culture, which includes the tradition of the “Pope as Antichrist” covered by Boyer (1992, 273-275). One example is the intensely anti-Catholic Chick Publications (mentioned in note 242 of chapter three apropos the “Big Daddy?” antievolution pamphlet). The Chick website avers that he does not hate Catholics, only that he wants to rescue them from their spiritual waywardness. Chick calmly answered the question, “Didn’t Christianity consist of the Catholic Church for the first 1500 years?” with: “No. While the Catholic Church was seeking to control the world through religion, true Christians were running for their lives from the Catholic holocaust that ran for centuries.” Another section advised: “It is helpful to one’s understanding of Bible prophecy to understand that the Roman Catholic Church is the wicked woman described in Revelation 17, the Woman who rides the beast. This was understood by the great leaders of the Reformation, because they understood Rome’s past and her deeds.” Upbeat San Diego preacher David Jeremiah was similarly ever so pleasant (and almost apologetic) as he likewise equated the Catholic Church with the Whore of Babylon in a long series of radio lectures on *Revelation* (aired on the American Christian Network in May 1994). Catholicism is among the “cult” fact book topics listed in Ankerberg & Weldon (1998, 393)—along with the Jehovah’s Witnesses, Islam, the Masonic Lodge, and the Mormon Church. A similar emphasis may be found in the chapter on “Occultism and the Roman Catholic Church” in Hunt (1998, 407-431). Hunt (1998, 561-565) even pillories the popular “Promise Keepers” movement for its heretical flirtation with Catholic ecumenism. Compared to that, the opinion of Hunt (1998, 369) was a fast sprint: “we can state dogmatically that evolution is a fraud.” See Boyer (1992, 233-234, 269, 278-280, 326) on Hunt’s position in the End Times prophecy movement. Tactically, there is a distinct eschatological advantage to identifying the Antichrist with the institution of the Catholic Church rather than personifying it as an individual (as in the Hal Lindsey manner), since it allows much more leeway for the “soon” leading up to Christ’s return. That is the approach taken by the Adventist “Amazing Facts” seminars, a traveling apocalyptic road show I had occasion to observe in action in April 2000 (their website is at netry99.org). Along the way they affirm their traditional Adventist positions of a literal six-day creation and the reality of the global Flood.

⁴⁴ Gish (1995, 330) retains the same slim pair that Eve & Harrold (1991, 75-76) criticized per Gish’s 1985 version. A 1983 *Science News* blurb noted Tim White pointing out that anthropologist Noel Boaz had mistaken a dolphin’s rib for a human clavicle; Wendell Bird (1989, Vol. 1, 228) also

fielded this example. Like Phillip Johnson's selective use of Stephen Jay Gould, Gish (1995, 243, 247, 274-275) showed no propensity to agree with White on his specialty of australopithecine anatomy. The other example (cited by Gish from that venerable anthropological journal, the Moline, Illinois, *Daily Dispatch*) was a 1984 UPI bit on a juvenile donkey skull that overeager Spanish investigators had briefly dubbed "Orce Man."

⁴⁵ Gould (1991, 432-447). Roger Lewin (1987, 54-55), Ecker (1990, 145-146) and Eve & Harrold (1991, 75) provide short summaries of the Nebraska Man case.

⁴⁶ Creationist accounts of Nebraska Man are invariably paired with Piltdown: Gary Parker in Morris & Parker (1987, 155), Wendell Bird (1989, Vol. 1, 227), Johnson (1991, 5, 82), Gish (1978, 119-120; 1995, 327-328), Paul Taylor (1995, 36), Huse (1997, 134-135), Hanegraaff (1998, 49-50, 52-54), along with the Chick "Big Daddy?" pamphlet. Both made it into D. James Kennedy's "Evolution's Greatest Bloopers, Blunders and Hoaxes"—though not always without some distortion. Ecker (1990, 146): "According to televangelist D. James Kennedy, defense attorney Clarence Darrow not only confronted William Jennings Bryan on the witness stand with the Nebraska Man evidence, but brought in Henry Fairfield Osborn to testify (McIver 1987, 14). The fact is that according to the court record, not one mention of Nebraska Man was made by anyone during the course of the Dayton, Tennessee, trial (McIver 1988b, 2; Wolf and Mellett 1985, 39). Several scientists were in Dayton to testify in defense of evolution (though the judge did not allow them to do so), but Osborn was not among them. Osborn had already received the first specimens from the renewed Nebraska field work that would discredit his identification of the tooth. Little wonder that during the Scopes trial he stayed 'out of reach in New York' (Wolf and Mellett 1985, 39)." Ecker's Tom McIver citations were to articles in the *Creation/Evolution Newsletter* 7(4): 13-14 & *Creation/Evolution* 23: 1-13. Wolf & Mellett (1985, 39) noted Francis Hitching similarly mangled the particulars of the Scopes Trial.

⁴⁷ Dental characters play a prominent role in tracing mammal evolution because they have developed along trademark lines (cautionary episodes like Nebraska Man notwithstanding). For instance, Rich *et al.* (1996, 550) noted how the Late Cretaceous insectivores contained representatives with specialized dentition along with ones with a more generalized dental kit, from which the later placental mammals diverged. Much of the primate diagnostics reviewed in Lambert & The Diagram Group (1985, 158-159; 1987) similarly involve their skulls and teeth. One of the best known of the early primates is the North American lemur *Notharctus*, illustrated by Rich *et al.* (1996, 553), Lambert & The Diagram Group (1987, 54-55), and Strahler (1987, 476), and its dentition was tracked by Philip Gingerich's study (alluded to in note 204, chapter four). Simpson (1983, 162-163) highlighted this work, as did C. Loring Brace, "Humans in Time and Space," in Godfrey (1983, 246-247) and Strahler (1987, 477). The shifting molar shape (as distinctive as the grillwork on 1950s automobiles) traced an evolutionary pattern combining gradual and punctuated episodes. The precursor genus *Pelycodus* developed through several successive species, each with enlarging molar range, until the last split into a new genus, *Notharctus*. Like that radiolarian branching mentioned in note 199 of chapter four, one *Notharctus* species retained the large molar mode, while the other graded backwards. In *Creation Scientists Answer Their Critics*, Duane Gish first berated Brace's use of that analysis, then muddled the primitive Oligocene anthropoid *Aegyptopithecus zeuxis* Brace also mentioned as a possible ape ancestor. Brace in Godfrey (1983, 248): "when one looks at the patterns of cusp arrangement on the molar teeth, they are quite different from those of modern monkeys but absolutely indistinguishable from those of modern anthropoid apes—and human beings." This indication of an evolving characteristic was lost on Gish (1993, 349): "Something seems strange about this scenario. What is supposed to be one of the oldest fossil monkeys found is unquestionably a monkey with no fossil evidence to link it to its alleged prosimian ancestors, and yet what is supposed to be the most ancient monkey yet known already has traits that are supposed to indicate it was on its way to becoming an ape—and man." Gish's difficulty in appreciating the concept of mosaic evolution extended to minutia, as Brace had said nothing about *A. zeuxis* being the "most ancient monkey," only that it was "the best documented" fossil from that early period. Lambert & The Diagram Group (1985, 160) or Dunbar & Barrett (2000, 30) reflect the view that *Aegyptopithecus* was a possible ancestor of modern apes.

As Strahler (1987, 477-478) criticized Gish for glancing over early primate evidence such as Brace's discussion of *A. xeuixis*, the lack of comment in Gish (1995) is true to Gish's habit. Cf. the short shrift given *A. xeuixis* by Gary Parker in Morris & Parker (1987, 155).

⁴⁸ See Wolf & Mellett (1985, 36) on the tooth matter, and Zimmer (1998, 135-137) on Cuvier's paleontological technique. Not that Cuvier was infallible. Schwartz (1999, 61): "Cuvier also has the dubious distinction of being the first paleontologist to identify a primate in the fossil record, which he called *Adapis*. Although the word "*Adapis*" literally means "toward the bull" (*Apis* actually referring to the Egyptian bull god), Cuvier concluded in his description of the fossil that the species represented a type of extinct pachyderm. On both counts—the name and the interpretation—he erred. *Adapis* was a fossil primate whose evolutionary relationships lay with the lemurs of Madagascar." For how deductive reconstruction is applied to human fossils, see Lambert & The Diagram Group (1987, 226-229). Many an inept science fiction monster has been cobbled together in violation of these principles, such as the menacing lobster men with wholly inappropriate claws that turned up so often in Irwin Allen's *Voyage to the Bottom of the Sea* or *Lost in Space* in the 1960s. Reconstituting an animal from its preserved fragments depends on how diagnostic the features are, which is why some familiarity with the taxa is a prerequisite. An illustration of justifiable paleontological resuscitation concerns the largest known crocodile, the mid-Cretaceous *Deinosuchus*. The specimen is incomplete, a point noted by Norman (1985a, 177) but not in the more general Lambert & The Diagram Group (1985, 119). Judging by its gigantic skull, though, if the rest of the body was proportioned anything like a conventional crocodile, *Deinosuchus* was a monster 40-50 feet long, perfectly capable of munching down the average passing dinosaur. Cf. Sereno (2001) on the recent discovery of the mid-Cretaceous "SuperCroc" *Sarcosuchus*. Likewise, many fossil sharks are known primarily from their teeth (since their cartilaginous bodies don't fossilize easily). The basic shark layout means that the existence of mammoth prehistoric shark teeth suggests they were attached to a concomitantly large body (extinct Miocene predatory forms like *Carcharodon megalodon* running as big as sperm whales), Rich *et al.* (1996, 359-360) or Ellis (2001b, 127-130). In other cases, like the strange spiral tooth whorls of the Permian shark *Helicoprion*, reconstruction is a far more speculative enterprise, Ellis (2001a; 2001b, 118-120).

⁴⁹ Like Wallace, Haeckel and Dubois, Osborn favored an Asiatic origin for man, Schwartz (1999, 100-101), but Nebraska Man was also closely allied to the Piltdown phenomenon. Just as Elliot Smith was more impressed with Nebraska Man than most, Osborn (initially skeptical of Piltdown) had embraced those fossils after the corroborating Piltdown II finds turned up. Roger Lewin (1987, 55) also noted: "Racism of a peculiarly pure, intellectual form was a persistent theme of American and British anthropology of the time, and not surprisingly Osborn was a leading figure in the eugenics movement. Consequently Osborn, and to a lesser extent Keith, had a very arrogant view of the world, in which the evolution of man was a noble undertaking, certainly with no place for close relations with a tree-climbing ape. Keith later shifted his views, but Osborn never did." A final dash of irony: Osborn was one of the few paleontologists who had a chance (very briefly) to handle the "Dawn Man" specimens directly at the British Museum. Osborn died in 1935, however, and so was spared the further chagrin of the Piltdown exposure (or witness the far less congenial apotheosis of "scientific racism" undertaken in Europe by the Nazis).

⁵⁰ Eve & Harrold (1991, 76) observed of Gish's recent examples of scientific error (note 42 above) that he had not only consistently left out "clarifying details, but he also fails to appreciate the fact that these mistakes were all put right *not by creationists* but by evolutionist scientists." Phillip Johnson (1991 5-6) mentioned Osborn's support of Nebraska Man as a way of mitigating the impact of William Jennings Bryan's dumbfounding Dayton testimony. Like most other creationists, Johnson did not mention Osborn's grudging role in Nebraska Man's repudiation. Whereupon Gould (1992, 120) cited that in his critical review as illustrating "omissions that unjustly castigate a person or a claim," since Osborn had "properly tested his claim by mounting further collecting expeditions, discovering his error and correcting it—in other words, science working at its best." Johnson (1993b, 209) stuck to his guns, however, considering it more important that Osborn might have been made to look foolish at the hands of "clever and ruthless advocates like Darrow and

Mencken." Johnson (1997, 121) subsequently resumed his original apologetic orbit, declaring simply that "Osborn was a fervent supporter of the discredited Nebraska Man and Piltdown Man fossils as proofs of evolution," again *sans* Osborn's follow-up revision.

⁵¹ In his history of creationism, Ronald Numbers (1992, 58, 85) touched on two revealingly trivial examples. The 1922 book *God—or Gorilla* was "a sneering, indignant attack on human evolution by a muckraking Catholic journalist, Alfred Watterson McCann (1879-1932), who reveled in exposing Piltdown man as a hoax years before the scientific community conceded that it was." Incidentally, what McCann (1922, 6-11) considered fraudulent about Piltdown were the varying reconstructions, such as Keith's (cf. notes 35-36 above and 63 below). Numbers' other example was George McCready Price, who deferred to anthropological authority by accepting the existence of Piltdown as easily as Neanderthal. Price regarded Neanderthals as "degenerate" forms of man (along with Negroes, Mongolians, and perhaps *apes*) which appeared after the dispersal of humanity following the confusion of tongues at Babel, putting his sensibilities well back into the 18th century (re note 5 above). Larson (1997, 31-32, 272n) remarked that William Bell Riley (founder of the World's Christian Fundamentals Association), Scopes trial consultant John Roach Straton, and antievolutionist Harry Rimmer also expressed doubts about Piltdown. Though how much of this was due to a general creationist reluctance to believe in any fossil evidence (as opposed to opinions solidly grounded on forensic analysis) was unclear—McCann, for example, was a dietary activist, not a professional scientist. See Kossy (2001, 166-168) for more on McCann's niche in questionable anthropology.

⁵² Which puts a tart backspin to Duane Gish's smug characterization: "An ape's jaw in 1912, a pig's tooth in 1922, a dolphin's rib and donkey's skull in the 1980s—the script is the same, only the actors and props have changed. Perhaps Lord Zuckerman was right when he declared that it is doubtful whether there is any science at all in the search for man's fossil ancestry," Gish (1995, 330). Indeed, had Gish wanted to apply his loose standard rigorously, he could have sunk his own reliance on Chatterjee's *Protoavis* from the same volume. An interesting juxtaposition can be made regarding Gish's selective use of clavicles (re note 44 above). Gish remarked on the *Science News* piece: "Alan Walker is quoted in this same article as stating that there is a long tradition of misinterpreting various bones as hominoid clavicles; in the past, Walker says, skilled anthropologists have erroneously described the femur of an alligator and the toe of a three-toed horse as clavicles!" What this should have signified is how careful paleontologists have come to be with the data—and that, ultimately, it is that data that matters. Clavicles also proved to be a problem for Richard Milton, in a 1995 article ("Battling the Suppression of New Ideas") slated for the British weekly *Times Higher Education Supplement*, but supposedly spiked after a campaign by Richard Dawkins. I encountered Milton's squib at (of all places) lauralee.com, the home page for the syndicated radio Laura Lee Show (more on that in note 400 below). Milton tripped over clavicles while discounting the theropod origins of *Archaeopteryx*: "the candidate most favoured by neo-Darwinists is a small agile dinosaur called a Coelosaur [*sic*], and this is the explanation offered by most text books and museums." However, "such a descent is impossible because coelosaurus [*sic*], in common with most other dinosaurs, did not possess collar bones while 'Archaeopteryx', like all birds, has a modified collar bone to support its pectoral muscles." Milton referenced once more his trusty copy of David Norman's dinosaur encyclopedia, though without page number. Which may have been prudent, since Norman (1985a, 193) had explicitly stated: "The major problem of the lack of a 'collar-bone' or clavicle in theropods was shown not to be a problem at all, because several theropods did in fact possess clavicles (see page 47)." As with hominoid clavicles, those of theropods could easily be confused for ribs or gastralia (and vice versa), but more examples of them had turned up properly *in situ* by the mid-1990s when Milton was still relying on a source ten years out of date. See Kevin Padian, "Pectoral Girdle," in Currie & Padian (1997, 532-534) for a survey of dinosaur clavicles, Norell *et al.* (1997) on the discovery of a *Velociraptor* wishbone, and Webster (2000, 28) on the first tyrannosaur furcula (from the spectacular "Sue" specimen). And, just to pick one more nit: the proper term was *Coelurosaur*, not "Coelosaur"—as again Norman's text had made plain.

⁵³ Another object lesson on the interplay of evolutionary theory cropped up when the editors of *National Geographic* had to wipe egg off their face after featuring a suspicious bird-theropod intermediate (*Archaeoraptor liaoningensis*) among the latest fossil finds reported in their November 1999 issue (re note 157, chapter two). The acceleration of information dispersal in the PC-era meant the life cycle for this particular gaff played out in just under a year. The dirty “bird” had emerged from the flurry of activity (amateur and professional) attending the splendid font of deposits becoming available in China, vividly described by Stokstad (2001b). The trip wire was pulled by Smithsonian ornithologist Storrs Olson, who noticed that the fossil appeared to be pasted together from at least two specimens of early toothed birds and dromeosaurid theropods (neither one of which had feathers preserved). The flap was widely covered in all media, making the *ABC Evening News* and that week’s *Discovery News* on the cable Discovery Channel, as well as scientific press such as Dalton (2000a-c). The Chinese paleontologist involved, Xu Xing, agreed in a March 2000 letter to *National Geographic* that the fossil appeared to contain more than the one critter, and the magazine commissioned a thorough (and telling) independent autopsy, Lewis Simons (2000). The bird part is of paleontological interest, Zhou *et al.* (2002), but the dromeosaurid tail segment even more so: from a *Microraptor*, Stokstad (2000c) and bbc.co.uk/1/hi/sci/tech/1248079.stm, plus notes 126 & 161 (chapter two). The reason why evolutionist Olson caught the slip so quickly reinforces the primary role of *theoretical* insight in motivating scientific caution: Olson remains steadfastly unconvinced of the dinosaur origin for birds, and so was especially skeptical of the latest poster fossils. But what was clear from the Simons survey was how the scientific participants (including Phillip Currie) had failed to correlate their various doubts, even after both *Nature* and *Science* raised red flags by rejecting preliminary papers on the find. There was a financial incentive as their co-author Stephen Czerkas hoped to make the fossil a centerpiece attraction at his dinosaur museum, far off the beaten track in Blanding, Utah. All of which lent considerable irony to Czerkas having been enthusiastically quoted in Sloan (1999) how *Archaeoraptor* was a perfect intermediate between birds and dinosaurs—as we saw back in chapter two (re note 138), a decade ago Czerkas was on the other side of the fence, favoring Chatterjee’s *Protoavis*. As ever, the world of mortal ken is replete with potholes! Given the embarrassing aspects of this story I fully expected creationists to pounce on the “Piltown bird” ... which they have. March 2000 saw Steven Austin weighing in for the ICR (IMPACT No. 321) and Nancy Pearcey did likewise in *Human Events* (March 10, 2000). Jonathan Wells (2000a, 123-126) included it in his critique of evolutionary icons. Austin and Pearcey’s pieces were quite ironic, for they illustrated how little they grasped the lessons of the *Archaeoraptor* episode (failure to do the proper homework first) by playing “jump the gun” newspaper paleontology over a *USA Today* interview (February 1, 2000) with Chinese paleontologist Zhonghe Zhou, inaccurately casting doubt on a recent pterosaur fossil discussed by Ji *et al.* (1999). See paleo-electronica.org/2000_2/editor/padian.htm for Kevin Padian’s commentary. Along the apologetic daisy chain, the “Twin Cities Creation Science Association” (tccsa.freesevers.com) picked up on Pearcey’s contribution, joining a dated piece by Ian Taylor defending the *Archaeopteryx* hoax theory (re note 118, chapter two).

⁵⁴ If anyone deserves the dubious honor of godfather to the Nazi’s “applied biology” of racial extermination, it would be the Darwinist gadfly Ernst Haeckel, who welded Virchow’s polygenism to a mythic Aryan stock whose superiority needed eugenic pruning to keep things that way, James Burke (1985, 261-266), George Stein (1988), Trinkaus & Shipman (1993, 210-211) and Burke & Ornstein (1995, 243-245). (Incidentally, have you noticed how rarely racists attribute superiority to groups to which they do not personally belong?) Haeckel’s views filtered through early 20th century anthropology via Arthur Keith, his Harvard follower Earnest Hooten (1887-1954) and Hooten’s rowdy “Indiana Jones” student, Carleton Coon (1904-1981). Wolpoff & Caspari (1997, 134-172) track the influence of works like Hooten (1931)—though cf. Kossy (2001, 142-143) on Hooten’s parallel disillusionment with eugenics. David Hurst Thomas (1999, 106-111) noted how Aleš Hrdlicka of the Smithsonian and Hooten were “working squarely within the tradition of Morton and Agassiz” in their reliance on skull classification in their promotion of racial determinism. Although once acidly describing God as a “gaseous vertebrate,” Haeckel eventually

professed a vague “God is everywhere” deism (as in an 1892 piece available online at fordham.edu/halsall/mod/1892haeckel.html). None of this “faith” stalled Haeckel’s enthusiastic “scientific” extrapolation of Darwinian selection to the sort of overt eugenic cleansing of the “unfit” that Hitler would later put into horrific practice. Some opprobrium here can legitimately be traced back to Darwin himself, though, particularly in *The Descent of Man* when he remarked breezily on a host of social and moral issues with the same comprehensiveness that he applied to barnacles and pigeons. Chapter V described how civilized sympathy of workhouses, hospitals and asylums allowed the poor, sickly and imbecilic to survive—but also how warfare and inherited wealth skewed the natural distribution of human talent, Darwin (1871, 501-503) and the analysis by Landau (1991, 57-59). Desmond & Moore (1991, 627-628) noted how Darwin’s Malthusian views led him to oppose contraception, so as not to interfere with natural variation. Whether the conservative Darwin (who died in 1882) would have supported the liberal 20th century welfare state is unclear. The younger Haeckel lived on to 1919, however, and his more explicit rantings lie too close to the root of the NSDAP to let him off the hook so easily (ideas do have consequences, remember). A personal aside: as a classical music lover, I experience a similar spectrum of ill ease when it comes to appreciating the works of 19th century anti-Semites like Wagner in Germany and Vincent D’Indy in France, or Frederick Delius in 20th century Britain. One doesn’t have to strain to get over how the Nazis fawned over the 19th century Wagnerian symphonist Anton Bruckner (a gentle rustic who, as far as anyone can tell, wouldn’t have hurt a fly). But the cosmopolitan Richard Strauss (whom a card-playing buddy once matter-of-factly described as “a pig”) managed to accommodate himself all too easily to the vitrified artistic life of the Third Reich.

⁵⁵ Eldredge & Tattersall (1982, 86-117) provide an especially clear survey of the African discoveries, starting with Robert Broom’s early fragmentary australopithecine finds at Sterkfontein in the 1930s. See also Tattersall (1995a, 71-88, 100-117, 127-158, 171-212) for a full account that traces the field into the 1990s. The African origin of man was accepted at a 1947 anthropological conference. The Leakey family (Louis and his wife Mary, their son Richard, and Richard’s second wife Meave) rose to prominence as active paleoanthropologists, first at Olduvai Gorge in the 1950s, adding Omo and East Turkana in the 1960s, and Laetoli in the 1970s. Berger & Hilton-Barber (2000, 11-112-, 120-121) comment on their family tragedies and division over apartheid. Newer figures include Tim White and Donald Johanson, the latter concentrating on the Hadar site (recall how intruding on one another’s turf can raise hackles, as the Leakey-Johanson feud alluded to in note 67, chapter two). *Past Worlds* (1988, 54-57) or McKie (2000, 63, 77) have good maps of the main African fossil sites. An australopithecine 3.0-3.5 mya has been discovered outside the South Africa/Rift Valley arc, 2500 miles northwest in Chad, Brunet *et al.* (1995). How this will fit overall into australopithecine biogeography remains to be seen, as indicated in the preliminary work of Strait & Wood (1999).

⁵⁶ Eldredge & Tattersall (1982, 129-131), Stahl (1985, 540-543), the chart in Colbert & Morales (1991, 422-423), Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 221-224), Tudge (1996, 171-173, 199-200), Zimmer (1999) on Ward *et al.* (1999), and Dunbar & Barrett (2000, 27) chronicle the scarcity of sites. Elwyn Simons (1993) describes a prominent Egyptian deposit that covers some of the later phase of early primate evolution; their diversity is broad enough by 36 mya that Simons suspects they stretch back a further 5-10 my (cf. the 2003 finds cited in note 165, chapter three). The early Miocene is better represented, showing taxa such as *Kamoyapithecus* (27-24 mya) and *Proconsul* (24-20 mya). An especially prized later formation is Ethiopia’s “Middle Awash” at the Red Sea/Gulf of Aden junction, which Kalb (1984) correlates with the stratigraphy of other African sites. Stretching back over the last 10 million years, the Middle Awash is notable for covering the critical 6-3.75 mya Late Miocene/Early Pliocene transition. Colin Groves, “Our Earliest Ancestors,” in Burenhult & Thomas (1993, 42-43) broadly charts the available fossils and the proposed cladograms based on the anatomical and molecular data. Dunbar & Barrett (2000, 29-31) note the biogeographical aspect of the early distribution of Old and New World monkeys (whether islands existed in the 310-mile stretch then separating Africa from South America). Roger Lewin (1988, 30-49), Jordan (1999, 132-135), Tavaré *et al.* (2002), and Sargis (2002) on Bloch & Boyer (2002) reflect developing views on primate origins,

and Moffat (2002) reports on a recent primate origins conference. Discussions in the creationism context occur in Futuyma (1982, 106-107), C. Loring Brace, "Humans in Time and Space," in Godfrey (1983, 246-249), and Berra (1990, 88-93). The "map of time" aspect was reflected by Brace in Godfrey (1983, 270): "We still do not have a picture of how a quadruped was transformed into a biped. That would require the discovery of fossil material in the time span between 4 and 8 million years ago, a gap that is still unfilled." Recently the 6-7 mya Toumaï hominid from Chad has stirred up the data set, Bernard Wood (2002) re Brunet *et al.* (2002) and Vignaud *et al.* (2002), and Wong (2002). On the rarity of fossil apes of all types starting about 8 mya, Johanson & Edey (1981, 363) pointed out that "tropical forests do not preserve them. The soil is too acid. Bones are eaten away by that acid and by bacteria before they can begin to undergo the slow process of fossilization." See also John Bower, "The Origin and Evolution of Humankind," in Wilson (1983, 119) and Peter Andrews & Stringer, "The Primates Progress," in Gould (1993, 221). Tattersall (1995a, 242) reminded that "the act of excavation destroys the record even as it exposes it, and meticulous documentation of what had been removed is a relatively new development in archaeology. Some of the most significant sites were dug during an era when archaeology was extremely low on its learning curve, and most of the information they contained is irretrievably lost. It's tragic, if inevitable, that at a time when archaeologists are finally beginning to understand how to deal with all the myriad complexities of their subject, many of the most important sites have been lost forever." Political instability hasn't helped either (e.g. Ethiopia, where work only resumed in the early 1990s). Add such unforeseen complications as hyenas filching bone fragments curing overnight after being coated for preservation because they love the smell of the hardening agent used in the resins, Gee (1999, 13). See Berger & Hilton-Barber (2000, 122-134) on the many factors complicating hominid fossil forensics, taphonomy and dating.

⁵⁷ Examples run from the glancing references in Henry Morris (1985, 172), Sunderland (1988, 97) and Wendell Bird (1989, Vol. 1, 225-226) to the more extensive shell game of Gish (1978, 96-100; 1995, 209-219). More peripherally, a chart in Hitching (1978, 34) indicated a "Gap in the Fossil Record" of human evolution 5.5 to around 9 mya without venturing any details about why that gap existed. Denton (1985, 116) obliquely cited primatologist John Buettner-Janusch (misspelled as "Beuttner Janusch") on the absence of early bipedal hominids. Beside its Bermuda Triangle Defense aspect, Buettner-Janusch's comment dated from 1963, an oddly ancient source for Denton to use in the mid-1980s. Incidentally, Buettner-Janusch (1965, 173-178) also represented the unproductive "single species" approach to hominid evolution (an issue explored further below). Had Denton deigned to illustrate the available fossil material as Denton (1985, 183) had horses, it would have been entertaining to have seen his explanation why these taxa didn't connect as readily as *Hyracotherium* with *Equus*. Parenthetically, Michael Brown (1990, 54) recounted how nasty a character Buettner-Janusch turned out to be: convicted in 1980 of drug manufacturing in his NYU lab, he got another sentence later for sending poisoned valentine candy in revenge to the home of the presiding judge!

⁵⁸ See Cartmill *et al.* (1986, 413-414), Johanson & Edgar (1996, 33) or Tudge (1996, 183-185) for short accounts of the *Ramapithecus* story, Tattersall (1995a, 119-126), Roger Lewin (1987, 85-127; 1988, 44-49), or Edey & Johanson (1989, 354-365) for more detail, and Chaimanee *et al.* (2003) on recent fossil evidence pertaining to orangutan origins. The accounts in Leakey & Lewin (1977, 66-74; 1992, 76-80) reflect what a difference fifteen years can make in anthropological circles. Anachronistic paleontological references to *Ramapithecus* would be Lambert & The Diagram Group (1985, 160), which listed it as "possibly an early hominid," but Lambert & The Diagram Group (1987, 78-79) had revised its status. Dixon (1990, 16-17) is a more problematic instance, where *Ramapithecus* was still plotted as "ancestor of apes and humans." True, Dixon's example occurred a bit off to one side, in a survey of anthropological opinion that prefaced one of his entertaining paleontological speculations: *Man after Man*, which sketched out an intensely dystopian evolutionary future for humanity after an inopportune geomagnetic reversal trips up our fragile and polluted technology. By way of background, Dixon's vision of the collapse of middle class civilized veneer represents an especially common theme in British science fiction, starting with H. G. Wells and continuing through most episodes of the delightfully cheesy *Dr. Who* serial.

Conway Morris (1998, 200-205) shared this Brit pessimism when he drew on Dixon's book as an allegory to criticize Stephen Jay Gould on the contingent character of evolution. Cf. Wade (2001, 5-6, 133-134). Apart from stubborn *Star Trek* optimism (where reasoned peacemaking with even the most belligerent aliens is a recurring motif), the "Borg" exception embodies the flip side of American science fiction anxiety: the loss of individuality or free will. Examples run from Heinlein's 1951 novel *The Puppet Masters*, to *Invasion of the Body Snatchers* or *The Matrix* on film. Most ironically, the one American literary form where British social anxiety thrives is the premillennialist novelization of the post-Rapture Tribulation, such as sampled by Boyer (1992, 258-260).

⁵⁹ Tattersall (1995a, 126). Creationist accounts of the *Ramapithecus* tale include the dated Henry Morris (1985, 172-173), which drew on a 1972 treatment rather than the repudiation of *Ramapithecus* that had already taken place in anthropological circles. The accounts by Hayward (1985, 50-51), Gary Parker in Morris & Parker (1987, 155), Gish (1993, 349-350; 1995, 226-233), Davis & Kenyon (1993, 108) and Paul Taylor (1995, 33, 90) were more current. Strahler (1987, 478-479) commented on the anthropological context of the "ramamorphs" and the creationist glee in reporting on the demotion of *Ramapithecus*.

⁶⁰ Davis & Kenyon (1993, 108), applicable to the chart on p. 109.

⁶¹ Davis & Kenyon (1993, 108), referring to the chart on p. 110.

⁶² Roger Lewin (1987, 32-33). See Landau (1991, 6) for a concise graphic representation of the varied theories of Darwin, Gregory, Osborn, Wood Jones, Keith and Elliot Smith—and Landau (1991, 67-142) for a more in-depth examination of the latter two. Stanley (1996, 5-7, 10) remarks that Darwin got it right when it came to thinking that upright posture probably predated human intelligence, but missed matters in believing humans evolved from a knuckle-walking quadruped. There was also a tendency for these early anthropologists to single out "important" factors to the exclusion of others that might actually afford just as valuable clues to human origins. As Cartmill *et al.* (1986, 410) dryly commented: "we have far more to say about our relative brain size (which in fact overlaps with brain sizes among cetaceans) than about the cascade of scalp hair perpetually falling into most people's eyes—a bizarre trait with no parallels among wild animals." Of course, tracing the growth of scalp hair growth is impossible for fossil specimens (though the genetics and developmental dynamics of it could be traced from extant primates). On this puzzle, Jolly (1999, 97) suspects "that we segued from primate mutual grooming and parasite-picking straight on to a sexually selected advantage of showing off that we had the manual skill to do our hair, and that we had friends who would help with the bits around the back." Something else to keep in mind is that anthropologists labored under a much more constrained time scale prior to the advent of radioactive dating. A 1931 primate family tree proposed by Keith covered all of 2.1 million years (from the Eocene on), with human evolution presumed to have commenced in the Miocene (900,000 years ago). Contemporary dating now pegs the start of the Eocene at around 53 mya, with the Miocene about 23 mya, with hominid evolution proper spread over the last 5 million years. Keith's view is illustrated in Johanson & Edey (1981, 95) as well as Edey & Johanson (1989, 337-338, 345, 353), which went into more detail on how subsequent phylogenies have incorporated new finds and chronology.

⁶³ Iain Davidson & William Noble, "When Did Language Begin?" in Burenhult & Thomas (1993, 52) compared endocasts for chimpanzees, various australopithecines and *Homo*. The existence of the Taung Child provided a useful juvenile benchmark for cranial growth, allowing Stanley (1996, 155) to chart the brain development of the adult australopithecines against the modern great apes and man. Jolly (1999, 175) remarked how bonobos are "unnervingly close to the body shape of Lucy" (*A. afarensis*, from roughly 3 mya). Savage-Rumbaugh & Lewin (1994, 98-100) and Frans de Waal, "Apes from Venus: Bonobos and Human Social Evolution," in de Waal (2001a, 41-68) also draw limited comparisons between the bonobos and early hominids. Full skeletal comparisons of the major australopithecines (*afarensis*, *africanus*, and *robustus*) against *H. erectus* and *sapiens* may be found variously in Johanson & Edey (1981, 182-183), Mithen (1996, 205), Gore (1997b, 92), Wolpoff & Caspari (1997, 16) and Berger & Hilton-Barber (2000, 203). Swisher *et al.* (2000, 170-171) noted the circumstantial evidence suggesting *erectus* brain growth was on a human scale

(tripling after birth). The anatomy of *Homo erectus* is sufficiently human that the “multiregional” model favored by Wolpoff & Caspari (1997, 250-256) regards *H. erectus* and *H. sapiens* as the same species, grading imperceptibly into one another (cf. note 193, chapter two). Moving from the skeleton to their overall appearance, Johanson & Edey (1981, 354-357, 377-382) trace the steps scientific illustrator Jay Matternes followed in reconstructing *A. afarensis*, which may be compared with that of sculptor John Gurche based on newer skull material, Roger Lewin (1988, 67-67) or Johanson (1996, 107-109). See also Tattersall (1992) on how the American Museum of Natural History displays were developed. For those with access to the map insertions in *National Geographic*, the February 1997 issue vividly pictured to scale the various presently known members of the hominid family tree ... and, for comparison, the equally evocative male and female hominid illustrations Mauricio Anton provided for Tudge (2000, 502-511). Confusing the medium with the message, antievolutionists from ID Wells (2000a, 219-220) to YEC Paul Taylor (1995, 38) and Henry Johnson (omniology.com/NeanderRecons.html) disparage hominid reconstructions that happen to disagree on details—paying more attention to the art than to the forensic reasoning and evidence on which that art is based.

⁶⁴ McGowan (1984, 171-175)—though tempered (per note 24 above) by Beynon & Dean (1988), Martin (1990, 249-253), and Jacopo Moggi-Cecchi, “Patterns of Dental Development of *Australopithecus africanus*, with Some Inferences on Their Evolution with the Origin of the Genus *Homo*,” in Tobias *et al.* (2001, 125-133). Gould (1980, 127) noted the apelike layout of the *A. afarensis* palate justified its exclusion from the *Homo* genus; cf. illustrations in Leakey & Lewin (1992, 106) and Tattersall & Schwartz (2000, 86-87). Creationists understandably try to turn the dental particulars of hominids into cavities, such as Gish (1978, 103) selectively citing information on the teeth of an extinct species of gelada baboon, which had relatively small incisors and canines in a somewhat shorter, deeper face (at least relative to baboons in general). This isn’t true of the one living species of gelada, though, which is smaller than the earlier forms and possesses quite long canines. But even apropos the material Gish was addressing, the particulars didn’t help his case. McGowan (1984, 177) pointed out that in “all other dental features the gelada baboon compares with non-hominids: the cheek teeth and canines on the left and right sides lie in a straight row, and these rows lie essentially parallel to one another; the distances between the canines and the last molars are approximately the same; the canines are long and project beyond the level of the cheek teeth, especially in males; the canines are pointed; and there is a diastema between the canine and the incisor teeth. The suggestion that the gelada baboon possesses dental features that undermine the hominid status for australopithecines is therefore unfounded.” Strahler (1987, 483-483) indicated how Gish must have agreed with McGowan’s assessment, since the creation scientist removed the gelada claim from the 1985 version (*Evolution: The Challenge of the Fossil Record*). Nor has it resurfaced in Gish (1995, 234-235), which has fallen back on the even more tenuous argument that the large molars and premolars of the robust australopithecines somehow pose an evolutionary problem (cf. note 128 below). Meanwhile, the present edition of Henry Morris (1985, 173-174) retains the gelada tooth claim (though without reference). Interestingly, the extinct geladas (which at 65 kg were about the size of a female gorilla) figure in the hominid evolution story in another way: around 600,000 years ago, the Bodo *Homo heidelbergensis* were apparently using their Acheulean-format stone tools to slaughter them for meat, Kalb (1984, 173-175). See notes 143 & 150 below for more on the Bodo cranium and Acheulean tool technology, and Dunbar & Barrett (2000, 14, 19-20, 34, 116-117, 171) for the lifestyle of the gelada baboon.

⁶⁵ Tattersall (1995a, 142) on the importance of Lucy (*A. afarensis*): “Up to 1974, the earliest reasonably complete hominid skeletons known were those of Neanderthals, close relatives of *Homo sapiens* and under 100,000 years old. As documentation of earlier stages in human evolution, only isolated bones were available. The only pre-Neanderthal hominid specimen that came even remotely close to Lucy in completeness was Broom’s *Australopithecus africanus* pelvis from Sterkfontein, with its associated partial femur and some vertebrae.” Lucy’s skeleton is 40% complete, missing the feet and parts of the skull, Roger Lewin (1988, 56-57) or McKie (2000, 30)—so by interpolating the missing arm and leg bones most of the skeleton can be reconstructed. See Johanson & Edgar (1996, 124-125, 136-137) on Lucy and the 1947 Sterkfontein finds (about

2.5 myr old); Strahler (1987, 481) illustrated the Sterkfontein pelvis, along with a chimpanzee and a modern Australian bushman. Stanley (1996, 44) summed up: “Whereas the hind limbs of an ape are normally almost straight when extended, Lucy was slightly knock-kneed, like a typical modern human.” Incidentally, since the pelvis was shaped somewhat differently than human or putative Neanderthal females, it is possible that “Lucy” might not be a female, though this isn’t deemed especially likely. Cf. Gore (1997a, 80-81, 89), Dunbar & Barrett (2000, 212-213), Jolly (1999, 357-358) and McKie (2000, 88) on the birth canal debate, with various illustrations of the pelvic birthing clearance for chimps, Lucy, and humans. Stanley (1996, 159): “Lucy could give birth to a baby only about the size of a newborn chimp—one much smaller than a human baby—and the head of a baby even this size would have had to emerge at an oblique angle.” Owen Lovejoy of Kent State University has suggested that with no need to accommodate a wider birth canal Lucy’s flaring pelvis may actually have been *more efficient* for bipedal balance than later hominids (including us), Tattersall (1995a, 154-155); cf. Lovejoy *et al.* (1999) on the developmental aspects of pelvic evolution. Rosenberg & Trevathan (2001) describe the profound cultural effects brought on by the shift from primate to human birthing patterns. Further anatomical information will come from the virtually complete skeleton of the “Little Foot” australopithecine (Stw 573) found in 1997 in South Africa, Berger & Hilton-Barber (2000, 248-257), and which may date to 4 mya, Gibbons (2003b) re Partridge *et al.* (2003). See also notes 376 & 381 below.

⁶⁶ Stanley (1996, 41-47, 75-85) relates australopithecine climbing to the predatory threats they faced in Africa. See also Leakey & Lewin (1992, 90-91, 193-196) on the anatomical specializations suggesting australopithecines were not good at active running, with Tattersall (1995a, 154-157; 2002a, 85-91), Johanson & Edgar (1996, 86-89) and Berger & Hilton-Barber (2000, 164-211) for further views. The long australopithecine arm puzzled analysts like Owen Lovejoy back in the 1970s, Johanson & Edey (1981, 348-349), and the australopithecine foot has sparked a similar debate between Lovejoy’s fully terrestrial view and the arboreal focus of Randall Susman (cf. notes 372 & 376 below). The Discovery Channel book, Palmer (1999, 151) favors a climbing australopithecine. Tudge (1996, 169) recently noted an unsung hero in this saga: how developments in some primate shoulders allowed a rotational range that freed up the front limbs for such specializations as brachiation (swinging from limb to limb) among the forest apes ... or tennis and needlepoint for our own terrestrial lineage. “Only the boneless trunk of an elephant or the tentacle of an octopus or the multiboned neck of an ostrich has such universal mobility.” More on elephant trunks in due course.

⁶⁷ Heavier forestation prevailed around 4.5 mya when the earliest of the known australopithecines lived (since ascribed to its own genus, *Ardipithecus ramidus*), WoldeGabriel *et al.* (1994) on White *et al.* (1994), and Gee (2001) on WoldeGabriel *et al.* (2001) and Haile-Selassie (2001). See also Richard W. Wrangham, “Out of the *Pan*, Into the Fire: How Our Ancestors’ Evolution Depended on What They Ate,” in de Waal (2001a, 126-127). Schwartz (1999, 14-18) and Tattersall & Schwartz (2000, 94-98) describe the initial *ramidus* find; Herbert Thomas (1994, 144-145) reprints a useful *New Scientist* piece (October 1, 1994) evaluating the several opinions on how *ramidus* fits into the early australopithecine picture. *A. ramidus* was morphologically close to both chimps and the later australopithecines, as noted by Wood (1994) or Tudge (1996, 185-186). Wood (1994, 281): “Most significant discoveries of hominid fossils are usually, but not always justifiably, announced with the implication that they will necessitate a radical reappraisal of hypothesis of human evolutionary history. It is a sign of the growing maturity of palaeoanthropological research that, important as the discovery of *A. ramidus* is, the presence of a hominid much like it had been predicted.” Next of the chronological blips on the hominid scope would be the primitive *Australopithecus amanensis*, which dates from slightly younger (4.1 mya), Leakey *et al.* (1995). Johnson & Edgar (1996, 117-117, 122-123) illustrate both forms. A track of progress in reviewing these new finds may be found in Meave Leakey (1995), Tudge (1996, 100-109), John Noble Wilford, “New Fossils Take Science Close to the Dawn of Humans,” “New Fossils Reveal the First of Man’s Walking Ancestors,” & “The Transforming Leap from Four Legs to Two,” in Wade (1998a, 182-186, 191-203), Tattersall & Schwartz (2000, 96-97), Gibbons (2002) and Begun (2004) re Haile-Selassie *et al.* (2004).

⁶⁸ Stahl (1985, 542-543); cf. Ingram (1998, 110) and Paul Ehrlich (2000, 358n). Lambert & The Diagram Group (1985, 158-161; 1987, 66-79) illustrate *Oreopithecus* and survey the Catarrhini suborder (consisting of the Old World monkeys, apes, and man). Incidentally, Stahl's account was evidently unrevised from the 1960s edition, since it did not reflect recent paleontology re-dating *Oreopithecus* to the late Miocene (9-7 mya). Recent work affirms that genus' bipedality, Köhler & Moyà-Solà (1997) and Rook *et al.* (1999). Interestingly, Richard W. Wrangham, "Out of the *Pan*, Into the Fire: How Our Ancestors' Evolution Depended on What They Ate," in de Waal (2001a, 131) noted *Oreopithecus* appears to have fielded its bipedality in a relatively predator-free island habitat, suggesting "the australopiths were able to become bipedal only because they found a way to lower the risk of predation. In addition to escaping into trees, therefore, they are apt to have had other forms of defense, such as stabbing weapons, thrown rocks, swung thorn-branches, or cooperative attack."

⁶⁹ Tattersall (1995a, 235-236). Cf. Budiansky (1998, 105-122) and Jolly (1999, 200-206) on mental maps in primates and other species. Pinker (1997a, 192) noted why ground-hugging mammals don't easily slide into the "cognitive niche" our ancestors did: "Here is an exaggerated way of stating the difference. Rather than living in a three-dimensional coordinate space hung with movable objects, standard mammals live in a two-dimensional flatland which they explore through a zero-dimensional peephole." Bipedality also freed up our respiratory pattern from the "one stride per breath" rule that constrains functional quadrupeds like chimpanzees, Provine (2000, 75-76). And the primates' limited sense of smell may have played a contingent role, with hominids developing an acoustic way of sharing range information, Harry J. Jerison, "Adaptation and Preadaptation in Hominid Evolution," in Tobias *et al.* (2001, 373-378).

⁷⁰ Jolly (1999, 2) deftly summed up: "We who inherit Lucy's legacy now have babies so helpless that they cannot even form their brains unless we tend them in a bath of language, culture, and love." Some of the relevant wiring commences during gestation, of course, such as the cortical convolutions toward the seventh month, Greenfield (1996, 70-73; 1997, 97, 102). A few parameters here, as described by Calvin (1994, 102) and quoted by Budiansky (1998, 8-9), and illustrated by Greenfield (1996, 19): the mammalian neocortex is a thin sheet of cells wrapped around the brain that figures prominently in processing sensory information and controlling limb movements. It occupies 30% of a hedgehog's brain volume, 70% in monkeys, 75% for a chimpanzee, and 80% in our case. But gross volume belies the wrinkling that greatly increases functional area. If flattened out, a rat's neocortex could rest on a postage stamp, while a monkey's would need a postcard. You'd need a sheet of typing paper for a chimpanzee ... and *four* sheets for a human. Thus our neocortex is roughly four times that of a chimpanzee's. For further reference, the full human cortex is a layer "about two millimeters thick and has a total surface area of about 1.5 meters, approximately that of a desk," Fischbach (1992, 51).

⁷¹ Stanley (1996, 12-13, 41-51). Tudge (1996, 189-193) is similar. Tattersall (1995a, 233, 235) remarked on the "good circumstantial" evidence for linking bipedality to climatic shifts, while cautioning that the African forest environment did not immediately switch *en bloc* to savannas (though that contingency would be consistent with Stanley's argument, since the larger hominid brain didn't involve the earlier australopithecines). See Haines (2001, 142-182) for scenic reconstructions of the Australopithecines and their habitat. McKee (2000, 82-86, 202-209) is also wary of taking the climate-driven model as a catch all explanation, favoring a more nonlinear "autocatalytic" view where many factors interact chaotically. Stanley was particularly influenced by Elisabeth Vrba's "Turnover Pulse Hypothesis" that suggested similar bottlenecks occurred among other fauna 2.8-2.5 mya (and thus roughly contemporary to the australopithecine-*Homo* shift). More recent studies surveyed by Prothero (1999) have tended to undermine Vrba's model; e.g. Behrensmeyer *et al.* (1997) indicating a slower replacement of mammal species from 2.5-1.8 mya. As for outlining the possible defining factors in human evolution, Tattersall (1995a, 115) wryly observed that "Keith had fancied the large brain; Leakey was for toolmaking; today's Rubicon, as my colleague Mike Rose points out, is bipedalism." But the process of human evolution was most probably both contingent and synergistic, as the many factors surveyed by Paul Ehrlich (2000, 84-87) or Swisher *et al.* (2000, 146-153) indicate (see also note 148 below). One effect of bipedalism

is that it might lend a thermoregulatory advantage compared to a horizontal stance, raising the question of whether the network of veins in the australopithecine head facilitated a radiator effect for the cooling of a larger brain, Mithen (1996, 203-204). To add further spice, a “forest-edge or savanna habitat” encourages in primates a “fission-fusion” social structure of shifting group alliances (including internecine violence), which may in turn be related to the development of human sexuality as a prolonged and highly socialized human activity, as explored by Jolly (1999, 193-195). On this front, Johanson (1996, 112) noted apropos the smaller canine crowns found in *A. afarensis* that “Male gorillas keep harems and use their canines in combat with other males to establish dominance or to compete for females in estrus. Perhaps *afarensis* had evolved a different mating strategy. Owen Lovejoy, a paleoanthropologist at Kent State University, suggests that there was much less competition for females among *afarensis*—an indication that monogamy may have been evolving more than three million years ago.” The evolutionary perspective puts all these on the table as pieces of the grand puzzle of our hominid inheritance, which future anthropological geneticists may be able to clarify through the interactive study of our own structural and developmental genes.

⁷² Stanley (1996, 4). Gore (1997a, 82) shows graphically the overall climate shift occasioned by the severance of the Atlantic-Pacific connection. This rippled up through the oceanic food chain as well—the change in fish population drove many whale species to extinction, and with them the gigantic mega-sharks that preyed on them. Schilthuizen (2001, 40-42, 195-197) recounted how this phenomenon illustrated Mayr’s allopatric speciation model (cf. notes 72, chapter one, and 136 below). Charts of climate fluctuations relevant to the hominid story occur in *Past Worlds* (1988, 58), Stringer & Gamble (1993, 45-50), Calvin (1994, 103), Tattersall (1995b, 122), Mithen (1996, 32), McKie (2000, 81), Haines (2001, 14), Balter (2002a, 1225) and Ward & Brownlee (2002, 76). Cf. also Alley (2000) on how the Greenland ice cores have revolutionized climatology in the 1990s.

⁷³ Johnson’s theological paean per note 299, chapter three. I am reminded of that snappy palindrome on Teddy Roosevelt and the Big Ditch: “A MAN, A PLAN, A CANAL: PANAMA!” But such Grand Plans are as dust to Gerald Schroeder (1997, 99), who rolled the anthropic barrel all the way back to the K-T extinction. By disposing of the stupid dinosaurs, Schroeder argued that the asteroid splat “gave life the chance to redirect toward the desired goal of a sentient, intelligent being able to absorb within it the amazing concept of ethical monotheism.” Move over Father Teilhard and Alfred Wallace. Not unlike the dated swamp-dwelling dinosaurs of Reid (1968, 135-138), Schroeder showed the pitfalls of conclusion-hopping based on limited understanding. It is arguable whether the impact was the sole culprit in destroying the dinosaurian ecosystem (per note 6 of the Introduction). But for Schroeder the analogy was strictly Biblical anyway, plowing on to defend God’s convoluted naturalistic stage managing of the miracles of Exodus (such as using wind to part the waters instead of a more overtly Cecil B. DeMille spectacle). Such misplaced concreteness only arises because Schroeder starts from the assumption that there is a *deus ex machina* pulling the levers behind the scenes in activities that were reliably reported in somebody’s Sacred Scrolls. Not to his liking is the far simpler solution: that the Hebrews may have goosed up the mythological impact of the story *post facto* by mixing in misunderstood natural phenomena.

⁷⁴ Johnson (1991, 79-80).

⁷⁵ Johnson (1991, 80). Johnson never did explain what he meant by the Mayr reference, but a remark by Roger Lewin in *Bones of Contention* is relevant. Whenever isolated fossil bits turned up, the tendency of anthropologists used to be to give each new blip a separate species name: “Ernst Mayr remembers with dismay this species-naming frenzy. ‘By the 1950s, the student of fossil man had to cope with 29 generic and more than 100 specific names, a totally bewildering diversity of types.’ Le Gros Clark was equally distressed by the spectacle. ‘Probably nothing has done more to introduce confusion into the story of human evolution than the reckless propensity for inventing new (and sometimes unnecessarily complicated) names for fragmentary fossil relics that turn out eventually to belong to genera or species previously known.’ Instead of filling gaps in the story of human ancestry, this habit tended ‘to produce gaps that did not exist,’” Roger Lewin (1987, 27). A similar thinning-out process has proceeded in paleontology generally, as more data have resolved earlier muddles. In dinosaur taxonomy, for example, isolated teeth from what had

been taken for the herbivorous “Troodon” turned out to belong to the man-sized theropod *Stenonychosaurus*, and so the taxon was renamed *Troodon* to conform to the rules of nomenclatural priority. See also notes 106 & 136 below on Mayr as citational shuttlecock.

⁷⁶ Johnson (1991, 80-84). The 1984 AMNH “Ancestors” exhibit is described by Roger Lewin (1987, 21-22). Adding to the scholarly daisy chain, Lubenow (1992, 26-27) quoted Johnson’s comments on Lewin being “absolutely correct” and how human evolution was “the secular equivalent of the story of Adam and Eve.” Interestingly, Davis & Kenyon (1993, 112) tracked the same points as the last few paragraphs of Johnson’s account (the Mitochondrial Eve hypothesis ruling out the Asian and African *Homo erectus* as human ancestors, and the comparison to the reptile-mammal transition). Wendell Bird (1989, Vol. 1, 233) made similar apologetic use of Lewin’s *Bones of Contentions* as Johnson: “In this field of the origins of man, Lewin concludes that theory relies so heavily on interpretation of a few scraps of bone that it never can be unbiased.” With a rococo flourish of the “Von Däniken Defense,” Bird settled for the Trojan Horse of untrammelled open-mindedness, concluding that when it comes to fossil evidence relevant to human evolution, “Many interpretations are possible.” That is especially true if one doesn’t pay attention to the data.

⁷⁷ Johnson’s backhanded acknowledgement that evolutionists engage in lively theoretical debate ironically underscored the paucity of comparable give-and-take on the creationist side. Apart from occasional Old Earth/Young Earth debates between the likes of Duane Gish and Hugh Ross, creationists tend to ride their various hobbyhorses without much reference to one another’s mythologies. The ICR need to dispose of revisionist Flood theories (re note 314, chapter three) is a fairly rare counterexample. The spirit of Moreland & Reynolds (1999) is far more typical—and may be contrasted with the combativeness of the evolutionists interviewed by Brockman (1995) or that splendid “food fight” over Dennett (1995), covered in notes 106 & 258, chapter four. For the umpteenth time: ideas worth having are worth *defending*—honestly, and without subterfuge.

⁷⁸ Johnson has not pressed this economic defense in his later writing, preferring to fall back on the personal “fame and fortune” motivation (as per note 189 of chapter four on anthropology, and Johnson’s Research Notes on human evolution recounted below). John Morris grumped in 1995 (BTG No. 84b) about the “extensive coverage in the press” given the *Australopithecus anamensis* finds of Meave Leakey’s team: “That may be what this is all about.” See Johanson & Edgar (1996, 122) on the type specimen KNM-KP 29381 (dating about 4.1 mya). Duane Gish (1995, 226) tread a parallel path: “More than one obscure paleoanthropologist has become famous overnight by announcing sensational and extravagant claims following the find of some fragmentary remains of a creature he believes to be related to man’s origin, especially if the find was made in some remote area of Africa or Asia.” Further examples of Johnson’s snap assessments of scientific reputations will be explored in chapter seven.

⁷⁹ The methodological aspects of extremist ideologies were driven home quite serendipitously (and appropriately) on Halloween 2000 when PBS’s *NOVA* aired a real life shocker: a chilling reenactment of the recent trial of British Holocaust denier David Irving (a thorough airing of the particulars was available at this writing at pbs.org). See Evans (2001) or Guttenplan (2001) on the trial, Shermer & Grobman (2000) on the *dramatis personae* in this disreputable area, and Shermer (1997, 131-132, 175-241) for its parallels to creationism. Harboring a distinct hero worship for Hitler, Irving sought to exculpate him from any taint of guilt for the Holocaust. When Deborah Lipstadt (1993) included him in her book *Denying the Holocaust*, Irving filed for libel. Irving’s general method was eerily reminiscent of the worse excesses of creationist “scholarship.” Evans (2001, 69-70) noted that Irving “falsely attributed conclusions to reliable sources, bending them to fit his arguments. He relied on material that turned out directly to contradict his arguments when it was checked. He quoted from sources in a manner that distorted their authors’ meaning and purposes. He misrepresented data and skewed documents. He used insignificant and sometimes implausible pieces of evidence to dismiss more substantial evidence that did not support his thesis. He ignored or deliberately suppressed material when it ran counter to his arguments. When he was unable to do this, he expressed implausible doubts about its reliability.” Large swaths of Irving’s legal defense consisted of meaningless concessions—admitting time and again that organized

murders had taken place, but never wondering how such activity could have gone on without Hitler's complete acquiescence, if not overt permission. A lynchpin of Irving's argument was the supposed lack of reinforced roof holes on the crematoria at Auschwitz, through which Zyklon B had been introduced into the "showers." An architectural historian had the actual blueprints for the installation, though, which had been dynamited by the Nazis just before the camps were liberated precisely in order to cover their tracks. What Irving had failed to note was that the roofs were thus today a pile of debris, complicating the identification of the actual poison gas conduits ... which means Irving was employing his own slanted version of the Bermuda Triangle Defense. Irving also relied on Fred Leuchter, an "expert" who had supposedly proven the absence of cyanide residues at the crematoria. Irving freely admitted that Leuchter had been thoroughly discredited, yet continued to rely on his argument—thus refusing to defend his position, nor abandon it. In history as in evolutionary biology, not only ideas have consequences ... so do *faulty methods*. Cf. McIver (1987, 3-4) on the Holocaust skeptic and anti-Trilateralist John Birch Society admirers among a 1985 creationist group tour of the Grand Canyon.

⁸⁰ See note 188, chapter three, on Milton's side of the equation. Johnson's "veneration" take on Roger Lewin's discussion of the 1984 "Ancestors" exhibit also threatens to go over the top, since Johnson's contrasting insouciance about the record of human origins owes a great deal to the fact that fossil information has *never* mattered to his argument. Whether anthropologists ogling an australopithecine mandible really have quite the same effusive internal conviction as do believers in the Shroud of Turin is debatable. In a field where every scrap of precious information counts, there is naturally a respectful awe that bubbles up when one can handle the *originals*. Many a playing card historian would have exactly the same reaction to an opportunity to inspect the 15th century Mamluke Pack (the only extant deck of Arab playing cards), presently tucked away in the Topkapi Museum in Istanbul.

⁸¹ Johnson (1991, 67), drawing on Gould's essay "Evolution as Fact and Theory" from *Hen's Teeth and Horse's Toes*, as noted by Johnson (1991, 172). Ironically, left to his own devices, Johnson (1998b, 26) inadvertently backed into the same distinction Gould was making: "If Newton had tried to discover the nature of gravity rather than its precise effects, he probably would have been as unsuccessful as he was with alchemy." Part of Johnson's general problem is that ideas in the physical sciences have become so entrenched that contemporary nonscientists can accept them without blinking, forgetting just how tricky their genesis really was. We recognize today that falling objects do so under the force of gravity—but all that has ever been *seen* in this department is motion in the raw. When an apple falls to earth does it do so because it wants to return to the soil? Now there's "purpose" for you! Even when you start noticing that apples *accelerate* when they fall, as Galileo was the first to do, there is nothing about that motion that wouldn't be as precisely explained by hordes of mathematically compulsive angels (or demons?) who are fulfilled by pulling objects to the ground. To attribute the fall to a natural law called *gravitation* (a mindless mechanical force pervading the universe) was as dependent on a theoretical revolution as Darwin's later evolutionary insights. It sounds silly to invoke sprites instead of gravity as the agency responsible for falling bodies—but is that any more strained than to imagine a single creative animator absentmindedly churning out fifty million years' worth of synapsid reptiles that just coincidentally mimic an evolutionary sequence? To make matters worse, since we have no empirical records of scientists prior to Galileo actually measuring the acceleration of falling objects, technically speaking it takes a dose of retroactive methodological naturalism to *presume* that apples fell in the same way for dear old Aristotle.

⁸² The epistemological aspects of historical inference show up only peripherally in Johnson's antievolutionary writings, but when they do it's with a bang. As we'll see next chapter, Johnson employs a double standard at several levels, treating the historical institutions of the religion he favors and the politics he does not in exactly opposite ways.

⁸³ Solly Zuckerman waved the Old School tie in a 1974 speech on the supposed travails of modern hominid taxonomy, quoted by Roger Lewin (1987, 27): "It is an incredibly difficult problem," says Lord Zuckerman. "It is one so difficult that I think it would be legitimate to despair that one could ever turn it into a science." But that was before cladistics elbowed in to supply exactly the

“rigorous objective analysis” that Johnson demanded. This is especially ironic given Gary Parker’s assurance (via Michael Denton) that cladism represented the impending restoration of evolution-free taxonomy (per note 220 of chapter four). Since paleoanthropologists have begun framing their arguments in a cladistic milieu, such as Tattersall (1995, 229-246) or Johanson & Edgar (1996, 38), it has been necessary for Gish (1995, 212) to mine for authority quotes to quarantine any inconvenient hominid cladograms. But the procedure is straightforward enough, as Tattersall (1995a, 159-170) outlined: after laying out a rigorous cladogram, formulate an evolutionary phylogeny parsimoniously consistent with it, on which one may build a possible scenario to relate adaptive change (to ecology, behavior, or whatever factors are deemed pertinent). Not that cladistic stickler Gee (1999, 88) is willing to go that far, considering adaptive scenarios inherently untestable: “To speculate about adaptations in extinct creatures is at best pointless, at worst recklessly misleading.” Though Gee is not above some informed evolutionary speculation himself, as Gee & Rey (2003) indicates on the life of dinosaurs. One such “plausible yet untestable” scenario is feminist Elaine Morgan’s “aquatic ape” theory of human origin. Originally proposed by marine biologist Sir Alister Hardy in 1960, it is the idea that one of our Pliocene ancestors was more than casually a swimmer, accounting for our retention of subcutaneous fat, a virtually hairless body studded with sweat glands, and a newborn baby’s astonishing swimming reflex.

Unfortunately, fine mammalian swimmers can be quite hairy (such as seals), and features can be non-adaptive (making them spandrels). The rare coverage of *Homo aquaticus* tends to be very skeptical, from Edward Wilson (1975, 28-29) and Tudge (1996, 208) to Gee (1999, 100-101) and John H. Langdon, “Umbrella Hypotheses and Parsimony in Human Evolution: A Critique of the Aquatic Ape Hypothesis” (a 1997 *Journal of Human Evolution* article, 33:479-494, available online at biology.uindy.edu/Biol345/ARTICLES/umbrellas.htm). Dennett (1995, 243-245) was skeptical too, though he thought the idea had been given short shrift. The most favorable treatment occurs in Ellis (2001b, 243-246), who included sidebars on *Oreopithecus* (note 68 above) and even the circumstantial aquatic ancestry of elephants proposed by Gaeth *et al.* (1999), cited in another context in note 345 below. Kossy (2001, 195-212) focuses on the personalities and philosophies of Morgan and her critics, without reaching a verdict on the scientific front. Cf. Verhaegen *et al.* (2002) on possible hominid wading behavior. Off to one side, Ingram (1998, 102-117) related our yearning for water activities to human ancestry in a savanna habitat (a notion that has exercised critics of evolutionary psychology, as will be seen next chapter). Pulling up the anti-Darwinian rear, Berlinski (1996b, 28) briefly alluded to the aquatic ape theory as another “preposterous” evolutionary “just so” story.

⁸⁴ It is a tossup who is the most egregious offender in this category. Since we know Duane Gish has read Chris McGowan, that Gish (1995, 209-331) could devote *one third* of his book to human evolution and yet not touch on these major points was daring, to say the least. The closest Gish (1995, 234-235, 237) got was to acknowledge that the canines and incisors of *A. boisei* were smaller and its dental arcade more curved than the typical ape. Stiff evasive competition comes from Lubenow (1992)—which was, after all, a whole book purportedly devoted to the subject. Lubenow (1992, 61, 132-133) listed some skeletal characteristics of Neanderthal and *Homo erectus*, though with no explanation of how these related to the actual specimens nor how other hominids might compare to them. Then again, the implications of the australopithecine dental *diastema* or the morphology of the Taung child were not of primary concern to Lubenow (1992, 168): “The most unique distinction between humans and animals is ignored by most evolutionists. It is that humans are created in the image of God. Only this spiritual dimension explains both our glory and our agony.” Lubenow’s version of things was siphoned off secondarily by Ankerberg & Weldon (1998, 231-246). Shorter accounts that failed to deal with the anatomical basics (ranked by descending text length): Wells (2000a, 209-228), Gary Parker in Morris & Parker (1987, 151-163), Morris & Morris (1996b, 79-91), Milton (1997, 196-208), Huse (1997, 133-141), Hanegraaff (1998, 49-57), Henry Morris (1985, 171-178), Wendell Bird (1989, Vol. 1, 226-233), Davis & Kenyon (1993, 107-113), and Hayward (1985, 50-53). Apart from the brief citation of “Beutner Janusch” (re note 57 above), Michael Denton (1985) skipped the subject of human evolution entirely, as did Michael Behe from behind his biochemical keyhole. Behe does earn a special “hit-

and-run” award for remarking in Arnhart *et al.* (2000, 28-29): “The experimental evidence that natural selection could build a vertebrate from an invertebrate, a mammal from a reptile, or a human from an ape is a bit less than the experimental evidence for superstring theory—that is, none at all.” What Behe means by “experimental evidence” here is unclear; would genetic engineers have to cobble up a vertebrate, mammal, or hominid from scratch, à la Carl Baugh’s biosphere? In this respect Behe comes off sounding exactly like Robert Gentry (re note 239, chapter three). There is, of course, a large body of fossil, embryological, and genetic data relevant to these topics, but apart from his “meaningless concession” candidate from note 28 above, “none at all” is a pretty fair description of the coverage “common descent” Behe has devoted to them. For further calibration in this “none at all” category, recall Gary Parker on *Archaeopteryx* (re note 106, chapter two).

⁸⁵ See note 68 (chapter one) on Spetner. *Forbidden Archaeology* was published by the Bhaktivedanta Institute, and dedicated to “His Divine Grace A. C. Bhaktivedanta Swami Prabhupāda.” Cremo & Thompson (1993, xxxvi) acknowledge their “underlying purpose” was an affirmation of their religious views, but asserted that this shouldn’t disqualify their work. “What really matters is not a theory’s source but its ability to account for observations.” While this attitude does at least rise above the “don’t need to offer a theory” approach of Phillip Johnson, it sidestepped what those religious positions were and how open Cremo & Thompson would be to scientific theories that openly contradict them. Cf. Shermer & Grobman (2000, 240-241) and C. Brown (2002). The main claims of Cremo & Thompson are abstracted at a website (spiritweb.org/spirit/forbidden-archaeology.html) devoted to spiritual consciousness and Hinduism; none of the critical anatomical benchmarks (foramen magnum, etc.) were considered important enough for inclusion. As for religion and science, the “Hare Krishna News Network” site (krishna.org) dedicated to Prabhupāda’s teachings is a treasure trove that includes the claim that NASA faked all the Apollo moon landings. Part of their argument rested on secular Apollo deniers—a crowd who got a publicity boost in February 2001 via a special on the Fox network (whose “documentary” telecasts have seldom been burdened by either editorial discretion or taste) ... followed by a punch in the nose by Buzz Aldrin in 2002. See Plait (2002, 155-173) or the apollo-hoax.co.uk website for field guides to this surreal area—cf. also the rationalist attitude of George Smith (2000, 16) and warnings of Oberg (2003). Of relevance is how Prabhupāda’s reasoning turned on *scriptural* authority, precisely like Henry Morris on the Genesis Flood. In “Man On the Moon—A Colossal Hoax that Cost Billions of Dollars,” Prabhupāda (who died in 1977) declared that “The Vedic account of our planetary system is already researched, concluded, and perfect. The *Vedas* state that the moon is 800,000 miles *farther* from the earth than the sun. Therefore, even if we accept the modern calculation of 93 million miles as the distance from the earth to the sun, how could the ‘astronauts’ have traveled to the moon—a distance of almost 94 million miles—in only 91 hours (the alleged elapsed time of the Apollo moon trip)? This would require an average speed of more than one million miles per hour for the spacecraft, a patently impossible feat by even the space scientists’ calculations.” So much for those fuddy-duddy astronomers who reasoned centuries ago that the moon couldn’t possibly be farther away than the sun and still cause *solar eclipses*. Judging by Rowley (1971, 117), Hare Krishna literature has considered space travel a waste of effort for some time, recommending instead that visitations to the planets be accomplished via Krishna Consciousness.

⁸⁶ Cremo & Thompson (1993, 681). For comparison, Schwartz (1999, 123) illustrates the placement of the simian shelf in the jaw of a gorilla.

⁸⁷ Cremo & Thompson (1993, 474, 662, 731). They did note that the diastema had disappeared altogether by the time of the “Heidelberg jaw”—but that was an “archaic” *Homo sapiens* mandible (found in 1907) which is only about half a million years old. As that was the only example of early “archaic” man discussed by Cremo & Thompson, a huge block of intermediate data lay off their scope. The Heidelberg jaw (Mauer 1) was one of only a paltry few illustrations to grace Cremo & Thompson’s lengthy work, which preferred showing dated material (Java Man on p. 485, Piltdown on p. 507) instead of more recent australopithecine and *Homo* discoveries. See notes 32 above and 147 below for *H. erectus* background resources and appearance, and Johanson & Edgar (1996, 196-197) or Schwartz (1999, 106-107) specifically on the Heidelberg jaw. For comic relief in this

area, Flindt & Binder (1974, 123-125) cited our lack of a diastema as evidence our ancestors originated through interbreeding with aliens that lacked that feature.

⁸⁸ Gish (1978, 106, 117; 1995, 235, 286, 298) remains a type specimen for the breed. A full *A. africanus* skull was shown next to an orangutan's, which only underscored how different the australopithecine's shorter face and jaw structure were (points he didn't go into), while a cast of Peking Man and a later inclusion of the Turkana Boy skeleton were similarly useless space-fillers. Lubenow (1992, 69, 80, 91, 135) restricted his examples to *silhouettes* of Java Man, Peking Man, Neanderthal, and "archaic" *Homo sapiens* (a.k.a. "Rhodesian Man," discussed below re note 143). Davis & Kenyon (1993, 110-111) had the aforementioned chart skull samples and a skeleton of *A. africanus* next to that of a human. Gary Parker, in Morris & Parker (1987, 159) sufficed with the Lucy skeleton, an artist's depiction of *A. africanus*, and one skull (that of *A. boisei*). That latter species served as the sole hominid illustration in Wendell Bird (1989, Vol. 1, 209): a collection of varying reconstructions of Louis Leakey's "Zinjanthropus" (as *A. boisei* was originally known). Apart from the examples noted shortly, Cremo & Thompson (1993, 464-465, 473, 485, 556-557, 657) offered a melange of early finds (Java Man skullcap and thighbone, the Heidelberg jaw and a 1945 reconstruction by Franz Weidenreich, along with tracings of the outlines of various jaws obtained from photographs and drawings).

⁸⁹ In a 1981 ICR pamphlet (Impact No. 101), Parker noted that the ICR Museum shows a chimpanzee next to the Lucy skeleton, and concluded: "The similarities are striking. In fact, the similarities between gracile australopithecines and chimpanzees are so striking that 'modern chimpanzees, by this definition [Richard Leakey's] would be classified as *A. africanus* [australopithecines].' Lucy's discoverer, Donald Johanson, made that statement about Leakey's definition, and he goes on to say that Lucy is even more "primitive" (i.e. more ape-like) than Leakey's australopithecines. Perhaps the most logical inference from our observations—certainly one students should be allowed to consider—is that Lucy and her kin are simply varieties of apes, and nothing more." A similar treatment (though minus the ICR Museum reference) occurs in Morris & Parker (1987, 157), and John Morris takes a parallel tack in the revised 1990s posting "Has the 'Missing Link' Been Found?" (BTG No. 71b) available at the ICR website. Morris stressed that some australopithecine species "exhibit a chimp-sized brain and chimp-like teeth and jaws, with a few minor differences" (which he didn't go into). As Parker's item was referenced, it was possible to learn directly what "Leakey's definition" was. The Johanson remark (in *Science*, 7 March 1980, p. 1105) was part of the Technical Comments elicited by an analysis of recent finds in Johanson & White (1979) that put *A. afarensis* squarely on the hominid line of descent. The snippet Parker quoted was actually a thinly veiled criticism of the approach of the Leakey school. "The most comprehensive definition offered to this date is that of R. E. Leakey (14), who gives as typical characteristics 'gracile mandibles with small cheek teeth, cranial capacity values at 600cc or less and sagittal crests rare or nonexistent.'" Reference 14 was to Richard Leakey (1976). Thus Johanson's critical point was one of practical definition (never a creationist strong suit). If one were to define "car" as a self-propelled four-wheeled vehicle, then a hundred-ton dump truck would be a "car"—except it would be a poor definition. For contrast, Leakey & Lewin (1992, 105) also compared the dental particulars of chimps and australopithecines (with *Ramapithecus* and man thrown in for good measure), and concluded the hominids were "somewhat intermediate" between the ape layout and man (this coming from a camp notably less than enthusiastic about australopithecine relations).

⁹⁰ Cremo & Thompson (1993, 668) set a drawing of a partial chimpanzee skull (courtesy of a 1954 work by Solly Zuckerman) against a photo of *A. africanus* (Sts 5, known as "Mrs. Ples," although probably a male) found in 1947. A proper comparison would have been between full skulls, such may be seen in Berra (1990, 98, 101) or Whitfield (1993, 45). McKie (2000, 19, 34) shows the underside of the skulls of adult chimps and humans, indicating the markedly different position of the foramen magnum, and compares the lower mandibles of chimps, *A. afarensis*, and humans. Paul Ehrlich (2000, 80) illustrates the foramen magnum and neck musculature of a gorilla, *A. afarensis*, and a human. Incidentally, Berra's examples were part of a long and thorough parade of primate and hominid skulls deployed apropos human evolution, Berra (1990, 90-92, 95-98, 101, 103-105,

111-114, 116). Cremo & Thompson anachronistically labeled Sts5 “*Plesianthropus (Australopithecus) transvaalensis*”—which inadvertently touched on the tendency of its discoverer, Robert Broom, to coin new taxa at the drop of a hat. Although Broom eventually reclassified Sts5 under that new genus, the designation never caught on precisely because subsequent australopithecine finds put “Mrs. Ples” in perspective (which is more than Cremo & Thompson got around to doing). Johanson & Edgar (1996, 134-135) reflect the current view by listing Sts5 as an example of *A. africanus*. Incidentally, another controversy attaching to Robert Broom was his questionable sale of a mass of protomammal specimens from the South African Karoo formation to Osborn at the AMNH just before WWI, on which Broom netted a handsome personal profit, Peter Ward (2000, 72-75).

⁹¹ Cremo & Thompson (1993, 662, 731).

⁹² *Forbidden Archaeology* danced around the subject. Like Duane Gish with his fishy Ommanney quote, Cremo & Thompson (1993, 681) merrily invoked dated material with no attention to its historical context. They latched onto a remark Louis Leakey once made, that the placement of the foramen magnum differed among the proposed human ancestors—or at least, those that were known in 1960, when Leakey’s book came out. But it was only in 1959 that the Leakey team uncovered the first hominid found at Olduvai: “Zinj” (*A. boisei*). Cremo & Thompson (1993, 689) did note the progressively forward position of the foramen magnum as one moved from the australopithecines to *Homo habilis* (the ER 1470 skull, found in 1972, and dating roughly 2 mya), but that’s as far as they got. Milton (1997, 203) veered perilously close to the issue when he called on Solly Zuckerman (from circa 1954!) to support the claim that “*Australopithecus*’s head was balanced like that of an ape, not a human.” Without skipping a beat, Milton (1997, 204-207) then briefly discussed Leakey’s *Zinjanthropus* and Johanson’s Lucy as supposedly failed missing links—all without relating any of their anatomy to the matter of australopithecine head placement or more recent anthropology. Such work has tended to distinguish ER 1470 from the main *Homo habilis* group, such as Johanson & Edgar (1996, 177) who classify it as a separate species (*H. rudolfensis*)—though Tattersall also favors this, the collaborative Tattersall & Schwartz (2000, 115-117) offers a few demurs. The recent find of an older hominin (*Kenyanthropus platyops*, from 3.5 mya, involving a new genus proposed as a possible offshoot of *A. amanensis*) may include *rudolfensis* as derived descendants, Lieberman (2001) on Maeve Leakey *et al.* (2001). Cf. Lange (2001) and Wong (2001b).

⁹³ Cremo & Thompson (1993, 662-666), including drawings of the Taung Child skull next to an immature gorilla. Johanson & Edey (1981, 54) observed that Grafton Elliot Smith held a similar position as Keith. See also note 36 above.

⁹⁴ Noted by Whitfield (1993, 89)—and more at length by Chris McGowan (re note 103, chapter two). Gibbons and tarsiers also have similar foramen magnum layouts, Schwartz (1999, 120), which is why a full skeleton was needed. Incidentally, Dunbar & Barrett (2000, 56-57) describe tarsiers as a possible “missing link” between prosimians and monkeys. The idea of human neoteny was also, ironically enough, the favored view of Sir Arthur Keith! Landau (1991, 73): “Keith’s belief that the locus of evolution lies in the embryo had further implications: adaptations arise by the retention of fetal characteristics.” See also Schwartz (1999, 45). In the australopithecine Taung Child, Keith had a vital piece of the neoteny puzzle right under his nose, but couldn’t see its significance for all the distracting glare of the fraudulent Piltdown.

⁹⁵ Gamlin & Vines (1986, 101). See Gould (1977b; 2002a, 1037-1051), Raff (1996, 254-291), Zimmer (1998, 172-173), David Moore (2001, 193-204)—and Voss & Shaffer (1997) and Voss *et al.* (2001) on axolotl genomics. Forey (2000b, 175-181, 218-233) and Gon’s website (note 75, chapter two) track neoteny and heterochrony (differential juvenile development) in trilobite carapaces molted from larvae to adults (such as *Olenellus* adapting to increasing water temperature and higher oxygenation in the early Cambrian). Cf. also Chipman *et al.* (2000) and MacDonald & Hall (2001) on heterochronic development in anurans and mice.

⁹⁶ Stanley (1996, 157).

⁹⁷ Gould (1983, 370). Mickey Mouse came up in Gould (1980, 95-107), which was primarily about Konrad Lorenz’s observations on how humans respond to juvenile features in animals (what

may be called the “Cute Big-Eyed Baby Syndrome”). Gould (1977a, 63-74) is a more useful introduction to neoteny, along with Gould (1981, 113-122) on how the notion was mangled in the racist recapitulationism of Haeckel and others before 1920. Johanson & Edey (1981, 43) contrast juvenile skulls in humans, chimpanzees, and the Taung Child; see also Lambert & The Diagram Group (1987, 88-89). Futuyma (1982, 102-103) also noted the concept—therefore Duane Gish and Phillip Johnson could theoretically have been aware of it. Matt Ridley (1993, 326-329, 342-343) and Schwartz (1999, 126-161) cover the virtues and limitations of man as an especially neotenic ape. Neoteny bears on many issues—e.g., Schwartz (1999, 139) noted that embryonic apes start out just as hairless as humans, suggesting our comparative nakedness may be the result of neoteny and not an aquatic stage in our ancestry (re note 83 above). Incidentally, to dismiss general primate similarities, Gish (1993, 281; 1995, 221) grabbed Schwartz (1984) on features humans share with orangutans more than chimps or gorillas; cf. note 28 above and Schwartz (1999, 62, 83).

⁹⁸ Surprise! The list of antievolutionists not discussing tool use tracks those who missed the taxonomical data (foramen magnum, etc.): Hayward (1985), Henry Morris (1985), Morris & Parker (1987), Wendell Bird (1989, Vol. 1), Lubenow (1992), and thus Ankerberg & Weldon (1998), Gish (1995), Huse (1997), Milton (1997) and Hanegraaff (1998). See note 83 above for page coverage for these sources. Gish (1993, 354-356) tiptoed close to the issue in his criticism of C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 260-263) where the Oldowan tools were mentioned—though Gish restricted his riposte to whether bipedality conferred some selective advantage on the australopithecines. “But yet we are told *bipedalism existed for up to two million years before tools and weapons were invented*, and certainly there was no substantial, if any, increase in brain size during that alleged vast stretch of time,” Gish (1993, 355). He did not dwell on the existence of toolmaking apes (however long it took them to get around to it)—nor did he press on with the logic of his own Flood Geology position. For wouldn’t australopithecines have had to have been included aboard Noah’s Ark? This is another pithy question for Creation Scientists to mull over one of these days.

⁹⁹ Cremo & Thompson (1993, 85-393) devoted over a third of their work to a mind-numbingly tedious account of tool discoveries (this time often with illustrations). Essentially they followed the same line of reasoning as Richard Milton had with the ammonites (note 225 of chapter four): a parade of historical accounts rather than cutting to the chase and hitting the arguments of contemporary researchers. Cremo & Thompson (1993, xxv) were also trying to set a logical trap whereby anomalous finds (modern tools supposedly found in rock millions of years old) have to be accepted (or rejected) along with the more conventional material. Such an “A&B” approach would naturally undermine the whole logic of how archaeological sequences are determined by continuously factoring in new data. Rather than evaluate that full chain of evidence, Cremo & Thompson (1993, 375) preferred to highlight particular inadequacies: “The Heidelberg jaw was discovered by workmen in a gravel pit, with no scientist present, and was assigned a Middle Pleistocene date. Furthermore, most African hominid fossils, including those of Lucy (*Australopithecus afarensis*), were discovered on the surface and were assigned specific dates because of their loose association with certain exposed strata. In Java, also, most of the *Homo erectus* discoveries occurred on the surface, and, in addition, they were found by paid native collectors, who shipped the fossils in crates to distant scientists for study.” Of course, if Java were the only place where *H. erectus* fossils had turned up, they might have had a point. Indonesia accounts for only about a third of *erectus* fossil finds—with native fossil collectors still adding to the pile, as recounted by Larick *et al.* (1999).

¹⁰⁰ Davis & Kenyon (1993, 109-110).

¹⁰¹ Tattersall & Schwartz (2000, 106-117) cover the *habilis* taxonomy. Johanson & Edgar (1996, 170-176) list four main *H. habilis* specimens (OH 7, OH 24, OH 62, and KNM-ER 1813), found at Olduvai and Koobi Fora from 1960 to 1986 (all are placed in the 1.75-1.9 mya range). Tattersall (1995b, 57) illustrates “the only associated skeleton yet known of *Homo habilis*,” a very incomplete and fragmentary specimen. “*Homo habilis*” thus touches on the same “map of time” problem as *Archaeopteryx* (where there were probably more than only half a dozen of them

flapping around the Jurassic). Because *H. habilis* is not yet represented by the fuller skeletons known for australopithecines (Lucy) and *H. erectus* (the Turkana Boy), paleoanthropologists have endeavored to pin down the identity of that period's toolmakers by other means. Randall Susman (1994) focused on the metacarpal thumb bones used to grasp tools, work also reported on by John Noble Wilford, "Toolmaker's Thumb Not Unique to Humans," in Wade (1998a, 211-215). Humans use three extra muscles that chimpanzees lack in their opposable thumb, and by this standard *A. afarensis* appeared not to have a human-style opposable thumb. Later forms acquired it, though, including possibly the australopithecine cousin *P. robustus*—though Aiello (1994) cautioned the isolated "paranthropus" specimen might have been from *H. erectus* (which did possess a human-style opposable thumb). Since both the *erectus* and *robustus* fossils date 1.8 mya, the origin of the Oldowan tool culture 2.5-2.7 mya is still up in the air. Moreover, at a recent meeting of the American Association of Physical Anthropologists, Mary Marzke of Arizona State University challenged Susman's criterion, noting that human use of the hand for tools is not diagnostically restricted to the thumb, Gibbons (1997a). For comparison, Neanderthals had similar thumb dexterity to humans, Niewoehner *et al.* (2003).

¹⁰² Davis & Kenyon's dodging the methodologically portentous issue of how old the earth really is (and thus whether there was a "1.8 mya") was alluded to in note 111 of chapter one.

¹⁰³ Tattersall (1995a, 205-207); cf. Tattersall (2002a, 95-99). Lambert & The Diagram Group (1987, 108-111) characterize the Oldowan tool form and possible early campsites (1.8 mya), while Burke & Ornstein (1995, 8-13), Johanson & Edgar (1996, 250-253) or Ambrose (2001) provide concise overviews of Paleolithic tool technology. See John Noble Wilford, "Human Ancestors' Earliest Tools Found in Africa," in Wade (1998a, 216-219) on some 2.6 myr old tools (possibly associated with *A. aethiopicus*), and Wood (1997) on Semaw *et al.* (1997) concerning recent finds from Ethiopia. Roche *et al.* (1999) offer evidence for temporal variations in tool production around 2.3 mya which suggests toolmaking techniques were not entirely static. The lesson of "cores versus flakes" Tattersall alluded may be applied to later examples. For instance, as indicated by Laura Longo & Carlo Peretto, "Functional Experimentation and Analyses," on the 700,000-year-old Isernia La Penta site in central Italy, described by Carlo Peretto, "Isernia: Europe's First Settlement," both in Forte & Siliotti (1997, 102-105). For more detail on the Kanzi experiment, see Savage-Brumbaugh & Lewin (1994, 201-221), and Swisher *et al.* (2000, 172-173) for a perceptive summary. Chimpanzees show the greatest variety of tool use, which reflect differing localized "cultural" traditions—see Whiten *et al.* (1999) with commentary by de Waal (1999), Dunbar & Barrett (2000, 204-207), Whiten & Boesch (2001), Richard W. Byrne, "Social and Technical Forms of Primate Intelligence," William C. McGrew, "The Nature of Culture: Prospects and Pitfalls of Cultural Primatology," in de Waal (2001a, 162-164, 242-251), and Vogel (2002) re Mercader *et al.* (2002). Significantly, such variation has also been found among orangutans, Vogel (2003) re van Schaik *et al.* (2003)—supporting the idea that culture is a more general feature of the great apes, and hence may have existed for many millions of years in addition to our own specialized hominid version. More basic "tool" use among vertebrates and invertebrates is surveyed by Edward Wilson (1975, 172-175) and Budiansky (1998, 122-130). Page (1999, 33-39) reflects the common theme that animal tool use involves a decided lack of *improvement*. Cf. also Yoerg (2001, 158-160).

¹⁰⁴ Strahler (1987, 482). Additional instances were pointed out above in notes 30 & 47 (as well as note 64, apropos Gish's removal of the gelada ape claim). Gish's penchant for selective reading and semantic hairsplitting was illustrated also when he took aim at a remark of C. Loring Brace, "Humans in Time and Space," in Godfrey (1983, 253-254) as to how apelike parts of the *A. afarensis* skull were. Brace noted that "if one simply had a better part of the skull, face, and teeth, an expert could quite reasonably conclude that the creature could not be distinguished from a fossil ape"—hardly a shocking revelation, the australopithecines being the earliest (and hence most apelike) of the hominids. But even though Gish quoted Brace's actual wording, he nonetheless embarked on a dainty pirouette. Gish (1993, 353): "How can the dentition of these creatures (and the skull and face) be so apelike that an expert could not distinguish the creature from a fossil ape, and yet, as Brace declares, be 'perfectly intermediate between the apelike and human condition?'"

The answer involved looking at the *complete* skull—which was Brace’s point, and only underscored how Gish has consistently avoided doing that.

¹⁰⁵ The examples explored in chapter two regarding Johnson’s failure to deal with *Lagerstätten* (re Gould’s *Wonderful Life*, note 55) or mammalian monophyly and embryology (Stahl’s *Vertebrate History* and the Hopson article, notes 198 & 214) come perilously close to active suppression. But just as Duane Gish might be granted the benefit of the doubt when it comes to processing the information in a lengthy volume (such as *The Dinosauria* by Weishampel *et al.*), it is always possible such data were overlooked due to merely inattentive reading. On the other hand, snipping that sentence out of the Weinberg passage (per note 243, chapter four) does suggest Johnson pays more than casual attention to at least what he opts to directly quote.

¹⁰⁶ Johnson (1991, 174-178). A few marginalia regarding Johnson’s Research Notes....

Zuckerman (1990) consisted of an unfavorable review of Spencer (1990), bristling particularly at Spencer’s suspicions about the complicity in the Piltdown hoax of Zuckerman’s mentor, Sir Arthur Keith (Zuckerman preferred Hinton as the culprit; see note 40 above). Investigative journalist Michael Brown’s *The Search for Eve* laid out the mitochondrial Eve debate as a clash of egos and confrontational science (much as had his prior works on environmental pollution)—less “vulgar” advocacy will be discussed shortly. Interestingly, much like Johnson, Brown used a similar breezy essay format in lieu of conventional notes. Brown is a likely source for Johnson’s demur about scientists doubting “*A. Afarensis* and *A. Africanus* were really distinct species,” as Brown (1990, 149) quoted Ernst Mayr: “*Africanus* and *afarensis* quite likely were geographical races of the same species!” See Roger Lewin (1997, 168-171) for a summary of the competing views as to whether *A. afarensis* represented one or several species. Schwartz (1999, 315-316) comments on Mayr’s analysis (see also note 127 below).

¹⁰⁷ Roger Lewin (1987, 82). Zuckerman’s backpedaling role in anthropology came up twice in Roger Lewin (1987, 81-83, 164-165). Zuckerman was part of the Piltdown-era chorus dismissing Dart’s Taung Child in the 1920s—by the 1950s he was snobbishly characterizing Louis Leakey as merely an untutored fossil collector. Parenthetically, Zuckerman was also highly critical of American and Soviet nuclear defense policy, frequently contributing to *The New York Review of Books* on this topic, right up to his death in 1993. That antiballistic interest accounts for the third bit in the title of Zuckerman’s autobiography: *Monkeys, Men and Missiles*. Had Zuckerman been a rocket scientist rather than a primatologist, perhaps Arthur C. Clarke’s Law would have applied: “When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong,” Clarke (1962, 14). Though by “elderly” Clarke meant (for physics, mathematics, and astronautics, at least) anyone over 30—for other disciplines “senile decay is sometimes postponed to the forties.” Born in 1904, Zuckerman was long past that.

¹⁰⁸ The characters that impressed the Leakey camp included molars reduced relative to jaw size, and expansion of the frontal, temporal, and parietal lobes. The debate over the placement of *habilis* in the hominid family continued as more australopithecine specimens appeared. Popular treatments of the issues run from Johanson & Edey (1981, 101; 1996, 170-176) and Eldredge & Tattersall (1982, 136-140) to Lambert & The Diagram Group (1987, 106-107) and Tattersall (1995a, 190-194). As with dinosaur paleontology, one way to settle such issues would be through cladistics, but paleoanthropologists have been fairly slow to ride that taxonomical wave: while Tattersall regularly features cladograms in his writings, Johanson was more diffident, and Tim White plays hold-out. See Wood & Collard (1999) for analysis of several cladistic takes on *habilis*. Discussions of *habilis* taxonomy relevant to creationism occur in McGowan (1984, 178-181), Strahler (1987, 487-489), and Berra (1990, 110). Futuyma (1982, 108) is concise: “the differences between *Homo habilis* and *Australopithecus africanus* are so slight that many anthropologists feel the distinction between them is totally artificial.” C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 258-260) plainly thought it should be *Australopithecus habilis*. With logic tracking that of Phillip Johnson, Wendell Bird (1989, Vol. 1, 230) picked up on Brace’s comments as a way to undermine that link in the human evolutionary chain (as though merely moving *habilis* to the australopithecines made it any more or less a potential human ancestor). Cremo &

Thompson (1993, 700-710) also cited Brace's views (secondarily) in their discussion of the *habilis* classification debate. When Gish (1993, 133-134) assessed the OH 62 *habilis* skeleton (found by Tim White in 1986, and dating c. 1.8 mya) the ICR sage ended up sounding like a holdover of the "British school," grumbling how this fossil was not that anatomically advanced over the australopithecines. Gish's conclusion was especially amusing: "Just as it was with Chatterjee's fossil bird [*Protoavis!*], so it is with OH62—evolutionists' expectations have been frustrated, and support for the contentions of creation scientists is strengthened." *Just as it was with Chatterjee indeed!*

¹⁰⁹ Leakey & Lewin (1977, 84-85) charted this view, showing an adaptive radiation around 6 mya, but that was when only two australopithecines were on the scope (*A. africanus* and *boisei*). Anti-Darwinist Hitching (1978, 34) apparently high dived off the Leakey position, as his chart of "missing links" in human evolution placed *habilis* 2-4 mya (twice as old as its known temporal range), with the australopithecines on a side branch splitting off from the hominid line before 6 mya. By the time of Leakey & Lewin (1992, 108-109) *A. afarensis* and *A. aethiopicus* had joined the parade, along with a rival gang of anthropologists (Donald Johanson, Tim White, Ian Tattersall *et al.*) who viewed *Homo habilis* as a descendant of the australopithecines. By the time Meave Leakey (1995) summarized matters for *National Geographic* the australopithecines were firmly pegged as a basal hominid group. Incidentally, the window for the emergence of the hominids from the apes still falls within the late Miocene gap, somewhere around 5-7 mya.

¹¹⁰ Leakey & Lewin (1977, 86, 88); see note 91 above on the status of ER 1470 in the *Homo* genus. Incidentally, the dating of this skull was the occasion for the KBS Tuff controversy, recounted in chapter three (re note 264). McGowan (1984, 182-183) also noted how the physical intermediacy of *habilis* played an important part in the Leakey-Johanson feud—aggravated by nomenclatural turf wars over who had priority to name new taxa and under what circumstances these might be announced in public, as related in depth by Roger Lewin (1987).

¹¹¹ Leakey & Lewin (1992, 110-116).

¹¹² Zuckerman (1991, 48). This occurred as an offhand remark in a critical review of a quintet of books related to the issue of primate intelligence (including efforts to teach chimps and gorillas sign language). This matter will be explored further below.

¹¹³ Of course Le Gros Clark operated under his own theoretical opinions, as Cartmill *et al.* (1986, 412) noted of his 1930s view that human ancestors started in an arboreal environment not unlike that of chimpanzees and gorillas. Ironically, under this model it was "the *failure* of the apes to become human" that "posed a problem" for Le Gros Clark. Yet like Arthur Keith (but unlike Wood Jones or Zuckerman!), Le Gros Clark became convinced of the hominid character of the Australopithecines after WWII on the basis of the evidence, as noted by Phillip V. Tobias, "Conversion in Palaeo-Anthropology: The Role of Robert Broom, Sterkfontein and other Factors in Australopithecine Acceptance," in Tobias *et al.* (2001, 23-24).

¹¹⁴ See Strahler (1987, 482-483) for a short survey of what multivariate analysis entails, and how creationists have deployed Zuckerman and his occasional collaborator Oxnard. Kitcher (1982, 182-183) also hit on Gish's selective deployment of Oxnard.

¹¹⁵ Oxnard (1975, 394), noting along the way that the humerus, metacarpal, and phalanges are "anatomical areas thought to be somewhat less like man than the remainder." He didn't explain that any further either. Oxnard (1987) was even more rarified: cataloguing tooth variation among various fossil primates, including the australopithecines, with the focus being the prevalence of sexual dimorphism. The contrast of approaches may be seen when Oxnard (1975) relied on Wood (1974) for multivariate analysis of the talus (ankle) of *Homo erectus* (KNM-ER813) that suggested how much closer to human that later specimen was. During the intervening quarter century Bernard Wood has obviously not taken biometrics to be a death knell for the australopithecines as human ancestors, as indicated by current contributions such as Wood & Collard (1999).

¹¹⁶ Gish (1993, 344). One may also compare Gish's selective use of White above in note 38. Of course, Johanson and White play a pivotal role in anthropology because they are the ones doing a lot of the actual work, particularly regarding *A. afarensis*, the species proposed by White and Johanson in 1977 to encompass much of Johanson's Hadar finds. Tattersall (1995a, 150) observed

that, “Between them, these two researchers were responsible for the description of virtually all the hominid fossils known then from the period between about 4 and 3 mya, and it was in a way natural that the two should have ended up collaborating on an analysis of these fossils, despite the fact that the two researchers were of very different temperaments.” Of White, Gore (1997a, 88-89) observed: “Few anatomists are as respected as he is for the rigor of their analyses—and few are as feared for the sharpness of their criticism.” And someone else deserves note: the most prolific fossil *finder* has been the Leakeys’ indefatigable colleague Peter Nzube Mutiwa, reminded Gee (1999, 100-101).

¹¹⁷ Gish (1993, 352). The Oxnard-Zuckerman argument dates back at least to Gish (1978, 109-112) and persists in Gish (1995, 237-241) and Milton (1997, 203-204). Other antievolutionists likely absorb this position parasitically, such as when Huse (1997, 139) relied on Oxnard for the conclusion “that the australopithecines did not walk upright, at least not in the same manner as humans.” The older Hayward (1985, 52) was distinctive for not citing either Oxnard or Zuckerman in arguing that Lucy “did not walk upright like a woman, but in a slouched position like an ape.” An ironic addendum here concerns how Oxnard’s British School view of leisurely human evolution led him to hold on to *Ramapithecus* as a human ancestor long after other anthropologists had given up on it (Talk.Origins has an informative .faq on the australopithecines, covering Oxnard and Zuckerman’s views). Since Creation Scientists have been so enthusiastic about heralding the demotion of *Ramapithecus* (notes 58-59 above), their reliance on Oxnard required as much artful stage direction as Johnson arranged for Zuckerman.

¹¹⁸ Cremo & Thompson (1993, xxxv). The sort of evidence they have in mind for disinterment is explored below in relation to “The Mysterious Origins of Man” TV special.

¹¹⁹ Parenthetically, being species designations within the *Australopithecus* genus, Johnson’s capitalization of *afarensis* and *africanus* in his Research Notes (re note 105 above) was a mistake. In my own draft of this work I let slip an occasional typo regarding “*T. Rex*”—which one of my own scholarly proofreaders duly corrected me on. Which suggests that Johnson’s dovecote of “diligent scientific consultants” failed to spot so rudimentary a nomenclatural gaff.

¹²⁰ Per note 267 of chapter four on Johnson’s jousting with Lewontin over this issue, and note 41 above on Bowden’s giddily unapologetic geocentrism. Bowden’s online advert for the 2nd edition of *Ape-Men: Fact or Fallacy?* included Johnson’s remarks among “Comments by reviewers” (along with Duane Gish). Judging by the account of Bouw and Bowden in McIver (1988b, 26), Bowden apparently kept his geocentric affinities well under wraps until the Internet age. Johnson, Huse and Paul Taylor (note 41 above) weren’t alone in relying on Bowden, such as Chick Publication’s *Battle Cry* newspaper and Francis Hitching’s *Neck of the Giraffe* (so much so in Hitching’s case that Bowden accused him of plagiarism), McIver (1988b, 113-114, 122-123). Bowden’s faulty methodology was far more transparent, however. An interesting exchange over “Pekin” Man (available at this writing at talkorigins.org/faqs/homs/hfmb.html) showed Bowden in “willing neither to defend nor abandon” mode, as Jim Foley kept trying to pin Bowden down on specific source citations. Bowden eventually backed off from the debate. For a dandy parallel, Milton (1997, 207) took exactly the same slippery position as Johnson: “Lucy was immediately and enthusiastically greeted as a missing link, Darwinists apparently having forgotten that it was Lucy’s *Australopithecine* relatives that Solly Zuckerman found were ‘predominantly ape-like, and not man-like creatures’ some thirty years earlier.” And Jim Foley also engaged Milton in extended and revealingly fruitless debate (likewise available via Talk.Origins) trying to get Milton to append specific citations to his bald assertions. All this is of methodological relevance in deciding whether Richard Milton is simply Phillip Johnson minus the Presbyterianism (stay tuned to the next chapter).

¹²¹ An instance would be Gould (1977a, 60), who favorably referred to Oxnard’s work of that time, agreeing that multivariate analysis suggested the australopithecines were “uniquely different” from both apes and humans. As Gould’s subsequent writing has affirmed, though, this recognition has not translated into a sentiment that the australopithecines were not ancestrally related to man.

¹²² Perhaps because biometric analysis is deemed too “technical,” creationists have ventured into this area only rarely and warily. Besides the tiptoe overage by Johnson and Gish, one may compare the even more cursory treatment of Wendell Bird (1989, Vol. 1, 228-230) and Morris & Morris

(1996b, 85-86) with the lengthier (but still artfully misleading) account in Cremo & Thompson (1993, 710-720).

¹²³ Johanson & Edey (1981, 76).

¹²⁴ Johanson & Edey (1981, 77).

¹²⁵ Johanson & Edey (1981, 262-273). The significance of the foramen magnum was noted by Johnson & Edey (1981, 44, 51).

¹²⁶ McGowan (1984, 174). Another of Johnson's cited sources, Cartmill *et al.* (1986, 415-416), also noted (with illustrations) that the australopithecine pelvis was far more like that of a human than a chimpanzee. Putting even the best face on it, Johnson's dated invocation of Zuckerman was just as questionable as Duane Gish trying to beach the new whale finds by trotting out the earlier comments of the Russian whale expert Mchedlidze, as covered in the previous chapter.

¹²⁷ See Roger Lewin (1988, 85-87) for a quick summary of the theoretical dispute and relevant *dramatis personae*, and Tattersall (2000b) for the role the American Museum of Natural History has played in the ebb and flow of anthropological thinking over the last century. Like J Harlen Bretz trying to sell colleagues on the Spokane Flood, Brace's "brash style" complicated the assessment of the data, Tattersall (1995a, 127). Indeed, "Brace branded as 'antievolutionary' virtually anyone who might doubt that hominid history had been an elegantly linear progression from australopithecines through pithecanthropines [*H. erectus*] to Neanderthals and thence to modern humanity," Tattersall (1995a, 116). Tattersall & Schwartz (2000, 31-33) also highlight the theoretical influence of Ernst Mayr and Theodosius Dobzhansky (charter founders of the modern evolutionary synthesis) regarding the single species concept. Schwartz (1999, 42-43) ironically pointed out that Dobzhansky (1962) failed to apply his own experience with the patterns of fruit fly variation to the human example (much the same point "Stephen" Stanley was trying to make, re Johnson per note 106 above)—cf. also Dobzhansky (1941; 1955).

¹²⁸ Cartmill *et al.* (1986, 416) pointed out that the "single-species hypothesis expired in 1973 on the shores of Lake Turkana in Kenya," as Richard Leakey's *Homo habilis* clearly coexisted with the distinctive late australopithecines. Shreeve (1995, 18-19) made a similar point. C. Loring Brace, "Humans in Time and Space," in Godfrey (1983, 255-258) had partly given way by recognizing two species: the original "gracile" *africanus* and its later "robust" *boisei* offshoot. As colleagues at the AMNH in New York, Eldredge & Tattersall (1982, 121-159, 131-136) reflected the start of the sea change toward the multiple species perspective, which had solidified by the time Leakey & Lewin (1992, 115-116) or Peter Andrews & Christopher Stringer, "The Primates Progress," in Gould (1993, 240-241) surveyed the field. Tattersall (2000a) surveys the present consensus. Unlike the later *Homo erectus*, where males and females varied no more than humans, a good case can be made that the australopithecines and transitional *Homo* were at least as sexually dimorphic as living gorillas, Paul Ehrlich (2000, 176). The average australopithecine male stood 4.6 feet and weighed around 94 pounds, the female 3.75 feet and 70 pounds (for comparison, the figures for the less dimorphic *erectus* males were 6 ft and 138 lbs., 5.3 ft and 117 lbs. for females), Swisher *et al.* (2000, 158). The 1987 Stony Brook conference came to regard the gracile and robust branches as representing a much broader split, restoring *A. robustus*, *aethiopicus*, and *boisei* to Robert Broom's original designation, *Paranthropus*. While Tattersall (1995a, 195-196) reflects this view, popular accounts like Gore (1997a, 85-87) retain the *Australopithecus* designation. Edey & Johanson (1989, 348-352), Johanson (1993) and Johanson & Edgar (1996, 152-153) describe the intermediate *A. aethiopicus* "Black Skull" (KNM-WT 17000) from 2.5 mya, which is a possible link between *afarensis* and subsequent *Paranthropus* species. Ironically, as noted by Schwartz (1999, 151-152), Broom had initially regarded *Paranthropus* as closer to the human lineage than the australopithecine cousins. Eldredge (2000, 58) remarks that the robust australopithecines were "ecological specialists obliged by their dental adaptations to eat tubers, nuts, fruits, and other vegetable materials. And, like other ecological specialists, the robust australopithecine lineage shows very rapid rates of evolution—with at least five different species occurring in Africa in a 1-million-year period (2.5-1.5 million years ago). The flip side of the rapid evolutionary rates of ecological specialists is their characteristically high rates of extinction: none of the species of robust australopithecines so far discovered lasted very long." (Eldredge's "five" may be a typo, as only

three of the contemporary five species were robust.) *P. boisei* and *robustus* might not be separate species, however, but only regional variants, as cautioned by Delson (1997) regarding the discovery of the first complete *boisei* skull (1.4 mya), described by Suwa *et al.* (1997). A counter-argument comes from the developmental end: much of the distinctive robust australopithecine face may stem from the correlated progression (cf. note 183, chapter four) of large molars among otherwise small front teeth, Morell (1999b) on McCollum (1999). Berger (1998) and Tattersall (1997; 2000) survey the present consensus on *Paranthropus* as an offshoot of the australopithecines. Tattersall (1995a, 197) warned: “If there are two things we can be sure of it’s that, first, there are more early hominid species out there than we have yet, for whatever reason, been able to recognize; and, second, that among the species that we have accurately characterized, there’s not one whose full time span on Earth we know.” Similarly Tudge (1996, 199-203) suspected there were more hominid taxa to be discovered, and time has confirmed that. From 2.5 mya, *A. garhi* is another contender for intermediate between *A. afarensis* and early *Homo*, Culotta (1999a) on Asfaw *et al.* (1999) and de Heinzelin *et al.* (1999). Farther down the trail (at 1.8 mya) a new find at Olduvai has helped sort out how the hominid branches were related, Tobias (2003) re Blumenschine *et al.* (2003). See also Tim White (2003) for some cautionary notes on the proliferation of new taxa.¹²⁹ Stanley (1996, 20, 62-64). *P. boisei*, *H. rudolfensis*, *habilis*, and *ergaster* all coexisted at Lake Turkana 1.8 mya, Tattersall (2000a, 56-57), as did humans and Neanderthals for many thousands of years in Europe and the Levant, Bar-Yosef & Vandermeersch (1993) and Gibbons (2001a). A pocket of *erectus* appears to have hung on in Java as late as 27,000 ybp, John Noble Wilford, “Three Human Species Co-existed Eons Ago, New Data Suggest,” in Wade (1998a, 231-234), and Gibbons (2003a) re Baba *et al.* (2003). For spice: Berger & Hilton-Barber (2000) argue *sapiens* may have originated in South rather than East Africa—cf. Henshilwood *et al.* (2002) on engraved ochres suggesting human behavioral patterns there c. 77,000 ybp.

¹³⁰ See Johanson & Edgar (1996, 168-186) for coverage of the lineup, including the 2.3 million-year-old “*Homo sp.*” maxilla found in 1994 that don’t quite fall under any of the three noted pre-*erectus* taxa. For “End of Days” Christian paranoids, one may note the catalog designation for this indeterminate upper jaw is “A. L. 666-1.” Berger & Hilton-Barber (2000, 305) caution how the lack of full skeletons for both *Homo habilis* and *rudolfensis* hamstring efforts to clarify that stage of human evolution—similarly Tattersall (2002a, 99-106). Meanwhile, McKee (2000, 221) discerned a larger evolutionary pattern: “Such stasis, when it occurs, is not so much an equilibrium (though it can appear to be) as it is a paradoxical fixation at a certain stage of impasse. The evolutionary forces are still at work, but they are working against extremely poor odds.” Which relates in turn to the matter of what might happen if lots of species are idling at the same time ... this may have been part of what knocks off whole ecosystems in mass extinctions (whether pushed over the edge by asteroid impact or tectonic plume eruption).

¹³¹ Tattersall (1995a, 192).

¹³² Tattersall (1995a, 219). All but the Arago skull were illustrated by Tattersall (1995a, 47, 54, 147, 175); Johanson & Edgar (1996, 194-201, 208-210) shows the full group. See Stringer & Gamble (1993, 66-69) on European middle Pleistocene fossil hominids (including Arago and Petralona) as they relate to the appearance of Neanderthal. Cf. Tattersall (2002a, 107-117) and Lieberman *et al.* (2002).

¹³³ Lubenow (1992, 129). Incidentally, when Lubenow (1992, 166-167) did get around to the australopithecines it was only to give them such short shrift that there was hardly any chance for him to ponder the implications of the multi-species debate on his own Creation Science misconception of human evolution. The derivative Thompson & Harrub duly followed Lubenow down that dead-end garden path (apologeticspress.org/docsdis/2002/dc-02-sa06.htm) when they offered Lubenow’s “classic text” to castigate Rennie (2002b) for a failure to “understand how evolution is supposed to work”!

¹³⁴ Wendell Bird (1989, Vol. 1, 229). Such underlying logic is reflected in Ross (1994, 141): “New evidence indicates that the various hominid species may have gone extinct before, or as a result of, the appearance of modern humans.” It is also a component of the argument in Lubenow (1992, 50-52) to disconnect the pieces of the australopithecine puzzle. To this end, Lubenow drew on 1970s

efforts to date “the cave from which the Taung skull had come.” Dating of the walls did suggest the cave might have been formed as late as 870,000 years ago. But that would only set a ceiling for the Taung Child’s skull, not a floor—since the sediments exposed by the cave’s erosion had to have been older. Unfortunately, the Taung Child was not excavated using modern techniques, and it is not certain even where in the cave it was found back in the early 1920s. Lewin (1988, 72) conservatively ballpark the skull at 1.0-2.0 mya; Johanson & Edgar (1996, 142) specify an earlier 2.3 mya figure.

¹³⁵ Lubenow (1992, 48). Drawing on Lubenow, Ankerberg & Weldon (1998, 243-244) marched off the same theoretical cliff. Similarly Gish (1995, 271): “If *Australopithecus*, *Homo habilis*, and *Homo erectus* existed contemporaneously, how could one have been ancestral to another?”

¹³⁶ Robert C. Newman, “Conclusion,” in Moreland & Reynolds (1999, 154) reflects the confusion inherent in the creationist position: “Regarding anthropoid fossils that predate modern human beings, I am inclined to see these as not ancestral to us, though I am not sure where to put the break.” An especially off-center analysis was offered by Schroeder (1997, 127) when he declared that Ernst Mayr “has come to admit that the origin of our species is a ‘puzzle’ (to use his word) that may never be solved. The link that leads directly to *Homo sapiens* is missing.” Exactly two sources were cited: Horgan (1992) & Rennie (1994). The latter was a biographical interview with Mayr, during which the subject of human evolution had not arisen at all. The Horgan piece was a survey of current trends in science, and the extent to which fundamental discoveries remain to be made (primarily in physics). Horgan (1992, 20) mentioned Mayr *once*: “All that remains, Mayr contends in *One Long Argument*, a book published last year, are ‘puzzles.’ Some of these puzzles, he concedes, particularly historical ones such as the origin of life or of *Homo sapiens*, are extremely difficult and may even resist a final, satisfying explanation. But however they are resolved, Mayr argues, they will not force any significant changes in the underlying paradigm of Darwinian evolution.” Here’s where lazy scholarship took its toll, for Horgan was misstating Mayr’s position—which Schroeder might have noticed had he turned to *One Long Argument* instead of commandeering Horgan’s abstraction. Mayr (1991, 25): “today this derivation is not only remarkably well substantiated by the fossil record, but the biochemical and chromosomal similarity of man and the African apes is so great that it is puzzling why they are so relatively different in morphology and brain development.” Cf. Mayr (2001a, 235-256) on human evolution, and notes 217 & 347 below on genes and neurology. The conservative culture critic Rabbi Daniel Lapin (1999, 54) subsequently escalated the Horgan-Schroeder with some of his own misapprehension: “In his recent book, *The Science of God*, Schroeder quotes [*sic*] Harvard professor emeritus of zoology, Ernst Mayr, who has been a noted authority and advocate of Darwinian evolution. After many years of study Mayr had the intellectual honesty to admit that we may never solve the puzzle of the origin of species.” Lapin may have been reading a bit too quickly to have spotted the “our” Schroeder had put in his point on speciation, but since Mayr (1963; 1970) all but defined allopatric speciation (based on geographic isolation), Mayr was probably the last person to invoke as a source of mystery in this department. Mayr (2001a, 174-187) represents his latest survey—see Coyne (1994), Futuyma (1994), Gould (1994b), Schilthuizen (2001, 13-14, 19-22, 27-28, 53-58, 97-98) and Lenormand (2002) on Mayr’s influential contribution to current views on speciation. For contrast, Lapin (1999, 53) lauded those “courageous men” Phillip Johnson and Michael Behe for driving “six-inch, titanium steel nails” into “the coffin of Darwinian evolution.” Once more, forgetting to put that lid on.

¹³⁷ The ICR bloc: Gish (1978, 112), Henry Morris (1985, 173-174), Morris & Parker (1987, 155-163), John Morris in a 1995 online position statement (BTG No. 83b), and Morris & Morris (1996b, 85). Gish (1995, 262): “They were apes that were uniquely different than any ape now living but nevertheless, just apes, in no way related to the ancestry of man.” Laboring on their own agenda, Cremo & Thompson (1993, 728-733) arranged a mass of quotations to buttress the view that the australopithecines were fairly conventional arboreal apes (see also note 365 below). Paul Taylor (1995, 34) reflects a more muddled creationist stance by considering both australopithecines and *habilis* as apes. While Gish (1978, 136, 137-138) seemed to slide *habilis* on the human side, Gish (1995, 261) highlighted australopithecine aspects. Henry Morris (1985, 176) took the *Homo*

genus status of the Leakey finds as meaning “Modern Man”—which explains the claim by Morris (1985, 160) that *evolutionists* believe “true modern man had arrived at least one million years ago, possibly more than three million years ago.” Morris & Morris (1996b) left *habilis* out of their discussion of human evolution. Since Richard Milton freely siphoned off Morris’ dinosaur material (re note 80, chapter three), the position in Milton (1997, 206) that *habilis* “is a human—not a missing link” may have derived from that source.

¹³⁸ Davis & Kenyon (1993, 112-113). Wendell Bird (1989, Vol. 1, 231) and Huse (1997, 136) sought to dispose of *erectus* as some sort of gibbon by drawing on a 1937 opinion by Dubois himself concerning how gibbon-like his Java Man finds were. Milton (1997, 198) tried a similar trick, but indulged in his customary murky scholarship by concluding that, “Today, ‘Java Man’ is thought to be an extinct, giant gibbonlike creature and not connected to humans.” Who exactly is supposed to be thinking this, Milton did not say—indeed, he offered no references to *any* scientists who hold that position (as we’ve seen, per note 112 above, even Lord Zuckerman accepted *erectus* on the hominid line). Tattersall (1995a, 39-40) explained the curious context of Dubois’ later view: Dubois was trying to salvage his old ideas about brain size correlating to body mass, attributing to Java Man a gibbon’s physical proportions. Incidentally, by the time Bird, Huse and Milton were writing, the build of *erectus* was clarified by new fossil finds, per note 146 below. The Talk.Origins Archive has much useful commentary on how creationists have approached the fossil record of *erectus*.

¹³⁹ Lubenow (1992, 87), followed by Paul Taylor (1995, 34-36). Henry Morris (1985, 174): “It may well be that *Homo erectus* was a true man, but somewhat degenerate in size and culture, possibly because of inbreeding, poor diet and a hostile environment.” While less explicit about their deleterious lifestyle, Morris & Morris (1996b, 89-90) still regard them as humans. C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 268) remarked on Morris’ take on *erectus*, including a mistaken item about the taxon surviving in Australia 10,000 years ago—a bit subsequently removed from Morris (1985), and not commented on by Gish (1993). Gish has been something of a loose cannon when it comes to *erectus* too. Strahler (1987, 489-490) noted Gish parted company from Morris by pegging *erectus* as an ape. Schizophrenically, Gary Parker relied on Gish (and not his co-author Morris) for an ape classification in Morris & Parker (1987, 154-155). More recently, Gish has stuck to his guns, sort of—parsing his view on newer finds to embrace all options, as Eve & Harrold (1991, 76-78) discovered concerning his 1985 edition. The version in Gish (1995, 304-305): “At this time, it is our opinion that some specimens attributed to *Homo erectus*, such as Java Man and Peking Man, are definitely from the ape family with no link of any kind to man. In other cases (some of which have not been described here), specimens have been attributed to *Homo erectus* which otherwise would have been attributed to Neanderthal Man if the authorities making this decision had not believed that the fossil creature was too old to have been Neanderthal Man. In these instances, as, for example, the very recent find by Walker and Leakey near Lake Turkana, it may be that the creature was fully human, *Homo sapiens*.” This is creationist “Zeno slicing” at high setting!

¹⁴⁰ Lubenow (1992, 138). “Neanderthal was a card-carrying member of the human family, a descendant of Adam, and probably a part of the post-Flood population,” Lubenow (1992, 65). He cited anthropologists who (following the linear view of human evolution) linked some late *erectus* with Neanderthal—but that’s not the conclusion he was jumping (the identification of all of them as merely unusual people). Lubenow (1992, 61) played hopscotch around the anatomy: “The typical Neanderthal does differ somewhat from the typical modern human. However, the two also overlap.” He didn’t go into details on what that “overlap” consisted of, but Lubenow (1992, 76-77) reprised a dated smorgasbord of theories proposed over the years to suggest their specialized anatomy might have been due to diseases (from rickets to syphilis). Likewise Bird (1989, Vol. 1, 231) and the aforementioned 2000 Christian radio spot. A new player here is New Jersey orthodontist Jack Cuzzo (1998), whose “startling truth” is that Neanderthals were just conventional human beings from the Biblical patriarchal era whose atypical skeletal features were but a consequence of having lived past 500 years of age! Since the early 1980s Cuzzo (anglefire.com/mi/dinosaurs/bernifal.html) has also been promoting cave “carvings” supposedly

showing dinosaurs. Having some training in forensic anthropology, Cuzzo contends several museum specimens were incorrectly restored or interpreted. The March 2000 edition of D. James Kennedy's "Truths That Transform" (where Phillip Johnson was featured) duly pumped this claim into "proof" that it is "common practice" for evolutionists to tamper with evidence. Regarding the physical traits and geographical distribution of Neanderthals, these may be seen in Stringer & Gamble (1993, 10-11, 76-87, 100), Cavalli-Sforza & Cavalli-Sforza (1993, 55), Tattersall (1995b, 11-17), Gore (1996, 11-15), Jordan (1999, 12, 75, 46-59), McKie (2000, 159), Tattersall & Schwartz (2000, 194-206), Wong (2000, 100) or Arsuaga (2001, 74-90). The curious effects of the posited patriarchal longevity would thus be their chin dropping off and forehead rippling down into the prominent Neanderthal brow ridge, accompanied by a general compulsion to migrate to Europe (there being only a handful of Neanderthal sites known from the Biblical Near East). By the way, Tudge (1996, 217) points out that the Neanderthal brow ridge differs from the solid one seen in *Homo erectus*, and may have played a role in sexual display. Cuzzo has only started to surface in the creationist canon. Paul Taylor (1995, 34, 197) briefly cited a few of his views. A preliminary critique by Australian anthropologist Colin Groves appeared in early 1999 for the National Center for Science Education (at earth.ics.uci.edu/faqs/homs/cuzzo_cg.html, with a link to Cuzzo's January 2000 rejoinder). CBN.com acknowledged the criticism (October 7, 1999 & December 14, 2000) while featuring Cuzzo's views, but supplied no details. The skeptical religious Institute For Biblical Studies folk reported on Cuzzo's role in 2001 creation/evolution debate (bibleandscience.com/debate.htm). Farther down the food chain, the pro-creation "Non-Politically Correct" page (members.aol.com/isaiah312/ayers/npc.html) recommended Cuzzo among a Who's Who of YEC pundits: Steven Austin, Carl Baugh, Robert Gentry, Ken Ham, Kent Hovind, Henry Morris, Gary Parker, and John Woodmorappe. A link to Isaac Newton's writings on the prophecies of Daniel rubbed shoulders with several NPC sources busily repealing the last few centuries of astrophysics: Charles Lucas on "how the theory of relativity is inconsistent with both real science and christianity," and Gerardus Bouw on geocentrism (re note 41 above).

¹⁴¹ See Johanson & Edgar (1996, 194-210) for commentary on and illustrations of these forms, and McKie (2000, 118-143) or Balter (2001a) for useful surveys of the implications of recent discoveries at Atapuerca (780,000 ybp), as well as the archaic human settlements at Boxgrove in Britain. Tattersall & Schwartz (2000, 164-166, 170) note how Atapuerca greatly expanded the data set for the poorly understood European end of the *erectus* expansion, and offer cautions about the still-murky state of "heidelbergensis" taxonomy. Cf. Manzi *et al.* (2001) on the implications of the still more recent Ceprano skull find.

¹⁴² Lubenow (1992, 81). Lubenow (1992, 78-85) mentioned 49 specimens devoted to the emergence of modern man—but only a third involved diagnostic skulls. Seven of Lubenow's examples are grouped by Johanson & Edgar (1996, 194-210) under *Homo heidelbergensis*.

¹⁴³ Lubenow (1992, 85). Regarding how "human" Broken Hill 1 was, one may compare the skull shown in Tattersall (1995a, 54) or Johanson & Edgar (1996, 209-210) with the front and side skull views for the various human races by Johanson & Edgar (1996, 58-71). Cuzzo (1998, 70-72) presses much farther than Lubenow by contending that a partially healed injury in the Broken Hill skull was actually a bullet wound in a modern human. Finally, for those itching to know, Genesis 4:21-22 describes two brothers of Jabel, son of the polygamous Lamech (great-great-grandson of Enoch, Adam's grandchild via the troublesome Cain): "And his brother's name was Jubal: he was the father of all such as handle the harp and organ. And Zillah, she also bare Tubalcain, an instructor of every artificer in brass and iron: and the sister of Tubalcain was Naamah." These informative gems may be appended to that comparably profound list of Biblical refinements recounted in chapter three, apropos "The Incredible Discovery of Noah's Ark." Morris & Morris (1996b, 87) tried a comparable gambit when they fielded this dated quote from Richard Leakey (1976, 177): "At one locality, remains of a stone structure—perhaps the base of a circular hut—were uncovered; there is an excellent date of 1.8 million years for this." The Morrises then extrapolated: "Now a circular stone hut could hardly have been constructed by anyone but a true human being, but the stratigraphic level of this structure was *below* the levels of fossils of both *Australopithecus* and *Homo erectus*!" Actually, the article had said no such thing about the site's

stratigraphy. As for how sophisticated a piece of masonry this was, the Leakey piece had no picture of the hut base. But the illustration of the stones in Lambert & The Diagram Group (1987, 110) showed a *very* rough circle of debris, with the caption explaining that the “stones evidently anchored branches providing the structure of a lakeside hut at Olduvai.” Subsequent anthropological works do not offer it as a human artifact, but even had the find panned out it would still have represented something far from Morris’ “stone hut.” Cf. the reconstruction of a 400,000 year-old wooden *heidelbergensis* shelter from Terra Amata on the Mediterranean, illustrated in Tattersall (1995b, 72).

¹⁴⁴ Johanson & Edgar (1996, 194), noting the resemblance to Rhodesian Man. Cf. also Berger & Hilton-Barber (2000, 287-288).

¹⁴⁵ Balter & Gibbons (2000) survey the current evidence on how early the Eurasian migrations were undertaken. John Noble Wilford, “Bones in China Put New Light on Old Humans,” in Wade (1998a, 220-223) discusses the Asian penetration, while Gore (1997c), Gabunia *et al.* (2000) and Wong (2000b) focus on the European end. McKie (2000, 106-107) and Tattersall & Schwartz (2000, 171) note major *erectus* sites and migrations. An interesting feature to the spread of *erectus* concerns population density, and what that may imply about larger evolutionary processes. The estimates in Lambert & The Diagram Group (1987, 214-215) suggest possibly a million australopithecines populated the African woodlands 2 mya, compared to 1.7 million *erectus* 500,000 years ago (thus considerably less population density given their broader spread out of Africa). For comparison, there were maybe 10 million humans on earth 10,000 years ago. Population levels for the group directly ancestral to humans have remained at around 100,000 for the last million years, though with one bottleneck reducing the ancestral gene population to around 10,000, Gibbons (1995a). Estimates on when that took place began with wide margins (anywhere from 400,000 and 10,000 years ago), but as understanding of mutation processes increases, dating the bottleneck has focused on the last part of that range, the colonization of Europe during the Upper Paleolithic, Marth *et al.* (2003). Interestingly, Eyre-Walker & Keightley (1999) indicate the human genome is remarkably prone not only to mutation, but to tolerating a higher level of harmful ones: running an average 4.2 mutations per person per generation, with 1.6 of those being deleterious! The commentary by Crow (1999a) notes the possible role of sexual reproduction in this phenomenon (though our human rate is fairly low as a means of counteracting “bad” mutations). Whether that genetic “drawback” is actually a clue to the mechanism of human success will await further research—cf. Mark Ridley (2001a, 43-45; 2001b, 229-241). Regional mutation rates may also have been affected by climate, as Mishmar *et al.* (2003) suggest for mtDNA. Beyond that, cultural feedback can short-circuit selection pressure on all levels—from compassionate caring for a diseased relative to technological intervention (such as the invention of eyeglasses rendering genes for poor eyesight irrelevant).

¹⁴⁶ Burned stones and bones heated to temperatures typical of campfires are known from perhaps a million years ago, Lambert & The Diagram Group (1987, 130-131) or Berger & Hilton-Barber (2000, 41)—though attributing them to human causation has been difficult, as cautioned by Balter (1995) or Paul Ehrlich (2000, 169). Based on the reduction in *erectus* tooth size around 1.9 mya, Richard W. Wrangham, “Out of the *Pan*, Into the Fire: How Our Ancestors’ Evolution Depended on What They Ate,” in de Waal (2001a, 137-138) presents the case for an early use of fire for cooking. While naturally occurring flame could be exploited initially, it is harder to figure out when the knack appeared to produce fire on demand. Casting doubt on the fire signs at the Zhoukoudian cave site (dating 500,000 ybp), Weiner *et al.* (1998) with commentary by Wuethrich (1998) suggest that skill appeared after 300,000 ybp. A small further reduction in *erectus* tooth size around 250,000 ybp suggests to Wrangham improvements in cooking technology, rather than the introduction of fire *per se*. There seems a consensus that full fire use was on hand by around 200,000 ybp—which still falls just before the transition to anatomically modern humans. On a broader front, Tudge (1996, 259-273) notes the effect of fire use on the landscape, and contends this may have eventually led to agriculture as a byproduct of fire-induced forest management. Recall also how Atlantic seaboard Indians employed fire to facilitate game proliferation in a forest habitat—though cf. note 408 below!

¹⁴⁷ Leakey & Lewin (1977, 121-123). One may also compare the recent reconstruction of an adult *erectus* female illustrated in Gore (1997b, 93). Incidentally, Roger Lewin (1988, 93) noted that more recent discoveries (including Leakey's own Turkana Boy in the 1980s) suggest *erectus* had a height range comparable to *sapiens*. Which (per note 138 above) suggests Lubenow was a tad dated in 1992, still thinking of *erectus* as shorter even than the stocky Neanderthals.

¹⁴⁸ Gore (1997b, 95). Tudge (1996, 193-198, 254-259), Paul Ehrlich (2000, 167-170), and McKie (2000, 109-114) offer similar arguments, with Tudge and Ehrlich focusing also on the circumstantial evidence for meat eating among the earlier australopithecines; cf. Tattersall (2002a, 91-95). Two contributors to de Waal (2001a, 97-117, 121-143) evaluate the social feedback spurred by occasional carnivory (Craig B. Stanford, "The Ape's Gift: Meat-eating, Meat-sharing, and Human Evolution") and root foraging (Richard W. Wrangham, "Out of the *Pan*, Into the Fire: How Our Ancestors' Evolution Depended on What They Ate")—that latter diet particularly suggested by the blunt, thickly enameled australopithecine teeth. Backwell & d'Errico (2001) offer evidence of possible hominid termite foraging, while Yoerg (2001, 152-158, 160-163) explores how an omnivorous diet promotes animal intelligence. Tattersall & Schwartz (2000, 120-123) and Swisher *et al.* (2000, 163-165) note how meat-eating was reflected in *Erectus* tool technology, their broadening ecological range, and even shifts in the intestines consistent with the slimmer *erectus* build. Our much smaller gut (as compared to the other distinctly herbivorous primates) may have been part of a feedback loop in which intelligence "helped *Homo* secure a higher quality diet, which allowed for a smaller gut. As guts shrank, more energy became available to run a still larger, more complex brain," Gore (1997a, 91). Cf. Burke & Ornstein (1995, 12) on the parallel synergy of fire use. Interestingly, diet has played a role in the long-term decline of the apes over the last 20 million years, as the monkeys have proliferated because they "can tolerate many defensive chemicals used by plants," Peter Andrews & Christopher Stringer, "The Primates Progress," in Gould (1993, 233).

¹⁴⁹ Jolly (1999, 367-368). The Walker & Leakey comments are to be found in Gore (1997a, 97). Not that Walker is completely down on the social skills of *Homo erectus*. As noted by McKie (2000, 89-90), Walker is impressed with the study suggesting that a 1.5 mya adult female (KNM-ER 1808) may have suffered from vitamin A poisoning—as she survived for some time with this malady, she could only have done so by being cared for by her fellows. Peter Andrews & Christopher Stringer, "The Primates Progress," in Gould (1993, 243) and Swisher *et al.* (2000, 156) further observed that her ultimately fatal diet may have been an over-consumption of carnivore livers, where vitamin A is known to concentrate. The pathological condition of the Nariokotome Boy may also prove relevant to this issue (re note 32 above). A further point to consider is how expressive the *erectus* face may have been: Donald (1991, 181) noted some of the "indirect anatomical evidence for an early increase in the range of facial-vocal expression over that of australopithecines."

¹⁵⁰ For concise treatments of the history and form of stone tool use, see Eldredge & Tattersall (1982, 156-159), Tattersall (1995a, 201-207) or Ambrose (2001). Tattersall & Schwartz (2000, 160-161) note how the revised early datings for *erectus* migrations helps resolve the persistence of Oldowan chopper tools in Southeast Asia long after Acheulean handaxes appeared in Africa, the Middle East, and Southern Europe. For contrast, the coverage of *Homo erectus* tool use by Lubenow was revealingly superficial. A quarter of his book (six chapters) was devoted to *erectus*, Lubenow (1992, 86-143)—but four of those were given over to churning about the purported inadequacies and controversies concerning Dubois' original work on Java Man a century before. Only towards the end was hominid tool use mentioned, Lubenow (1992, 140-142), mixing in later periods (like Neanderthal) and providing no substantive description or chronological context to allow the reader to understand what was going on.

¹⁵¹ Tattersall (1995a, 240-241). See Lambert & The Diagram Group (1987, 126-129) on the Acheulean (a.k.a. "Acheulian") tool form, and evidence for *Homo erectus* hunting. Though in his evaluation of the possible language skills of early man Bickerton (1995, 47) cautions that the Acheulean handaxe might also have been the core for flaked tools, with the later Levallois technique a means to reshape old cores for more flakes. (See note 103 above on the "cores versus

flakes” problem.) Some interestingly shaped stone slivers from 250,000 years ago in Kenya may also suggest a shift to more specialized toolmaking, Gutin (1995). Stringer & Gamble (1993, 55) have an interesting chart showing the output production for the later tool forms. The Acheulean obtained 8 inches of cutting edge from a pound of flint—compared to only 2 inches for the previous Lower Paleolithic Abbevillian form. That output jumped radically when more modern humans (Neanderthal and *sapiens*) appeared on the scene over the last quarter million years: the Middle Paleolithic Mousterian “prepared-core” method would extract 40 inches from the same material, and the Upper Paleolithic Magdalenian a whopping 10-40 feet.

¹⁵² The overall anatomical picture may be seen in a chart in Mithen (1996, 12) plotting the brain volume of dozens of specific skulls (rather than selecting single ones to represent whole taxa). Seen graphically in this way, the basal australopithecines maintained a quite flat range of brain volume through their lineage, until a “spurt” of brain development bumped up through *habilis* into *erectus* 2.0-1.5 mya. It is probably not coincidental that *Erectus* then sustained a much broader range of brain volume, consistent with a globetrotting form that hunted in more socially complex ways, and even began to fiddle with fire. Around 500,000-200,000 years ago a second “spurt” saw *erectus* brain volume nudging up somewhat, grading into Neanderthal and *H. sapiens* (archaic and modern). Comments on hominid brains relating to the creation/evolution debate run from McGowan (1984, 175-176) and Strahler (1987, 490-492) to Niles Eldredge in his debate with Johnson at Calvin College (re note 214 of chapter four). Cf. also Tobias (1971).

¹⁵³ From the cognitive psychology side, Pinker (1997a, 201-203) suspects that a lot of significant brain evolution went on during the periods when gross brain volume remained relatively static. Regarding the *erectus* phase, Donald (1991, 175) noted that the final stages of the Acheulean culture “had the earmarks of organized group activity. The campsites left in the later periods of *erectus*’ tenure on Earth provide evidence of a society in which there must have been some specialization of function, especially between the sexes, and group coordination.” Donald argues that *erectus* had achieved a “mimetic” level of culture, in which non-linguistic actions could be made intentionally to affect others (the “mythic” culture of *Homo sapiens* involved first spoken language, and then the memory-enhancing tool of writing). “Innovative tool use could have occurred countless thousands of times without resulting in an established toolmaking industry,” stressed Donald (1991, 179), “unless the individual who ‘invented’ the tool could remember and re-enact or reproduce the operations involved and then communicate them to others.”

¹⁵⁴ Tattersall (1995a, 242).

¹⁵⁵ A comment by Donald (1991, 179) is particularly relevant: “The stone tools of *erectus* required expert fashioning; archaeologists require months of training and practice to become good at creating Acheulean tools.” The skills involved are more graphically seen in video treatments of human prehistory, ranging from *National Geographic* specials to PBS’ *Nova* and programs on the Discovery Channel. An illustration of Kathy Schick using a simple stone flake to butcher an elephant carcass may be seen in Tattersall (1995b, 54). Or Jolly (1999, 368): “Wooden spears 400,000 years old, dug up from a German coal mine, have points shaped from the hardest part of spruce trunks and balance at a third of the way from the point, like a modern javelin. It is clear that our predecessors worked with patience, skill, and foresight, and they were hunting big game. From about 300,000 years ago, brains grew rapidly larger. By then they absolutely must have changed toward modern childhood growth and, as we shall shortly see, to tongue-wagging.” (That issue will be explored further below.) Early human toolmaking skills underwent another jog upward around 250,000 years ago in Africa, the Near East and Europe with the Levallois method of flaking, Mithen (1996, 26). As illustrated by Mithen (1996, 120), modern replication has again revealed how much concentration was required, attending to “both visual and tactile clues from the core, to have constantly monitored its changing shape, and to have continually adjusted his or her plans for how the core should develop.” For contrast, Shreeve (1995, 147-150) sounded a few cautionary notes on how careful paleoanthropologists have to be in interpreting shifts in stone tool use—while Devlin (2000, 191-192) glossed over the mental implications of toolmaking completely.

¹⁵⁶ As the evidence has been shaping up, the issue further turns on whether “*H. ergaster*, the stay-at-home in Africa, is the true ancestor of modern *H. sapiens*, not the migratory *H. erectus*,” Tudge

(1996, 225). Further pieces have been added to the picture as *erectus/ergaster*-style fossils have been found at Dmanisi in the Republic of Georgia, Gabunia *et al.* (2000), Balter & Gibbons (2002) re Vekua *et al.* (2002), Gore (2002)—and in Ethiopia, Asfaw *et al.* (2002).

¹⁵⁷ Polygenism certainly has had a long and checkered past, dating at least as far back as the 16th century German philosopher Theophrastus Bombastus von Hohenheim, as noted by Schwartz (1999, 55-56). During the Enlightenment human racial unity became the operating credo, running from Linnaeus and Blumenbach, even if its 19th century evolutionary practitioners like William Henry Flower still had no doubts as to which race belonged at the top of the heap, Ritvo (1997, 123-127). Which ironically put polygenists like Agassiz rather out of touch with the general trend of 19th century taxonomical thinking. See Wolpoff & Caspari (1997) for a thorough airing of its historical antecedents and recurrent racist controversies, or Trinkaus & Shipman (1993, 312-316) for the digest version. Over at the ICR enclave, Morris & Morris (1996b, 94-95) hold the line on who supposedly wears the black hats here: “Evolutionists, as well as creationists, have in recent years come to believe in the monophyletic origin of all the tribes and races of mankind. Most of the earlier evolutionists, however, believed in man’s polyphyletic origin, thinking that each of the major ‘races’ had evolved independently from a different hominid line.” The Morrises did not go into details on how many of these “earlier evolutionists” it would take to constitute “most”—or that the founding figures of Darwin, Wallace and Huxley were certainly not among them. Turning to the contemporary world, polygenism is still alive and kicking in at least one venue: the blithering racism of the Christian Identity movement, as noted by an appalled local minister, Jerome Walters (2001, 11). “Identity” believers rely on props running from ludicrously strained readings of the Bible (where all the proper Israelites are held to be as “Aryan” as they think they are) to the historical revisionism of Holocaust denial. Noticeably absent, though, are any identifiably *Darwinian* arguments. Which only serves to reinforce my own personal experience: of the mercifully few genuine bigots I have had the ill favor to encounter over the years, *none* of them has ever been even remotely an “evolutionist.”

¹⁵⁸ There are actually half a dozen different variations each on the two competing models (population replacement versus regional continuity), with pet names like “Noah’s Ark” and “Candelabra.” See Stringer & Gamble (1993, 35-36) or Shreeve (1995, 88, 112) for tidy digest versions of the major contenders, or Tudge (1996, 220-234) for a more comprehensive tour. Arguably the most garbled antievolutionary account of the multiregional debate occurs in Lapin (1999, 67): “If, as secularists believe, various tribes of baboons evolved into early tribes of primitive humans at different times and in different places around the world, we would expect to see many separate and distinct languages. We might find groupings of languages but we certainly would not expect to find all languages related to one another and to one original mother of all language. If in fact all languages are descended from one original language, it makes it just a little bit more difficult to accept a purely materialistic account of mankind’s origins. Yet that is precisely the direction in which current research is leading and which secularists find so disturbing.” Which disturbed secularists he had in mind, Lapin did not say. Evolutionists like Roger Lewin (1997, 190) or Dingus & Rowe (1998, 269) seemed perfectly happy to highlight a chart showing how genetic variation matches up with human linguistic diversity. And that’s because no “secularist” I know of advocates so preposterous a polygenism as Lapin’s straw man of the parallel evolution from “baboons” to humans.

¹⁵⁹ Davis & Kenyon (1993, 111) pressed on instead in an attempt to turn the tables: “Less attention has been given to the first appearance of morphologically modern humans in Africa and the middle East, because of their recency, but these may be quite important discoveries. These earliest anatomically modern types were found at burial sites in caves at Qafzeh in the far south of Israel, and Es Skhul, for example.” They did not indicate who it was supposedly paying this lesser attention, however—presumably not all the working anthropologists who were responsible for the digs in the first place. Incidentally, Jebel Qafzeh, Mugharet es-Skhul, and other early human sites had already made it into general accounts by the time *Of Pandas and People* went into its 2nd edition—such as Putnam (1988) in *National Geographic*, Roger Lewin (1988, 128-129), or *Past Worlds* (1988, 66-67). Or consider the useful comparisons of Qafzeh early modern skulls with

Neanderthals in Bar-Yosef & Vandermeersch (1993, 98) or Stringer & Gamble (1993, 100)—exactly what Davis & Kenyon were insisting paleoanthropologists weren't doing. Other creationists have stressed the sparse character of the hominid record. The version in Hayward (1985, 50-52) leaned toward the Von Däniken Defense by arguing that anthropologists were too guided by their evolutionary preconceptions. The Bermuda Triangle Defense was more in force when Morris & Morris (1996b, 80) trotted out an assortment of authority quotes on what they intimated to be the general scarcity of human fossil ancestors. One piece by Colin Tudge in *Nature* (May 20, 1995) indicated the available evidence translated into about 2000 individuals (which is either a lot or a little depending on what one is trying to infer from them).

¹⁶⁰ Lubenow (1992, 33). The survey by Lubenow (1992, 28-32) of the British Museum *Catalogue of Fossil Hominids* concluded there were roughly 4000 individuals documented there. Although he acknowledged (p. 29) that “an individual may be represented by just a tooth or all the way up to a complete skeleton,” he failed to reflect that when accusing evolutionists of misrepresenting the record. For example, Lubenow (p. 31) mentioned the same AMNH exhibit Johnson touched on, which Tattersall said had assembled over “half of the most complete specimens.” Lubenow’s verdict: “Because Tattersall is a responsible scientist, I suspect that he was misquoted. As it stands, the statement is so patently wrong as to be absurd. Even if he had said ‘more than half of the most important fossils,’ the statement would still be false. A large number of very important fossils were not brought to the exhibit.” These he did not specify.

¹⁶¹ Lubenow (1992, 79, 121-123, 128, 170-171). See note 84 above on Lubenow’s brief treatment of *erectus*. Without knowing what was being discussed, comments like this one in Leakey & Lewin (1992, 81) could easily lead creationists astray: “The prehistoric record in Africa is now extensive, no longer the quip about fewer fossils than would cover a dining room table. By my count there are fossilized fragments of about a thousand human individuals from the early part of our evolution, and I wouldn’t even try to count the number of stone tools.” As for how that translates into fossil reality, the photo of Johanson and several assistants examining the “First Family” group shows a table-full of bits, Roger Lewin (1988, 63). The entire Hadar and Laetoli collections (which include the “First Family” group) illustrated in Johanson & Edey (1981, 221), Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 231) or McKie (2000, 27) covered an area only slightly larger than a tournament Ping-Pong table. The back rows contained a plethora of chimpanzee skulls, but the “First Family” itself consisted of a considerable pile of fragments. Lucy was the sole skeleton (the Nariokotome Boy only turned up in 1984, as per note 32 above). Since *erectus* was a tall biped, isolated skeletal bones could resemble those of their equally bipedal human counterparts—a consideration which Lubenow invariably did not mention as he summarily lumped them under the “modern human” category. Once more we face the Alphonse/Gaston problem, which has plagued creationist “paleontology” from square one. Finding a distinctive hominid tooth establishes a temporal and spatial blip on the scope—but not whether its big toe could still flex enough to shinny up a tree jig-time, or whether it represented a close or more distant cousin to other better-known specimens.

¹⁶² Lubenow (1992, 140).

¹⁶³ Lubenow (1992, 170); a sporadic time scale along the left margin put Kanapoi closer to the “5 m.y.a.” value than “4 m.y.a.” As the skeleton of Lucy established, australopithecines had “relatively long arms” for their size, Johanson & Edgar (1996, 124)—which means an isolated arm bone could well appear very similar to its human counterpart. Significantly, in his discussion of the Kanapoi fragment, Lubenow (1992, 52-57) never got around to explaining in what respect such a partial bone would look different from that of an australopithecine. See Schwartz (1999, 27-32) for fuller coverage of the problematic Kanapoi humerus. Lubenow stretched matters even further by including on his list of modern man the type specimen of *H. rudolfensis*, KNM-ER 1470 (dating to 1.8-1.9 mya). In this case, Lubenow had to rather pointedly ignore its far from human dentition, notably its “very large incisors and canines,” Johanson & Edgar (1996, 177-178). Ankerberg & Weldon (1998, 244) relied exclusively on Lubenow for the claim “that fossils which are indistinguishable from modern humans, according to the evolutionary time scale, can be traced all the way back to 4.5 million years ago.” But Huse (1997, 139) topped that by a wide margin.

Blissfully unaware that the Kanapoi find consisted only of an arm bone, Huse decided “there is evidence that people walked upright before the time of Lucy. This would include the Kanapoi hominid and Castenedolo Man. Obviously, if people walked upright before the time of Lucy, then she must be disqualified as an evolutionary ancestor.” One may recall another of Huse’s fractured syllogisms (per note 177, chapter two.) Huse’s sole source here was Gary Parker’s 1981 ICR pamphlet (Impact No. 101), which still affirmed the authenticity of the Paluxy River “man tracks.” Parker in Morris & Parker (1987, 160-161) used the same two hominid examples and logic as Huse, describing the Castenedolo skull as “Mid-Tertiary.” Meanwhile, Morris (1985, 177) picked on the Pliocene: “For example, there were the Castenedolo and Olmo skulls, found in Italy in 1860 and 1863, respectively. Both were identified as modern skulls and yet were found in undisturbed Pliocene strata. The Calaveras skull was found in California in 1886, also in Pliocene deposits, and it too was a fully developed modern skull.” Since neither Parker nor Morris offered any sources for their Castenedolo or Calaveras claims, the reader would be left trying to unscramble a confused 19th century stratigraphic terminology (by modern reckoning, the “Mid-Tertiary” and “Pliocene” occur roughly 30 million years apart). Old Earth creationist Hayward (1985, 146-148) reminded that “Castenedolo Man” was actually only 25,000 years old, and “Calaveras Man” was a hoax—though Hayward offered this chiefly to criticize how Young Earth creationists used dated material as a means to undermine conventional geochronology. Thorough surveys of these “anomalous fossils” may be found at the Talk.Origins Archive—Weber (1981c, 21) and Conrad (1982a) are available at nseweb.org. A scholarly observation jumps out from all this: neither Gish (1995) nor Morris & Morris (1996b) mentioned Castenedolo or Calaveras in their treatments of human evolution—instances of wimpy internal housecleaning which may be contrasted with the openness of anthropologists on the important lessons of Piltdown.

¹⁶⁴ One may note that Lubenow did not even try to support his claim about what charts were not available in the evolutionary literature. An obvious counterexample would be the one used as end papers by Eldredge & Tattersall (1982). It has been regularly updated as new information has appeared: for Tattersall (1995a; 1995b, 71), again (with cladogram) for Tattersall & Schwartz (2000, 243-244), and yet again for Tattersall (2002a, 126-127). Pellegrino (1991, 128) shows a similar chart, but with the fossils grouped to show more clearly the australopithecine split (and placement of relevant tool types next to the examples of the genus *Homo*), while Swisher *et al.* (2000, 144) and Zimmer (2001g, 264) added the latest fossil discoveries. Compare also Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 230-231), Stringer & Gamble (1993, 125, 137), Paul Ehrlich (2000, 83) ... or even Steven Pinker (1997a, 198-199), who included in his recent book on the human mind a listing of the various hominid finds, their chronology and main features.

¹⁶⁵ See Rogers (2001) on Alonso & Armour (2001) & Zhao *et al.* (2001), or Huelsenbeck & Imennov (2002), on the limits of detecting past population surges and origin points from present gene distribution. Jolly (1999, 45, 369-372) noted the potential fly in the calibration ointment: occasionally (one in every 500 generations or so) *sperm* mitochondria may survive to share genetic information with that of the egg. If so, this could significantly effect mutation rate calculations over the “short-term”—like the hundred thousand years or so covering late human evolution. The result might in principle *double* Eve’s timeframe, putting the African genesis back to 300,000 to 400,000 years ago. See Awadalla *et al.* (1999) for the technical analysis of mitochondrial recombination in humans and chimpanzees, and Strauss (1999b) for perspective.

¹⁶⁶ See Cavalli-Sforza & Cavalli-Sforza (1993, 62-74), Sykes (2001, 187-194) or Zimmer (2001a; 2001g, 295-299) on mitochondrial Eve and Y-chromosome Adam, with Bertranpetit (2000) on Shen *et al.* (2000) and Thomson *et al.* (2000), Takahata *et al.* (2001), Stumpf & Goldstein (2001), Cann (2001) and Petit *et al.* (2002) detailing the technicalities. Human Y-chromosome is a curious molecule, riddled with “junk” DNA sequences, whose evolution in mammals has only recently begun to give up its secrets via the Human Genome Project, Jegalian & Lahn (2001). The insertion of our old buddy the Alu pseudogene (note 129, chapter four) has become one clock here. Based on the Y Alu polymorphic sequence (YAP) in 15 humans and 4 chimpanzees, Hammer (1995) dated the human gene’s split from the ape base at 188,000 ybp. As in all radiometric dating, the

center value is only a probability—Hammer specifically noted the 95% confidence level assures us that the true date falls somewhere between 51,000 and 411,000 ybp. In the same *Nature* issue, Whitfield *et al.* (1995) studied a much smaller Y-chromosome sample (only 5 humans and 1 chimp) indicating a more recent origin for that particular DNA segment, 37,000-49,000 years ago. Although he cited both of these studies, Ross (1998, 111-112) relied on the Whitfield paper to jump a very broad conclusion: “This finding represents a significant breakthrough in physical anthropology. The recent date eliminates the possibility that modern humans evolved from another bipedal primate species (meaning that humans must be specially created).” Ross did not note the substantial difference in sample size between the two studies; nor did he mention that subset genes can indeed have different terminal points along the same physical line of descent, Avise (1998, 38-40)—indeed, scores of thousands of individuals probably contributed to our genome, Wiuf & Hein (1997). Asian DNA suggests an African origin 35,000-89,000 ybp, Ke *et al.* (2001) with commentary by Gibbons (2001c), and Wells *et al.* (2001). Burrows & Ryder (1997) and Stone *et al.* (2002) note the limitations of Y-chromosome divergence estimates as compared to mtDNA regarding gorillas and chimpanzees (and by extension, the temporal placement of extinct hominids on the family tree). By the way, Stone *et al.* (2002, 47) suggest that “Chimpanzee subspecies should be considered as populations in the process of differentiation, a process that could ultimately lead to speciation (as was the case when bonobos diverged from the *P. troglodytes* lineage)” about 1.8 mya. Cf. Berra (1990, 94-100) on mitochondrial dating methods applied to sorting out early primate divergence.

¹⁶⁷ *Scientific American* reflected the early debate by printing the contrasting views of Thorne & Wolpoff (1992) on multiregionalism with Wilson & Cann (1992) on the African genesis. Dawkins (1995, 45-57), Johanson & Edgar (1996, 41), Gee (1999, 207-211) and Swisher *et al.* (2000, 183-200) favor the African scenario, with Tattersall (1995a, 213-222) and Tattersall & Schwartz (2000, 224-230) especially doubtful about the multiregional model because it doesn’t square well with current views on population dynamics. Multiregional advocates in the Wolpoff camp naturally discount the conclusiveness of such analyses, and press on with comparisons of what few skulls are available in the critical locales and timeframe—see Hawks *et al.* (2000), the overview by Soares (2001), Pennisi (2001a) on Wolpoff *et al.* (2001), and Cann (2002) re a new genetic analysis by multiregionalist Alan Templeton (2002) suggesting two African migrations (600,000 & 95,000 years ago). Leakey & Lewin (1992, 219-223) recommended letting the evidence play out, while Roger Lewin (1988, 127-133; 1997, 188-189) solo and even “Out of Africa” advocates Stringer & Gamble (1993, 134-136) cautioned the technique of tracing specific mutation clusters is insufficiently fine to conclusively distinguish the two models. One thing any sound theory has to account for is the higher genetic variability found in the African population. Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 251) illustrate the tibia/femur length ratio, which relates to another factor: “The earliest modern skeletons in Europe and Israel are unlike the Neanderthals and look as though they came from a hot climate, possibly Africa.” Although McKie (2000, 111-118, 170-183) leans toward multiregional continuity, he suspects both sides may be missing the bigger picture. “In my view the geneticists and the morphologists are probably both wrong, largely because the course of evolution and the fate of genes are chaotic and unpredictable,” McKie (2000, 118). Add to that the inevitable personality conflicts, such as the often testy interactions of Wolpoff and Stringer recounted by Shreeve (1995, 87-89)—and still going on as of Balter (2001b).

¹⁶⁸ Lubenow (1992, 72): “The alleged evidence for evolution from the DNA molecules is not an independent confirmation of evolution but is instead based upon an evolutionary interpretation of fossils as its starting point.” Since Lubenow was familiar with Johnson’s *Darwin on Trial* argument (re note 76 above), it is possible that some of the Von Däniken Defense logic rubbed off on him from that source.

¹⁶⁹ Lubenow (1992, 73). Meanwhile, Faid (1993, 101-107) bucked the creationist tide by taking the Eve theory all too literally, as genetic affirmation for the existence of *the* Eve (PO Box Eden).

¹⁷⁰ See the material surveyed in note 106, chapter four. The most recent stab by Johnson (2000, 72) hardly had endosymbiosis on his mind: “Lynn Margulis, famed for her theory that mitochondria

were once independent bacterial cells, regularly challenges scientific colleagues to name a single unambiguous example of the formation of a new species by the accumulation of micromutations. The challenge being unmet, she commented acidly that science will one day judge neo-Darwinism as ‘a minor twentieth-century religious sect within the sprawling religious persuasion of Anglo-Saxon biology.’” Graduating to footnotes instead of clumping his sources into Research Notes, Johnson (2000, 180n) cited “C. Mann, ‘Lynn Margulis: Science’s Unruly Earth Mother,’ *Science*, 1991, pp. 252, 378-81.” But the “252” was actually the volume number—the citation was accurately rendered in the similar take on Margulis by Behe (1996, 26, 278n). Mann (1991) covered Margulis’ sweeping attribution of evolutionary change to self-regulating “autopoietic” relationships, most notably involving bacterial symbionts, and the cautionary reactions of colleagues ranging from Maynard Smith to Niles Eldredge. Neither Behe nor Johnson quoted those comments, nor a point Margulis made concerning her alternative to those micro-mutational processes. Mann (1991, 379): “Inside each thin, translucent *M. rubrum* [a Finnish species of “red tide”] are more than 20 small blobs, the vestigial remains of another organism called a cryptomonad. ‘Long ago,’ she says, ‘one of these guys ate but did not digest the other. Now they require each other to reproduce, meaning they are reproductively isolated, and that speciation occurred. I can give you a dozen examples of these examples—and you give me a type of corn, maybe. Maybe I have the evidence. So why do you think I’m wrong?’” Indeed, does Johnson think Margulis is wrong? Margulis averred that “the major source of evolutionary novelty is the acquisition of symbionts—the whole thing is then edited by natural selection. It is never just the accumulation of mutation.” Redecker *et al.* (2000) is a recent examination of how symbiotic relationships come into play in evolutionary processes: Ordovician fungi may have facilitated the initial radiation of land plants, Blackwell (2000). But as Margulis & Sagan (2001) again suggests, such unions would have been just as natural and undirected as the neo-Darwinian orthodoxy Johnson is out to repudiate. Had Johnson stopped to consider this as a methodological problem he might have asked how scientists are supposed to identify if there are point mutations (or karyotypic fissioning) responsible for a speciation event ... or, if one wants to opt for his absolutist mantra, new organs or genetic information. It is the same difficulty Behe stumbled over. To pin down the speciation of a vertebrate would involve substantial gene sequencing of many individuals, both for the species and its proposed parent (assuming it is available and not extinct), along with more than a passing idea of how those genes interact to contribute to species differentiation. Biology has yet to reach that point.

¹⁷¹ The incorporation of endosymbiosis theory in Lucas’ epic was a curiosity that struck Philip Cohen (2000). In *The Phantom Menace* the “midi-chlorians” were even deemed responsible for the “virgin birth” of Annakin Skywalker (the future Darth Vader, and father of the redemptive Luke Skywalker), while Annakin’s overconfident Jedi mentor functioned in the temporary role of John the Baptist. Such messianic elements are of a piece with Lucas’ penchant for incorporating mythic elements in his films (he is an unabashed admirer of the late philosopher Joseph Campbell). Some may have taken this pastiche religion rather too seriously, adopting “Jedi” as their belief—though it may be only a hoax, Boese (2002, 220). On the opposite front, Harding (2000, 146-147) noted in her Falwell critique that some of the most devout seminary students at Liberty Baptist College picketed *Star Wars* when the college administration loosened the restrictions and allowed this first non-Christian movie to be shown at the campus theater. The evangelical Hunt (1998, 329) targeted the “occult” elements of the *Star Wars* saga with as much glib enthusiasm as Johnson did the supposed moral relativism of *Star Trek*. In much the same vein, *Los Angeles Times* religion columnist Russell Chandler (1992, 199, 349n) relied a tad too much on “David A. Reed, ‘Star Trek V Blasts “God”,’ *Gospel Truth* newsletter II, no. 3 (1989): 1,” who mistook a plot line about an exiled alien pretending to be God (as a way of luring spacefarers to the center of the galaxy to effect his escape) for a profession of Trekkian theology, where “the real ‘God’ lies within themselves.” Messianic themes as overt as those in *The Phantom Menace* (or as misrepresented as those in *Star Trek V*) have only rarely cropped up in science fiction films, though—most notably in the 1951 classic *The Day the Earth Stood Still*. Sent to earth to warn mankind how our aggressive nature and experiments with nuclear weapons might unwittingly provoke obliteration by their

automated robot planetary peace patrol, the Venusian Klaatu is wounded by a trigger-happy soldier dispatched in panic when his poached egg-shaped flying saucer parks in front of the White House. Intent on some independent fact-finding, Klaatu slipped out of army custody in the borrowed clothes of a “Mr. Carpenter” (an intentional allusion to the Carpenter of Galilee). Betrayed eventually by a fame-seeking Judas, Klaatu is killed in a military ambush—only to be resurrected technologically by the intimidating robot Gort. Spotting the touchy implications of that, Fox mogul Darryl F. Zanuck had the script changed to clarify that Gort had not exercised the ultimate power of “life and death” reserved to the Almighty Spirit. Farther afield, the curious Mormon doctrines on the primeval planet “Kolob” somehow found their way into the clunky 1970s series *Battlestar Galactica*, Abanes (2002, 575-576n). And more recently, TBN’s Paul Crouch and son Matt offered up a pair of toasty Armageddon epics (*The Omega Code* and *Megiddo*) ... while L. Ron Hubbard’s *Battlefield Earth* (a project avidly promoted by its Scientologist star, John Travolta) constituted a “disaster” film of quite another sort.

¹⁷² Avise’s remarks per note 109, chapter four. Had God wanted to throw a monkey wrench in my own appreciation of the human evolution argument, a cleaner mitochondrial system for man would have been a dandy start—or no independent mitochondria at all, simply running the power cycle exclusively through nuclear DNA. Incidentally, Davis & Kenyon (1993, 111-112) missed the same connection as Johnson—but then, their mitochondrial arguments were running closely anyway (re note 76 above). Schroeder (2001, 60, 66-68, 75-76, 95) dealt with mitochondria only for their role in the ATP process, without considering either the odd design aspects of this or their significance as bacterial inheritance. Comic relief here is provided *en passant* by David Berlinski, who embodies Phillip Johnson’s “we don’t know” approach to Darwinism run amuck, as he strenuously resists being labeled a “creationist” while Zeno-slicing every possible reason for not being one. The curiosity of this position was neatly illustrated following Berlinski (1996b), when the September issue of *Commentary* printed a lengthy special “Controversy” section (pp. 4, 6, 8-11, 14-28, 30-39) consisting of letters pro and con, with Berlinski’s rejoinders. Martin Gardner inquired whether Berlinski thought “the first humans had parents who were beasts, or no parents at all?” Berlinski replied that “for many years I have been puzzling over whether the first humans had parents; sad to say, I still have no answer.” Seemingly the only way for a vertebrate (with or without designer mitochondria) to avoid not having parents is for it to have been specially created ... *zot!* Which suggests Berlinski lacks even the means to decide how little of a “creationist” he really is.

Like Behe (re the end of note 72, chapter four), Berlinski also defined evolutionary theory mightily tightly to keep matters from resembling “Darwinism.” For instance, botanists Rieseberg *et al.* (1996) isolated the mutations responsible for the evolution of several sunflower species and reproduced them experimentally. Berlinski decided this “contravenes Darwinian doctrine”—by which he meant Gould’s argument on the contingent and unpredictable outcome of evolution, where “rewinding the tape” of life would purportedly produce very different results. Berlinski opined that “the tape in this experiment ran to precisely the same genetic end product every time it was played.” But Gould’s opinion is hardly a core of “Darwinian doctrine”—ask Conway Morris, or even Coyne (1996a) on Rieseberg *et al.* At most, Gould’s view would apply to only the broadest phyletic and class categories, not mandate chaos all the way down to mutation selection in speciation and plant hybridization. Cf. Manché *et al.* (1999) and Wichman *et al.* (1999) on constrained mutation in bacteria and viruses, Salehi-Ashtiani & Szostak (2001) on multiple origins for self-cleaving RNA, and Nishimura & Isoda (2004) on the theoretical consideration of variant evolutionary paths emerging from initially identical phenotypes.

¹⁷³ Incidentally, Jolly (1998, 370-371) noted the hate mail and racist umbrage Cann received from creationists and political groups in the late 1980s, nonscientific critics who were very much disgruntled at the prospect of our ancestry “taking on a female face and a black skin.” In this area, the grassroots has a different slant than the upper echelon, since creationists of all stripes decry racism and prejudice in their published material—as do any evolutionists with even a glimmer of consideration for their reputation (cf. note 270, chapter six).

¹⁷⁴ See also note 77 above. Scientific reluctance to trim their utterances has a venerable tradition, of course—indeed, a similar vocal difference of opinion back in the 1920s when neo-Darwinian

thinking was dislodging neo-Lamarckianism fueled the rhetoric of antievolutionists like William Jennings Bryan, Larson (1997, 26). Many scientists go about their business paying little attention to creationists and their quote mining, even when it applies to them. Ecological activist Paul Ehrlich has been one target for some time, Hutcheson (1986, 5-7). Henry Morris (1985, 6-7, 9-10), Gish (1978, 19; 1993, 37, 268-269; 1995, 4, 8) and Bert Thompson (1995, 43-44) field Ehrlich's comments on taxonomy and species identification, such as the "reservations" Ehrlich & Holm (1962) supposedly had about evolutionary theory (an article actually about the need to put population biology on a firmer footing). Incidentally, Ehrlich & Holm mentioned the then-new technique of multivariate analysis in assessing species relationships; this was, of course, decades before cladism revolutionized evolutionary taxonomy. Morris, Gish or Thompson are unlikely to quote the more recent Paul Ehrlich (2000, 47-48, 347-348n) on speciation, which indicates Ehrlich is nowhere close to chucking mainstream Darwinism. But equally indicative was the lengthy footnote Ehrlich (2000, 429-430n) devoted to criticizing "creationist silliness" like the current "design" incarnation. Ehrlich was evidently unaware of how Young Earth creationists had used his own comments from thirty years ago, and covered only the margins of Intelligent Design, alluding briefly to Berlinski (1996b) but missing Phillip Johnson and especially Michael Behe. This was curious, given how Ehrlich highlighted the antievolutionary stance of Bork (1996)—recall that Bork had offered Behe as his only scientific reference (re note 40 of the Introduction). Cf. also Numbers (1992, 270-271) on Ehrlich's interaction with creationist graduate student Ervil Clark (1927-1981) in the 1960s.

¹⁷⁵ Johnson (1997, 110, 111). Ironically, the leading scions of Piltdown shared with Johnson a downward view of humanity, Landau (1991, 135-140). While Arthur Keith thought civilization a sign of physical decline, Elliot Smith classed it a mental disorder! This attitude was more understandable given the character of their times. Writing in the era of the Great War and communist revolutions, Elliot Smith could easily have seen civilization as no improvement over the idyllic life he imagined for pre-agricultural man. "Like Keith, Elliot Smith depicts civilization as an unnatural state: it spreads like a disease, by intimate contact and addiction," Landau (1991, 135). Cf. also Keith (1946).

¹⁷⁶ Hal Lindsey (1976, 51) offered the title deed contract analogy, but Biblical creationists indulge in similar "misplaced concreteness" on their own. Morris & Morris (1996a, 98): "Death is the penalty for sin and, since all men are sinners, only by the substitutionary death of the sinless Son of God can atone for sin and provide salvation." (Take note of that *only by*.) The Morrises continued: "It was, therefore, necessary for God to become man—for the Creator also to become the Redeemer—in the person of His son, Jesus Christ." (Again, notice the term *necessary*.) This framework perceives the fallen world and its sinful inhabitants as though there were some independent metaphysical regulatory board demanding of God suitable recompense *quid pro quo*. With Jesus effectively tendering an infinite credit line via the Crucifixion, the theological books may be balanced—and salvation made available for all willing to accept it. That the terms "only by" and "necessary" appear to put arbitrary constraints on how God is allowed to approach the salvation of sentient man is another of the theological puzzles to join those previously recounted in chapter three (notes 171 and 187) involving Genesis.

¹⁷⁷ The sticking point of human origins came into focus during the Bryan campaign in the 1920s, as evidenced by the contemporary reactions recounted by Larson (1997, 47-55). A non-binding resolution passed by the Florida legislature in 1923 called it "improper and subversive" to teach in public schools that Darwinism was true or "any other hypothesis that links man in blood relationship to any form of lower life." The original sponsor of the Tennessee antievolution statute that sparked the Scopes trial took the same position, as did grassroots letter writers to newspapers when the state Senate tarried in passing the House version. For the very conservative the mere idea of paleoanthropology was both impossible and pernicious, as the incendiary evangelist Billy Sunday roared during Tennessee revival meetings: "Teaching evolution. Teaching about pre-historic man. No such thing as pre-historic man." By the time the ICR entered the picture, Unger (1972, 149) freely tagged evolutionary thinking thus: "The truth that the human race began with a monotheistic faith is an inescapable corollary of the fact that man is a direct creation of God and not the product

of naturalistic evolution. The theory that man evolved instead of being created contradicts the Word of God so flagrantly that it might well be called a ‘doctrine of demons.’” Unger was from the influential Dallas Theological Seminary, from which such theorists as Norman Geisler and Hal Lindsey have drawn their own specialized inspiration. Pressing on another quarter of a century ... Ankerberg & Weldon (1998, 65) reprised Unger’s opinions with evident approval. Though they slightly misquoted the passage: “Perhaps it is also why theologians of such repute as Dr. Merrill Unger, writing in *Demons in the World Today*, can comment that evolution: ‘opposes the Word of God so flagrantly that it should be labeled “a doctrine of demons.”’ (See 1 Timothy 4:1.)” For reference, 1 Timothy 4:1 declares: “Now the Spirit speaketh expressly, that in the latter times some shall depart from the faith, giving heed to seducing spirits, and doctrines of devils;”—how this would be applied to the analysis of primate diastema or mtDNA Ankerberg & Weldon did not clarify.

¹⁷⁸ Colson & Pearcey (1999, 196). Romans 5:12 is relevant: “Wherefore, as by one man sin entered into the world, and death by sin; and so death passed upon all men, for that all have sinned.” A 1997 pamphlet (“Issues Tearing Our Nation’s Fabric”) from D. James Kennedy’s Center for Reclaiming America wholeheartedly agreed with an atheist’s commentary on this passage, by which Adam’s sin impels Christianity to reject evolution in a cascade based on the acceptance of special creation. Hunt (1998, 25) took the same position in *The Occult Invasion*: “Genesis lays the foundation for all of Scripture. If its account of creation isn’t reliable, then neither is the rest of the Bible which rests upon it; and Christ is proven not to be God and Savior but a mere man who foolishly took a mythological story of Adam and Eve literally” (referencing Matthew 19:4-5). Likewise Hanegraaff (1998, 103). These high stakes underlie not only YEC exegesis from Bert Thompson (1995, 223-230) to those quoted in note 248 of chapter three—the swipe at theistic evolution by Hayward (1985, 189-200) also rests on the historicity of Adam. For contrast, Lloyd Bailey (1993, 11-12) noted YEC interpretations that Adam personally authored portions of Genesis (though cf. note 192, chapter three, re Robert Faid). Faced with the available physical evolutionary evidence, Christian theological thinking on this topic has reached what Ruse (2001, 74-77) charitably described as “an impasse.” Polkinghorne (2000, 58) suffices with: “There are clearly stories in the Bible (Adam and Eve in the garden) that convey deep truth through imaginative narrative, but which we do not have to believe are matter-of-fact historical occurrences.” Barbour (2000, 133-134) was more direct: “In the light of evolutionary history, the fall of Adam cannot be taken literally. There was no Garden of Eden, no original state of innocence, free of death and suffering from which humanity fell.” For Barbour, “original sin” reflects an acknowledgement of “sinful social structures, such as those that perpetrate racism, oppression, and violence.” Nonetheless, Barbour (2000, 48) stressed earlier how in the Bible “creation is inseparable from redemption.” Cf. Haught (2001, 5, 80-82). Such theological juggling acts distinguish liberal Christian theology from its more conservative brethren.

¹⁷⁹ C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 266), drawing on material still in Henry Morris (1985, 13), along with Morris’ 1975 book *The Troubled Waters of Evolution*.

¹⁸⁰ Gish (1993, 353), re Henry Morris (1985, 189-190). Theological imperatives also guide Ross (1998, 55): “The challenge in deriving a date for the creation of Adam and Eve is to ascertain, or even estimate, the completeness or incompleteness of the biblical genealogies. Comparative analysis of overlapping genealogies throughout the Bible suggests that they may range anywhere from about 90 percent complete at best to about 10 percent complete at worst. Using genealogical data alone, we can place the date for the creation of Adam and Eve very roughly between about seven thousand and about sixty thousand years ago. The date might be stretched a little further back but cannot justifiably be stretched far enough to accommodate the early bipedal primate species (circa five hundred thousand to four million years back).” Clearly for Ross the chronology of man has to be consistent with the patriarchal *vitae* of Genesis—and where it isn’t, it is the paleoanthropology that has to give way. Schroeder (1997, 15-16) draws more freely on the conventional longevity of Biblical characters, which would seem to put Adam about 800 years before the Flood. And let’s not forget Cuozzo and his hyper-geriatric interpretation of the Neanderthals (re note 140 above) or Ross (1998, 115-122) on antediluvian longevity generally; cf.

Lloyd Bailey (1993, 64-67) on the numerological features underlying the great ages attributed to early Biblical man. As with the vampire problem recounted in chapter four, fussy naturalistic thinking would suggest that no humans have ever lived to be centuries old—where Intelligent Design advocates like Phillip Johnson stand on this intriguing issue remains to be seen.

¹⁸¹ Gish (1993, 354). For contrast, one may note the comment by Donald (1991, 210): “Mimetic culture introduced a number of novel features, but because of its fixation on an episodic data base, it had a very slow rate of change when compared with our own culture. The present evidence suggests that *erectus* took half a million years or more to domesticate fire, and three-quarters of a million years to adapt to colder climates.”

¹⁸² This view is reflected of course by C. Loring Brace, “Humans in Time and Space,” in Godfrey (1983, 274), but also in Strahler (1987, 492-495), Edey & Johanson (1989, 328) and Berra (1990, 113-117). Note also the brief reference in Larson (1997, 12) apropos the Scopes trial that Neanderthals “were fully human.” Antievolutionists duly followed this tide, including Cremo & Thompson (1993, 889). Henry Morris (1985, 175): “Many skeletal remains of these people are available now, however, and there is no longer any doubt that Neanderthal Man was truly human, *Homo sapiens*, no more different from modern men than the various tribes of modern men are from each other.” Similarly Morris & Morris (1996b, 84).

¹⁸³ Tattersall per note 132 above. Eldredge & Tattersall (1982, 151-154) and Roger Lewin (1988, 112) were cautious about whether Neanderthal qualified as a human subspecies. Tattersall & Schwartz (2000, 197-198) note classic Neanderthals have a specialized nasal cavity (“not found in other mammals, much less hominids”) that argues against their being conspecific with *sapiens*. Misunderstanding what a derived feature means, Ross (1998, 113) decided this datum meant “Neanderthals cannot be biologically related to any known primate species or any known mammalian species.” See also Ponce de León *et al.* (2001) on Neanderthal cranial development. To what extent Neanderthals contributed to the human genome remains an open question. The polarity of opinion runs from Stringer & Gamble (1993), who present the “Out of Africa” interpretation of Neanderthals as complete evolutionary dead ends, to the more combinatorial view of Trinkaus & Shipman (1992) that allows for some Neanderthal interbreeding. Neanderthals and early *Homo sapiens* certainly coexisted in the Levant 100-120 thousand years ago (thus due west of Mesopotamian Eden), Tattersall (1995a, 224). Suggestive evidence for at least some late interbreeding comes from burials at a 28,000-year-old cave in Croatia. Their largely Neanderthal features sported a bit of a chin, and they were accompanied by the accoutrements of a more sophisticated “Aurignacian” tool culture that suggests cross-fertilization with their human contemporaries. But no consensus has yet been reached, as indicated by Wong (1999b; 2000a), Trinkaus & Duarte (2000), Fred Smith (2000), and Gibbons (2001b)—not to forget Hawks & Wolpoff (2001), still in the fray with a multiregional interpretation of Neanderthal. The earlier Neanderthal “Châtelperronian” culture (around 36,000 BP, in France, Belgium, Italy and northern Spain) shows similar problematic signs of late acculturation, Stringer & Gamble (1993, 200-201), Tattersall (1995b, 159-162; 2002a, 130-134), Hublin *et al.* (1996), Jordan (1999, 211-214), Tattersall & Schwartz (2000, 220-221), and Zilhão & d’Errico (2000). But the general conclusion by Donald (1991, 205) remains applicable: “Contemporaneous Neanderthal and Cro-Magnon campsites in Europe show that while Cro-Magnon culture was evolving at a steady rate, Neanderthals were not changing.”

¹⁸⁴ See Krings *et al.* (1997; 1999). Commentary by Lindahl (1997, 2) noted how earlier attempts to extract DNA from Jurassic fossils proved faulty, and commended Krings’ team for their more stringent precautions that have allowed further discoveries in this area. Martin Jones (2001) surveys the quest for ancient DNA samples. Wong (1998), Nicholas Wade, “Neanderthal DNA Sheds New Light on Human Origins,” in Wade (1998a, 235-238), McKie (2000, 184), Sykes (2001, 116-130), Zimmer (2001g, 299-301), Marks (2002, 96-99) and Olson (2002, 79-84) offer caveats on what all this means for *Homo* phylogeny. Concerning human-Neanderthal hybridization, occasional matings could have taken place without leaving much mtDNA trace in the human genome. For example, were a human female attracted to a Neanderthal male (thus passing on her mtDNA)—or if the line from a Neanderthal female eventually died out before being sampled by

contemporary geneticists. A sample of mtDNA from the Australian Mungo man (putatively dated 60,000 ybp) suggests a broader range of ancient nucleotide diversity, Holden (2001a), Relethford (2001) on Adcock *et al.* (2001), and *Scientific American* commentary online (at sciam.com/news/010901/2.html). But there is considerable uncertainty over both the dating (a 40,000 ybp date seems more likely) and whether the mtDNA was uncontaminated—see Peter Brown (at www~personal.une.edu.au/~pbrown3/LM3.html) and Bowler *et al.* (2003). Off in YEC-land, Chuck Missler’s K-House eNews for March 4, 2003 invoked the sages at Answers in Genesis and True Origin for his minimization of Mungo Man.

¹⁸⁵ “Neanderthals were descendants of Noah,” according to John Morris (BTG No. 105b) in 1997, and thus “as human as you and I.” Hugh Ross (1998, 112-114) took a jab at this view when he commented on how “some well-known creation scientists” (citing only Morris’s BTG 105b) had followed the anthropological view by mistakenly identifying Neanderthals as part of the *sapiens* family. Ross relied on the new mtDNA data to shunt Neanderthal back off the Adamic tree (where they did belong in the grand scheme of things he did not specify). But in an appendix on “Scientific Discoveries Supporting Genesis 1-11” Ross (1998, 201) claimed such data affirmed the scriptural account in Genesis 1:25-27. He included such scriptural links “for the sake of anyone who cares to test or retest these Genesis chapters and to share the testing process, as well as the understanding and faith to which it leads, with others.” A far cry from Phillip Johnson, this “testing” of Genesis ... especially when you read what those verses actually had to say. “And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it *was* good. And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth. So God created man in his *own* image, in the image of God created he him; male and female created he them.” So a Biblical text which does not mention the creation of any sentience other than man capable of toolmaking, hunting, and burying their dead ... is supposed to be successfully “tested” by the discovery that prehistoric beings of exactly that curious character actually had lived independent of man. As with his sojourn among the whales chronicled last chapter, Ross again would do well to stick to physics.

¹⁸⁶ As noted by anthropologist Ralph Holloway, as indicated in Roger Lewin (1988, 118-120). Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 245) survey that and other theories about the Neanderthal brain.

¹⁸⁷ Mithen (1996, 122, 126), indicating 70-80 percent of Neanderthals died before 40, though Arsuaga (2001, 205-232) offers some caveats. Stringer & Gamble (1993, 88) noted the possible social fallout of that limited Neanderthal life span: “Two important consequences of this would have been reduced information derived from long-term experience, and a greater number of ‘orphan’ children.” Cf. Kaplan & Robson (2002). For comparison, life hasn’t been a bowl of cherries for humans either. Jump ahead a few score thousand years, and the labor force responsible for building the Egyptian pyramids suffered from such maladies as degenerative arthritis, and seldom lived beyond 35 themselves, Marcus (2000, 61). But by then there was written language to compensate, at least among the elite. Diamond (2000c) describes the profound cultural effects of being able to learn about things from elders in a preliterate world. Unfortunately, the same factors that successfully pass on what plants not to eat also apply to which neighbors to kill ... as well as overlooking potentially dangerous novelties (think Pompeii) or long term trends that have escaped the sieve of experience, such as the climate shifts that disrupted the Anasazi culture.

¹⁸⁸ Stringer & Gamble (1993, 88). Mithen (1996, 134) notes that the Shanidar I Neanderthal “suffered head injuries and a crushing of the right side of his body, possibly from a cave rock fall, and blindness in his left eye.” Tattersall (1995b, 16-17) shows how modern forensic reconstruction allows a face to be put to this troubled prehistoric gentleman. Cf. also note 148 above on *erectus*’ possible compassion, and Lebel *et al.* (2001) on the cultural inferences to be drawn from fossil specimens. Interestingly, Shanidar 1 comes from northern Mesopotamia, about the closest the Neanderthals ever got to Eden. That is, unless one happens to follow the Mormon trail, as Joseph Smith declared Eden to have existed in Missouri—the Kansas City suburb of Independence, to be

exact (Harry S. Truman's old stomping grounds), Newell (2000, 18) or Abanes (2002, 147, 536n). The American locale for Eden figured in the argument between Mormon geologist James Talmadge (1862-1933) and Joseph Fielding Smith (1876-1972), grandnephew of the Church's Prophet, when Smith embraced Price's Flood Geology in the 1920s. Talmadge "had personally inspected a pile of stones at Spring Hill, Missouri, declared by Joseph Smith to be part of 'the altar on which Adam offered sacrifices,' and had seen that it contained fossilized animals. 'If those stones be part of the first altar,' he reasoned, 'Adam built it of stones containing corpses, and therefore death must have prevailed in the earth before Adam's time,'" Numbers (1992, 311).

¹⁸⁹ Mithen (1996, 130). Describing the replication of Cro-Magnon spears and experiments regarding their hunting practices, Knecht (1994) noted atlatl use dates back at least 22,000 years. New evidence concerning fishing has turned up from a cave in southern France that was used by a succession of Neanderthals and humans over 300,000 years, Wong (2000c). The preliminary report suggests Neanderthals living there 54,000-66,000 years ago dined on trout and pike, possibly even smoked at the hearth—though how they obtained their catch will doubtless be of relevance in assessing its cultural significance. Overall the evidence suggests Neanderthals relied on terrestrial hunting for most of their diet, Richards *et al.* (2000; 2001) or Arsuaga (2001, 177-193). Churchill (2001) on Niewoehner (2001) relates Neanderthal's hunting skills to their differing hand anatomy (Neanderthals were better suited for powerful hammerstone down-thrusts, compared to the human hand being more comfortable with oblique power grips, as in wielding a hammer). Cf. the dramatic version of Neanderthal hunting in Haines (2001, 246-249). Shreeve (1995, 164-167, 268-276) and Tattersall & Schwartz (2000, 207-219) explore the pros and cons of reinterpreting Neanderthal social life, relating biology, culture, and language. Stringer & Gamble (1993, 50-53, 162-164, 174-178, 198-207, 213) survey Neanderthal hunting and social patterns, including distances traveled to obtain raw materials, and the relation to changing climate as the Eurasian ice sheets waned. Tattersall (1995b, 148-159) includes the observation that Neanderthals appeared to have engaged in a "radiating-mobility" pattern of relatively permanent base camps, as compared to the "circulating-mobility" strategy of seasonally shifting main encampments favored by early humans. The differences extend to those base camps, where Neanderthals apparently undertook specialized work in separate areas, unlike early humans who clustered all their activity around the central hearth, Mithen (1996, 136-138). Such division of production may be a hallmark of later human technology, but it could have represented the leading edge of a conceptual dead end for Neanderthals.

¹⁹⁰ While it is possible to learn something about what is going on in our brains when we think about different things, such as Mitchell *et al.* (2002) re our different approach to persons and objects, we obviously have no such data set for Neanderthal minds, so one must fall back on informed scientific speculation. James Shreeve's *The Neanderthal Enigma* concluded they ultimately faded from the scene because of a relative aversion to cultural novelty, deriving not from any lack of intellect, but from their particular compartmentalized mixture of transparent honesty and disinterest. Shreeve (1995, 339) imagines Neanderthals "regarding strangers not as an anxious, imminent threat, but as a sort of superfluous blur on the very fringe of awareness. Strangers do not matter." Under this view of the Neanderthal mind, knowledge "would not be to gain control, but to increase intimacy, not just between individuals but between the individual mind and whatever it sees, touches, smells, and remembers," Shreeve (1995, 340). A perfectly satisfactory strategy ... until the more "Machiavellian" Cro-Magnon showed up on the scene, capable of soaring duplicity as well as trust, as we'll see shortly. Tattersall (2002a, 134-137) suspects our human propensity for warfare played a part, but many factors likely contributed to Neanderthal extinction, as surveyed by Paul Ehrlich (2000, 101-104), Balter (2001c), Arsuaga (2001, 299-302) and Richard Klein (2003). Cf. also note 200 below.

¹⁹¹ Mithen (1996, 130-131). Peter Andrews & Christopher Stringer, "The Primates Progress," in Gould (1993, 245) make a similar point. Though cf. Tattersall (2002a, 74-78, 129-130). Bone tools, including barbed points consistent with seasonal fishing, have been found from 75,000-90,000 years ago associated with human settlements in Zaire, Brooks *et al.* (1995) and Yellen *et al.* (1995). But the commentary by Gibbons (1995b) cautions about the uncertainties in the dating,

which stretched the limits of available technology. Animal parts have shown up in a tool context for far longer, of course, such as a horn core which was apparently used 1.7 mya as a digging tool, possibly by *Paranthropus*, Tattersall (1995b, 49). From his perspective of cognitive studies Pinker (1994, 352) raised a further warning flag: the perishable nature of wooden artifacts in particular would tend to “seriously underestimate the antiquity of language” that would be implied by the social skills required for their production. He offered the example of transitory crafts still to be seen among many contemporary hunter-gatherer societies—people obviously fully possessed of human cognition and complex language. Incidentally, just as Neanderthals were exiting the scene, human culture was shifting into a new phase: the Gravettian. Besides atlatls, human technology mastered the first ceramics (for human and animal figurines) and fashioned the earliest eyed needles (from central European sites) that permitted “carefully tailored clothing,” such as the remains of burial garments found in 1969 near Sungir, Russia, Tattersall (1995b, 182-183, 186-187) or Gore (2000, 109-111).

¹⁹² Henry Morris (1985, 175). Likewise Gary Parker in Morris & Parker (1987, 152) condensed the case to the claim that “Neanderthal peoples had a well-developed culture, art, and religion.” No references were provided. Morris & Morris (1996b, 91) have since hedged their bets: “It was already well-known that both Neanderthal man and Cro-Magnon man not only were human in anatomy and brain size, but also buried their dead, made tools, grew flowers, painted pictures, and showed other aspects of a truly human culture.” By openly consolidating Neanderthal with Cro-Magnon, the Morrises sidestepped all their considerable differences, and thus avoided following through on the implications of what all this would mean for the nature of the human mind. Cremo & Thompson (1993) gave the Neanderthals even shorter shrift, failing to delve into any of their cultural aspects (language skill, burial rituals, or lack of art). Lubenow (1992, 64) also skipped lightly over the art issue, remarking of a May 1989 article by Jared Diamond in *Discover* magazine that “The Neanderthals, Diamond claims, lacked art, needles for sewing, boats, long-distance overland trade, and most of all, the precious human quality: innovation.” Diamond (1992, 43-44) offered similar views. But Lubenow offered no evidence that Neanderthals did indeed possess any of these intriguing attributes, and so fumbled the ball as thoroughly as the Morrises or Cremo & Thompson.

¹⁹³ For Neanderthal burial practices and evidence for ritual and culture, see Lambert & The Diagram Group (1987, 150-151), Roger Lewin (1988, 120-122, 186), Stringer & Gamble (1993, 158-160), Tattersall (1995b, 165-170; 2002a, 122-125), Mithen (1996, 135-136), Jordan (1999, 97, 112), McKie (2000, 154-157), Tattersall & Schwartz (2000, 215-217) and Arsuaga (2001, 271-273). Jordan includes a favorable take on their possible “bear cult,” as do Newberg *et al.* (2001, 54-55) from the neurophysiological end—though Tattersall and Schwartz are highly skeptical. Stringer & Gamble reminded that some Neanderthal burial data came from older sites conducted under less rigorous standards. Even so, a pattern may be discerned: “It is noteworthy, for instance, that not one Neanderthal burial/complete body comes from an open site anywhere in Europe. Yet such open-site burials are common in the Upper Paleolithic, when deep grave pits were dug,” Stringer & Gamble (1993, 160). Evidence that some Neanderthals may also have practiced cannibalism has turned up at excavations undertaken from 1990-1999 at a hundred-thousand-year-old cave in the south of France, Defleur *et al.* (1999), with commentary and sidebars by Culotta (1999b) and Holden (1999c). Defleur’s University de la Mediterranee team examined 78 bone fragments from at least 6 individuals (evenly representing adults, teenagers, and children) that showed the same butchering techniques detectable on animal bones. This circumstantial case is consistent with the extraction of their brains and marrow—though whether done for purely dietary reasons or as part of some ancient ritual practice cannot be easily settled. Cf. Pennisi (2003d) on Mead *et al.* (2003) suggesting prehistoric cannibalism in the spread of prion-based disease. Whether ritual or dietary, cannibalism is an activity that can embroil the reporting scientists in a “politically correct” firestorm. This isn’t so likely concerning the Neanderthals, since no one alive is claiming them as such close kin that they may feel the family honor has been impugned. But when the issue gets closer to home, such as the 12th century Anasazi in the American southwest, the debating thermometer rises, as Diamond (2000b) noted of Marlar *et al.* (2000). See also the

survey of the current evidence by Tim White (2001). Cannibalism has been a cliché analog for barbarism for some time, as noted by Ritvo (1997, 209-212). “For example, in the middle of *Man’s Place in Nature*, an analysis of the relationship between human beings and the great apes, Huxley gratuitously inserted a long extract from a sixteenth-century account of African cannibalism, with an illustration of a butcher’s stall stocked with human appendages,” Ritvo (1997, 211, 213). Gardner (1998a; 2000b, 135-143) takes the skeptical position that there is no solid evidence for the widespread practice among any human cultures, past or present (though not ruling out isolated instances of ritual cannibalism, such as devouring deceased relatives). Interestingly, among punishments to be meted out to those who disobey God, Leviticus 26:29 has forced cannibalism: “And ye shall eat the flesh of your sons, and the flesh of your daughters, shall ye eat.” Always a barrel of laughs, that Leviticus.

¹⁹⁴ Shreeve (1995, 320). The broad geographic range of “Venus” figurines (distinctively corpulent in most cases) indicated by Stringer & Gamble (1993, 210) also suggests a human scale of cultural transmission. Incidentally, Hauser (2000b, 62-63) considers trade as critical in the evolutionary reinforcement of our uniquely human way of combinatorial thinking, where we spontaneously assign and combine arbitrary symbols. When trading, approximations won’t do, and the very action of specific negotiation inevitably spills over into ethical considerations of fairness. It is interesting that written language also emerged in a trading context, as outlined by Donald (1991, 285-299). Mesopotamian accounting tokens date from 8500 BC. By 3000 BC cuneiform script was in broad use, and began to take on syllabic applications around that time.

¹⁹⁵ Evidence for Neanderthal artwork is, to say the least, extremely problematic, Stringer & Gamble (1993, 160-161), Tattersall & Schwartz (2000, 217-219) and Arsuaga (2001, 297-298). Göran Burenhult, “Image-Making in Europe During the Ice Age,” in Burenhult & Thomas (1993, 104-114) explores the possible cultural implications of art in Upper Paleolithic society (for resources on Paleolithic artwork, see note 29 above). Burke & Ornstein (1995, 20-33), Gore (1997d; 2000), Tattersall & Schwartz (2000, 236-242) and Tattersall (2002a, 138-146) offer varied takes on the issues, while Mithen (1996) is a thought provoking exploration of the problem in terms of a “modular” approach to the “Swiss army knife” character of the human mind—see Maynard Smith & Szathmáry (1999, 143-145) for a précis of Mithen’s argument. Donald (1991, 275-284) regards artistic expression as inextricably linked to the “mythic” character of early human society, revolving around fertility and hunting—but also as a bridge to later written culture via the externalization of symbolic representation. Jolly (1999, 373-379) relates the arts to a fuller developmental package that included religion, calendars, fashion, and fancy burials.

¹⁹⁶ Though sometimes creationists succumb to a little too much explanation, as when an ICR radio broadcast (September 9, 2000) mistook a 1997 *Discover* magazine April Fool’s piece on Neanderthal band instruments as an actual paleontological find (Talk.Origins has links to the relevant material). The gaff was quickly noticed by critics, prompting the ICR to issue a disclaimer—the first time they’d ever needed to do that, they insisted. They tried to salvage as much of their main point by citing Holden (1997) and Wong (1997) as “strong evidence of Neanderthal use of musical instruments.” These concerned a broken section of bear bone found in a Slovenian cave in deposits dating sometime between 43,400-67,000 years ago (if one went by Holden), or 43,000-82,000 ybp (according to the Wong summary). The fragment had four spaced holes consistent with it being a flute, though whether the piece had been made locally or was a trade good cannot be known—had it been a Mousterian burial artifact (and, better, *intact*) that would have been a firmer provenance. Two interesting things about how the ICR swallowed the *Discover* joke: their tendency to siphon information solely for apologetic purposes, and how ill equipped their method is to reliably winnow out problematic data. Hoaxes (and their detection) actually reveal a lot about sound method, Boese (2002). Sokal & Bricmont’s parody of deconstructivism and Jamal’s “Noah’s Ark wood” (though not the 1917 episode per note 214, chapter three) were both aimed at puncturing the pretensions of their pseudoscientific targets. But the essence of a good April Fool’s media prank builds on the same logic. The piece must start with a superficial plausibility, then escalate to a level of absurdity fairly calculated to invite disbelief. In that respect, a soundly crafted hoax is a good measure of the ability to assess novel information.

The classic 1957 BBC film visit to a Swiss spaghetti plantation (less famed than the neighboring Italians!) reached that point when they showed the peasants merrily harvesting *cooked* pasta draped like tinsel from the grove of “spaghetti” trees. National Public Radio’s news programs have also indulged in this sublime pastime. One deft entry some years back reported on the potential adverse ecological impact of a plan by Starbucks’ coffee to build a transcontinental pipeline so that Midwest java junkies could partake of brew as fresh as that imbibed by their luckier Seattle counterparts. In all such exercises, of course, having a functioning sense of humor is essential. Which raises the further irony of the evolutionary origins and adaptive role of humor: where primate tickle play has been extended into a precision tool for the detection of discontinuity and dissembling, Harris (1999), Small (2000) and Provine (1996; 2000). See also Ingram (1998, 3-17). This very human skill exploits a neurological specificity: true smiles (provoked emotionally, as in humor) are controlled by the limbic cortices, quite different from where the brain manages voluntary (nonemotional) control of the same muscles, Damasio (1994, 141-142) or Ramachandran & Blakeslee (1998, 13-14). In other words, “funny” is something not easily *faked* (crying is usually easier for an actor to do than laugh convincingly). Mithen (1996, 198) highlights the integrative utility of humor as a critical feature of our human nature, while Ramachandran & Blakeslee (1998, 201-211) and Dunbar & Barrett (2000, 215) note the stress-reducing side of laughter, an exaptation of the limbic system’s “false alarm” tension relief system. But Nørretranders (1991, 152-153) reminds us of its double edge, poised on the mismatch between the amount of “exformation” the brain has to deal with compared to what gets filtered through to the conscious self. “Snobbery, cliquishness, clubbiness, prejudice, and the persecution of minorities all involve mocking those who do not understand the exformation in the information,” while at the same time a proven weapon of choice to disarm “such vulgar information fascism” is the well-honed joke. Drawing partly on Koestler (1964), Pinker (1997a, 545-554) also notes the aggressive aspect of humor, equal parts incongruity, indignity, and resolution. Cf. also Minsky (1986, 278-281).¹⁹⁷ See Paul Ehrlich (2000, 159-162), Tattersall (2001), Zimmer (2001g, 301-304) and Balter (2002a) on competing theories of the Great Leap (from environment and culture to neurobiology). Fagan (1999, 68-69) noted how the North African desert acted as a “Saharan pump” to pulse hominid expansion. While glacial cooling produces dry conditions at the ice boundaries, cycles of increased rainfall tend to occur in the tropics. It was during the drier ice age conditions prevailing 186,000-120,000 years ago that anatomically modern man appeared in Africa. When a climate blip turned the Sahara into shallow lakes and semiarid grasslands around 130,000 years ago, *sapiens* promptly expanded through the Middle East and beyond. The first flowering of human artistic culture also took place when a colder phase expanded European glaciers 37,000 years ago, and this Stone Age culture remained the norm until the present warming trend kicked in 15,000 years ago, shutting down the Saharan pump once more. The result was an end to the wild swings in Ice Age temperatures, stabilizing at the much warmer and comparatively more gentle oscillations of the last 9000 years, as graphed by Alley (2000, 119). It was at this time that agriculture and the first stirrings of civilization occurred, connecting up with the more recent climate burps covered in chapter three regarding the Black Sea flooding.

¹⁹⁸ The recent analysis by Keys (1999) suggests that even that 6th century cultural convulsion may have been climatically driven. Briefly mentioned in note 184 of chapter three, Keys’ scenario starts with the physical evidence for a major volcanic eruption somewhere near Krakatoa around 535 AD. This generated sky-darkening ash falls, of course, but in Africa torrential rains were the result. These conditions encouraged the spread of a previously minor and locally contained infectious agent: the Plague ... which ivory traders inadvertently spread to the Byzantine world, decimating that culture, which in turn provided a stimulus for the rise of Islam. That same volcanic blast changed the climate in the steppes of central Asia, sending a cascade of “barbarian hordes” westward, some of whom set up a lucrative protection racket that further weakened the disintegrating Byzantine state. One of the migrant tribes ended up as the Turkish Empire that finished off what was left of the Byzantine Empire just as Columbus was sailing the ocean blue. By such a fall of cultural dominoes, extending over nearly a thousand years, Keys’ exhilarating hypothesis ultimately relates the rise of the modern world to that single Sumatran eruption.

¹⁹⁹ Elliot Smith atypically highlighted the “rare genius” as part of the heroic “struggle for existence” (a.k.a. “dog eat dog”) view of human development favored in early 20th century evolutionary thinking, Landau (1991, 133-134). Because of its rarity and inherent tendency to break the rules by rewriting them, the “genius” factor is difficult to pin down. We ought to differentiate between levels of “genius,” such as what an observer noted about computer pioneer Alan Turing concerning his involvement in breaking the German Navy’s Enigma code back in WWII. Your run-of-the-mill “genius” is someone who comes up with a very clever answer—but after they explain how they did it, you can see how you might have done it too (if only you’d had enough time). But a *genius*, like Turing, is someone whose reasoning is clear but unnerving, where the insight is so removed from conventional steps that explanation only reinforces how you could never have figured it out, given all the time in the world. Comfort (2001b) notes a parallel property of how the insights of genius often come in an integrative *flash*, offering examples from physicists Einstein and Feynman to mathematician Srinivasa Ramanujan and geneticist Barbara McClintock. How the brains of genius differ (if at all) from the more run-of-the-mill is, of course, among the many mysteries of the human mind—something very much to marvel over, as Paul Davies (1992, 153-156) does. But let’s not underestimate the contingent role of individual actions running below the Turing “genius” level. Shermer (2001, 262-282) noted hard work and practice counts more than misty inspiration in generating the “Amadeus Myth,” and such factors likely apply all across the talent scale. Of relevance here also are Ramachandran & Blakeslee (1998, 192-198) and Treffert & Wallace (2002) on the “idiot savant” phenomenon. Rita Carter (2002, 136-137, 206-207) suggests that autistic savants may be able to focus so intently because of a failure of frontal brain areas normally inhibiting such concentration, and that artistic genius generally may be a case of being able to see the world through innocent eyes. How much of human intelligence and behavior may be traced to deterministic “nature” versus environmental “nurture” is dramatically reflected in Frank Capra’s classic *It’s a Wonderful Life*. Only the bitter Mr. Potter was the same in the alternate world the angel Clarence showed George Bailey—everyone else had been so affected by their many interactions with the altruistic hero that they were in many respects no longer the “same” people. Interestingly, the *individual* plays out even where no intelligence is involved. McKee (2000, 153-167) describes how computer simulations of species turnover can be radically affected by the loss of even a *single* member. In one instance, the removal of a genetic variant cascaded through the simulation, producing a temporary burst in species success, only to go extinct when that absent mutation would have come in very handy.

²⁰⁰ Interestingly, Milford Wolpoff has claimed the African Eve replacement model requires modern man killing off rival *erectus* in what amounts to genocide, though Swisher *et al.* (2000, 193-194) notes how a competing species can decline due to quite minor demographic shifts (cf. the previous note). Johnson (1995, 229) flatly reflected Wolpoff’s view: “The molecular Eve hypothesis asserted that the ancestors of modern humans evolved in Africa about 200,000 years ago, thereafter spreading through the world and replacing (that is, exterminating) all preexisting hominid species.” Recall the lugubrious Lubenow (note 133 above). The origin and role of violence in human evolution has naturally frayed a lot of philosophical nerves. For example, Gould (1977a, 237, 242) noted the “dubious” violent australopithecine ape model (with “Konrad Lorenz as godfather, Robert Ardrey as dramatist, and Desmond Morris as raconteur”) that played a prominent thematic role in 2001. See Eldredge & Tattersall (1982, 5-6) for a kinder view of the evolutionary basement of Kubrick’s cryptic cinema classic, and Frans de Waal, “Apes from Venus: Bonobos and Human Social Evolution,” in de Waal (2001a, 45-48) for further perspective on the “killer ape myth.” Recent anthropological discovery has also undermined the “blitzkrieg” view of modern humans violently clashing with Neanderthals, Gibbons (2001a). Neanderthals appear to have been gradually edged out of their broad historic northern range into a constrained ecological box along the Mediterranean, where they succumbed during a cold phase around 28,000 ybp. The first evidence of humans killing one another occurs at an Egyptian site 20,000 years ago, with more organized violence showing up about 6000 years later among the late Ice Age Magdalenian culture, Gore (2000, 111-115)—though cf. Zollikofer *et al.* (2002). Not that we can count the dubious distinction of internecine warfare among our unique attainments—we have some amateur

competition from other animals, especially our primate cousins, the chimpanzees. See Diamond (1992, 291-294), Jolly (1999, 75-79), Dunbar & Barrett (2000, 189, 193) or Paul Ehrlich (2000, 206-208) ... but Marks (2002, 172-173) for caveats. Jennifer Lindsey (1999, 78-79): "Although Goodall had witnessed many territorial and hierarchical disputes [in Tanzania] among the males of the Gombe [National Park] chimpanzees, none was as fierce or devastating as the four-year war that took place in the early 1970s. Ten years after she began her research, she began to notice a division in the group—some animals remained in the north of the park, where she first encountered the chimpanzees, while others ventured farther south. As time went by, the relationship among the males of the two divided groups became more hostile, erupting into angry and noisy fights whenever each group's 'border patrol' would cross paths. Slowly, the northern community began to systematically attack and kill their former companions—not only did they kill the rival males, but infants, females, and the elderly as well. In the end the breakaway group in the south was completely annihilated. It was this discovery that furthered Goodall's and Leakey's understanding of the similarities between humans and chimpanzees, our closest genetic cousins. Not only do we share the ability to make and use tools, to form complex social groups, and to feel and show emotions—chimpanzees, like humans, are capable of sophisticated and premeditated warfare." In her survey of the fieldwork on chimpanzee violence, Jolly (1999, 173-174) noted that gang attacks tended to occur when the victims were strategically outnumbered—a mob approach lamentably characteristic of much of our own human violence. Territoriality (especially the economics of food range accessibility) also appears to play a role in chimpanzee warfare, Anne E. Pusey, "Of Genes and Apes: Chimpanzee Social Organization and Reproduction," in de Waal (2001a, 16-19).

²⁰¹ Ross (1998, 110). Paleochronology has never been Ross' strong suit, as with his assertion that "Genesis 1 tells us that the land mammals and *both* Adam and Eve were created on the sixth day," Ross (1994, 50). With mammals arriving in the Triassic, that "day" would have embraced the 200 million years between then and the Pleistocene (cf. note 169, chapter four, re Ross and mammal history). With his 1.5-mya date for hominids the 1998 Ross had whittled his confusion down to only about 2.5 million years (re the earliest australopithecines c. 4.0 mya). Incidentally, Ross offered only six sources for this paragraph, all from *Science News*: one by C. Simon on a stone-age shrine, 120 (1981), p. 357; the others by Bruce Bower, 130 (1986), 378-379; 131 (1987), 58-59, 340; 133 (1988), 344-345; 150 (1996), 216-217. Ross cited only that latter item apropos the "just five thousand years" timeframe for the appearance of art expressing "indisputable spiritual content." Unfortunately, not only had Bower (1996) made no such claim—that wasn't even its subject matter. As its subtitle explained, "Rock and cave art may offer insights into shamans' trance states and spiritual sightings," particularly in the interpretation of geometric shapes common to hallucinatory visual processing. The idea that at least some prehistoric art was part of a shamanistic worldview ("a means of traveling to a supernatural world," as Paleolithic art expert Jean Clottes put it) is highly plausible. But this would apply all through the history of human artistic expression, 20,000 years and more ago—as Bower made quite plain. So where Ross obtained his 5000-year figure is anybody's guess. A decorated Irish passage tomb of that age was mentioned, but not as any spiritual benchmark. Interestingly, Ross (1998, 55) double-dipped the same reference for the more accurate claim that "religious relics date back only about eight thousand to twenty-four thousand years," reprising in turn a position previously taken by Ross (1994, 141). Walter Bradley, "Why I Believe the Bible Is Scientifically Reliable," in Geisler & Hoffman (2001, 175, 309n) picked up on this 24,000 ybp dating for his secondary gloss on Ross (cf. note 192, chapter three, on Bradley & Ross).

²⁰² Ross (1994, 141). Archer (1982, 65) is similar. Cf. Diamond (1992, 168-179) on animal art, and Wright (2000, 295-296) re Marten *et al.* (1996) interpreting dolphin bubble play. Ross also observed with considerable understatement: "Some differences, however, between the Bible and secular anthropology remain. By the biblical definition, these hominids may have been intelligent mammals, but they were not humans. Nor did Adam and Eve physically descend from them. (According to Genesis 1:26-28 the human species was created complete and brand-new by God through His own personal miraculous intervention.)" And that settles that! There were no references. Likewise, Ross (1996, 117-128) didn't bother with any of the relevant data on the

evolution of language and cognition when expounding on the Biblical position concerning whether animals were “soulish” or not.

²⁰³ Schroeder (1997, 117). His take on paleoanthropology was hopelessly vague and superficial. Schroeder (1997, 126) speculated: “It is possible to explain the hominid fossils that predate Adam as having been placed there as a test by the Creator.” He didn’t explain whether this was a test for the hominid, or a dry run by a Creator who evidently had some difficulty making up his mind. Like Hugh Ross above, a muddled chronology may have contributed to Schroeder’s conclusions. Schroeder (1997, 129) stated: “Some time between one and two million years ago, a creature having a cranial capacity a bit less than one liter appears to have walked upright. Data from this period are tentative at best, being based on only a few partial fossils.” His citations for this fell beyond “tentative at best,” since he didn’t give any. Whether Schroeder was thinking of australopithecines (the upright hominid that appeared around 4 mya) or *erectus* (the toolmaking and globetrotting taxon that dominated the 2-1 mya timeframe) remains unclear. Schroeder’s only comment on toolmaking was in the next paragraph, referring to Neanderthals: “Stone tools found with the fossils appear to have been formed by deliberate chipping, a possible indication of ability to plan and to execute plans.” By giving the impression that worked tools first appeared only at the time of Neanderthal, Schroeder was not only off by several million years, he compromised any substantive understanding of what may have been going on in the evolving mind of the beings that made them.

²⁰⁴ Per note 254, chapter three, on Pennock’s “demon lettuce” problem. In his review of Schroeder’s book Phillip Johnson (1998b, 29) commented: “Because the Six Days of quark confinement time equal fifteen billion years of earth time, and because Jewish scholars have never read the first chapters of Genesis literally, Schroeder can easily accept most of the standard evolutionary story, provided that it is directed by divine providence and ends with God putting the breath of life (*ruach*, in Hebrew) into man and making him a living soul (*neshama*).” That Johnson thought Schroeder accepted “most of the standard evolutionary story” was fascinating enough—but what I should have liked to have learned was Johnson’s own opinion concerning when the “breath of life” supposedly entered the hominid picture and “a living soul” resulted. And while he’s about it, Johnson might also take a stab at the 1960s demonic anthropology of Henry Morris. “In his Sunday-school lessons, which became ‘the all-time best seller’ for its publisher, he suggested that the antediluvian ‘giants’ mentioned in Genesis 6—perhaps the very ones that had walked the Paluxy River bed—might have resulted from evil angels possessing men’s bodies,” Numbers (1992, 211). The idea of souls being dropped on animal homunculi reminds me of the plot of Philip José Farmer’s “Riverworld” novels, where advanced aliens visiting our planet felt sorry for us temporally challenged hominids. Having added to our ancestors’ brains “psychomorphs” to record our experiences, without prior consultation or warning the aliens later physically resurrected everyone from Neanderthals on and deposited the lot on a gigantic engineered planet. Arriving buck-naked with only a computerized lunch pail strapped to their wrist, characters from Mark Twain to Hermann Göring tried to fathom what was going on. The first installment in the trilogy, *To Your Scattered Bodies Go*, netted Farmer a science fiction Hugo Award in 1972 ... Schroeder or Morris’ nonfiction speculations should be so lucky.

²⁰⁵ See Adler (1967) for a full treatment of his position on evolution, and Adler (2000, 51-96) for the texts of his lectures in the pioneering 1950s educational TV series *The Great Ideas*—which I viewed with much enjoyment in my high school interdisciplinary Humanities class in the late 1960s. Thinking back on it, though, my willingness to entertain the vague antievolutionism of Velikovsky or Koestler in my early college years owed at least some of its underpinnings to the typological essentialism previously absorbed from Adler’s lectures. Of interest too is an observation Ruse (2001, 40) made apropos the application of Aristotelian “properties” and “accidents” in Christian thought: “Traditionally, in the case of humans, the fact that we are rational is considered essential, a property, whereas the fact that we are bipedal is considered an accident. Humans would not be humans without rationality, whereas if we ran on all fours we could still be human.” But the evolutionary details suggest that we probably could not have become human without our contingent bipedality (e.g. note 69 above). An essentialist conception of bipedality would therefore

fail to make the proper connections necessary in figuring out the natural process ... another instance of ideas having consequences.

²⁰⁶ Adler (2000, 80-83) presents the esthetic issue—cf. Adler (1985, 5-29) on human consciousness. Mithen (1996, 154-159) finds it inconceivable that fully modern human minds were not responsible for Paleolithic art. Interestingly, primates are known to engage in “art” of a sort, such as playing with paint to make pictures, Jolly (1999, 292-294). Dissanayake (2000) relates human artistic expression to an extension of the mother-infant bond to the broader venue of communal theater. The prime unknown here concerns the neurology of such behavior, and how it might compare to localized functions in our own “Swiss Army Knife” brains, where a cognitive fluidity naturally integrates everything (sometimes whether we like it or not).

²⁰⁷ Budiansky (1998, 42) wryly condensed the whole process when he remarked that we “can write a list of things that people can do that animals cannot.” Incidentally, “Aristotle called man the sole ‘political animal’; Darwin said man was the only moral animal or ‘utopian animal,’ in that he could modify his actions in obedience to an ideal that exists beyond any immediate, real experience,” Budiansky (1998, xv).

²⁰⁸ De Waal (1995), Miller (1995) and Berger & Hilton-Barber (2000, 135-139) discuss Jane Goodall’s pioneering studies (cf. notes 103 & 199 above on tool use and warfare), while Vogel (1999b) and Smuts (2000) evaluate recent work on chimpanzee “culture” and “politics.” Marks (2002, 182-185) is unimpressed. Zimmer (2000e, 200-202) and Bekoff (2002, 69-71) note chimpanzee medicinal plant use (swallowing leaves to clear intestinal parasites), though many animals show such adaptive dietary behavior, Engel (2002). Maynard Smith & Szathmáry (1999, 137): “The essential points are that, in higher animals, social interactions within a group depend on individual recognition, and that an individual’s behaviour towards another depends both on genetic relatedness, and on a memory of previous interactions with that individual.”

²⁰⁹ Wendell Bird (1989, Vol. 1, 232) took this tack with a string of authority quotes by evolutionists from Dobzhansky to Ayala on how the human mind differed in kind, not degree, from the nonhuman (such as that humans have ethics in a way apes don’t). Though this begged a sizable question: what sort of mind did intermediates like *H. erectus* have?

²¹⁰ Adler (2000, 52, 56) also objected that Darwinism removed “a discontinuity between man and the rest of nature” and so represented “the most serious threat to man’s conception of man.” One section title baldly maintained that “Darwinism Is Incompatible With Human Dignity,” Adler (2000, 94). Ernst Mayr overdid the argument on the opposite front while nominating Darwin as the most influential scientist of the modern age. Although he wasn’t referring to Adler’s argument specifically, Mayr (2000, 81-82) drew equally dire conclusions from the difference between natural variation and Platonic essentialism: “Variation, in contrast, is nonessential and accidental. A triangle illustrates essentialism: all triangles have the same fundamental characteristics and are sharply delimited against quadrangles or any other geometric figures. An intermediate between a triangle and a quadrangle is inconceivable. Typological thinking, therefore, is unable to accommodate variation and gives rise to a misleading conception of human races. For the typologist, Caucasians, Africans, Asians or Inuits are types that conspicuously differ from other human ethnic groups. This mode of thinking leads to racism. (Although the ignorant misapplication of evolutionary theory known as ‘social Darwinism’ often gets blamed for justification of racism, adherence to the disproved essentialism preceding Darwin in fact can lead to a racist viewpoint.)” Cf. Pinker (1997a, 325-326) on essentialist geometry analogies. Ironically, Simpson (1953, 349) detected lingering traces of typological essentialism in Mayr’s own thinking on systematics as late as 1942.

Neither the essentialist Adler nor the evolutionist Mayr would have defended any brand of racism, of course, but their antecedents have not always been so scrupulous. Mayr does raise a proper scientific point, though, in that viewing human races as typologically distinct is unsupported both morphologically and genetically. See notes 8-11, 13-14, 20, 49, and 173 above for a grab bag of potshots on racism.

²¹¹ Johnson (1995, 67). His use of “principles of biochemistry” is a curiosity. Animal neurons are virtually identical, and the chemistry of their signals is well known (involving calcium, potassium

and sodium)—it is their *organization* into functional networks that differentiates one brain from another, and that is the venue the “materialist theory of the mind” addresses. Non-mammalian brains offer many clues to human neural organization, as Marder (2002) noted of Brainard & Doupe (2002), Kauer (2002), Knudsen (2002), Nusbaum & Beenhakker (2002), Panda *et al.* (2002) and Webb (2002). Cf. Barinaga (2002) re Gutfreund *et al.* (2002). A lengthy exposition on the mechanics of brain signaling in Schroeder (2001, 94, 103, 105-145) made a similar mistake as Johnson, castigating Pinker (1997) for not dwelling on the neurons and neurotransmitters. Schroeder decided that Darwinism not only “fails to describe reality,” but that it was “a farce” for Darwinists to think that new organs like the brain could have evolved naturally. Schroeder did not investigate what was known about the comparative structure of primate and human brains (or their fossil antecedents). See Greenfield (1996, 44-77; 1997) for a general introduction to the various physical elements of the brain and associated nervous system. Study at the base level of cellular organization suggests how transformation of function can turn on the seemingly trivial, such as how many neuron clusters there are in a region and how far apart they are spaced. This appears to play a role in the hemispherical differentiation of “Brodmann’s area 22,” Gazzaniga (2000) on Galuske *et al.* (2000). Area 22 is concerned with auditory association—but whereas the right hemisphere uses it to assess melody, pitch, and sound intensity, the cells of the left version (generally arrayed a mere 20% farther apart) are specialized for word detection and generation. While the neocortex plays an important role in signal processing for more advanced brains, animal retinas in general appear to preprocess a lot of the information on their own, Galambos *et al.* (2000; 2001). At that fundamental level it matters which retinal ganglion cells fire in concert to “compute” a given main signal, Taylor *et al.* (2000) with perspective by Barinaga (2000). Cf. also Vaadia *et al.* (1995) on neuron interactions.

²¹² For reference to the prior issues ... ultra-Darwinism v. Punk Eek in notes 8 & 9 (Introduction), note 33 (chapter one), and 106 & 270 (chapter four); sociobiology per notes 118 (Intro.) and 91 (ch. one); cladism in notes 230-233 (ch. four).

²¹³ I am deliberately paraphrasing Richard Dawkins (1998a, 32): “By all means let’s be open-minded, but not so open-minded that our brains drop out.” The sentiment (delivered in a 1996 BBC lecture) is not original to him—Pennock (1999, 282) attributes it to Bertrand Russell. On a personal note, I admit to another antipathy shared by Dawkins: grammar school debating, wherein one is supposed to arbitrarily support or oppose an argument, by whatever tactical means work best. Like Dawkins, I cannot honestly argue a position I do not personally hold. If the facts are equivocal, then say so—if not ... an idea worth having is one worth defending.

²¹⁴ Morris & Morris (1996a, 200-201). Sans references or details, this is but a sunbeam gloss on Morris (1972, 39): “As far as Scriptures are concerned, as we have seen, both men and animals have body, soul, and breath, in their present earthly lives. There are many similarities between man and animals, in terms of both structures and function, and it is perhaps understandable that evolutionary relationships might be suggested by non-theists to explain those similarities.” Dembski (1999b) and the chapter on “Your Incredible Brain, Your Magnificent Mind,” in LaHaye & Noebel (2000, 45-54) are comparably general.

²¹⁵ Johnson (2000, 123). Godfrey-Smith (2000), Maynard Smith (2000a,b), Sarkar (2000), Sterelny (2000) and Winnie (2000) show how murky this issue can get when philosophers get in the act. Cf. Haught (2001, 25-26). The mysterian Berlinski (1996a, 43) (“the role attributed to DNA is at odds with the obvious fact that the information resident in the genome is inadequate to specify the whole of a complex organism”) has led to Berlinski (2001). Lapin (1999, 350-353) waxes political: “data stays, matter decays” information theory supports “restoring our cultural data” as embodied in the conservative wing of the Judeo-Christian tradition. The “overweening ambitions of mind-science” aside, information complexity is not some monolith to be claimed for Intelligent Design like the summit of Mt. Everest. Nor is there an inevitable way of “measuring” it, even where you find it, Roche (2001). Nørretranders (1991, 208) noted two approaches as the brain crunches the rush of reality into our perception. *Thermodynamic* depth is the sheer volume of data discarded to arrive at a certain output (as in replacing “1+1+2” with “4”); *logical* depth concerns the processing time required to discard the information. Cf. Tononi *et al.* (1994; 1996;

1999) on assessing neurological complexity. Johnson (1997, 127) asked: “Does it require no more intelligence than the wind possesses to write *Don Quixote* or Windows 95—or to specify the genetic information required to create Miguel Cervantes or Bill Gates?” *At one stroke?* Johnson’s theology appears to be defining his rhetoric here, being consistent with the idea that we owe our brains not to a lineage of progressively less advanced ones (*erectus*, etc.), but to an inheritance restricted to some initially created *human* brain (presumably Adam’s). A significant theoretical problem here for ID turns on how our brains are not like Beta to VHS, different engineering solutions to achieve a similar output. Our brain hardware shows no quantum disparity in internal structure compared to those of animals—consider the cortex layout of chimpanzee and human brains illustrated in Greenfield (1997, 17). The DNA information is also objectively susceptible to duplications, transpositions, mutations and erasures, as well as being put on the shelf via pseudogenes. Intelligent Design will therefore have to decide which particular nucleotide sequences relevant to the assembly of living human and animal brains they are ascribing to the presumed *original* designs. Only then can their information argument be lifted from abstract plaything to scientific hypothesis. Given the intricacy of the task, however, I suspect it will be some time before “The Intelligent Design Mind Map” becomes available.

²¹⁶ Johnson did exactly that regarding the evolutionary naturalism of Pinker (1994, 360-361) when he articulated the standard Richard Dawkins view that natural selection is the only process capable of creating order apart from God. Johnson (2000, 186n): “Even the most speculative just-so story, ungrounded in any testable process or fossil evidence, is preferable to allowing God a role or invoking design.” As we’ll see below, though, Pinker had actually offered quite a bit of physical evidence relevant to the point of his book (the origin of language)—none of which Johnson thought to remark on. An even more irony-laden example concerns Behe (1996, 29-30, 155-156) complaining about Stuart Kauffman of the Santa Fe Institute, who has applied complexity theory to the origin of life as an instance of emergent properties deriving from otherwise conventional chemistry. Behe objected that Kauffman used no specific examples (“no AMP, no aspartic acid, no nothing”) and for good measure invoked an external authority: “John Maynard Smith, Kauffman’s old mentor, has accused him of practicing ‘fact-free science.’” Since Behe referred to him once as simply “Smith,” he may have been unaware that Maynard isn’t his middle name (Phillip Johnson has not made that particular mistake). While Kauffman’s insights were apparently not credible enough for *Darwin’s Black Box*, Behe subsequently deemed them of sufficient moment to criticize the 2001 PBS *Evolution* series for not dealing with them (a Sep 28, 2001 WorldNetDaily.com posting at the Discovery Institute website section on the series). Ironically, Behe’s initial skepticism about Kauffman’s views drops him tactically in the reductionist/sociobiology camp, with Edward Wilson (1998, 86-90) sharing his doubts about the present utility of complexity theory. See Dennett (1995, 220-227) for a slightly different slant on how Kauffman’s ideas relate to the quest to understand the “meta-engineering” underlying the structure of life. Evolutionist Kauffman also shares with many antievolutionists a tendency to bypass the brickbats thrown at his position by critics (like Maynard Smith). On the evidential front, Kauffman (1993; 2000) tends toward a level of abstract modeling several notches above even Richard Dawkins. But he does touch on significantly more specific biological examples than anything in Dembski (1999a), which raises the question of whether Behe or Johnson are capable of venting equal critical spleen against cloudiness in their own camp without recourse to double standards (more on Dembski v. Kauffman in the last chapter). Interestingly enough, Wakefield (2001a) describes how biologically inspired complexity models (including Kauffman’s) have been successfully applied in at least one demanding “survival of the fittest” venue: the business world. To the extent that one heeds the call of market forces, the Kauffman approach to the dynamics of complex systems appears to be alive and kicking.

²¹⁷ Pinker (1994, 322). The Human Genome Project’s announcement in Venter *et al.* (2001) that humans have only 30,000 genes (instead of the previously estimated 100,000) has been tempered somewhat, such as Hogenesch *et al.* (2001), trending up to perhaps 70,000 functional genes. Cf. Harrison *et al.* (2002). But whatever figure bears out, it is already clear that there is no simple correspondence between genes and neuron structure, as reported by Natalie Angier, “Finding Elusive Factors That Help Wire Up Brain” and “A Brain Cell Surprise: Genes Don’t Set Function,”

in Wade (1998b, 165-166, 178-182). Incidentally, nature again appears to have used related molecules in different contexts: the chemotropic proteins dubbed “netrins” that guide the linkage of the vertebrate spinal cord to the brain turn out to be related to *unc-6* that nematode worms use to wire their sensory axons. Despite 600 million years of evolutionary dust since their common divergence, the genes for netrins and *unc-6* are still about half the same. It took about a decade of careful experimental work to discover the existence of netrins and reveal their physical affinities. Other aspects of neurobiology have proven just as daunting. For example, researchers are only now working out the basement end of nerve cell generation, discovering how critical the timing of expression is for the Hunchback and Krüppel genes involved in the early production of nerve cells in fruit flies, Livesey & Cepko (2001) on Isshiki *et al.* (2001).

²¹⁸ Pinker (1997a, 26). Clues can come from all over the scientific map. For example, only certain groups of birds are capable of learning new vocalizations (songbirds, parrots, and hummingbirds). This capacity appears to be related to comparatively small changes in specialized brain areas, as well as the expression there of the ZENK gene, Heist (2000). Knowing some of the factors involved in avian vocal learning may offer insights as to comparable processes in the mammalian brain.

²¹⁹ See Ruse (2001, 77-82) for a different take on how “information” plays out in the evolutionary consciousness/soul debate. Australian physicist Paul Davies (1983, 86) ricocheted off the “information” dilemma from another direction, along a trajectory of “functionalism” that equates consciousness with software. “Functionalism solves at a stroke most of the traditional queries about the soul. What stuff is the soul made of? The question is as meaningless as asking what stuff citizenship or Wednesdays are made of. The soul is a holistic concept. It is not made of stuff at all.” Davies then asked, “Where is the soul located? Nowhere. To talk of the soul as being in a place is as misconceived as trying to locate the number seven, or Beethoven’s fifth symphony. Such concepts are not in space at all.” Davies goes beyond accepting conceptually that minds might be engineered, such as Chalmers (1995, 84-86) does in the context of his information-based theory of consciousness. Provided the proper nexus was present, “minds” could even be entirely disembodied. While a dandy topic for a Star Trek episode, it does show the limitations of regarding consciousness as purely an information problem, since a great many things would embody “information” in that sense. Indeed, Chalmers (1995, 86) ended up suggesting that “even a thermostat might have experiences, although they would be much simpler than even a basic color experience, and there would certainly be no accompanying emotions or thoughts.” Cf. McCrone (1999, 302-309), Rita Carter (2002, 76-77) and Barr (2003, 193)—and note 223 below. The exit from this quagmire turns on how the “mind” is very much dependent on a full integration of our physical experience (re note 228 below). For that reason, it may well be that the only way for a bundle of biological “information” to be self-aware in anything like the way we are is for that “software” to be running with a full package of sensory hardware whose cross-connected processing is indistinguishable from our own. One may note that multiple personalities would be consistent with the idea of the self as software, where more than one mental subroutine might be present in a way difficult to account for if they are distinct spirits (demonic possession notwithstanding). The feature of different personalities being either aware or unaware of the existence of the others would also make sense in the software model, as nested subsets of one another. Philosophers Hofstadter & Dennett (1981, 479-481) and Ian Hacking (1995) note that genuine multiple personalities appear to be quite rare, though in better documented cases the phenomenon appears to be related to the limbic system (including malfunctions in the hippocampus) as well as traumatic experiences, Rita Carter (2002, 264-272). Cf. Ramachandran & Blakeslee (1998, 224-225).

²²⁰ Johnson (2000, 108-111). Pinker (1997a, 59-148) presented the basics of the “computational” theory of mind Johnson alluded to, but did not specifically reference. Pinker (1997a, x) defined the “big picture: that the mind is a system of organs of computation designed by natural selection to solve the problems faced by our evolutionary ancestors in their foraging ways of life.” And Pinker (1997a, 77): “Why should you buy the computational theory of mind? Because it has solved millennia-old problems in philosophy, kicked off the computer revolution, posed the significant

questions of neuroscience, and provided psychology with a magnificently fruitful research agenda.” See Kosslyn & Koenig (1992) for a concrete illustration of the sort of things Pinker had in mind. McCrone (1999, 119) noted the next step: “once the brain’s activity is viewed as an evolutionary competition carried out by structured, yet basically fluid circuits, a lot of existing neuroscience begins to make much more sense.” The Dawkins-Pinker exchange (edge.org/documents/archive/edge53.html) was another of the continuing dialogues on the Third Culture at John Brockman’s Edge website, furthering the process begun with Brockman (1995). Johnson (2000, 184n) cited the online version (news scientist.com/ns/19990313/mememyself.html) of Blackmore’s summary of her views penned for *New Scientist* (March 13, 1999). The inclusions represented text in the original Dawkins and Blackmore quotes not found in Johnson’s version. These omissions may have been due to the foibles of website downloading, where a slow processor or web connection can generate many a slip betwixt html and printer. The mismatch between quotation marks (“/”) in Blackmore’s quote from Dawkins was also in Johnson’s copy, not the original Internet passage. Regarding context, Dawkins’ question related to the contrast between the human mind and the social collective of a termite colony, where the individual insects presumably don’t contribute to a termite “consciousness.” Blackmore alluded to Dawkins’ view of religions (plural) as “computer viruses of the mind,” which “succeed because of the tricks they use to persuade us to copy them.” See also Blackmore (2000, 66).

²²¹ Here a digression on memes is warranted. At this stage we are talking a tempest in a premature teapot. When *Scientific American* printed Blackmore (2000) on the theme, they reflected the level of uncertainty by bracketing it with a flock of critics. Psychobiologist Plotkin (2000), and Boyd & Richerson (2000), respectively an evolutionary anthropologist and population biologist, took issue with Blackmore’s generalizations about imitative behavior (the animal part of the equation is covered in note 250 below). See Dawkins (1982, 109-112; 1989, 189-201, 206; 1995, 158; 1998b, 302-308) on the “meme bomb,” and Dawkins-friendly Dennett (1991, 199-226; 1995, 335-368) for an extended exploration of its implications that “Human consciousness is *itself* a huge complex of memes.” Edward Wilson (1998, 136) noted that he and biologist Charles J. Lumsden suggested in 1961 that the unit of culture “be the same as the node of semantic memory and its correlates in brain activity,” and that this might as well be called a *meme* as the handiest term available. While Wright (2000, 87-89) is fairly meme-friendly, others are more skeptical: Pinker (1997a, 208-209), Wimsatt (1999), Paul Ehrlich (2000, 352n), Gardner (2000c, 207-216), Pascal Boyer (2001, 34-40), Palumbi (2001, 242-252) and Zimmer (2001g, 308-210). Jolly (1999, 63) noted: “Where the analogy falls down is the same place that Darwin faltered through not knowing the work of Mendel. We can imagine no particulate, minimal idea.” Blackmore (1999, 53-66) recognized that, rightly countering that memes would operate in a *Lamarckian* way, exchanged back and forth in a manner totally distinct from the Darwinian selection that governs so much of genetic inheritance. Maynard Smith & Szathmáry (1999, 139-140) make a similar point. But the crucial difficulty Blackmore skirted around in her book concerns whether memes and *ideas* are interchangeable—which Johnson might have explored had he got past her *New Scientist* summary. Blackmore (1999, 15) acknowledged that “not all thoughts are memes,” but ended up acting as though they were, partly by sloughing off social institutions (like the Catholic Church) as “memeplexes.” Jumping from that to the more inclusive claim that “Our memes is who we are,” Blackmore (1999, 22) preferentially defined an individual’s “selfplex” to be a particularly extensive memeplex generated by the memes to further their own propagation. Blackmore (1999, 19) referred in passing humorously to a “meme-immunological system” ... indeed, that is precisely what the idea called “philosophy” is all about, a filtration system that examines both ideas and memes for potential social, psychological, or moral toxicity. The less contentious and potentially more useful feature of memes is the extension of the Darwinian process beyond the physical genes that interact to produce the hardware of the brain and our basic consciousness, to aspects of the cultural software spun off as part of our prolific reasoning and reflection. Blackmore (2000, 65) got closer to this when she observed that, “It is tempting to consider memes as simply ‘ideas,’ but more properly memes are a form of information.” Recognizing a meme as an idea whose copying comes to have “a life of its own” is reminiscent of Jungian archetypes, in that they function unconsciously and establish

frameworks for their own acceptance. This feature of memes (I pointedly do not say “the meme of memes”!) certainly makes sense of childhood fads, from the Disney Davy Crockett mania in the 1950s to those Cabbage Patch dolls that sucked parental Christmas budgets dry, as well as the more recent Pokémon card craze. A refined conscious esthetic choice hardly seems adequate to describe what is going on there. The persistence and attraction of ideological theater would also be clarified were it considered partly memetic, such as the Nazi penchant for regalia that resonates with deep-seated yearnings for ritual and spectacle. The Nazis also co-opted many Christian concepts in a “blasphemous parody” of wedding, baptismal and funeral services, Paul Johnson (1977, 486-487). See Kinser & Kleinman (1969) for an evocative treatment of the Germanic cultural icons woven into the Nazi mythos.

²²² Johnson (2000, 184n, 186n) cited Pinker (1994; 1997) on issues of evolutionary philosophy, and so theoretically could have been familiar with the technical evidence Pinker mentioned along the way. Another resource available to Johnson was Brockman (1995, 147-257)—a full quarter of the book being devoted to how much of consciousness might be explained scientifically. The specific topic before Brockman’s house was whether consciousness arises from “A Collection of Kludges” (a jury-rigged arrangement not unlike a Rube Goldberg machine, rhyming with “stooges”). Brockman interviewed a disparate group representing many positions and egos, from physicist Roger Penrose to the neo-Darwinian position of philosopher Daniel Dennett and his colleague, psychologist Nicholas Humphrey. Computer scientists Marvin Minsky and Roger Schank reflected the view that consciousness would be cracked by artificial intelligence research. Minsky in particular is a lightning rod in much the same sense as Stephen Jay Gould. Brockman (1995, 164) quoted Steven Pinker classifying Minsky as a “guru” (he did not mean this as a compliment), while biologist Francisco Varela was blunter: “a pain in the ass, an arrogant son of a bitch.” Cf. Shermer (2000, 59-60) on Minsky and the consciousness fringe. But Pinker and Varela are not philosophical allies generally, with Pinker following a Darwinian materialism clearly far removed from the misty Buddhism favored by Varela—indeed, the vocabulary and attitude of Pinker (1997a, 149-210) on the evolution of the mind is far closer to Dawkins or Dennett. Cf. Jerry Fodor’s critical review of *How the Mind Works* in the *London Review of Books* (January 15, 1998), available online at lrb.co.uk/v20n02/fodo2002.html. Much as with Margulis and Goodwin, per note 106 of chapter four, sorting out the conflicting parties requires broader investigation. But the only other work touching on this field that Johnson (2000, 121-122) directly cited was John Horgan’s *The Undiscovered Mind*, drawn on for some authority quotes because Horgan is very skeptical of whether the “consciousness conundrum” can be cracked, especially by Darwinian psychology, Horgan (1999, 167-198). Horgan is equally gloomy about traditional religion doing any better here, but Johnson chalked that up to Horgan’s unwillingness to see things in the fresh way promised by the Wedge.

²²³ For one particularly quirky trail, we may start with the position of Sagan *et al.* in Margulis & Sagan (1997, 183): “Either we are like other live organisms in that both we and they exert choices, or both we and they are mechanistic, deterministic beings whose choosing behavior is essentially illusory. The middle ground is philosophical quicksand.” Margulis has certainly been consistent in measuring everything by a microbial yardstick: “Said succinctly, all organisms larger than bacteria are intrinsically communities. In this nonmechanistic view, animal and plant physiology becomes a specialized branch of microbial community ecology,” Lynn Margulis, “Big Trouble in Biology: Physiological Autopoiesis versus Mechanistic Neo-Darwinism,” in Margulis & Sagan (1997, 272). From that perspective a cow is not an individual—only bacteria are true individuals. Such is the context for Margulis’ views, which helps explain why so many scientists find her both challenging and exasperating (as well as adding an entertaining backspin to Phillip Johnson’s selective invocation of Margulis as seen in note 170 above). As for the “philosophical quicksand,” Vine Deloria trucked in a fresh load in a 1993 essay, “If You Think About It, You Will See That It Is True.” From his vantage of Native American religion, Deloria readily embraces the Lovelock/Margulis Gaia hypothesis but thinks it doesn’t go nearly far enough in affirming that “The Universe Is Alive.” Deloria (1999, 49): “But the debate has often centered on false arguments, with both the advocates and the opponents of the theory restricting the definition of ‘life’ to

reactive organic phenomena that are observed primarily in the higher organisms.” Also Deloria (1995, 55): “The major difference between American Indian views of the physical world and Western science lies in the premise accepted by Indians and rejected by scientists: the world in which we live is alive.” Getting to examples, a 1992 piece on “Relativity, Relatedness, and Reality” in Deloria (1999, 34) explained that “Indians knew that stones were the perfect beings because they were self-contained entities that had resolved their social relationships and possessed great knowledge about how every other entity, and every species, should live. Stones had mobility, but did not need to use it. Every other being had mobility and needed, in some specific manner, to use it in relationships.” Whether Theistic Realism would embrace “giving science a sense of purpose” as Deloria (1999, 39) envisions it, where spirit and purpose apply to limestone or basalt, is one of those many questions of ideological ecumenism as yet unanswered by Johnson’s Wedge. Cf. Gulliford (2000, 67-176) on Indian sacred places.

²²⁴ Descartes grew prudent in his public speculations, which fueled the idea that truth could be discovered analytically independent of divine revelation. With an eye on the travails of Galileo, Descartes stopped publishing in France and skipped over the border to more tolerant Holland. Remember this was the 17th century, a time of enormous political and social upheaval, with absolute monarchs staking out their turf amid debilitating religious wars. Many of Descartes’ brilliant contemporaries were thus understandably rather pessimistic about the nature of man, from Spinoza to Thomas Hobbes. When things settled down (somewhat) during the next century, the ideals of Cartesian empirical skepticism moved to the front intellectual burner as the Enlightenment. A few bloody revolutions later, the bloom was off pure Reason, and 19th century Romanticism saw the pendulum swing over to the moody side, only to glide back again to the institutional rationalism of our own more “scientific” times that Creation Science and Intelligent Design are out to reform. See Johnson (2000, 172-173) for a different take on the legacy of Cartesian dualism, wherein materialism once more emerges the villain.

²²⁵ Dorion Sagan, Lynn Margulis & Ricardo Guerrero, “Descartes, Dualism, and Beyond,” in Margulis & Sagan (1997, 173). Burke (1999, 133-135) noted the effect decorative water gardens had on Descartes’ hydraulic view of life, while the midline position of the pineal gland stood out as unlike all the other features that were paired in the brain, Greenfield (1997, 60).

²²⁶ Interestingly, Descartes himself was a dog owner, and from all accounts an affectionate one, as noted by Finger (2000, 69-83) in his survey of Descartes’ mixed contribution to neurology. Incidentally, a contemporary of Descartes who was highly skeptical of his pineal theory was Nicolas Steno, as skilled an anatomist as he was a pioneer in geology. Sagan *et al.* in Margulis & Sagan (1997, 179) represent the broadest attribution of animal awareness: “That bacteria are simply machines, with no sensation or consciousness, seems no more likely than Descartes’ claim that dogs suffer no pain. We reject the idea that microbes act without any feeling.”

²²⁷ As Ruse (2001, 78) affirmed (with notable understatement), “Darwinians take consciousness very seriously.” One may start with Donald (1991) and Mithen (1996) concerning how our own cognitive “central processor” evolved as each level superceded and encapsulated prior modules. Indeed, Mithen thinks our unique nature rests on our ability *not* to be single-minded—to be able to daydream while whacking off tool flakes. Donald’s approach isolated the various levels by examining which functional hierarchies are affected by damage to the brain, as does neurologist Damasio (1994; 1999) on emotions and consciousness. *Scientific American* has kept up with the field through a series of survey articles, devoting a special issue to the theme in September 1992. Their articles by Gazzaniga (1998), Chalmers (1995), Horgan (1994), and Crick & Koch (1992) were included in *Scientific American* (1999, 129-138, 287-295, 297-309, 311-323). See also their pieces by Calvin (1994), Crick & Koch (1995), and Beardsley (1997). Horgan (1999, 230-257) and Trefil (1997) offer trenchant assessments of the limits of “reductionist” thinking in this area, though many useful points are still raised by exemplars such as Dennett (1991), Humphrey (1992), Crick (1994) or Blackmore (1999). The reductionist data set is given a particularly interesting twist by Nørretranders (1991) and McCrone (1999), as we’ll see. Up until the advent of CAT scanners and such, progress in cognitive research was at a snail’s pace. The neurological information available to William James late in the 19th century, as collected in James (1992), was

almost as up-to-date as the survey by Broad (1929), with only the promise of things to come hinted at by the pop gloss of Marilyn Ferguson (1973) or the essays in Hofstadter & Dennett (1981). Compare also the assessments of Leakey & Lewin (1977, 180-205; 1992, 239-311), as well as Strahler (1987, 496-509) from the standpoint of the creationism controversy.

²²⁸ Sagan *et al.* in Margulis & Sagan (1997, 175). Hofstadter & Dennett (1981, 6) had remarked: “Your thinking seems to happen behind your eyes and between your ears—but is that because that’s where your brain is, or is that because you locate yourself, roughly, *at the place you see from?*” Probably both—abetted by the twelve pairs of cranial nerves that link the head and face directly to the brain, Greenfield (1996, 80-83). The view that raw physical sensations are central to consciousness (“*I feel, therefore I am*”) is a major theme of Cambridge psychologist Humphrey (1992), and Damasio (1994, 236-244) relates our sense of self partly to how we obtain and update our whole body image. Possibly the most interesting discovery concerns the main topic of Damasio’s 1994 work, *Descartes’ Error*: the relationship between reason and emotion. Philosophy has tended to regard these as opposites, but studies of the brain suggest exactly the reverse is true—that to “reason” *reasonably* requires fully integrating our emotional side. This carries over into the ethical realm, as new evidence suggests that emotions are being drawn on when the brain engages in moral reasoning, Helmuth (2001b) on Greene *et al.* (2001). Barbour (2000, 135-137) relates Damasio’s insights to liberal Christian thinking, where *heart, soul, and mind* are overlapping characteristics of a unified spiritual personality; Nussbaum (2001, 115-119) assesses some of the philosophical implications. Blackmore (1999, 46) aptly described how Damasio “has worked with many patients who have brain damage, often in the frontal lobe, that causes them to lose their normal emotional responses and become emotionally flat. Far from turning into super-rational decision-makers, able to plan their lives without all the irritating distraction of unwanted emotions, they become almost paralysed with indecision. Whether to choose pickle and pumpkin crisps, or cheese and onion, can become a nerve-wracking dilemma to be resolved only by long and careful thought, and a normal life becomes impossible. Most of us would just think ‘well, I feel like cheese and onion today’ not realising that the emotions have done the complex work of juggling the possible consequences, weighing up the results of past experiences, throwing these in with species-specific preferences and coming up with some rough and ready bodily reaction that allows that tiny verbal part of our brain to say ‘I think I’ll have the cheese and onion please—if you don’t want it’. *Star Trek*’s Mr Data is simply implausible. If he truly had no feelings he would not be able to decide whether to get up in the morning, when to speak to Captain Picard, or whether to drink tea or coffee.” *Star Trek*’s other rationalist icon, Mr. Spock, got it from the other direction when Pinker (1997a, 372) wondered whether it was possible for a sentient being to function without emotional input as Vulcans are wont to do. Pinker (1997a, 299-424) covers human reason and emotion; cf. Plutchik (2001) on how human emotions relate to a deeper evolutionary core. An intriguing sidebar here relates to another group of people whose “reason” subroutine appears able to run somehow without its essential emotional input. Popularly called “sociopaths,” they suggest being liberated from emotion is one dangerous software malfunction!

²²⁹ Donald (1991, 365). He noted that Marvin Minsky’s view that there are “myriads of subroutines and networks called ‘agents’” whose competition generates the illusion of our unitary consciousness doesn’t resolve the problem either. This simply replaced “the traditional homunculus with platoons, indeed entire armies, of homunculi; it is difficult to accept that this is a significant improvement in the state of our metaphysics.” Perusing Minsky (1986), I am inclined to agree. Concerning Francis Crick’s view that our conscious selves are effectively just a “pack of neurons,” Trefil (1997, 188) located this “foursquare in an ancient and honorable British tradition—the anticlerical intellectual curmudgeon. He is obviously worried that if people do not accept the Astonishing Hypothesis, they will be driven to accept religion and the existence of the soul.” Cf. Crick (1994, 24-25, 258-259), Pinker (1997a, 79) and Damasio (1999, 189-192) on “the infamous homunculus,” Kosslyn & Koenig (1992, 431-437) on consciousness as a quite real “parity check” system in the brain, and note 242 below regarding Susan Blackmore’s mimetic reductionism. Once the dust has cleared away, though, the philosophical challenge remains, as Paul Davies exemplified in Brockman (1995, 304). The origin of consciousness (and with it, the human soul) is one of three

great “gaps” in present natural understanding—the other two being the origin of life and the universe itself. Davies then noted that these were the only areas still left for God to be involved “as a direct influence in the world.” That attitude is of course exactly the sort of materialist imperialism Johnson’s Wedge is out to dispose of.

²³⁰ Donald (1991, 356-257). For a different brand of “symbiosis,” Lynn Margulis, “Speculation on Speculation,” in Margulis & Sagan (1997, 113-123) offers the idea that the nervous system, and the brain linked to it, is a symbiotic system, “an unholy microscopic alliance between hungry killer bacteria and their potential archaeobacterial victims.” Thus brain chemistry becomes a variety of “spirochete microbial ecology.” Similarly, Dorion Sagan & Lynn Margulis, “Futures,” In Margulis & Sagan (1997, 245) refer to Neil Todd’s idea that “karyotypic” fissioning (where chromosomes split at their centers) has played a role in mammalian evolution, including humans. How these offerings will stack up experimentally against Behe’s “irreducible complexity” or Dembski’s “specified complexity” arguments, and whether any will hold up as well as Margulis’ endosymbiotic origin of organelles, is a matter for the science of the 21st century to resolve.

²³¹ Curiously, during the Discovery Institute Artificial Intelligence symposium (re note 39 above) “comprehension” was covered more by the evolutionist contributors Ray Kurzweil and his critic John R Searle than by ID lights Denton, Dembski, George Gilder & Jay W. Richards. Searle’s influential Chinese Room metaphor—reprinted in “Minds, Brains, and Programs,” with “Reflections” by Hofstadter, in Hofstadter & Dennett (1981, 353-382)—posits people locked in a room with a dictionary to translate Chinese ideograms into English for others outside to read. Knowledge of Chinese or English would not seem necessary, which bumps into consciousness once you realize that our brains are composed of unaware subroutines that function as a collection of Chinese Rooms. Human languages embody *thought*, and thus the only way to really “translate” them is to understand what is being said—which means having a “homunculus” somewhere in the Chinese Room. Comprehension has indeed proven troubling for computer recognition software, which can handle sentences only so long as they don’t get too idiomatic—cf. Wiles & Halliran (2001) re Cangelosi (2001), Kirby (2001) & Hurfurd (2001), and also note 298 below. Much like Stephen Jay Gould versus Steven Pinker, though, Searle and Kurzweil actually agree on the theoretical issue (that successful AI requires understanding the natural mechanisms behind human consciousness)—differing strenuously on how likely that will be achieved during the exponential growth of computer technology. One may contrast the creationist account of AI and Searle’s argument in Habermas & Moreland (1998, 92-94) with the evolutionary perspective of Rita Carter (2002, 65-69, 177-183).

²³² The section on “Materialism and the Mind” in Johnson (1997, 81-83) was content to draw secondarily on the curmudgeonly Horgan (1996b, 181-182) for the dispute between “dedicated materialist” Christof Koch and cognitive philosopher David Chalmers. Koch is a computation theorist who questions whether Chalmers’ information based model of subjective experience explains things better than studying what the brain does during that activity. Both are young scientists, incidentally, and thus disposed to the sort of contentious boat rocking energetic investigators are prone to. Horgan’s book version was a variant on his earlier article, Horgan (1994)—though, as seen above in note 75, Horgan is capable of a bit of abstracting himself for the sake of a dramatic arc. For what the contending parties were up to in their own words, see Chalmers (1995) and Crick & Koch (1995). “Chalmers believes, as we do, that the subjective aspects of an experience must relate closely to the firing of the neurons corresponding to those aspects (the neural correlates),” Crick & Koch (1995, 84). See also Sandra Blakeslee, “The Conscious Mind Is Still Baffling to Experts of All Stripes,” in Wade (1998b, 238-242) on a 1996 conference Koch and Chalmers participated in, as well as Wakefield (2001b) and notes 219 above and 245 below. Chalmers (1995, 80) touched on a relevant point: “For many years, consciousness was shunned by researchers studying the brain and the mind.” With behaviorists and early cognitive scientists avoiding thinking about consciousness, that meant no discussion for antievolutionists to winnow for authority quotes. But that was before the 1990s, when neuroscientists, psychologists and philosophers picked up the consciousness trail once more, and started to lay out the boundaries of how the brain assembles the vivid reality of our subjective perception. Rather than explore this

“binding problem,” Johnson pigeonholed the issue as another of his “God or matter” dichotomies, where “consciousness” is a self-evident divine mystery opposed to the bleak and evasive reductionism of “materialism.”

²³³ Dembski (1990; 1999a, 214-222; 1999b, 29) hit this mark during his surveys of the cognition issue, which focused on the mystery of consciousness while sparing the accumulating neurological detail. Dembski cited Roger Lewin (1980b) on the work of British neurologist John Lorber, who highlights a mathematics student of above-average intelligence who had “virtually no brain.” But the case was considerably more problematic than Dembski made out. Barry L. Beyerstein, “Whence Cometh the Myth that We Only Use 10% of Our Brains?” in Della Sala (1999, 19-24) covers the particulars, noting how fundamentalist creationists have drawn on Lorber (and a British documentary about him) to argue against the mind-brain identity. Brain scanning technology was in its infancy twenty years ago, making it much harder to discern just how much tissue the fellow really had (under the fluid pressure of hydrocephaly, he apparently had only a quarter of the outer cerebral mantle—but still had the core brain sections). Lorber’s point was that “there must be a tremendous amount of redundancy or spare capacity in the brain,” which has turned out to be true enough in a general sense. But damage the wrong parts, and you cannot necessarily compensate for it (which would be a puzzling circumstance for an incorporeal soul, not dependent on the brain for its existence). In this area see Damasio (1994, 3-78) on how brain damage can severely alter personality, where “previously acquired social convention and ethical rules could be lost as a result of brain damage, even when neither basic intellect nor language seemed compromised,” Damasio (1994, 10). Damasio (1994, 212-217) related such injuries to an inability to perform rational risk assessment, such as in gambling experiments (cf. also note 228 above). The textbook example is Phineas Gage, whose 1848 brain injury left intact his “attention, perception, memory, language, intelligence,” but released a torrent of profanity and self-destructive behavior that meant “Gage” was no longer *Gage*. Interestingly, the Gage case has inspired two non-Darwinian physicists to comparable fence straddling. While the self “is not some mystical metaphysical cloud that surrounds our head,” Schroeder (2001, 136-138, 152) still located the mind external to our brain which “does for the mind what the radio does for music.” Polkinghorne (2002, 104-106) likewise acknowledged that “human beings look much more like animated bodies than like incarnated souls,” but salvaged the soul by defining it vaguely as the “information-bearing pattern” of our continuity. Adler (1985, 53) is succinct: “We do not think with our brains, even though we cannot think without them.” Such views seem hardly an improvement over Henri Bergson (1911, 42): “the ‘vital principle’ may indeed not explain much, but it is at least a sort of label affixed to our ignorance, so as to remind us of this occasionally, while mechanism invites us to ignore that ignorance.”

²³⁴ A search of online bookstores determined that Fix’s paranormal literary output included a 1978 work called *Pyramid Odyssey* and an undated *Star Maps: Astonishing New Evidence from Ancient Civilizations and Modern Scientific Research of Man’s Origins and Return to the Stars*. The thin line separating acceptable from unacceptable supernaturalism among some Christians is suggested by Hunt (1998, 56-57): “If the physical/material universe is all there is, then every facet of occultism (which necessarily occurs in a nonphysical universe) is simply a delusion. There is, however, far too much evidence in support of so-called ESP, telekinesis, precognition, poltergeist activity and other forms of the occult to allow one to accept materialist dogma.” Hunt (1998, 62-63) was thinking of demonic forces here, by the way—more on that next chapter (and cf. note 204 above). Similarly LaHaye (1999, 224): “Missionaries have told us of phenomena so fantastic that they can only be explained on the basis of supernatural power.” LaHaye offered no examples, making such phantasmagoria difficult to calibrate on a James Randi Flim-Flam index. Sociologist Goode (2000; 2001) and Sparks (2001) offer contrasting assessments of the potential crossover between religious beliefs (including creationism) and the paranormal. A survey conducted by Roof (1999, 322) produced a similar mix, with belief in astrology being the most significant (38% of “born-again” Christians believing in it—only slightly below the 41% of metaphysical believers, as compared to only 24% of secularists). Chuck Colson has got in the act at his breakpoint.org

website, decrying the rise of “Credulous Christians” in a 24 August 2001 essay on the findings of Roof.

²³⁵ Another instance of an antievolutionist applying the theological brakes occurred when Glynn (1997, 90-94) warily cited “scientific” studies affirming the efficacy of prayer. It clearly bothered Glynn that treating prayer as a mechanistic process (by which God appears to fulfill prayer requests *pro forma*) sounded more like magical invocation than divine intercession for a spiritual purpose. This focus may be contrasted with the skeptical attitude of Tessman & Tessman (2000) or Humphrey (2000), who simply applied Occam’s Razor to the study protocols to conclude that no medical improvement had actually been observed to begin with. Though cf. note 239 below on Glynn’s more ecumenical view of Near Death Experiences.

²³⁶ Shermer (2001, 159-198) and Desmond & Moore (1991, 538, 647). Cf. also Desmond & Moore (1991, 546-547), Pinker (1997a, 299-301), Shermer (1997, 255), Ramachandran & Blakeslee (1998, 189-192), Arsuaga (2001, 253-258) and Gould (2002a, 248-249) on Darwin and Wallace’s competing views of the mind and evolution, and Milner (1996) on their respective reactions to the fraudulent spirit mediums bamboozling Victorian high society. Incidentally, like Darwin, Wallace was a religious agnostic, Edey & Johanson (1989, 74, 91). On a broader front, the review by Endersby (2003) suggests a full appreciation of Wallace’s life and contribution to evolutionary thinking are still underrepresented by the available biographical literature.

Davis & Kenyon (1993, 107) sidestepped the psychical or political aspects of this issue: “A difference later developed between Darwin and Wallace on the question of man’s origin, especially the origin of the human brain. Wallace believed that the human brain was the result of intelligent design. Darwin disagreed.” Desmond & Moore (1991, xx, 335) noted Darwin was “addicted to quackery,” though out of desperation rather than conviction. It is usually presumed his fitful ill health and hypochondria were aggravated by anxiety over the implications of the scientific arguments he was offering, and the offended religious convictions of his wife—see e.g. Edey & Johanson (1989, 62-63). Recall also Darwin’s grief over the loss of his daughter (re note 122, chapter one). But Morris & Morris (1996a, 109) blamed it all on the baneful effect of evolutionary philosophy: “Charles Darwin was a vigorous, healthy, almost happy-go-lucky man before he was converted to evolution, but a man of sickly body and troubled mind all his life thereafter.” Which may be contrasted with Zimmer (2000e, 158), summarized in Zimmer (2000f, 44): “Although no one is sure what made him suffer, some have suggested Chagas’ disease, which is caused by trypanosome, a parasite that in turn is spread by the *benchuca*, a biting insect of South America. The ways to die of Chagas’ are horrible in their variety: your misfiring heart may stop beating, for example, or food may pile up in your colon until you die of blood poisoning. Darwin was bitten by a *benchuca* as he was traveling around the world on the HMS *Beagle*, and many of his symptoms arose only after he returned to England.”

²³⁷ One need think only of the ghosts hectoring Scrooge in Dickens’ *Christmas Carol*, or the fey apprentice angel lobbying for his wings in Capra’s *It’s a Wonderful Life*. But the popularity of the paranormal is especially pervasive in the latest mythic realm of fantasy and science fiction. From the comic book worlds of *Superman* and *X-Men* through to *Star Trek* and *Star Wars*, parapsychical powers are an attractive lure—and, if not taken too seriously, can inspire dandy characters and insightful plot lines. Mary Norton wore both hats with ease: responsible for the charming *Bedknobs and Broomsticks* (filmed as a Disney musical in the *Mary Poppins* vein) along with psi themes in her brooding science fiction penned as Andre Norton. One Golden Age SF author who notably avoided paranormal topics was inveterate skeptic Isaac Asimov (a rare exception being his 1953 short story “Belief,” which dealt with the mixed reception of a man who discovered he could levitate himself). Whether Asimov’s sentient robots will turn out to be more technically agreeable than human levitation, only time will tell.

²³⁸ Plenty of first rate minds figuring in the human evolution debate have taken an interest in psychical research, from William James (1960) and C. D. Broad (1960) to Alister Hardy *et al.* (1973) and that influential firecracker, Alan Turing. James showed a regrettable credulity, particularly concerning the trance medium Leonora Piper, Gardner (2003, 252-262). Later in the 20th century, with the statistical evidence for ESP seemingly “overwhelming,” Turing (1950)

thought the existence of parapsychical talents complicated efforts to devise machine intelligence. But this rosy view of psi has wilted in the half century since, as noted in the accompanying “Reflections” on the reprint of Turing’s “Computing Machinery and Intelligence” in Hofstadter & Dennett (1981, 66-68). Major evidential props in the psi field began to dissolve in the 1970s, including the famed Soal-Shackleton tests from the 1930s, Rogo (1975, 95-96) and Randi (1980, 232-234). Meanwhile, advances in neuroscience have undermined the subject from the theoretical end, as Kirkland (2000, 41) affirmed: “If neurons are crucial to cognition, a fact that neuroscientists are convinced is true, then this precludes a number of interesting phenomena, including out-of-body experiences and ghosts. Such things are impossible, since perceptions and movement are mediated by neurons.” Cf. the skeptical Schick & Vaughn (1999, 182-183), Blackmore (2001a) and Polkinghorne (2002, 31-36) with the more upbeat assessment of Rita Carter (2002, 297, 303-305).

²³⁹ The recent spate of interest in “Near Death Experience” (NDE) was kicked off by Moody (1975), followed by works like Ian Wilson (2) (1987), with Osis & Haraldsson (1990) surveying NDE reports from around the world. Cf. Schick & Vaughn (1999, 268, 270-279) for perspective. While the theological component of NDEs vary by culture and individual, Osis & Haraldsson (1990, 41) highlighted common sensory themes: “Such major features as bright, saturated colors, peace, harmony, and extraordinary beauty seem, however, to prevail regardless of whether the patient is a Christian, Hindu, Jew or Muslim.” That smacks of a neurological imperative to Blackmore (1993; 1996), reflecting our common neurological wiring, not a parapsychically real afterlife. “In the case of the NDE, a good theory is one that explains why NDEs are like they are: why, for example, there is so often a tunnel and not a green square or a sea shore; why the tunnel is light and not dark at the far end; why OBEs [“out-of-body experience”] look down from above and not up from the floor; why there are rushing and roaring sounds and not the squeaking of mice or the blasting of trumpets; and, perhaps most difficult of all, why the insight is so often that ‘I’ and my death are unimportant and not ‘Get as much as I can for myself ‘cos I haven’t got long.’ These are the real questions that any theory of the NDE must satisfy,” Blackmore (1993, 48). By comparing NDEs with related phenomena (including the effects of hallucinogens like LSD) Blackmore’s Dying Brain Hypothesis pinpoints cerebral anoxia as setting the stage for a “disorganized activation” of brain cells during endorphin releases. The religiously inclined Habermas & Moreland (1998, 206-218) firmly disagree with Blackmore’s Dying Brain Hypothesis, but their response was remarkably shy regarding the neurological particulars she offered. Cf. Michael A. Persinger, “Near-death Experiences and Ecstasy: a Product of the Organization of the Human Brain?” in Della Sala (1999, 85-99), which includes a survey of preliminary efforts to replicate aspects of NDEs experimentally, and Blanke *et al.* (2002) for a recent laboratory induction of OBEs. Further factors of note would be how sensory awareness can leak through some forms of anesthesia, Robert H. Logie & Sergio Della Sala, “Repetita (non) Iuvant,” in Della Sala (1999, 131-133), Rita Carter (2002, 125-126), as well as the subconscious perception of “blind sight” (re note 266 below).

²⁴⁰ This is jarringly confirmed in rare instances of hippocampal damage, McCrone (1999, 211-212). Science fiction vividly plays on the memory theme: *Total Recall*, *The Matrix*, and *Dark City* (more on that below)—but especially in *Star Trek* with the transporter. A glitch in the pattern buffer can duplicate a character, with both going their separate ways rightly thinking they are the originals. One early episode had Captain Kirk temporarily split into two personalities that way, one violent and assertive, the other gentle and indecisive (per note 228 above, that emotional dichotomy actually wasn’t too far from the mark). Hofstadter & Dennett (1981, 3-7, 465-466) noted the teleporter problem, and how the idea of “body switching” has fascinated philosophers for centuries, starting at least with John Locke in 1690—and running as currently as Rita Carter (2002, 222-223). (*Star Trek* plays the body-switching plot occasionally, too, where it gives performers a chance to show off their versatility at mimicry.) Davies (1983, 90-91, 98) also touched on the teleporter issue regarding reincarnation and computer minds. Here the many sentient holodeck characters on the later *Star Trek* series are salient, where programming turns into true Promethean creation, and the characters start demanding rights of their own as self-aware beings—and, indeed, why shouldn’t

they? Cf. the anti-Darwinian Rifkin & Perlas (1983, 252) smugly declaring how real people could never feel “companionship” for artificial life (mere “living gadgets”).

²⁴¹ The mechanics and treatment of Alzheimer’s disease are still poorly known (involving at least a combination of protein malfunctions and contingent allele expression), Greenfield (1996, 176-177) or St George-Hyslop (2000). Memory is slowly yielding its secrets, Kosslyn & Koenig (1992, 341-400), Sherry (1997) and Rita Carter (1998, 158-176). While short-term “episodic” memory runs through the hippocampus and adjoining parahippocampal region (functioning as a sort of pre-amp), long-term “semantic” memory can bypass a damaged hippocampus, provided it is comparatively context-free, Vargha-Khadem *et al.* (1997) with commentary by Eichenbaum (1997). See Oitzl *et al.* (2001) on the role DNA binding to glucocorticoid receptors plays in spatial memory, Kleim *et al.* (2002) exploring the encoding of memories by synaptic growth, and Cavallaro *et al.* (2002) and Moser (2003) re Klausberger *et al.* (2003) on related hippocampal gene expression and neuron dynamics. Schank (1991) relates how memory is structured hierarchically (from the outer reaches of Marvin Minsky’s “frames” to the “scripts” we employ using the basic units of memory, the visually grounded “scene”). Relating the problem of awareness to the 40 Hz issue (see note 274 below) Rita Carter (2002, 37) offered the possibility that “A living human brain may never actually be unconscious—qualia may be experienced ‘in the moment’ but instantly forgotten.” On a broader scale, Donald (1991, 366) considers new systems of memory representation to be the common theme of the cognitive revolutions involved in the evolution of the human mind.

Such work may be contrasted with the sterile paranormal legacy of a paper by G. D. Wasserman, “An Outline of a Field Theory of Organismic Form and Behavior,” in Wolstenholme & Millar (1956, 53-72). Applying quantum mechanics to the mind-body problem, Wasserman proposed that memories were not based on neural activity but rather due to interacting “morphogenetic fields” that also accounted for psychic abilities. The morphogenetic field was an old concept borrowed from embryology—one which became excessively dated once the discovery of homeobox genes set developmental biology off on another footing. But researchers keeping the idea alive run from Amy L. Lansky, “Consciousness as an Active Force” (at renresearch.com/consciousness.html) to maverick physicist Rupert Sheldrake, who has elevated it to a universal principle as the “hypothesis of formative causation,” which prompted an especially unflattering review by Maddox (1981). See Sheldrake (1999, 301-317; 2002) on how he views the potential importance of “morphic fields” in understanding the organization of life, and van Genderen *et al.* (2002a,b) for critical takes. Blackmore (1993, 198-199) commented on how attractive Sheldrake’s approach was for her back in her psi research salad days. Cf. also Goodwin (1994, 94) and Bekoff (2002, 83), as well as note 276 below.

²⁴² Johnson (2000, 116) was aware of the overall problem in his soiree on infanticide, since he quoted Steven Pinker alluding to it, but Johnson’s purpose then did not involve tarrying to ponder the nature of consciousness. Besides sleeping and getting hit on the head, comas and epileptic seizures are other instances where wakefulness and consciousness are disrupted. One way out of this bind is to suppose that the spirit does not operate in time as we normally conceive of it. Though the idea of a soul clicking on and off like a voice actuated tape recorder whenever the curtain goes up in the Cartesian Theater is a rather *ad hoc* way of sustaining the spirit concept. After all, our conscious self has not been spared the experience of nerve-racking pain or the ravages of Alzheimer’s, so the idea that God would have constructed the soul to edit out just the comparatively minor inconvenience of temporal boredom seems rather dicey. Cf. the unapologetic atheist and “Happy Heretic” Judith Hayes (2000, 38-42) wondering just where such an incorporeal soul is supposed to be prior to birth.

Incidentally, in referring to the implication of artificial intelligence (should it ever become a reality), Adler (1990, 31) acknowledged that the belief in the Christian soul “depends for its rational support on the immateriality of the human intellect.” Adler did not investigate the details of neurobiology then available, however. There is an Adlerian streak to Barr (2003, 16, 173-174, 183, 191-192) pegging intellect and free will as human benchmarks rather than consciousness (which he characterized as a mystery) or following the implications of our capacity for unconsciousness. Although Barr (2003, 110, 160) apparently accepts evolution, he nonetheless

questioned how the human brain, “with all its astonishing powers—the brain of Mozart, of Einstein, of Shakespeare—evolved from an ape brain in about 5 million years or less.” He didn’t specify what about the process exceeded naturalistic limits (such as the antecedent appearance of Broca’s Area, discussed below in relation to language).

²⁴³ Edward Wilson (1998, 74-77). See also Greenfield (1996, 36-37, 120-121, 160-161; 1997, 77-91), Sandra Blakeslee, “Scientists Report the Discovery of a Brain ‘Switch’ That Brings on Sleep,” “Mystery of Sleep Yields As Studies Reveal Immune Tie,” & “Clues to the Irrational Nature of Dreams,” in Wade (1998b, 194-201, 226-231), and Rita Carter (2002, 165, 169-174) on sleep dynamics. Interestingly, the neurotransmitters involved in sleep also play roles in many aspects of drug addiction when improperly stimulated or suppressed. Schank (1990, 131-135) stresses the simulative aspects of dreaming, rehearsing life as it were. Here the developmental pattern of human dreaming is noteworthy: the fetus virtually sleeps in REM mode until later in gestation, when non-REM deep sleep first appears (newborns still spend half their slumber dreaming). That high proportion of REM gradually declines through our lives. How REM relates to the formation of brain cells in the fetus, and the subsequent flurry of neural connections after birth, is unclear (and hardly easy to study, technically or ethically). See Greenfield (1997, 110) for an illustration of cortical connections during the first two years of a newborn’s life.

²⁴⁴ The brain also inverts the retinal input so we don’t see everything upside down (and will switch things over again when special goggles are worn to reverse the image). Ramachandran (1992) and Ramachandran & Blakeslee (1998, 88-104) survey blind spot experiments; cf. Assad & Maunsell (1995). See Greenfield (1996, 88-95) or Crick (1994) on the basics of visual processing, and Pinker (1997a, 211-298) on perception generally. Budiansky (1998, 74-76) and Albright (1999) re Lu *et al.* (1999) explore the absence of central visual representations in primates, while Alain *et al.* (2001) and Ehret & Riecke (2002) cover the analogous organization of auditory signals. Gilbert (1998) and Wyss *et al.* (2003) investigate some of the cortical details. How vision becomes *perception* involves far more than simply tracing the wiring, Galambos & Juhász (2001), Shimojo *et al.* (2001), Ernst & Banks (2002), or Connor (2002) re Vanduffel *et al.* (2002). Interestingly, Crick (1994, 54-46) noted how Ramachandran’s experiments refuted Daniel Dennett’s claim that the brain doesn’t actually fill the spot in. An interesting possibility comes to mind re the vertebrate eye as compared to the cephalopod (note 111, chapter four). Could it be that a certain part of the contingency that provoked later evolution of the hominid brain built on the peripheral circuitry that evolved to get around the blind spot problem? Future analyses may offer clues one way or another—though there is always the possibility that Michael Behe may jump in to file this potential spandrel under God’s Providence after all.

²⁴⁵ Given how consistent our wiring is, it is solipsistic to treat our sensory experience as unreal. This is not to say that some pretty strange things can’t happen when one of the processing circuits fails—for example, injury to the “V5 visual (occipital) region” can disconnect the perception of *motion*, Greenfield (1996, 25). A woman so afflicted interviewed on a science show noted how she had to dip a finger into the cup when pouring coffee, since all she *saw* were still images and so couldn’t see when the cup overflowed. The “phantom limb” effect is another case where the brain conjures up sensory experiences on its own, Ramachandran & Blakeslee (1998, 23-62). Other impairments are even more socially or personally disconcerting—such as the inability to recognize the faces of loved ones, Pascal Boyer (2001, 220-221). This can escalate into Capgras’ delusion, where the person thinks family members (or even their apartment) are impostures and fakes that only resemble them, Ramachandran & Blakeslee (1998, 158-170) and a recent PBS special featuring Ramachandran, as well as Rita Carter (2002, 262-263). The root cause of the disorder turned out to be a lack of emotional feedback from the amygdala.

Although it is possible to investigate some aspects of the commonality of neural processing, such as Pessoa (2004) re Hasson *et al.* (2004), the overall scientific problem is complicated by the fact that perception is *inherently subjective*. Although the wavelength of light preferentially reflected by an apple’s surface can be described quantitatively, for example, it is literally impossible to know if that light is “really” red. Or if the “red” that you see is the same one I do ... or why we perceive the electrochemical cascade triggered by photons striking the retina as *colors* in the first

place. In *synesthesia* even that relationship breaks down, where one sense triggers another—most usually color by sound, Greenfield (1996, 114; 1997, 53) and Ramachandran & Hubbard (2003). This may be a retention of infant neurological processing patterns that don't differentiate sensory signals, Rita Carter (1998, 22; 2002, 17, 163). From the cognitive end, Ramachandran & Blakeslee (1998, 229-244) suggest that our ineffable "qualia" relate to how the brain has to make ultimately irrevocable choices based on a mix of flexible outputs. But as Crick & Koch (1995, 85) reminded, "we can never explain to other people the nature of any conscious experience, only its relation to other ones." Cf. also Crick (1994, 9-10).

In the Dawkins/Pinker lecture cited above, Pinker sounded very much like Chalmers (1995, 81-82) in stressing the fundamentals of the consciousness enigma: "The part that remains a mystery is why the purely subjective aspect of experience should exist at all. Some philosophers, such as Dan Dennett, argue that that isn't a scientific problem and may not even be a coherent question—since, by definition, pure subjective experience has no observable consequences, we're wasting our time talking about it. I think that goes too far, but it is possible that the existence of subjective first-person experience is not explainable by science." Dawkins simply mused, "It still feels like a hell of a problem for me." While Blackmore (1999, 73, 206) breezily dismissed human consciousness as undefinable, she nonetheless decided it was "not the driving force behind the creation of language (or anything else for that matter)." Leaving big things out of a scientific conception has not usually been a good idea (remember bumblebee wings or DNA). Which hubris bears on the creationist side too, for although they have their spiritual alternative ready philosophically, when it comes to working out how this relates to the actual act of experiencing they don't think about the substantive problem any deeper than Dawkins or Blackmore.

²⁴⁶ See Nørretranders (1991, 178-210), Kosslyn & Koenig (1992, 52-166) or Logothetis (1999) on visual perception and consciousness, Plait (2002, 77-86) on the moon illusion, and Driver (1996) on the McGurk Effect (with cee.hw.ac.uk/~cmj/projects/McGurk/discuss.html for online demonstrations). While Burke & Ornstein (1995, 15) noted how cultural factors can affect some visual illusions, *acoustic* ones (such as whether certain pitch combinations are heard as "ascending" or "descending") appear to be more directly based on environmental cues (the pitch dynamics of the mother's language), Deutsch (1992). This phenomena is similar to the way in which infants map vowels and consonants to their initial language experience, Kuhl *et al.* (1992) and Barinaga (1997) on Kuhl *et al.* (1997)—cf. Gibbs (2002). The moon illusion embodies a further philosophical lesson: the brain *correctly* tells us that the rising moon is a huge object ... but when seen at the zenith, the same brain "correctly" assesses it as a small light in the sky. As both views are simultaneously misleading and accurate, how much of our "human nature" turns on similar ambiguity in unconscious information processing? It could explain some of our knack for rationalizing ethical standards ... burning the witch to save the soul, or "destroying the village to save it." But then, no one should ever think executing a moral calculus would be easy.

²⁴⁷ In 1994 Sandra Blakeslee, "Two Studies Suggest Sleep Is Vital in Consolidating Memories," in Wade (1998b, 115-118), covered early work in this area—though debate has continued, as Peter Stern (2001) noted of Maquet (2001), Stickgold *et al.* (2001) and Siegel (2001). Rita Carter (2002, 247-256) surveys recent data relating to why the dream world seems so "real" to us. Moving to the conscious level, the brain inevitably orders its experience based on whatever is available, even constructing (instantly) imaginary stories to account for actions involving impaired brain activities of which we are unaware, Nørretranders (1991, 277-284) and Gazzaniga (1998). For comparison, Schroeder (2001, 160-172) recounted perceptual illusions (including a cursory comment on dreaming) without tumbling onto any of the deeper philosophical implications these have for the nature of "mind" and/or "soul."

²⁴⁸ Damasio (1999, 89-90).

²⁴⁹ For comparison, Greenfield (1997, 57): "Different animals display different amounts of REM. Reptiles do not display it at all, birds do occasionally, but all mammals, at least according to their EEG, would seem capable of dreaming." That only the advanced birds and mammals sleep suggests one more attribute of the ancient diapsid/synapsid divide. Gardner (2000b, 122) marveled at how dolphins dream in only one hemisphere at a time, so part of themselves can stay awake to

bob for air, and that the platypus is a record-setter for spending “up to eight hours a day in REM sleep!” The dolphin case suggests that whatever consciousness they possess, it differs markedly from our own if only by virtue of their differential dreaming.

²⁵⁰ Bekoff (2002, 74-75) notes that rats appear to relive their daily activity during dreams. Keeping consciousness safely offline during REM activity is probably a good thing for us, since its premature activation may be involved in the “alien abduction” phenomenon (note 3, chapter one). The existence of a basic “pay attention” routine is suggested by curious neurological maladies like anosognosia (a failure to notice disease in oneself) associated with damage to a particular brain segment in the right hemisphere, Damasio (1994, 62-68). Cf. Ramachandran & Blakeslee (1998, 127-134). Interestingly, William James’ essay on “Brute and Human Intellect” circled this point back in 1878: “Sunsets will not suggest heroes’ deaths, but only supper-time. This is why man is the only metaphysical animal. To wonder why the universe should be as it is presupposes the notion of its being different, and a brute which never reduces the actual to fluidity by breaking up its literal sequences in his imagination can never form such a notion. He takes the world simply for granted, and never wonders at it at all,” James (1992, 936). James wasn’t thinking of the dream state, of course; indeed, dreams and sleep weren’t even discussed in James’ 1892 *Briefer Course on Psychology!* A century later, Dennett (1995, 339-340) tripped as lightly around the issue, and sleep research was not included in the *Scientific American* (1999) anthology on the brain, though Wade (1998b, 184-201, 220-242) covered it. This sporadic reporting puts dream research in the same boat for creationists as dinosaur paleontology—off the scope of reactive scholarship.

²⁵¹ Of interest is that, while emotional expressions are not found in deep sleep (or some brain seizures), they do emerge in REM sleep, Damasio (1999, 99-100).

²⁵² In the dangerous spandrel department, Greenfield (1997, 58) relates dreamlike states to schizophrenia, while Edward Wilson (1998, 74-77) hyperbolically described dreaming as “a brand of insanity.” The biology of schizophrenia is connected to sleep, aggravated by defective access of working memory, Daniel Goleman, “Biologists Find Site of Working Memory,” in Wade (1998b, 99-102). See Karni & Sagi (1993) and Marinaga (1994) re Wilson & McNaughton (1994) and Karni *et al.* (1994) on dreaming and memory consolidation, and Sawa & Snyder (2002) on the etiology of schizophrenia. More controversially, psychopharmacologist David Horrobin suggests our cultural “big bang” may have involved changes in cerebral fat molecule use that secondarily increased schizophrenia risk. See Robin McKie’s March 18, 2001 review (guardian.co.uk/Archive/Article/0,4273,4154224,00.html) and “Creativity, Brilliance and Madness” (abc.net.au/rn/science/mind/s465567.htm). Ryan (2002, 223-224) adds an endosymbiotic twist, as some forms of schizophrenia appear related to retroviral RNA, Lewis (2001) re Karlsson *et al.* (2001).

²⁵³ Dennett (1991) is devoted to this whole subject. Rita Carter (1998, 180-207) and Damasio (1999, 94) concur that there is no central processor for consciousness. This shouldn’t be that unexpected, though, since there appears to be no localized center for experiencing pain either, but instead a mixture of attention systems and emotion, Rita Carter (1998, 13). But coupled with the consciousness and memory problems, all this makes the soul (if there is one) sound much more like the Eastern conception, which has no problem with the idea of sensory illusion. They’ve been thinking we live in *The Matrix* all along, where “reality” is an undesirable deadweight to be shed by the spirit in the impersonal union with the Godhead in Nirvana. Susan Blackmore touched on this in her *New Scientist* piece: “There is a long and venerable tradition of thinkers who have rejected the idea of a real and persistent self. The Buddha proclaimed that actions and their consequences exist, but that the person who acts does not. According to the Buddhist doctrine of **anatta**, the self is more like an ever-changing construction than a solid entity. The 18th-century philosopher David Hume likened the self to a bundle of sensations tied together by a common history.” This is far removed from the Western way of looking at things, of course, and hits conventional Christian notions of an afterlife especially hard. When people think of Heaven or Hell, it is not usually as some disembodied plane of spiritual essence, but as “physical” places. The choice real (or unreal) estate is where your soul is reunited with those of your loved ones to enjoy the proximity to God. The traditional disconsolation prize is that hotter spot where legions of sadistic demons remind you

of having backed the wrong theological horse. In this, the Western “soul” clearly assumes the persistence of both personal *consciousness* and *memory*. Ruse (2001, 35): “What is the nature of salvation and the future life? I suspect more Christians than not have thought it was something like life here on earth, only better. I like to think of it as a new Mozart opera every night, with lots of fish and chips at the intermission, and no student papers waiting to be marked when I get home. If the food is wrapped in salacious Sunday newspapers that my parents would not have allowed in the house, then so much the better. But really nothing absolute is said on this matter by Christianity other than that it will be an ecstasy and closeness with God.”

²⁵⁴ Hofstadter (1979, 710). Which prompted Paul Davies (1983, 96): “The attempted separation of brain and mind, body and soul, is a confusion born of trying to sever these two convoluted levels (or ‘Tangled Hierarchy’ in Hofstadter’s parlance). But it is a meaningless enterprise, for it is the very entanglement of the levels that makes you *you*.” Cf. McCrone (1999, 135, 333n) chiding the reductionism of Berns *et al.* (1997), Rugg *et al.* (1998), and Clark & Squire (1998)—though note Schacter (1998) on the latter. Hofstadter couldn’t resist a delightful pun in Hofstadter & Dennett (1981, 191): “Is a soul greater than the hum of its parts?” See Dennett (1991, 280-282) for his contrasting rhetorical gymnastics. Pinker (1997a, 65) aimed for understatement: “Something in the *patterning* of neural tissue is critical.” Pinker (1997a, 91): “Presumably the distinct formats of representation used by the human mind—images, phonological loops, hierarchical [grammatical] trees, mentalese—evolved because they allow simple programs (that is, stupid demons or homunculi) to compute useful things from them.”

²⁵⁵ Cf. McCrone (1999, 40-74). Christian apologists wasted no time in pouncing on quantum indeterminacy to “prove” free will, with Bertrand Russell (1957, 39) pouncing back in a critical 1930 essay. But if not grounded in what the brain is now known to do, such speculation can get into deep trouble. For example, collapsing wave functions got the star billing at a symposium on “Physics and the God of Abraham” jointly held at Whitworth College and Gonzaga University in Spokane, WA in April 2001 (with John Polkinghorne as featured speaker). Asking “Is Human Consciousness Merely Brain Circuitry?” Gonzaga President Robert J. Spitzer unrolled a gaggle of physics analogies to suggest that only an assumption of a transcendent designing Power could resolve the paradox of consciousness. Barr (2003, 175-244) followed a similar trajectory to conclude that “the idea that man can be nothing other than a machine is really nothing other than a pure deduction from atheism.” Like Dembski (1999b) on the same topic, nothing of actual brain circuitry was mentioned, making me wonder whether a “plate tectonic” view of consciousness might be equally informative.

Other physics boosters have fared little better. Merging the foamy chaos of quantum effects with Gödel’s insight that all logical systems contain undecidable propositions, Roger Penrose opined in Brockman (1995, 241) how “consciousness involves noncomputable ingredients.” The other participants in Brockman’s debate shrugged “so what?” (More of the same is on hand at consciousness.arizona.edu/hameroff/penrose1.html). See Rita Carter (2002, 73-76, 298-302, 305-307) on the pros and cons of “quantum consciousness” theories. Certainly the sort of “quantum animism” by which “mind permeates the world at every level” for Nick Herbert (1993) can lure mystically inclined physicists off the deck. Frank Tipler (1994) offered a long and obtuse cosmological “proof” for the existence of God (though evidently not a Christian one) and the eventual resurrection of all living beings at the end of the universe; cf. the unimpressed Raymo (1998, 109-114). Though shorter, Keith Ward’s *God, Chance & Necessity* was just as certain of his QED (a definite Christian one this time). As for the neurobiology of consciousness, Ward (1996, 147-153) and the derivative Barry Richardson (2001, 64-65) were as airy as Spitzer. Trying to slip the soul through the cracks of quantum physics, Fred Wolf (1996, 99) dragged along a kabalistic mysticism to outdo even Gerald Schroeder: extolling the work of Carlo Suarès as “a foundation for a new vision of the soul.” Suarès (1967) may be recommended as one of the more impenetrable entries in the dubious field of Bible codes. Wolf (1996, 336n) also veered up my alley by swallowing the historically fallacious occult theory that the tarot embodies kabalistic lore (see notes 24-25, chapter one). For comic relief: evangelist Rick Richardson (2000, 32-35) recounted his jarring interaction with “Bob,” a truly silly philosophy student who overdid the relativity bit in

the other direction (confusing quantum reality with historical contingencies) as though this somehow refuted the Bible. Richardson compounded the muddle by not appearing to understand why this argument was a complete crock.

²⁵⁶ There appear to be several levels of consciousness, Ramachandran & Blakeslee (1998, 228, 244-253), Damasio (1999, 236-260) and Churchland (2002). The deepest is a “core” vertebrate proto-self that reports on body states. Above that is a memory-driven “autobiographical” or “extended” consciousness, operating along the midline areas capable of receiving the converging signals from the various sensory sources, and concerns the superior colliculus, the thalamus (a major switching center for visual pathways). Finally, the cingulate gyrus in the frontal lobes acts as a sort of projection zone for the temporal lobe cross talk among the amygdala, septum, hypothalamus and insular cortex. Crick (1994, 83), Greenfield (1996, 30-35) or Damasio (1999, 181) show brain maps of these regions. See Helmuth (2003a) on the amygdala, and E. O. Wilson (1998, 101) on the essential role of the thalamus in the 1975 case of Karen Ann Quinlan, where selective destruction of the thalamus disconnected the otherwise functional cerebral cortex; cf. McCrone (1999, 218-240). A convergence area for body/self-representation is the periaqueductal gray (PAG) region of the midbrain, Jaak Panksepp, “The Primordial Self,” in Rita Carter (2002, 186-188). Most intriguingly, our higher order consciousness is anchored not in the neocortex but in the far more ancient neural structures, creating a “second-order” feedback loop that integrates the human mind—cf. the systems-based hierarchical psychodynamic terminology proposed by Peled & Geva (1999). Damasio (1999, 275): “The apparent ‘more’ of consciousness depends on ‘less,’ and the second-order is, in the end, a deep and low order. The light of consciousness is carefully hidden and venerably ancient.” This deep connection may be why we retain a unified sense of self even when direct links between the hemisphere are severed, such as to alleviate brain seizures. See Gazzaniga (1998) and Sandra Blakeslee, “Workings of Split Brain Challenge Notions of How Language Evolved,” in Wade (1998b, 127-130)—though Crick (1994, 171) noted that most split brain operations do not cut the “intertectal commissure” linking the hemispherical superior colliculi. Pinker (1997a, 134-148) described consciousness as involving three components: access to information, self-knowledge, and sentience. Pinker regards the first item as a “problem” capable of some resolution given present understanding, but that the other two are “mysteries,” in that science hasn’t yet progressed to the stage where it can articulate meaningful technical questions that might be resolved evidentially.

²⁵⁷ Nørretranders (1991, 242). His book *The User Illusion* became a bestseller in Europe, but is not so widely known on this side of the Atlantic. Wolf Singer (1995) surveyed some of the ways the brain organizes the vast stream of incoming signals. The bandwidth problem may kick in reverse during “tip-of-the-tongue” forgetfulness, where you can recall just about everything about a word *except* the word. See Sandra Blakeslee, “Traffic Jams in Brain Networks May Result in Verbal Stumbles,” in Wade (1998b, 121-126) on recent research in this area. Cf. Ramachandran & Blakeslee (1998, 80-81). Regarding the scale of our circuit board, Damasio (1994, 29): “On the average, every neuron forms about 1,000 synapses, although some can have as many as 5,000 or 6,000. This may seem a high number, but when we consider that there are more than 10 billion neurons and more than 10 trillion synapses, we realize that each neuron is nothing if not modestly connected.” Likewise Dawkins (1998a, 29): “If you laid all your brain cells end to end, they’d stretch round the world twenty-five times.” Gish (1995, 312) readily called attention to such cerebral complexity, but not its implications for the nature of the human mind. No less than with the bacterial flagellum, a great deal remains to be discovered about our mental hardware. It has recently been learned that hitherto unsuspected linkages are taking place among the GPCR family of neural membrane receptors (the most abundant in the human genome), with potentially new properties arising from the cross talk, Milligan (2000) commenting on Rocheville *et al.* (2000). And don’t overlook the cousins of our old pseudogene pal *Alu*: “A related example is the neuron-specific and regulated expression in primates of the monomeric *Alu*-like BC200 RNA, which binds SRP9/14 *in vitro* and *in vivo*,” Weichenreider *et al.* (2000, 167). Exactly what BC200 RNA does is uncertain. It belongs to a class of RNA that aren’t translated into proteins, but instead function on their own, interacting with the protein mix in apparently interesting ways (and which may be a

ghostly reflection of how molecules operated in a “RNA world” predating the DNA system in early evolution). In any event, the Alu propensity for inserting itself continues in humans, where several hundred pseudogenes occur along with the regular BC200 element, Kuryshev *et al.* (2001). See Fischbach (1992) for a quick introduction to mind and brain anatomy, and a more extensive treatment in Damasio (1999, 317-335).

²⁵⁸ Nørretranders (1991, 240). The details of Libet’s time displacement experiments are covered by Nørretranders (1991, 234-238). The rate also varies at which neurons achieve an activation threshold during volitional movement, Barinaga (1996) on Hanes & Schall (1996).

²⁵⁹ Nørretranders (1991, 226). Our use of language appears also to be as much a slowpoke as consciousness. Budiansky (1998, 18): “It is extremely significant that when we use language to tackle problems we are slower than computers, and slower than the innate, *nonverbal* mental processes our brains perform effortlessly and mostly unconsciously.”

²⁶⁰ Nørretranders (1991, 251-276). William James separated the objective “Me” from the subjective “I” when he considered the many social roles we play in life, as in “The Self” in the “Psychology: Briefer Course,” an 1892 abridged revision of his *Principles of Psychology*, in James (1992, 174-209). By the 1904 essay “Does ‘Consciousness’ Exist?” in James (1987, 1141-1158) had come to question whether consciousness was not an “entity” that experiences but rather “a function” of experiencing itself. For contrast . . . Glynn (1997, 57-78) devoted a chapter to excoriating the maleficent influence atheists like Freud and Skinner have had on modern psychology, yet didn’t think to investigate whether “mind” and “soul” really were any more interchangeable than “ideas” and “memes” are for Susan Blackmore. Instead, Glynn extolled studies reporting the salutary effects of religious belief (such as lowered drug dependency, suicide and divorce rates). Indeed, it does appear that a combination of an optimistic faith and a good sense of humor (plus a few favorable genes) can help you live past a hundred in reasonably fine fettle. But it also doesn’t seem to matter particularly which faith you have—only that you have a conviction in something that gives meaning to your life. Thus Glynn didn’t notice how close he was getting to marginalizing spirituality as little more than a benign social placebo.

²⁶¹ Had Phillip Johnson progressed from her online summary to the book itself, he would find Blackmore (1999, 233-234) a philosophical doozy: “In conclusion, the selfplex is successful not because it is true or good or beautiful; nor because it helps our genes; nor because it makes us happy. It is successful because the memes that get inside it persuade us (those poor overstretched physical systems) to work for their propagation. What a clever trick. That is, I suggest, why we all live our lives as a lie, and sometimes a desperately unhappy and confused lie. The memes have made us do it—because a ‘self’ aids their replication.” Ultimately, her views are very Skinnerian, such as her take on the shaping of sensory experience, emotions, memory, free will and creativity, Blackmore (1999, 42-46, 236-240). And especially her final plea to accept that our memes replicating in their cerebral environment “is all there is” to us, Blackmore (1999, 246). Such futile “freedom” comes not from any hope that “we can rebel against the tyranny of the selfish replicators but because we know that there is no one to rebel.” Skinner meets *The Matrix*. A particularly testy critic might attribute her conclusions to the “meme” of Dawkins’ brand of reductionism replicating unchecked in a particularly receptive environment. Marvin Minsky (1986, 306-307) tried to slip off this hook on utilitarian grounds, suggesting free will is an explanatory fiction we cannot do without because it is so engrained in our conception of ourselves. While on the topic of flip generalizations, John Elliottson, medical professor at University College in the 1830s, and the era’s leading materialist, was known for saying that the brain exudes thoughts as the liver secretes bile, Desmond & Moore (1991, 250-251).

²⁶² Blackmore (1999, 225-226) covered Libet’s work in somewhat more detail, but nothing approaching the context of Nørretranders (1991, 213-250) or McCrone (1999, 120-164). Libet’s seminal 1985 study (published as “Unconscious cerebral initiative and the role of conscious will in voluntary action” in *Behavioral and Brain Sciences*, vol. 8, pp. 529-539) involved only five subjects, which certainly contributed to initial skepticism about his findings. Shimojo *et al.* (2001) noted a “backward in time” aspect to work reported in Gilbert *et al.* (1996, 621). Cf. also Duhamel *et al.* (1992) on how primate brains anticipate eye movement.

²⁶³ Recall for comparison Duane Gish's data spiking re *Archaeopteryx* (note 117, chapter two). While there may be madness to their method, there is also a certain consistency.

²⁶⁴ Habermas & Moreland (1998, 168) plopped Libet's experiments against the "materialistic" interpretation of the mind. On the evolution side, Horgan (1994, 92-93), Damasio (1999, 127; 2002, 72-73) and Yoerg (2001, 183) were brief, Rita Carter (2002, 27-30, 46-47, 83-87) gave more detail, and Dennett (1991, 153-166; 2003, 228-256) waded through the critical side of Libet's work, especially the "backwards referral in time" study. The recent comment by Dennett (2003, 242), "You are not out of the loop, you *are* the loop," may be compared to note 254 above. Regarding sources available to Phillip Johnson, Libet wasn't mentioned by Dennett (1995), Pinker (1997a), or Horgan (1996b)—but Horgan (1999, 233-234, 246-247, 301-302n) did, recommending Nørretranders as a main treatment of Libet, noting also Crick's glancing reference to Libet regarding free will; cf. Crick (1994, 228-229). As seen in the case of Futuyama and Miller's coverage of hen's teeth (re notes 143 & 145, chapter two) there may be a threshold level for Johnson's curiosity meter when exposed to novel technicalities.

²⁶⁵ Nørretranders (1991, 242-243). In a recent contribution to the online *Journal of Consciousness Studies* (at imprint.co.uk/online/libet.html or via imprint.co.uk/jcs.html) Libet raised an obvious objection to the reductionist position. "If it is proposed that subjective experience and the phenomenal self are constructed illusions, then we should ask, 'Who is observing this illusion?'" He later commented, "Theories that avoid any 'ghost' have not successfully or convincingly explained the unity of conscious experience and the experience of conscious control of voluntary acts." Libet's position is that there is a "conscious mental field" that emerges from the totality of brain function, and concluded: "The CMF does not represent the dualism of Descartes, who described the mind as separable from substance. My CMF proposal is of course very speculative. But I do not know of any existing evidence that contradicts the proposal, and, furthermore, it is amenable to a direct experimental test of its validity."

²⁶⁶ Non-conscious or preconscious sensory processing has been known for some time, as Nørretranders pointed out concerning "priming," where visual stimuli can be so rapid that only an unconscious response occurs, Kihlstrom (1987) and Tulving & Schachter (1990). Cf. Kosslyn & Koenig (1992, 374-379, 393-394). This is nothing to get "subliminal advertising" off the ground, though, since the perceptions are far too rudimentary to affect conscious thought at the wallet level. There is also the phenomenon of "blind sight" in humans (and apparently monkeys too). This is where brain damage has disconnected the *consciousness* of seeing, yet visual input is still being processed somewhere in the brain, so that the individual reacts to the stimuli even though they have no conscious apprehension of it. The effect can also manifest via other senses, such as smell and touch. See Crick (1994, 171-173), Greenfield (1996, 92; 1997, 51-52), Rita Carter (1998, 184, 187, 189, 191; 2002, 19, 22-23), Ramachandran & Blakeslee (1998, 75-76), Page (1999, 47-48, 315-216), Robert H. Logie & Sergio Della Sala, "Repetita (non) Iuvant," in Della Sala (1999, 134-136), Zeki (1992, 73-74) and Crick & Koch (1992, 157)—those latter two reprised in *Scientific American* (1999, 24-25, 319-320). Crick (1994, 265-268) suspects that if there is a specific "Free Will" module in the brain, neurological evidence suggests it might reside near the anterior cingulate sulcus, adjoining "Brodmann's area 24."

²⁶⁷ Nørretranders (1991, 303, 321). Thus Blackmore (1999, 226) was far from the mark when she concluded: "My brain does not need me." There were simply too many steps missing in the simplified characterization of Blackmore (1999, 237): "The self is not the initiator of actions, it does not 'have' consciousness, and it does not 'do' the deliberating. There is no truth in the idea of an inner self inside my body that controls the body and is conscious. Since this is false, so is the idea of my conscious self having free will."

This sort of drab reductionism is shared in reverse by the creationist Chittick (1984, 140): "If mind is just the result of chemicals and electrical impulses going on in a particular organ of the body, then thought and all reasonings are a mirage. Even the question, What is mind? Is just the result of certain electrical impulses moving through a particular momentary arrangement of chemicals making up an organ called the brain. These chemicals and electrical impulses move about by chance. If they are the basis of reason, then reason is just an illusion, as are mind, will,

and emotion. They are only the result of chance.” This cartoon view of the primacy of “chance” typifies the modern creationist aversion to contingent phenomena (re note 23 of the Introduction). Not that Johnson (2000, 92) fares much better: “If inviolable laws govern all things, then there is no human freedom.” Habermas & Moreland (1998, 60, 389-390n) try a similar argument. Barr (2003, 15-17, 27, 185) indulged in a broad jump from the undocumented assertion that “Almost all materialists deny that free will exists,” to the flat conclusion that “free will is fatal to scientific materialism.”

The tendency for reductionist and religious ideologues to hack away at the far more fascinating middle ground has been going on at least since Descartes’ time—gaining “scientific” steam in the 20th century, as with Clarence Darrow’s repudiation of free will in his famous (and atypically successful) insanity defense of “thrill killers” Leopold and Loeb in the 1920s, Larson (1997, 71, 278n). Though Dennett (2003) strives to cover all the bases, I prefer the “witty and sparkling” homage to the reality and nature of free will offered by Raymond M. Smullyan, “Is God a Taoist?” and the “Reflections” by Hofstadter, in Hofstadter & Dennett (1981, 321-343).

²⁶⁸ Blackmore (1999, 238) related “memetics” directly to *mimetics*: “There are implications here for artificial consciousness and for animals. If ordinary human consciousness is entirely dominated by the selfplex then only systems that have a selfplex can be conscious in that way. So, since other animals do not generally imitate and cannot have memes, they cannot have the human kind of self-consciousness.” Maynard Smith & Szathmáry (1999, 138) noted that “Most animals seem incapable of observational learning,” though behavioral ecologist Dugatkin (2000b; 2001, 115-135) is less certain (and Blackmore herself recommends Dugatkin’s analysis in *The Imitation Factor*). While humans have the luxury of Lamarckian cultural communication (embracing Blackmore’s “memeplexes” as a subset), individual animals have to figure new things out on their own. Even our closest cousins, the primates, aren’t good at “aping,” as Mithen (1996, 77), Budiansky (1998, 175-182), Blackmore (1999, 47-50), Vogel (1999b, 2072) and Dunbar & Barrett (2000, 156-158) have variously noted, though Whiten & Boesch (2001, 66) offer caveats based on recent research. Tomasello (1997) noted that chimps are able to emulate the *results* of observed behavior, such as using a rake to push things—though sometimes using the wrong end, simply as a prod. By contrast, human children exactly imitate the *method* until they grasp the principle involved. Donald (1991, 194-196) indicated that the mimetic controls he identifies with the *erectus* level of mind appear to be widely distributed in the human brain. Iacoboni *et al.* (1999) describe recent research in this area, including how imitation relates to Broca’s area (re note 313 below). Should the neurology of the “I” ever be pinned down, Blackmore’s hypothesis could be tested against the presence or absence of those factors in animal minds. On another point the evidence doesn’t trend in her direction. Blackmore (1999, 67-107) attributes the increase in our brain size and the origin of language to meme-driven selection to improve imitation skills. While there is some connection between social behavior and overall brain size in primates, Seyfarth & Cheney (2002) on Reader & Laland (2002), no clear correlation links cultural spurts and episodes of hominid brain growth—cf. McHenry (1994) and note 153 above. Citing such work as Gilbert *et al.* (1996), Finlay *et al.* (2001) argue that the brain is more of a heterochronic spandrel, constrained by correlated progression (article also available online at bbsonline.org/documents/a/00/00/05/59/bbs00000559-00/bbs.finlay.html). Cf. note 183, chapter four. Meanwhile, recent experience with Sally Boysen’s Chimp Center has prompted Blackmore (2001b) to be more sympathetic to the idea of chimpanzee consciousness.

²⁶⁹ Budiansky (1998, xiv) noted that surveys in the mid-1980s “found that fundamentalist Christians remain among those most likely to strongly reject the notion of emotional or intellectual continuity between man and animals.” Adding with no trace of surprise, “they are also the most likely to reject evolution.” For comparison, Lord Zuckerman (1991) was as suspicious of any attempt to draw parallels between ape and human culture as he was of the placement of the australopithecines on the human family tree; cf. Bekoff (2002, 88). And throw in Dawkins (1998b, 211-212): “The opposition that de Waal and others have erected, between biologists who believe human and animal nature is fundamentally selfish, and those who believe it is fundamentally ‘good-natured’, is a false opposition—bad poetry.” *Bad poetry* is Dawkins’ current metaphor for scientific philosophies he

fundamentally disagrees with (re note 106 of chapter four on Gaia and Lynn Margulis). As surveyed by de Waal (2000) the many cultural permutations about nature and our place in it have sheared along the traditional fault lines of good versus evil and whether animals represent relations or resources. Ritvo (1997, 189-209) explores how the old notions of the world having been created for mankind's benefit led to conflicting views of animals as "vermin" to be exterminated, "pets" to be pampered, or "food." Religious and cultural proscriptions also intervened: while many British were especially avid meat-eaters, others adopted vegetarianism as a moral duty. And when the landed gentry took to regarding many "vermin" (such as foxes, hares, and pheasants) as game animals, a pervasive and lucrative network of illegal poaching arose to rival any 20th century drug cartel.

²⁷⁰ See Dyer (1997), and Gamlin & Vines (1986, 202-204) or Greenfield (1996, 12-13) for general data on brains and nervous systems in various organisms—the latter including an illustration of the transition to the adult sessile phase of the tunicates, which gets by with no brain at all. As Jolly (1999, 281) wryly commented: "After settling, with no more decisions to make, it eats its brain (like an associate professor getting tenure)." Ahem!

²⁷¹ See Menzel & D'Aluisio (2000) for an artful introduction to the modern world of robotics, including the ethical considerations of engineering sentient machines (if possible) and the role the military have played in pursuing robots for their tactical applications. Regarding insect skills, Weiss (2000) notes learned behavior in butterflies, while Griffin (1984, 458) described how the assassin bug exploits the termite practice of devouring their corpses (incidentally, next chapter we'll see E. O. Wilson mistakenly springboard off this termite activity regarding human ethics). The leaf-cutting ants who "farm" fungi for their ability to digest cellulose also come to mind, as pointed out by Maynard Smith & Szathmáry (1999, 103) regarding the intricacies of natural symbiotic relationships. And let's not forget the lesson of our busy little bumblebee. Page (1999, 167) noted that the 800,000 brain cells in your average bee would seem too skimpy to support their observed behavior, though Donald Griffin would apparently demure, per Vines (2001, 51). Cf. Giurfa *et al.* (2001) and Visscher (2003) on apian discriminatory skills and decision making—and Rita Carter (2002, 295-296) on the intriguing philosophical question of whether there might exist a "hive mind." But much as with the aerodynamic inadequacies of their stubby wings, this should be seen as a clue that something is being left out of the equation. Bees manage to navigate quite effectively by dead reckoning, Budiansky (1998, 111-115)—and the key to that turns on how animal brains don't need to operate as a general-purpose computer, but rather as a series of interacting processors running without any top-down command system. Just by properly filtering differential acoustic signals in the way crickets do, researchers have built a robot version able to duplicate a female's ability to home in on one particular male out of a din of other sounds, Barbara Webb (1996; 2002). Computer networks modeled on insect behavior show how simple rules yield cooperative results *without* direct communication, Bonabeau & Théraulaz (2000). Similar biological analogs are being applied to computer circuitry, as noted by Sipper & Moshe (2001) and Musser (2001a). See also Goodwin (1994, 68-76, 189-192) on ants, and Maynard Smith & Szathmáry (1999, 125-133) on how mathematical modeling of the behavior of eusocial animals from insects to mole rats has led to the successful prediction of behavior in newly discovered instances. "There is a real analogy here with the way in which, in development, morphological form appears from local interaction between cells, without the need for any one cell to have an image of the final result," Maynard Smith & Szathmáry (1999, 133).

²⁷² Pinker (1994, 192-193). Likewise Nørretranders (1991, 179): "It is not difficult to build computers capable of playing chess or doing sums. Computers find it easy to do what we learned at school. But computers have a very hard time learning what children learn *before* they start school: to recognize a cup that is upside down, for example; navigating a backyard; recognizing a face; *seeing*." Budiansky (1998, 51-55) also stressed how inept computers are compared to what animals (including us) can do so effortlessly. Trefil (1997, 129-145) presents a tidy critique of AI work, "a field that has suffered for decades from hype and overselling"—see also Budiansky (1998, 62-72) and Horgan (1999, 199-228). Pinker (1997a, 82) called attention to the polarizing element

of AI research: “One side says robots are just around the corner (showing that the mind is a computer); the other side says it will never happen (showing that it isn’t).”

²⁷³ A point made by Donald (1991, 366-368). See Crick (1994, 177-199) for a survey of relevant neural network experiments. In this vein, Schank (1990, 241) remarked how AI will need to emulate an essential quality of our own intelligence: “Intelligent machines would be good storytellers.” But Menzel & D’Aluisio (2000, 86) noted that “Roboticians took a surprisingly long time to realize the power of biological models.” Pinker (1994, 161) recounted an historical example: “When engineers first tried to develop reading machines for the blind in the 1940s, they devised a set of noises that correspond to the letters of the alphabet. Even with heroic training, people could not recognize the sounds at a rate faster than good Morse code operators, about three units a second. Real speech, somehow, is perceived an order of magnitude faster: ten to fifteen phonemes per second for casual speech, twenty to thirty per second for the man in the late-night Veg-O-Matic ads, and as many as forty to fifty per second for artificially sped-up speech. Given how the human auditory system works, this is almost unbelievable.” Pinker (1994, 183) stressed the synergy of this process: “Speech recognition may be so hard that there are only a few ways it could be solved in principle. If so, the way the brain does it may offer hints as to the best way to build a machine to do it, and how a successful machine does it may suggest hypotheses about how the brain does it.” The bald limits to auditory compression described by Ahissar *et al.* (2001) are ameliorated by the NASA rule of *multiple redundancy*. Using phonological rules that allow the brain to fill in missing pieces (which it’s darned good at, remember!) people can interpolate party chatter even when hearing only half the acoustic information. Pinker (1994, 181) noted how the principle carried over to the written word: “Thanks to the redundancy of language, yxx cxn xndxrstxnd whxt x xm wrxtxng xvxn xf x rxplcxc xll thx vxwxls wxth xn ‘x’ (t gts ltl hrdr f y dn’t vn kn whr th vwls r).”

²⁷⁴ Cf. note 271 above on insect behavior and their robotic simulacra. A further measure of how differently non-creationists approach the AI problem may be seen on the technical front, as researchers explore the dynamic parameters of thought. See Crick & Koch (1992, 159) and Sandra Blakeslee, “Nerve Cell Rhythm May Be Key to Consciousness” and “How the Brain Might Work: A New Theory of Consciousness,” in Wade (1998b, 221-225, 232-237) on whether the “40-hertz, or γ , oscillation” among neurons might play a role in consciousness. The gamma wave frequency is definitely related to attention and how mammals at least absorb information, Rita Carter (1998, 186-187; 2002, 125-129)—and this is true even when *unconscious*, though if the signal is “doubled-up” (reinforced through repetition) it can become a conscious perception. There is also a “synaptic plasticity” whereby neurons grow and link by their mutual interaction, Koch (1997), which suggests how the physical proximity and architecture of axons may be salient. Just as an egregiously slow “computer” can be built using steam pumps or even electric trains, it may not be possible to engineer a satisfactory silicon “brain” unless the parts can be packed comparably to neurons in the convoluted cortex. The recent survey of the state of AI by Moravec (1999) assessed what is involved in working up through the repertoire of animal behavior. Measured by the standard of a million instructions per second (MIPS), an insect nervous system runs at about 10 MIPS. Which is a situation we “superior” humans should shamefully bear in mind the next time we unsuccessfully try to swat a common housefly (whose reaction times are way faster than ours) or ambush a cockroach (for its size, one of the swiftest animals on earth). Then again, we use our brainpower for different pursuits. The human retina alone involves the equivalent of 1000 MIPS—roughly that of an entire guppy brain (which one may compare to their amenability to sexual selection, re note 34, chapter four). Affordable computers are just now getting to the 1000 MIPS level, but adequate understanding of interacting sensory processing mechanisms have lagged behind the power curve. A lizard brain requires around 5000 MIPS, a mouse 100,000, and a monkeylike brain five million. Moravec calculates the human mind at about 100 million MIPS. Parenthetically, and only because the subject of abstract units of measure reminds me of it: a science fiction author (whose name has long ago escaped my own ready memory) defined the “milli-Helen” to be that amount of feminine beauty required to launch *one* ship.

²⁷⁵ Budiansky (1998, 20). Similarly Simpson (1966, 478): “Man is not *merely* an animal, that is, his essence is not simply in his shared animality. Nevertheless he *is* an animal and the nature of man includes and has arisen from the nature of all animals.” Cf. Forrest (2000) on how evolutionary philosophers have tackled the issue of humanity’s place in the scheme of things. Such subtleties were nowhere to be found in a series of commercials run on the TLC, Discovery, and Sci Fi channels in the later 1990s, showing a wrinkled authoritarian professor in cliché lab coat haranguing students that “man is just an animal” with a mind of reductionist brain chemistry. The alternative being advertised was not Phillip Johnson’s “Creationism Lite” Wedge, however, but rather the “Clear” thinking of the Church of Scientology. In a version of “good cop, bad cop,” the Church ran a parallel set of adverts where an amiable (if slightly overweight) explorer traipsed from Stonehenge to a Mayan temple to mountaintop, fruitlessly searching for life’s answers until apprised of Hubbard’s illuminating *Dianetics*.

²⁷⁶ Budiansky (1998, 34). William James (1992, 910-949) again had the case pegged rather well in his 1878 essay, “Brute and Human Intellect.” Rupert Sheldrake (re note 241 above) touches upon this issue from the fringe end, jousting at his website (sheldrake.org) with John Maddox over such matters as whether dogs are telepathic, Sheldrake (1999). Sheldrake is an interesting case of someone with a genuine scientific curiosity about phenomena that probably don’t exist. One recent Sheldrake hypothesis concerns the idea that mental images can literally be projected outward to the perceived object, and thus might affect a host of psychological experiments, Sheldrake (1998; 2001). While sparking some surprisingly benign commentary in the September/October issue of *Skeptical Inquirer* (p. 65), it led to the idea that people might be able to tell whether others were staring at them from behind. Experimental rejoinders by Baker (2000; 2001) and Marks & Colwell (2000; 2001) suggest a negative on that one. See also Ingram (1998, 62-65) and Toby Howard & Steve Donnelly, “The Media and the Brain,” in Della Sala (1999, 243-244) on Sheldrake’s budding legacy of inspiring questionable research.

²⁷⁷ Not unexpectedly, theoretical constructs also play a role. Recall how Donald views the human mind as a layering of cognitive memory, re note 153 above (which may be compared to Damasio’s taxonomy in note 254). Thus Donald (1991, 363) emphasizes: “It follows that *generalizations about the localization and organization of higher mental processes cannot be made from animals, even apes, to humans, except for the purely episodic aspects of behavior.*” Donald (1991, 127-137, 217-218, 244-245) regards primate cognition as “episodic culture” taking place in an eternal *now*, which drastically limits their ability to use language. Donald (1991, 171) noted that, unlike children after 14 months, chimpanzees apparently even lack the “ability to attribute intention to the mother’s gaze” by following the eyes to the point of attention. Mithen (1996, 76-89) similarly characterizes the chimp mind as circumscribed by the inability to integrate new information, magnified by the lack of linguistic intelligence. See also Jolly (1999, 280-308), Pennisi (199b) and Zimmer (2001g, 270-272) on chimpanzee consciousness.

²⁷⁸ Budiansky (1998, 183)—Bekoff (2002, 47) favors the opposite view. Figuring out what an animal is “thinking” when signaling the presence of a predator is no easy task. For the stickler position, see sticklers Heyes (1998) also at bbsonline.org/documents/a/00/00/05/46/bbs00000546-00/bbs.heyes.html and Budiansky (1998, 37-39). Hauser (2000b) and Yoerg (2001) represent antidotes to excessive anthropomorphism, while Page (1999) offers a case for animal minds in his companion book to the PBS *Nature* series on that topic (aired January 2000). See also the *American Zoologist* symposium: Bickerton (2000), Cartmill (2000), Cartmill & Lofstrom (2000), Marian Dawkins (2000), Griffin (2000), Kimler (2000), Pepperberg & Lynn (2000), Ritvo (2000), Savage-Rumbaugh *et al.* (2000), Seyfarth & Cheney (2000), Staddon (2000). Research into nonhuman cognition moves away from behaviorist reductionism to an integrated view of consciousness as an adaptively useful feature. Donald Griffin (1984, 463) concluded “as a working hypothesis, it is attractive to suppose that if an animal can consciously anticipate and choose the most promising of various alternatives, it is likely to succeed more often than an animal that cannot or does not think about what it is doing.” Cf. Griffin (2001) on Hampton (2001). While Ryan (2002, 266-267) notes Lee Dugatkin’s religious objections to animal worth, Budiansky (1998, xxiii-xxviii) worries about the political and social extrapolations of animal rights in the wake of

Griffin or Sue Savage-Rumbaugh. And George Johnson, “Chimp Talk Debate: Is It Really Language?” in Wade (1998b, 147): “There is a suspicion among some linguists and cognitive scientists that animal language experiments are motivated as much by ideological as scientific concerns—by the conviction that intelligent behavior is not hard-wired but learnable, by the desire to knock people off their self-appointed thrones and champion the rights of downtrodden animals.” For that side of the case, see notes 287-289 below.

²⁷⁹ Relatively few creationists have touched on the matter of animal consciousness, and then only to trumpet the supposed “failure” of ape language research. One example was Oller & Omdahl, “Origin of the Human Language Capacity: In Whose Image?” in Moreland (1994a, 257-265)—cited subsequently by Habermas & Moreland (1998, 392n). Lapin (1999, 545-55) alluded briefly (and without reference) to “ill-fated experiments” intended to teach chimps and gorillas “to speak.” Gish (1995, 312-314) was another case—though, ironically, one of his sources was Epstein *et al.* (1980) concerning B. F. Skinner’s dismissive experiment in which pigeons were trained to simulate the activity of signing apes. Skinner’s doctrinaire behaviorist view that apes lack “minds” would hardly seem a safe harbor for Creation Science to dock in, since Skinner’s position was that *humans* lack minds too. More importantly, the newer survey of the field by Savage-Rumbaugh & Lewin (1994) was not covered by Gish, Habermas & Moreland, or Lapin (see the follow-up per notes 290-291 below). Despite (or because of) their distance from the data, Habermas & Moreland (1998, 82) are willing to accord animals souls, while remaining convinced that “Animal souls, no less than human ones, could not evolve from the simple rearrangement of matter. Since naturalistic evolution is a story that only explains how physical events (mutations, etc.) affect physical systems (DNA, other body parts), it is in principle incapable of explaining the emergence of conscious souls in the animal kingdom.” On the anthropic quasi-evolutionist side, Barr (2003, 190-206) did not touch on animal intelligence or behavior in assessing whether material brains can comprehend at least some mathematical concepts (see next note) or engage in quite complicated behavior without much brain processing at all (such as insects, discussed below).

²⁸⁰ Actually, numerical calculations are not the forte of organic brains, which do not function like souped-up pocket calculators. “We use hundreds of billions of neurons to do in minutes what hundreds of them, specially ‘rewired’ and arranged for calculation, could do in milliseconds,” observed Moravec (1999, 126). “A tiny minority of people are born with the ability to do seemingly amazing mental calculations. In absolute terms, it’s not so amazing: they calculate at a rate perhaps 100 times that of the average person. Computers, by comparison, are millions or billions of times faster.” Sheer processing speed is not intelligence—which is why we have laptop computers in the real 2001, and not HAL 9000. Incidentally, Alan Turing (1950) was arguably accurate in posing that by 2000 machines capable of *simulating* human behavior over a teletype would be possible, provided one didn’t start talking about poetry or creative pursuits.

²⁸¹ Cartmill (1998), Budiansky (1998, 96-104) and Hauser (1997; 2000a). While pigeons can tell small objects from large, they stumble over comparatives like “greater than” or “equal to.” And though Alex the African gray parrot and Ai the chimp can count and differentiate patterns about as well as a 3-4 year old, their learning curves are far more laborious than a child of that age. Rhesus monkeys grasp small numbers (1, 2, 3) but anything over that is just *many*. Using the same technique used to study infants, monkeys are puzzled by the same violations of sums (1+1=3). Such limited numeracy permits the California coot to minimize conspecific brood parasitism, Andersson (2003) re Lyon (2003). Compare that to reed warblers, oblivious to the presence of new eggs or the sudden absence of old ones chucked overboard by the voracious cowbird cuckoo chick—a rare example of a parasitical vertebrate, Zimmer (2000e, 135). Pinker (1994, 242) notes: “birds that nest on small cliff ledges do not learn to recognize their offspring. They do not need to, for any blob of the right size and shape in their nest is sure to be one. Birds that nest in large colonies, in contrast, are in danger of feeding some neighbor’s offspring that sneaks in, and they have evolved a mechanism that allows them to learn the particular nuances of their own babies.” Cf. Yoerg (2001, 8-12)—and Ingram (1998, 222-229) or van Noordwijk (2002) on the “arms race” coevolution of parasite-host relationships.

²⁸² See Hauser (2000a, 150). Spencer Tracy's "Drummond" reminded "Brady" in *Inherit the Wind*: "In a child's power to master the multiplication table there is more sanctity than in all your shouted *amens* and *holy holies* and *hossanas*." Seidenberg *et al.* (2002) re Peña *et al.* (2002) explore grammar's relation to a deeper statistical regularity, while Ferrer i Cancho & Solé (2003) suggest that language evolution may have involved "a communicative phase transition." Devlin (2000) related mathematical reasoning and language (especially gossip) to an underlying process of symbolic manipulation. Since he did so within an evolutionary perspective (e.g. p. 284), there was a certain irony to David Berlinski's back cover recommendation. This may have been due to Devlin's mathematical focus, though Devlin (2000, 72) defining mathematics as "the science of patterns" contrasts with Berlinski's reluctance to perceive evolutionary patterns in the fossil record.

²⁸³ See Donald (1991, 146-147), Leakey & Lewin (1992, 298-299), Savage-Rumbaugh & Lewin (1994, 265-271), Trefil (1997, 39-40), Budiansky (1998, 167-171), Zimmer (1998, 132-133), Jolly (1999, 295-296), Jennifer Lindsey (1999, 117), Page (1999, 246-252), Dunbar & Barrett (2000, 200), Hauser (2000b, 98-109), Richard W. Byrne, "Social and Technical Forms of Primate Intelligence," in de Waal (2001a, 161-162), Wynne (2001), Yoerg (2001, 64-65, 90-94), Tattersall (2002a, 62-66) and Wise (2002, 36, 64, 117, 152-154, 169, 188-189, 205, 230). Captive dolphins and orcas appear to pass it—though cf. Yam (2001) on Reiss & Marino (2001). This is of interest, as dolphin brains lack the primate frontal lobe involved in generating our self identity, nor do they possess the associated spindle neurons (re notes 266 above & 347 below). Baboons fail the mirror test, while dogs, elephants, monkeys and gorillas respond equivocally (the signing gorilla Koko evidently passed). Orangutans are slow, but get it eventually, while chimps vary widely by individual. Smuts (2000, 82): "Kanzi and his chimpanzee friend Austin also spend hours in front of mirrors, making faces, putting on makeup, and admiring themselves in new apparel." A related test involves a miniature room, where tiny toys are hidden and the connection has to be made that the same object might be found in its larger analog, Hauser (2000b, 79-80). Chimps generally fail here, though a few get it—geniuses perhaps? A typical 2.5 year-old fails too ... but a 3.5 year-old has no problem, which underscores how significant postnatal development has become in humans, Jolly (1999, 322-345).

²⁸⁴ See Page (1999, 189-207), Hauser (2000b, 226-227) and Bekoff (2002). The evidence for playing, joy, grief, and so on is circumstantial and problematic, yet tantalizingly suggestive, especially among primates and elephants. The PBS film showed the range: deer strolling right past a dead fellow without noticing, while elephants respond to elephant bones with considerable interest. Whether those elephants recall an individual is of course impossible to know without being an elephant. Jolly (1999, 290-292) and Wise (2002, 6) noted the occasional occurrence of chimpanzees playing with what amounts to dolls (treating a log like a baby, for example). Jennifer Lindsey (1999, 88) and Hauser (2000b, 218-219) relate the touching case of Binti, the new mother gorilla at the Brookfield Zoo in Illinois, who in 1996 rescued a human child who had fallen into the exhibit. It is difficult to prove altruism here—but hard not to be moved by it. The September 2001 "ASTOUNDING SEASON PREMIERE!" of the PAX cable network series *It's a Miracle* (hosted by Richard Thomas) featured a similar instance from the Isle of Jersey in the UK, intimating a miraculous quality to the gorilla's calm curiosity. This gee-whiz reverential attitude may be compared to the ever-cautious Budiansky (1998, xi-xii) who noted that Binti had been exposed to human style maternal behavior, and stressed that a factor in the gorilla's gentle response may have been that the child lay unconscious. Had he been raising a fuss from the start, Binti might have kept away or bitten him (the Isle of Jersey videotape showed the boy starting to cry later on, which caused the gorilla to hurry away). Another thing to consider is the role of individual excellence. Just as all humans are not capable of creative imagination like Mozart, why should we not expect a similar spectrum in other animal species? It is also hard not to feel empathy for the continuing tragedy of orphaned great ape infants, beyond threatened habitats and being poached for meat, as recounted by Jennifer Lindsey (1999, 128-136).

²⁸⁵ The skeptical position of Budiansky (1998, 21-41) or Dunbar & Barrett (2000, 155) may be compared to Savage-Rumbaugh & Lewin (1994, 272-278), Jolly (1999, 206-222), Richard W. Byrne, "Social and Technical Forms of Primate Intelligence," in de Waal (2001a, 154-157), and

Tattersall (2002a, 58-62) on apparent tactical deception by primates in social and play settings and how these bear on assessing chimpanzee consciousness. Humphrey (1992) and Shreeve (1995, 292-297) relate such “Machiavellian” interplay to the acquisition of human self-awareness, with Nørretranders (1991, 411-412) setting the ability to lie as “the truth about consciousness.” The iterative spiral of being able to deceive while trying to detect deception in others may well have generated a concomitant yearning for complete trust, manifesting eventually in religion and art ... and even humor (see note 196 above). For these reasons the oppressed aliens in the science fiction comedy *Galaxy Quest* were evolutionarily implausible: although capable of advanced technology and laughing at a good joke, they could not even imagine theatrical play-acting let alone its extrapolation into out-and-out lying. Much the same may be said of HAL 9000 in *2001* and *2010*. The problem would not be that HAL malfunctioned because he was instructed to lie although programmed not to—the story error would have been the very notion that a being can be sentient without an attendant ability to shade the truth. This idea was played to humorous effect in the Star Trek films when the stiffly honest Spock would defend the occasional strategic lie by saying he had “exaggerated.”

²⁸⁶ Primates and mammals (and even Alex the parrot) can get *bored* during testing, Page (1999, 82) and Vines (2000, 40). Cf. Tattersall (2002a, 180-184) and Wise (2002, 87-112). Though the “boredom” of one may translate into the “patience” of another. Jennifer Lindsey (1999, 99) quoted the project director of the National Zoo, Benjamin Beck: “if a zookeeper left a screwdriver within a chimpanzee’s reach, the chimpanzee might fiddle with it for a while and then move on to something else. An orangutan, by contrast, would pretend not to notice the screwdriver until the keeper left, then he would use it to dismantle his cage and escape.” An archetypal example of the organism as industrial robot is the wasp, as studied by 19th century entomologist Jean Henri Fabre, Budiansky (1998, 124). One particular wasp species (*Sphex*) lays its eggs in a paralyzed grub, which it stores in an awaiting hole to serve as living larder for its young. The wasp goes through a fixed operation: first it would position the grub, then go over to the hole to check that it was empty, and finally drag the grub over and drop it inside. But if you moved the grub away, the wasp would restart the whole routine, including checking the invariably empty hole, and this went on as many times as you cared to shift the grub. A recent replication of the experiment for a PBS nature show indicated that the scientist eventually got fed up with the test, while the wasp showed no indication of having learned anything about the emptiness of prepared holes or the boredom threshold of human beings. Interestingly, Ruse (2001, 211-212) alluded to this “sphexish” wasp behavior, though not as a matter of boredom, but rather concerning Daniel Dennett’s observation that sentient (and moral) beings like us “cannot afford to be sphexish.”

²⁸⁷ Adler (2000, 95). See Peter Singer (2000, 21-85, 293-302) or Bekoff (2002, 133-161) for the philosophy of “animal liberation” and Cohen & Regan (2001) for a trenchant debate. Dunbar & Barrett (2000, 156-158), Yoerg (2001, 175-191) and Marks (2002, 185-197) offer more skeptical turns. Wise (2000; 2002) advocates granting limited rights at least higher primates and dolphins. A chart in Wise (2002, 241) suggests how far that logic may be extended, though in practical terms most people draw such distinctions fairly easily. Squashing a spider in the bathroom is one thing—but few would take a shovel to a bird or cat that wandered in. Wise (2000, 255): “At some point the disparity between the autonomies of nonhuman animals with *no legal rights* and the virtual sea-level autonomies of humans *with* dignity-rights becomes completely indefensible.” But Wise (2000, 111,117) shied away from the obvious parallel with the abortion controversy. Over on the conservative *Kulturkampf* side, Lapin (1999, 143-145) opposes the animal rights movement for its secularist view of humans as merely animals (though cf. note 275 above). Meanwhile, the liberal Kowalski (2001) merrily revamped the whole Bible on an evolutionary and “biocentric” basis in order to give animals their due.

²⁸⁸ William James expressed disquiet over animal experiments (as on dogs) in an 1895 essay, “Is Life Worth Living?” in James (1992, 499-500). The long, if checkered, history of the conflict between scientific research and animal protection is chronicled by Rudacille (2000). Woods (1999) carefully explains the pros and cons for a young audience. As medical technology has improved, the drawbacks of using animal surrogates have only increased, especially concerning cosmetic

development—further prodded and polarized by the PR theatrics of People for the Ethical Treatment of Animals (PETA) and the considerably more radical lab (and technician) trashing of the Animal Liberation Front (ALF). A recent forum in *Scientific American* contrasted the various issues. Introduced by Rowan (1997), Mukerjee (1997) surveyed the present protocols and legal restrictions, Botting & Morrison (1997) focused on past successes to favor continued animal testing, while Barnard & Kaufman (1997) contended animal biology differed sufficiently to compromise its utility even beyond the ethical considerations. But just as with the creation/evolution debate, the animal rights controversy suffers from as much heat as light, and often for the same methodological reasons. For example, Greek & Greek (2000) press a similar argument as Barnard & Kaufman, that animal testing yields misleading results. But along the way there were some apparent scholarly oddities, such as concerning the thalidomide fiasco of the late Fifties and early Sixties (in which a morning sickness pill turned out to have dangerous mutagenic risks, deforming many children). Greek & Greek (2000, 45, 229n) appeared to cite a 1933 article for information about the introduction of the drug in 1957. Greek & Greek (2000, 46) also maintained that, “The pro-animal testing contingency still maintains that thalidomide was *not* tested on animals prior to its release. Two scientists, Jack H. Botting and Adrian Morrison, so stated in a *Scientific American* article supporting animal testing, February 1997: ‘Scientists never tested thalidomide in pregnant animals until after fetal deformities were observed in humans.’” But it was a stretch to conflate what Botting & Morrison (1997, 85) said about *pregnant* animals with a general denial that animal testing had taken place at all. This sort of scholarly looseness not only compromised what is a fairly strong case against further reliance on animal testing, it also adds to the general climate of slippery methodology that is ever the enemy of rigorous reasoning. This issue will recur in the next chapter.

²⁸⁹ Few vegetarians have had the weird consistency of vitalistic evolutionist Hans Adolf Eduard Driesch back in the 1930s. Driesch not only thought we humans should stop eating meat, but that any carnivorous animals that failed to accept this bright new order ought to be humanely (?) disposed of for the good of all, McMenamin (1998, 269). Such was the climate for the polyglot extremism of the Third Reich. As recounted in Rudacille (2000, 80-97) the Nazi mindset of “racial hygiene” readily embraced everything from animal rights (Göring apparently opposed vivisection) and vegetarianism (Hitler and Goebbels mulling it over by turns) to the virtues of organic farming for the noble Aryan yeoman. Nazis were also pro-ecology, Thornton (1999, 122-123). All of which reverses the characteristic observed of many serial killers (a youthful sociopathic willingness to torture animals), as the Nazis proved all too capable of treating Jews, Gypsies and homosexuals in ways they would never have condoned for their dogs and draft animals, or the innocent forest denizens of the *Schwarzwald*.

²⁹⁰ Pinker (1994, 335-341) and Budiansky (1998, 131-160) offer trenchant criticisms of animal language research; Savage-Rumbaugh & Lewin (1994), Meredith Small (1996) and Page (1999, 143-157) are more sympathetic. Analyses of animal communication and its relation to human speech occur in Diamond (1992, 141-167), Linden (1992, 30-34), Trefil (1997, 56-60), George Johnson, “Chimp Talk Debate: Is It Really Language?” in Wade (1998b, 142-147), Jolly (1999, 313-319), Jennifer Lindsey (1999, 87-119), Dunbar & Barrett (2000, 202-203), Hauser (2000b, 201-208), Rogers & Kaplan (2001), and Charles T. Snowden, “From Primate Communication to Human Language,” in de Waal (2001a, 195-227).

²⁹¹ There were scattered efforts earlier in the 20th century to train chimpanzees to speak, but given their limited vocal range and breath control (re note 292 following) that was an unsuitable approach. Chimps do have a facility for gesture, though, and the modern phase began in 1966 when Washoe was taught American Sign Language (ASL), followed in 1972 by the gorilla Koko (who before her recent death was known for a touching fondness for her pet kitten). Because ASL is indisputably a grammatical language, the apparent success in teaching it to chimps sparked a proliferation of experiments with the likes of Lucy and Lana and Nim Chimsky. That latter was a wry jab at Chomsky by Skinnerian behaviorist Herbert Terrace, who caught the primate language bug and was out to prove Chomsky’s views about uniquely human grammar wrong. That level of enthusiasm crashed in the late 1970s when deaf observers realized how syntactically impoverished

the ape signings were (and how freely hearing participants tended to mistake natural primate gestures for active signing). Even B. F. Skinner got in the act (as alluded in note 279 above)—while Chomsky (1972, 67) expressed skepticism about ape language studies due to its behaviorist premises. Doubts about the research peaked at the 1980 “Clever Hans Conference” (named for a notorious example of wishful thinking from the early 1900s, a horse mistakenly thought able to count and reason). With everybody from skeptic James Randi to a shamefaced Herbert Terrace all dumping on the field, it looked as though ape linguistics was a dead issue, Marx (1980) and Wade (1980). But scientific curiosity had not completely dried up, as Savage-Rumbaugh *et al.* (1980) indicated, and renewed efforts to clean up the methodology bypassed sign language in favor of abstract lexigrams accessed by computer keyboard—that way there would be no doubt about what was being signaled. See also note 300 below.

²⁹² After making this same point, Paul Ehrlich (2000, 156) nonetheless affirmed: “I have little doubt, however, that the bonobo Kanzi’s ability to use symbols, a component of language, is evolutionarily related to our own development of language.” Nonverbal cueing also plays a role, such as bonobo branch dragging to indicate a direction the group should go in, Savage-Rumbaugh & Lewin (1994, 118-120). Wild chimpanzees have about three dozen vocalizations, with each representing a particular meaning, Calvin (1994, 102). Jolly (1999, 309-321) stressed that even though there are several thousand human phonemes, we also rely on only a small number of sounds (the Khoisan Bushman employ 141, English a mere 40), generating unlimited flexibility by phoneme concatenation. For Calvin, the switch from “one sound/one meaning” to a combinatorial system “is probably one of the most important advances that took place during ape-to-human evolution.” With their broader acoustic range, if there are comparable phonemes in dolphin chatter it would be interesting to know how many and how they are used. Among humpback whales, newcomers familiar with the West Coast Australian song style introduced it to the East Coast crowd; some eastern whales tried a hybrid song in 1996, but in only a few years the West Coast lyric became the standard, Noad *et al.* (2000). Local groups of humpback males normally sing the same song, possibly as sexual displays for females, though what exactly the song is communicating is quite impossible to tell without being a humpback whale. As for the genetics of whale song, given how matrilineal whale species appear to interlock genes and cultural behavior, as noted by Dugatkin (2000, 147-150), tracing their dynamics will probably prove as challenging a scientific nut to crack as identifying the scaffolding of human language. Rendell & Whitehead (2001) explore what is known about “Culture in whales and dolphins” (also available at bbsonline.org/documents/a/00/00/04/91/bbs00000491-00/bbs.rendell.html).

²⁹³ Adler (2000, 84). See also Adler (1985, 49-51, 74-77) on animal minds and language.

²⁹⁴ See Chomsky (1972) for his views, Steven Pinker (1994), Boysson-Bardies (1999, 6) or Nowak *et al.* (2002) for examples of their seminal impact, and caveats courtesy of Ralph-Axel Mueller, “Innateness, autonomy, universality? Neurobiological approaches to language” and MacNeilage (1998) (at bbsonline.org/documents/a/00/00/05/46/bbs00000546-00/bbs.heyes.html & 23/bbs00000523-00/bbs.macneilage.html respectively). Interestingly, sociobiological colleagues Edward Wilson and Charles Lumsden have avoided pondering the universal character of language or its origin, Segerstråle (2000, 173). The debate over “innate” versus “learned” language spills over “universal grammar” and animal comprehension into practical discussions of how the deaf use and modify sign language, Gina Kolata, “Linguists Debate Study Classifying Language as Innate Human Skill,” in Wade (1998b, 137-141) and Hickok *et al.* (2001). Pinker (1994, 242) adds some ecology: “Evolutionary theory, supported by computer simulations, has shown that when an environment is stable, there is a selective pressure for learned abilities to become increasingly innate.” Recall the dynamic climate wobbles during our evolution (per note 72 above).

²⁹⁵ John Oller & John Omdahl, in Moreland (1994a, 255-257) and Morris & Morris (1996b, 93-95) put Chomsky’s work through their apologetic hoops. Johnson (2000, 138) was more hit-and-run, referencing Chomsky secondarily via Pinker (1994, 355). Interestingly, Chomsky is just as politically radical as Richard Lewontin or Stephen Jay Gould in their salad days, and under normal circumstances conservative creationists would have shied away from relying too heavily on him, but as an authority figure his views were obviously too useful to pass up. See Chomsky (1996) on a

variety of current issues, though cf. Lipstadt (1993, 15-17), Shermer (1997, 198), Shermer & Grobman (2000, 58), Guttenplan (2001, 125-126) and McWhorter (2001, 281-283). Chomsky has also irritated a few evolutionists (while pleasing Phillip Johnson *et al.*) for his “mysterian” intimation that Darwinian processes couldn’t account for language acquisition. See Dennett (1995, 381-400) for the “ultra-Darwinian” reaction to Chomsky’s gadfly role (with jabs at Gould and Skinner along the way). A nomenclatural aside on how “the new mysterians” label got applied to the anti-reductionist periphery of cognitive research: Duke University philosopher Owen Flanagan coined the term, as noted by proud mysterian John Horgan (1994, 90). The name refers to a minor 1960s rock group, Question Mark and the Mysterians, which alluded in turn to the title characters in a 1959 Japanese science fiction film about a species of clunky star-shaped aliens menacing earth. While we’re about it ... a similar chain of pop association links the rockers Duran Duran to the deranged scientist in the French comic strip *Barbarella*, filmed in high camp fashion around the same time with Jane Fonda, just before her Hanoi gunnery practice days. And one more free-association hop, courtesy of David Hurst Thomas (1999, 204): “Thousands of Indians were outraged when actress Jane Fonda was shown on national television supporting her husband Ted Turner’s Atlanta Braves with an enthusiastic rendition of the ‘Tomahawk chop.’” The ironies of life and politics—if only you live long enough.

²⁹⁶ Morris & Morris (1996b, 93), citing Chomsky (1972, 67). But back in those Watergate days Chomsky had available only studies done in the 1960s, before the ups and downs of modern ape language research had even been performed. Besides Chomsky, Morris & Morris (1996b, 93-94, 98-99) relied heavily on another well-aged resource, Stent (1975). But as usual they were mighty picky about how they used it. Stent’s article was actually about the opening moves in what turned into a major revolution in neuroscience, the shift away from “positivism” toward “structuralism”—work that has contributed to a better understanding of the underlying neurobiology of language, as we’ll see. Incidentally, *positivism* grew out of David Hume’s idea that empirical science is the only way the world could be understood, but ended up insisting that the mind starts out as virtually a clean slate, written on solely by experience. A “functionalist” streak to positivism also thought every feature had to be dynamically useful or it couldn’t be real. The *structuralist* competition represented a return to a more Cartesian rationalist philosophy, tempered by a Kantian skepticism, in which at least some human knowledge is accepted as innate. From there, thinkers in this department have been a philosophically diverse bunch, from Freudian subconscious drives to Chomsky’s characterization of language. One passage from Stent (1975, 1054) the Morrises did not see fit to quote: “the Kantian notion of a priori knowledge is not implausible at all, but fully consonant with present mainstream evolutionary thought.” Stent then took note of Konrad Lorenz’s view that such innate knowledge could be passed on via those genes that code for the structure and function of the nervous system—one of those dandy clues to the neurological puzzle that the Morrises slid right past.

²⁹⁷ As quoted in Brockman (1995, 178). Minsky (1986, 266) made a similar point (though not in reference to Chomsky).

²⁹⁸ Savage-Rumbaugh & Lewin (1994, 46). Tudge (1996, 242-250) and Swisher *et al.* (2000, 176-177) offer a similar assessment of the role of language in human evolution. Comprehension is where computer translation software remains problematic. The rules of grammar can easily be programmed in—but how do you specify context? That is a consciousness issue, a matter of the ‘I.’ As one cognitive researcher put it on a recent TV nature program, to *understand* “May the Force be with you” requires more than processing sound waves. Otherwise, it might just as easily be heard as “May the fours be with U”—or even “May LeForce be with Hugh.”

²⁹⁹ See Boysson-Bardies (1999) for a concise tour of infant language acquisition, and Pascalis *et al.* (2002) on the related issue of “perceptual narrowing” in infants. Piaget *et al.* (1973) represents an early effort to identify childhood cognitive development as related to distinctive memory skills—cf. Piatelli-Palmarini (1994, 178-179) and the more critical Devlin (2000, 27-31) on the limitations of Piaget’s “constructivist” model (such as its failure to account for what turned out to be a more innate sense of mathematics). Devlin especially follows Bickerton (1995) concerning the relation of proto-language and syntactical speech, though Boysson-Bardies (1999, 208-209) offers several

informative caveats on that front. Interestingly, the rhythms of infant hand gestures and babbling appear to mirror those of language, Petitto *et al.* (2001). See note 348 below on how the neurobiology of gesturing relates to language origins.

³⁰⁰ See note 290-291 above. In particular, the chimps Sherman & Austin achieved considerable interpersonal communication, though still at the proto-language level. David Premack's chimpanzee Sarah could eventually differentiate the meaning of sentences composed of plastic symbols, such as "If Sarah take apple then Mary give Sarah chocolate" and "If Sarah take banana then Mary no give Sarah chocolate." Though Stephen Budiansky cautions that Sarah need not have been getting all the grammatical nuances when homing in on apple/Mary/**chocolate** as opposed to banana/Mary/**no chocolate**. More interesting still is Savage-Rumbaugh's work with Kanzi, since Kanzi was not the object of the experiment—it was Kanzi's mother who was being shown the keyboard. Kanzi had caught on to it on his own, just by observing his mother's (unsuccessful) training, which is consistent with human experience where only a narrow childhood window exists to learn language easily. A "genius" factor may also have played a role here, since Kanzi's sister Panbanisha was not able to learn the system as he had (Kanzi's comprehension level is roughly that of a 2.5-year-old child). Just as some chimps apparently learned ASL from other chimps, and would "converse" in it unprompted, Kanzi often "talks to himself" in private using the keyboard—though whether he is playing or practicing at it is hard to confirm. One intriguing tidbit: Kanzi's favorite videos are noticeably ape-friendly, consisting of *Greystoke*, *Iceman*, and *Quest for Fire!* Apparently not *King Kong* however.

³⁰¹ An ironically relevant comment by animal language critic Pinker (1997a, 41) took aim at the effect of misplaced comparisons: "The first whale evolved in something like ten million years from its common ancestor with its closest living relatives, ungulates such as cows and pigs. A book about whales could, in the spirit of the human-evolution books, be called *The Naked Cow*, but it would be disappointing if the book spent every page marveling at the similarities between whales and cows and never got around to discussing the adaptations that make them so different." This was also an oblique stab at the pop anthropology of Desmond Morris (1967); cf. note 200 above.

³⁰² Budiansky (1998, 190). Many investigators in the field have emphasized the thrust of our linguistic engine. Calvin (1994, 102) remarked on how limited human thought is if not supported by full linguistic comprehension. Donald (1991, 213): "Stone Age cultures demonstrate how far language development initially outstripped technology. Technology in these societies is primitive, while language in social contexts soars to great heights." Though Bickerton (1995) adds a chaotic element: that we blundered into language, and thereby became clever. This is the reverse of the notion that language is a secondary skill acquired sometime along the route of our evolution. Naturally Blackmore (1999, 82-107) attributes language to mimetic selection, driven along as a way to more easily propagate memes. The meme version of linguistic origins is potentially testable through AI modeling, however, as Blackmore noted. Jolly (1999, 379-383) stresses the social element, where language acquisition was driven by gossip as much as practical or technological needs. Or Pinker (1994, 369): "Finally, anthropologists have noted that tribal chiefs are often both gifted orators and highly polygynous—a splendid prod to any imagination that cannot conceive of how linguistic skills could make a Darwinian difference. I suspect that evolving humans lived in a world in which language was woven into the intrigues of politics, economics, technology, family, sex, and friendship that played key roles in individual reproductive success. They could no more live with a Me-Tarzan-you-Jane level of grammar than we could." Incidentally, the earlier tendency to oversimplify the linguistic issue has had its affect in the creationist milieu. Numbers (1992, 108) noted Byron Nelson "first attracted national attention as a creationist in 1931, when his young daughter came home from school with a book that described prehistoric humans conversing in grunts, 'unfa, unfa, glug, glug.'"

³⁰³ John W. Oller Jr. & John L. Omdahl, "Origin of the Human Language Capacity: In Whose Image?" in Moreland (1994a, 236) framed the issue as a typically creationist rhetorical question, an absolutist dichotomy with no middle ground. "Are human beings just beasts with more flexible and better-developed vocal systems, or are we utterly unique creatures who approximate the divine traits of an invisible, omniscient (all-knowing), omnipresent (always present) and omnipotent (all-

powerful) Creator who, according to the Bible, stands both within and outside the space-time continuum?" Cf. David Menton (gennett.org/ankerb.htm) on Oller's YEC views.

³⁰⁴ Oller & Omdahl, in Moreland (1994a, 237). Johnson (2000, 76) indulged in a similar escalation in a chapter devoted to the 1999 Kansas School Board ruling on evolution. "For Maxine Singer and Jonathan Weiner—and for their local counterparts who made impassioned pleas on behalf of evolution at the Kansas board hearings—only blind religious prejudice could explain why anyone could doubt that pesticide resistance and finch-beak variation illustrate a process capable of evolving human beings not only from that hypothetical common ancestor with apes but ultimately from bacteria." Taking Weiner and molecular biologist Singer to task for making this supposed micro/macro mistake in their commentaries on the Kansas matter, Johnson wondered whether Weiner "may be a victim of inferior science education" and chided Singer for being "similarly uninformed." The educational import of the Kansas flap will be addressed in the last chapter.

³⁰⁵ Oller & Omdahl, in Moreland (1994a, 242, 252-254) drifted off instead into a philosophical union of language and DNA, in which "a profound similarity between the human language capacity and the unfolding series of biological language systems including the genetic code." This included a surprisingly irrelevant digression on general cellular function, which they painted in essentialist terms as "innate"—and therefore presumably *designed*. Their logic was similar to that used two years later by Michael Behe concerning "irreducible complexity." The DNA/language parallel (whereby an infinity of variety can be generated by a restricted set of components) crops up in other venues, from the antievolutionary Berlinski (1996b, 25-26) to the ultra-Darwinian Maynard Smith & Szathmáry (1999, 139). But ironically it is at the information end that the analogy breaks down, as Maynard Smith & Szathmáry (1999, 169) further noted: "It does not seem possible to draw a useful comparison between the way in which meaning emerges from syntax, and that in which chemical properties emerge from the genetic code."

³⁰⁶ Gish (1995, 312). His only reference was Simpson (1966, 477), in which the paleontologist expressed doubt that science would be able to ferret out much about the brain of extinct hominids. For example, Simpson was aware of early research on how speech processing is localized, but cautioned that "The nature or presence of these connections cannot be determined by fossils." That was a perfectly understandable sentiment at the time, but as we'll see, it turned out that scientists were able to tease out some aspects of the matter. The more important point is scholarly, however: Simpson's 1966 article could hardly be a substitute for the intervening three decades of research Gish paid no attention to.

³⁰⁷ Morris & Morris (1996b, 91-94).

³⁰⁸ Johnson (2000, 135-138). Johnson was criticizing the views of Robert Pennock (cf. note 190, chapter three). Noting that Pennock "points out uncontroversially that a kind of evolution occurs in language," Johnson tiptoed past the fact that for fundamentalist Creation Science such views are far from uncontroversial, in that the chronological framework for that evolution must be junked in favor of the Babel scenario. Cf. Henry Morris (1985, 182-185).

³⁰⁹ Maynard Smith & Szathmáry (1999, 126-127): "it is fortunate, as Darwin pointed out, if there exist in the living world examples with a lesser degree of functional specialization, which can give us a hint as to what the intermediate stages may have been. That is why it is much easier to discuss the origin of the eye than of language." Given the creationist opinion of the eye matter, though, you can see why evolutionists aren't cut much slack regarding language. But some useful advice comes from A. Frewer & F. Hanefeld of Georg-August-Universität Göttingen. Concerning some questionable analysis of photographs of Einstein's brain in *Lancet*, Frewer & Hanefeld concluded a letter to *Science* (September 15, 2000, p. 1878): "Sometimes we forget how limited our current research is. There is the dialectical saying, 'If the human brain would be so simple that we could understand it, we would be so simple that we couldn't.'"

³¹⁰ On this matter of timing and scientific imagination, one may also recall how Kurt Wise's contribution to the Moreland anthology compared to the unimaginable monoplacophorans David Norman commented on contemporaneously, re notes 234-235 of chapter two.

³¹¹ Pinker (1994, 334). Damasio & Damasio (1992), reprised in *Scientific American* (1999, 29-41), also cover language processing in the brain, including the specialized functions of the

perisylvian sector (involving phoneme assembly, speech rhythms and grammar). Donald (1991, 183) comments on primate and human use of “limbic speech.” Savage-Rumbaugh & Lewin (1994, 223-250) also survey the anatomy of speech, noting that the human vocal tract is able to produce consonants, which are processed differently in the brain than vowels. Other animals rely on vowels for their communicating, possibly because this leaves free an acoustic window to hear sharp sounds like the snap of a twig from an approaching predator. This may suggest that our brand of verbal communication developed when that level of cross-talk was no longer much of a problem, such as by the time *erectus* had graduated to being one of the top hunters on the block.

³¹² Hemispherical distribution plays a fundamental role in vertebrate sensory processing—in our case generating competing views of “reality” that our consciousness toggles between. Kosslyn & Koenig (1992, 491-431) view hemispherical specialization as a “Snowball Effect” cascading from relatively few core processes. Cf. Rita Carter (1998, 34-53). Richard Milton (1994, 208-209) seemed oblivious to this, having relied on a source from 1975. Recent work regarding visual illusions suggests a variety of stimuli (including laughter!) can short-circuit or reroute the conflict and allow us to briefly experience both hemispherical versions simultaneously, Gibbs (2001a). Owing to right-handedness being more common, prejudice against “lefties” has long been ingrained in culture as something odd or even unnatural, Michael C. Corballis, “Are We in Our Right Minds?” in Della Sala (1999, 38-39). Such attitudes remain fossilized in language: the English “dexterous” stems from the Latin term for right (*dexter*, akin to the Greek *dexlos*); while left is *sinister*. Likewise, the French for left is *gauche*—a synonym for “crude” and “awkward.” A further factor promoting the image of clumsiness is how many tools fabricated for “righties” are more difficult to manipulate with the opposite hand, such as scissors or some pens (which flow differently depending on whether they are dragged or pushed across the page). The genetic and neurological origins for left/right preferences are both of great scientific interest and largely a mystery, as noted in the survey by Close (2000, 35-42).

³¹³ Pinker (1994, 314). See also Kosslyn & Koenig (1992, 211-285), Budiansky (1998, 55-61) and Rita Carter (1998, 136-156). A century ago, William James knew only that Broca’s area related somehow to motor action, and Wernicke’s area with sensory aphasia, “Psychology: Briefer Course,” in James (1992, 115). Current brain maps are a bit more revealing, Roger Lewin (1988, 172), Damasio (1994, 21) or Greenfield (1996, 139)—though cf. Donald (1991, 262-267) and Pinker (1994, 46-53, 299-329) on the complex task of relating that neurological landscape to an individual brain’s linguistic “river of breath.” Notable brain disorders discussed by Pinker included Broca’s aphasia (from stroke), Specific Language Impairment (SLI), and Williams Syndrome. That latter is most interesting, as explored by Lenhoff *et al.* (1997)—the “elfin” physical effects associated with it led Lenhoff (1997) to argue the disorder may be the origin for tales of the loquaciously friendly “fairy folk.” Significant progress has been made on the pleiotropic genetics of SLI, Pinker (2001) on Lai *et al.* (2001), with background by Vargha-Khadem *et al.* (1995; 1998). Williams Syndrome appears to be related partly to a gene on chromosome 7 coding for a protein whose absence impairs spatial reasoning, Frangiskakis *et al.* (1996). Curiously enough, there is an inherited disorder related to another spot on the same chromosome: a single nucleotide substitution (adenine instead of guanine, generating histidine instead of arginine) in the FOXP2 gene apparently triggers a cascade of malfunctions including trouble with grammar. Our human version of the gene appears to track back no earlier than 200,000 ybp, Balter (2002b) and Enard & Przeworski *et al.* (2002).

³¹⁴ Endocasts for australopithecines and *Homo habilis* (KNM-ER1470) are known, Roger Lewin (1988, 176-181). “Broca’s area is large and prominent enough to be visible, as are the supramarginal and angular gyri,” summarized Pinker (1994, 353), “and these areas are larger in the left hemisphere.” When language (or even proto-language) came along is difficult to assess. Many analytical tools are only now becoming available, Van Essen *et al.* (1998) and Christoph P. E. Zollikofer & Marcia S. Ponce de León, “The Brain and Its Case: Computer-based Case Studies on the Relation between Software and Hardware in Living and Fossil Hominid Skulls,” in Tobias *et al.* (2001, 379-384). Leakey & Lewin (1992, 256-261) and Savage-Rumbaugh & Lewin (1994, 234, 250) favor early language use—with Mithen (1996, 108-113) characterizing *habilis* as a

“gregarious loudmouth” starting the process. But Peter Andrews & Christopher Stringer, “The Primates Progress,” in Gould (1993, 241) doubted *habilis* had as wide a vocal range as humans. Though they did note hand preference in toolmaking as one clue to how ancient our distinctive asymmetrical brain structure may be: “No other primates specialize in this way, but *Homo habilis* did, and left a record in the pressure patterns produced when making stone tools.”

³¹⁵ Swisher *et al.* (2000, 177-181). Mithen (1996, 141) reminded that *erectus* also had Broca’s area, though based on the Nariokotome Boy, Gore (1997b, 94), McKie (2000, 79, 82-85) and Tattersall & Schwartz (2000, 138) argue the later *erectus* still didn’t possess the spinal cord bandwidth to permit our level of complex speech. But that condition may have reflected the individual pathology of KNM-WT 15000 and not a common *erectus* feature (re note 32 above). Leakey & Lewin (1977, 203) favored the idea that *erectus* had some sort of early speech. A factor complicating analysis is the lack of preservation of soft anatomy, but there are features like the “basicranial flexion” that have been used as circumstantial correlates for a language-friendly larynx. The australopithecine layout is conventionally apelike, per the plates following Leakey & Lewin (1992, 184). Tattersall (1995a, 240; 1995b, 171-172; 2002a, 165-168) noted *Homo ergaster* had a small flexion, but was cautious and thought they probably didn’t yet have speech. Neanderthal had more of a flexion, yet still less than in humans. The Kabwe & Petralona skulls of about 150,000 years ago show almost modern configurations—though cf. Gibbons (2003a) re Baba *et al.* (2003) on a recent Java find. The hypoglossal canal that carries motor nerves from the brain to the tongue appears to have been present in *heidelbergensis* by 400,000 ybp, as well as the Neanderthals, Holden (1999a) or Jolly (1999, 380). Regarding Neanderthal, the consensus tends to the idea that they had language, though acoustically limited by a bit of their anatomy, Stringer & Gamble (1993, 88-90), Andrews & Stringer, in Gould (1993, 247), Shreeve (1995, 272-276), Jordan (1999, 56-58) and Arsuaga (2001, 262-268). Tattersall (2002a, 155-156) is more circumspect. Steven Pinker (1994, 353-354) thinks humans had language well before the Big Bang c. 30,000 ybp. Apropos Neanderthal’s throat, Pinker drolly reminded that “e lengeege weth e smell member of vewels cen remeen quete expresseve, so we cannot conclude that a hominid with a restricted vowel space had little language.” Incidentally, Morris & Morris (1996b, 89-91) mentioned the Broca’s area for *erectus* and accepted Neanderthal speech, but that’s only because they regard both taxa as simply misidentified human beings.

³¹⁶ An interesting unresolved linguistic problem concerns how human comprehension trips up on even fairly short sentences if they have too many embedded clauses, such as: “The malt that the rat that the cat killed ate lay in the house.” Pinker (1994, 205): “Why does human sentence understanding undergo such complete collapse when interpreting sentences that are like onions or Russian dolls? This is one of the most challenging puzzles about the design of the mental parser and the mental grammar.” Cf. Minsky (1986, 160).

³¹⁷ Martin Nowak (2000, 42-44)—see also Lachman *et al.* (2001) and Zimmer (2001g, 285-291). How reasoning relates to linguistics remains hotly contested, Pinker (1994, 56-67)—noting along the way the urban legend that Eskimos supposedly have more words for snow than in English (they don’t). Cf. McWhorter (2001, 49). Even closely related languages can have strikingly different surface structures. For example, there is no easy German equivalent to the English progressive form, “I am going to the library.” The English sense of *Ich gehe zur Bibliothek* (“I go to the library”) would be an indication of a general condition (“Do you go to the library?” ... “Oh, yes, I go to the library.”)—not that you were in the process of doing so now. Then there is word order: “I had to go to the library” is *Ich habe zur Bibliothek gehen müssen* (literally “I have to the library gone must”). Whether such inversions mean Germans “think” a bit differently from English speakers is more problematic. The “linguistic determinism” of Edward Sapir (who studied under anthropologist Franz Boas), Benjamin Lee Whorf, and more recently Alfred Bloom, traced cultural ills to how people used individual words—and tried to remedy that through linguistic tinkering. I do approve of removing arbitrarily sexist terminology (using “they” and “their” as neutral singulars instead of “he” or “she”). J. R. Minkel, “A Way With Words” at sciam.com/explorations/2002/032502language/index.html covers current views of Whorf’s theories. Pinker (1994, 56-57): “The most extreme of these movements is General Semantics,

begun in 1933 by the engineer Count Alfred Korzybski and popularized in long-time best-sellers by his disciples Stuart Chase and S. I. Hayakawa. (This is the same Hayakawa who later achieved notoriety as the protest-defying college president and snoozing U.S. senator.)” See Gardner (1957, 281-291) on the quirky heyday of General Semantics.

³¹⁸ Pinker (1997a, 90) comments on the distributed character of brain function: “The hippocampus and connected structures, which put our memories into long-term storage, and the frontal lobes, which house the circuitry for decision making, are not directly connected to the brain areas that process raw sensory input (the mosaic of edges and colors and the ribbon of changing pitches). Instead, most of their input fibers carry what neuroscientists call ‘highly processed’ input coming from the regions one or more stops downstream from the first sensory areas. The input consists of codes for objects, words, and other complex concepts.” How inflections fit into this is not yet clear, but Maynard Smith & Szathmáry (1999, 151) note that, “The idea that separate brain processes are involved in forming the past tense of regular and irregular verbs is supported by the study of patients with neurological disorders.” An example of which is surface and deep dyslexia, which suggested to Donald (1991, 302-304) that “at least two parallel routes to word (and, by implication, phrase and possibly sentence) recognition” are involved. This is supported by Paulesu *et al.* (2001), with commentary by Helmuth (2001a): although dyslexia appears to have a neurological substrate, it is greatly aggravated by languages like English and French which employ confusing or complicated spelling rules. Since written language is a fairly late acquisition in human history, the applicability of both phonological and visual processing thus offer clues to how the brain may have been coordinating multiple systems all along. Most intriguingly, Donald (1991, 329-332) argues that writing functions as an “external memory field” that carries out some of our complex thought in conjunction with conventional brain-based working memory. This is consistent with personal experience, where one often only figures out *what* to write in the context of *doing* the writing.

³¹⁹ Donald (1991, 379-380) highlights the theoretical importance of this individual cerebral variety, which any workable theory of consciousness has to eventually account for. Kirkland (2000, 41-42) indicated that this lack of uniformity between the exact wiring and processing in human brains means “sharing” thoughts via telepathy would be impossible—rather like trying to stick a Beta cassette in a VHS player. But even under a random system internal similarities in neural mapping can emerge, as Maynard Smith & Szathmáry (1999, 151) noted: “It has been shown by computer simulation that, as such a network learns, some parts will, by sheer accident, become associated with particular tasks. If one adds to this model the fact that particular sensory inputs (hearing, seeing, etc.) are localized, as are particular outputs (for example, speaking), then not only will functions within the net become localized, but the same localizations will appear in different nets, or, by analogy, in the brains of different individuals.”

³²⁰ Pinker (1994, 153). See also Boysson-Bardies (1999, 133-136).

³²¹ Pinker (1994, 156-157). Boysson-Bardies (1999, 146-148) noted infants learn more nouns first, accumulating verbs along with full grammar. A clue perhaps to how Chomsky’s *universal grammar* emerges from brain systems responsible for processing the action correlates of verbs. Interestingly, Tattersall (2002a, 160-165) links linguistic evolution to children’s play.

³²² And what we mean by “red” of course turns on our evolutionary history. In this regard, bees and humans both have three types of color-sensitive cells in our eyes, Coen (1999, 79-80). Two cover blue and green, but whereas we have a third directed at red, bees have one responsive to the other end of the spectrum, the ultraviolet. To what extent a lot of sensory specialization (and lifestyle adaptations brought about by them) come from simple contingent switching like this, far back in the scheme of things, remains to be seen. There appear to be several possible avenues to UV sensitivity—many birds appear to have gained their acuity through a single amino acid addition that modified the absorption characteristics of violet pigments, Yokoyama *et al.* (2000). Shi *et al.* (2001) survey what is known on the genetic front. Cf. also note 245 above.

³²³ Much visual information is actually mapped into the brain in a spatial analog (left on the left, right on the right, and so on). But other factors play a role. Pinker (1994, 166-170) noted that the physical constraints of how sounds are generated by the tongue in the throat (higher frequencies in

front, lower to the rear) appear to affect some higher-level word structure. There is a surprisingly consistent vowel and consonant placement in alliterative phrases like *fiddle-faddle* and *razzle-dazzle* (never *faddle-fiddle* or *dazzle-razzle*), while “phonetic symbolism” easily crosses cultural boundaries (where *ch’ing* means light in Chinese while *ch’ung* means heavy). This even extends to imaginary words. Given two abstract pictures (one curving, the other angular) to be matched up with their “names” (*takete* & *maluma* or *kiki* & *bouba*) people naturally correlate the angular image with *takete/kiki* and the other with *maluma/bouba*, Kimble & Garmezy (1968, 332) and Ramachandran & Hubbard (2003, 58-59).

³²⁴ An interesting episode of Star Trek’s “Next Generation” explored this problem rather nicely. Captain Picard was stranded on a planet with an alien whose language was so removed from our own that the handy Star Fleet “universal translator” couldn’t properly interpret it. Picard heard fragments of grammatical order, but the overall structure seemed incoherent. It turned out the alien used metaphors and drama in grammatical ways, and once Picard picked up on that he was able to communicate by relating the stories of our own world, including Gilgamesh and Enkido. Unfortunately, given the complex roots of syntactical language, it is difficult to imagine how any gizmo could be contrived to convert the brain patterns of a previously unknown being into intelligible speech in real time. Which means such a “universal translator” is probably as unlikely a piece of practical future technology as Star Trek’s holodecks and transporters.

³²⁵ Zimmer (1998, 134). Dolphins are able to “see” fish hidden beneath the sand by ultrasound (cf. note 38, chapter three). If such experiences are integrated into their “movie-in-the-brain” as our senses are, the dolphin Cartesian Theater would be running a very different show. For a considerably more effusive affirmation of dolphin intelligence from the early days of research, Lilly (1967) is of historical curiosity, influencing science fiction takes on future interspecies communication, such as *The Day of the Dolphin*.

³²⁶ For such reasons Trefil (1997, 48-49) may have pressed too far in minimizing the linguistic implications of individual dolphin whistles. “The animals seem to go through life saying ‘I’m Suzy,’ ‘I’m Suzy’ to other members of their group. In effect, dolphin communication seems to be the marine equivalent of those little sticky tags they hand out at conventions—the ones that announce ‘Hello, my name is ...’” But if dolphins have found some way to convey private information, it might not be through gesture or direct acoustic signaling, but in ways difficult for us to grasp, let alone translate. Context sensitivity may play a part—for example, were a call related to how it was last used. In that case “I’m Suzy” spoken at one meter to Sam today wouldn’t “mean” the same thing as when it had been said three times as far away to Sam yesterday, or to Betty at the same one meter last week, simply because different events would be associated with it. Not that we don’t depend on contextual cues too. A “titanic” event is a tremendous one, but a *Titanic* event involves malfeasance and tragedy (cf. also note 298 above). See Kosslyn & Koenig (1992, 240) and McWhorter (2001, 49-50, 180-181) for other instances of contextual grammar.

³²⁷ Budiansky (1998, xxi). Budiansky (1998, 73) advised that “nonlinguistic representations may take a form that is literally indescribable—neither visual, nor symbolic, nor anything.” A relevant essay here is Thomas Nagel, “What Is It Like To Be a Bat?” in Hofstadter & Dennett (1981, 391-414), with “Reflections” by Hofstadter. Nagel’s piece had a great effect on Donald Griffin’s recognition of the possibility that conscious states might be inferred in non-human animals, as noted in his interview with Gail Vines (2001, 50)—relevant, as Griffin was a pioneer in figuring out bat echolocation in the first place. As for the nature of nonhuman consciousness, Dennett (1991, 441-445) “flatly” rejected Nagel’s position that we couldn’t even conceptualize batness. Both sides are probably right. We can’t tell what it feels like to be a bat, but our very recognition that a bat’s world would be different from our own is at least a notion of what a bat’s life isn’t. Humans are actually pretty good at end-running things that can’t be experienced directly. In mathematics a Boolean hypercube in four physical dimensions can’t be visualized, yet we can draw out its shadow falling in three-dimensional space. Called a “tesseract,” it looks like a regular cube nested inside a larger transparent one, with each corner of the inner one connected to the corresponding corner of the outer one. See—that wasn’t so difficult! (Now on to squaring that circle....) Interestingly, the

Boolean hypercube figures in efforts to map out the properties of evolutionary fitness landscapes, Kauffman (1993, 37-39; 2000, 195-198).

³²⁸ Maynard Smith & Szathmáry (1999, 145): “It is a commonplace that creativity in science and the arts often depends on seeing analogies.” Calvin (1994, 101, 105) also ranks the ability to form fruitful analogies as a hallmark of human intelligence. Of course, if an analogy is taken too literally by one side or the other things can get out of hand. The physics correlates invoked by the crowd in note 255 above certainly come to mind—but also Gould & Lewontin’s “spandrel” argument (re note 270, chapter four) where Dennett (1995, 267-282) bogged down over whether real architectural spandrels (the spaces in between arches supporting a dome) were technically called “pendentives.” Civil engineer Mark (1996) investigated the fracas in an informative essay, deciding Dennett came off the loser—cf. Gould (1997d) with Conway Morris (1998, 11), who curiously interpreted Mark’s piece as chiefly a criticism of Gould! With a nod at note 67 of chapter two on Cambrian phyla, see Fortey (2000b, 142-145) for a bystander’s comments on the Conway Morris/Gould tiff. Fortey (2000n, 143) on this aspect of Conway Morris (1998): “I have never encountered such spleen in a book by a professional; I was taken aback.”

³²⁹ One may recall Gish’s questionable use of the bombardier beetle analogy when trying to appropriate the terrestrial *Parasaurolophus* as a stand-in for the imaginary fire-breathing aquatic Leviathan (re note 36, chapter three). An equally murky analogy cropped up in Habermas & Moreland (1998, 75-78) concerning Brian Goodwin’s “organocentric view” of “the organism as an autonomous, irreducible center of activity,” as opposed to the “genocentric” position that “genes must contain all the information for making” the structures of living systems. (Cf. note 106, chapter four.) Habermas & Moreland took this by analogy to support their own brand of unified dualism: *The Soul Is in the Body, and the Body Is in the Soul*. While Goodwin (1994) ably explains the evidence that in certain circumstances the effect of genes interact contingently with their cellular environment, it was hardly the case that this “view is currently gaining ground in the scientific literature” in the osmotic sense that this helped their crusade against materialist evolution. Cf. Ho & Saunders (1984) or Gould (2002a, 85, 1208-1214). Meanwhile, Habermas & Moreland (1998, 391n) pulled a Skinner/Johnson by citing the inadequate Moreland (1994a) exclusively for “a critique of evolution.” As for cognitive biology, Habermas & Moreland (1998, 43) thought to dispose of the neurological basis of thought with one lonely paragraph cursorily describing neurons, lacking even a single reference to the by-then voluminous literature (sampled in note 227 above). Which made Habermas & Moreland (1998, 10) unintentionally amusing: “as you read *Beyond Death*, you will notice citations to numerous end notes. Just because these notes occur at the end of the book does not mean they are unimportant. We hope you will refer to them to gather the names of sources that could help you pursue subjects of interest.”

³³⁰ Johnson (2000, 70-71).

³³¹ Like Gish (re note 140, chapter three), Johnson (2000, 182n) scored one technical hit on Miller: “In his biology textbook Miller makes the preposterous claim that Darwin ‘remained a devout Christian all his life’ (Kenneth R. Miller and Joseph Levine, *Biology*, 5th teachers ed. [Columbus, Ohio: Prentice Hall, 2000], p. 270). On the contrary, Darwin was never more than a lukewarm believer, and by the time of his death described himself as an agnostic.” The publishing inclusion was Johnson’s. Cf. the selective quotation of antievolutionist Federer (1999, 199, 301-302) painting both Darwin and Thomas Huxley as among the devout, and notes 122-123 of Chapter One on their actual lack of religiosity.

³³² Johnson (2000, 126). His summary was a familiar chain: the specified order of DNA “points to the conclusion that they are products of intelligent design,” macroevolution cannot be extrapolated from microevolution, and evolutionists refuse to accept any of this because of their adherence to methodological naturalism. Johnson recommended Dembski (1999a) as “a much more complete explanation” of Intelligent Design theory—an opinion seconded in June 2001 by the Bible Answer Man show (equip.org). What “complete” actually means in the ID “Dictionary of Scientific Terms” may be calibrated by recalling that Dembski did not discuss relevant topics in developmental biology or the fossil record (note 85, chapter one, note 218, chapter two, and notes 86, 106 & 127, chapter four). Add that Dembski’s Intelligent Design purports not to speculate on the identity of

the designer (note 118, chapter four)—while linking naturalistic thinking to “idolatry” and attributing bad design in nature to the perversion of a fallen world (note 315, chapter three, note 114, chapter four). For comparison, Johnson (2000, 154) has his own take on the nature of idolatry: “Primitive tribes make idols of wood or clay. Sophisticated modern intellectuals make idols of their theories, still employing the word *God* (as in ‘Spinoza’s God’) but in such a way that it adds nothing to chance and the laws of nature. All who pursue this strategy are substituting the created thing for the creator, and this is the essence of idolatry.”

³³³ Johnson (2000, 129-138) criticized Miller (1999, 27-28, 93-99, 126, 217) on general naturalistic science philosophy, and took Pennock (1999, 144, 203) to task for comparing creationist logic on the evolution of fossils and language (re note 190, chapter three), rather than accepting the created nature of language as Johnson does.

³³⁴ Johnson (2000, 138-139).

³³⁵ Miller’s arguments ranged from Behe’s seeming acceptance of human common descent (note 28 above) to a persistent unwillingness to address the data of biochemical evolution (notes 28, 44, 48, 52, 54, 63-64, 72*, 86, 105, 127, 132* & 183, chapter four; the asterisks re items Behe commented on in his July 2000 Internet postings). Behe’s DI response (confidently reprised at the YEC trueorigin.org/behe04.asp) also extracted only a tactical quote from the “particularly scathing” Cavalier-Smith (1997)—but addressed none of his substantive criticisms (e.g. those in notes 54 & 73, chapter four). Johnson (2000, 130) plowed ahead: “Miller either does not know, or chooses to ignore, that the argument for intelligent design rests primarily on the existence of complex genetic information and the absence of a natural mechanism for creating it.” Recall also Pennock’s jabs at Behe’s grip on analytical consistency and population genetics, as well as Johnson’s views on AIDS, “Berra’s Blunder” and philosophical relativism (notes 44, 60, 77, 217 & 263 of chapter four). AIDS did bob briefly to the surface in Johnson (2000, 174), though hardly as a riposte to Pennock: “Anyone who reads about the controversies involving the nature of intelligence and its heritability, or whether ‘nature’ designed males and females for different roles, or the details of the HIV theory of AIDS, or the various inflationary models of the big bang, knows that there is a lot of passionate disagreement in science.” Whether he holds these disparate controversies to be of comparable methodological merit was not clarified.

³³⁶ Indeed, Johnson (2000, 73, 180n) proceeded as though *Darwin’s Black Box* had never been criticized at all. This may have been because Johnson thought he had thoroughly eviscerated Behe’s critics in his previous book, *Defeating Darwinism*. Drawing on James Shapiro (1996) and Jerry Coyne (1996b), Johnson (1997, 80) declared that “Neither Shapiro nor Coyne contradicted Behe on any scientific point. Their objections were entirely philosophical, or based on a failure to comprehend the concept of design.” While that was largely true of Shapiro’s rarified critique for *The National Review*, it was not so with Coyne’s piece in *Nature*, which evolutionist Avise (1998, 237n) also cited for presenting “a critique of Behe’s book more in line with my argument.” The thrust of Coyne’s review concerned all the matters left out of *Darwin’s Black Box*, such as: “How one can admit common descent but deny macroevolution is one of the fascinating questions Behe leaves unanswered.” Besides the thrombin observation pointed out in note 86 of chapter four, Coyne specifically criticized Behe for failing to address larger biochemical issues like “the remarkable congruence between phylogenies based on anatomy and those based on DNA or protein sequence.” Regarding pseudogenes, Coyne mentioned that, “Unlike most mammals, humans cannot synthesize vitamin C; we still carry the gene for the final step in this pathway, but deletions have rendered it non-functional.” That Johnson considered all of this “entirely philosophical” or somehow a miscomprehension of the only element of the design concept Behe did care to explain (irreducible complexity) is another indicator of where Theistic Realism plans to land on the grid of empiricism versus ideology. Johnson (1997, 81) then went on to preface his remarks on Richard Lewontin (re note 266, chapter four) with: “What will the scientists do if the evidence starts to point *away* from materialism and *toward* the possibility that a Creator is necessary after all? Will they follow the evidence wherever it leads, or will they ignore the evidence because their philosophy does not allow it to exist?” By the last chapter of *Defeating Darwinism* (“Stepping off the Reservation”) he supplied his own prefabricated answer. Johnson (1997, 114): “Of course the

two are going in different directions, and much of the overelaborate baggage of Darwinism (punctuated equilibrium, Berra's Blunder) exists only because it helps the Darwinists avoid seeing the fact that would otherwise be staring them in the face."

³³⁷ Johnson (2000, 132-133). His citations were to Kenneth Miller (1999, 94-99) for the first paragraph and Miller (1999, 126) for the quote in the second. The first Miller quote had actually jumped from page 95 to 97; the "..." representing the phrase "pointing to Figure 4.3 and"—which alluded to a chart of elephant evolution that occupied page 96 (see note 344 below).

³³⁸ The questionable pair of assumptions underlying the antievolutionary position is that "massive" genetic changes are required in a particular instance, or that these cannot be accumulated in small increments via natural selection. An interesting neurological example concerns the brains of cats, Sandra Blakeslee, "Evolution of Tabby Cat Mapped in Brain Study," in Wade (1998b, 169-173). Rapid evolution has come about in the brains of domesticated cats over the last 20,000 years (as compared to surviving Spanish wildcats, *felis silvestris tartessia*) solely through differential cell death starting from essentially the same brain structure. The selection factor turns on lifestyles: wildcats build on color vision, while the nocturnal domestic cats discarded those neurons in favor of motion detection in dim light (retaining as an adult only 150,000 of the 900,000 ganglion cells connected to each eye in the fetal kitten). It is when such processes are related conceptually with the biogeographical turnover as evidenced in the fossil record that the antievolutionist would be confronted with "macroevolutionary" alterations—think of those African tenrecs diversifying so markedly on Madagascar. But as Gish illustrated on the Creation Science side, antievolutionists never press that far, relying instead on Zeno-slicing to keep the puzzle pieces small and apart. Then there is the scholarly parallel: in much the same way as Gish did Kitcher *et al.*, Johnson restricted himself to Miller's account of those "easily recognizable" elephant features instead of initiating some independent study. Ironically, Johnson had Douglas Futuyma's biogeographical elephant observation available from the start (re notes 92 & 94, chapter one). The trajectory of elephant evolution is easier to grasp when set against its spatial frame, such as the world map of general climatological conditions prevailing during their African origin and subsequent migration into Asia and North America, Christine Janis, "Victors By Default" in Gould (1993, 200). Cf. also Claudine Cohen (1994, 167-189, 205-220) on the evolution in thinking on elephant phylogeny, biogeography and cladistics.

³³⁹ Barbara Stahl (1985, 531-537) also devoted a section to elephant evolution, examining their origins among the Late Eocene subungulates of Africa and picturing skull examples reflecting some of their diversity. Illustrated (on p. 532) were the primitive elephant cousin *Moeritherium*, the more directly ancestral *Phiomia* and *Gomphotherium*, the Pleistocene woolly mammoth *Mammuthus primigenius*, and the funky cousin, *Deinotherium*, with its distinctive down-turned lower jaw tusks. Ironically, the difficulty in sorting out subsequent elephant diversification in the Miocene was due to the monotony of their dietary success. The gomphotheres in particular were all big herbivores that showed the same general browsing adaptations, rather than a suite of specialized quirks that allow one lineage to be related to another in the tidy ancestor/descendent way creationists complain about. There is also a "Bermuda Triangle" aspect to the elephant story, which straddles the same "fossil gap" that pertains to primate evolution. "The radiation of the gomphotheres during the middle and late Oligocene years cannot be traced, because fossiliferous rocks of that time have not been found in Africa and proboscidean remains of that age are not known from other continents. Gomphotheres appear again in the record at the beginning of the Miocene epoch, differentiated into more than a half dozen genera and spread throughout the Old World," Stahl (1985, 532-533).

³⁴⁰ Johnson (2000, 185-186n) dipped into his little bag of candy for that indigestible *bon bon* of the Von Däniken Defense wrapped around the Skinner/Johnson Gambit. "Although the elephant case is Miller's prime example, he also refers to various other examples that are said to illustrate possible macroevolutionary transitions in the vertebrate sequence—e.g., from fish to amphibians. As I have pointed out in various books and articles, Darwinists do not test their theory against the fossil record as a whole but mine the record selectively for confirming examples—meaning examples of fossils that suggest a possible evolutionary sequence to the eye of a believer. There is no objective

standard for telling the difference between fossils that merely resemble each other in some respects and those in a genuine ancestor-descendant relationship. I will not develop this critique further here because I dealt with the subject in chapters 4-6 of *Darwin on Trial* and because arguments over fossil stories tend to distract attention from Darwinism's crucial weakness. Even if there is a record of continuity of succession, which is very doubtful if all the evidence is considered without prejudice, this pattern provides us with no information about the source of complex genetic information." For reference, see notes 135 (chapter three) and 180, 211 & 237 (chapter four) on Miller's "other examples," with the elephant case alluded to briefly in note 179 of chapter four. Johnson (2000, 131) finally characterized Miller's position on elephants and speciation as "utter nonsense." Which leave us craning around the magician's screen trying to nab that recurring phantom behind Johnson's methodology: how exactly are paleontologists supposed to "test their theory against the fossil record as a whole" without ever touching on any of its particulars as Miller did?

³⁴¹ Not to mention elephantine social organization, which presumably would be governed by their genetic, developmental, and environmental conditions. Here too there are larger evolutionary lessons to be learned (ironically to be filed under *convergence*). For as Weilgart *et al.* (1996) noted, the social dynamics of living elephants show a striking similarity to sperm whales—not so much by size, but in their cliques of gregarious females and sexually roving males, suggesting comparable selective pressures.

³⁴² See Lambert & The Diagram Group (1985, 172-177), Norman (1994, 207-208), Rich *et al.* (1996, 581-591), Tudge (1996, 146-147) and Shoshani (1998) for synopses of elephant evolution. The early members of the order have tusks on both jaws, and later representatives lost one or the other pair (true elephants developed from one group missing the lower tusks)—charted in Colbert & Morales (1991, 404). "Scoop-tuskers" including *Platybelodon* and details of their extraordinary lower jaws are illustrated by Lambert & The Diagram Group (1985, 174-175) and Rich *et al.* (1996, 586). Lister & Bahn (1994, 11-35) relate the taxa to the perspective of the Pleistocene mammoths. Jaw and teeth of a basal proboscidean have turned up from Morocco (58 mya), Gheerbrant *et al.* (1996)—cf. the rather garbled coverage in the preface to the 2002 American edition of Claudine Cohen (1994, xx, 256n), which supplied it with a trunk!

³⁴³ See note 21 (chapter four) on Johnson *v.* species. Species stasis isn't even available at the living end, where the African elephant, long listed as a single species, turned out on closer genetic investigation to be two species that had diverged during the Pleistocene, Vogel (2001) re Roca *et al.* (2001). Hybridization still occurs occasionally among them, which relates to the leaky species issue which arose concerning Darwin's finches (see note 19, chapter four).

Call it "variation within a type" or "microevolution," an inability to conceptualize natural speciation has long been the bane of creationism. It embroiled the Adventist-dominated Deluge Geology Society through the 1940s, and the fate of YEC biologist Frank Lewis Marsh is illustrative, Numbers (1992, 124-133). Marsh coined the term "baramin" (a Hebraic neologism for "created kind") but allowed so much internal speciation that it smacked of "evolution" to prickly DGS co-founder G. M. Price. Numbers recounted Marsh's correspondence with leading evolutionary lights Ernst Mayr and Theodosius Dobzhansky. While Mayr dismissed Marsh as a religious crank (cf. note 210 above), Dobzhansky took a bit longer to reach the same conclusion: that Marsh would ignore the developing evolutionary evidence because his religious convictions dictated it. Marsh and Dobzhansky also differed on the nature of scientific proof, with Marsh demanding virtually a laboratory demonstration of macroevolution (recall Gentry's similar stance, re note 289, chapter three).

The baramin concept has bumped along behind the scenes in Biblical circles, such as Paul Taylor (1995, 28). Efforts to define "kinds" by hybridization (as covered at grisda.org/origins/23106.htm) functionally precludes a typology of extinct forms (cf. note 19, chapter four). Wayne Frair summarized "the first scientific baraminology conference" (held in August 1999 at Liberty University) for the *Creation Research Society Quarterly Journal* (creationresearch.org/crsq/articles/37/37_2/baraminology.htm). Not surprisingly, it affirmed that claims from Scripture about life have "priority over all other considerations" (e.g., requiring the

special creation of human beings). About the only contribution of the “new” baraminology is a proliferation of redundantly obfuscating terminology. There are “apobaramin” and “polybaramin” groupings of organisms that include one or more “holobaramins” (the preserved remnants of the actual created baramins, within which there may be many “monobaramins” as derived subsets). But if two organisms are not in the same mono- or holobaramin then they would have to be both apo- and polybaraminic—why then bother with two categories for unrelated organisms at all?

Baraminologists such as Frair, Walter ReMine, Kurt Wise and Todd Wood seem stuck on the same common categories (dog, cat, turtle, sunflower) as Henry Morris or Duane Gish. Although mentioning Wise’s “paleobaramin” category “for the older organisms” (meaning the extinct 99% of species), Frair managed to sidestep fossil clues. Thus he cited Hirayama (1998) without delving into its content: the discovery of the earliest fossil sea turtle that extended the sparse fossil record of chelonioids back 10 million years. This new Early Cretaceous find had the salt gland adaptation of a marine form, but retained the movable digits found in ancestral freshwater turtles. Frair’s accompanying figure of “a very generalized representation for all living and extinct marine turtles” was rather too generalized to tell how the holobaramin lines were to be drawn regarding such early specimens. Frair offered tentatively that the total number of holobaramins would turn out to be “probably in the low thousands,” suggesting a lot of families will be ranked as holobaramins (except of course for people, where only our species will do). Which is about where Marsh was half a century before.

Indeed, it may be expected that baraminology’s primary contribution to creationist taxonomy will be an affirmation of the correctness of *evolutionary* taxonomy. Thus baraminologists Wood & Cavanaugh (2001) and Cavanaugh & Wood (2002) determined that a group of sunflowers apparently were related (as a monobaramin) but couldn’t say how far up the phylogenetic ladder their holobaramin went. This posed a theoretical problem, as even these plants showed a range of photosynthetic systems (C₃, C₃-C₄ intermediate, and C₄) that had to be submerged in an initially perfect created type. Consequently Cavanaugh and Wood decided the genes for all the systems had to have been designed in, providentially anticipating the Flood whereby the sunflowers would be prompted to evolve (within their holobaramin, whatever that may be) the variant photosynthetic pathways. Wood (2002) reprised this line of reasoning, with a condensed version in a September 2003 ICR *Impact* pamphlet (No. 363).

Just how much data the baraminological view would have to somehow account for here (involving biogeography, endosymbiotic inheritance, gene duplications, positive Darwinian selection and other issues) may be sampled in Kim & Jansen (1995), Helariutta *et al.* (1996), Ku *et al.* (1996), Marshall *et al.* (1996), Bremer & Gustafsson (1997), Clegg *et al.* (1997), Drincovich *et al.* (1998; 2001), Kim *et al.* (1998), Panero *et al.* (1999), Bremer (2000), Lai *et al.* (2002), Remington & Purugganan (2002), Tausta *et al.* (2002), Yang *et al.* (2002; 2004) and Rieseberg *et al.* (2003).

The new baraminologists are honestly trying to identify holobaramins by mathematical analysis of dimensionally plotted morphological data arrays. The hope is that discrete holobaramins will show up as discernable discontinuities in the display. But the work so far doesn’t look too promising. Thus Wood & Cavanaugh (2003, 4-5) concede the monobaraminic status of the horse sequence. Not only does this accept a standard evolutionary relationship, it also opens up another batch of leaky monobaramins. For example, *Hyracotherium* was very similar to several contemporaneous taxa of comparable phylogenetic import (such as *Homogalax* at the base of the tapiroid superfamily). George Gaylord Simpson, “The History of Life,” in Tax (1960, 123) noted how *Homogalax/Hyracotherium* represent “not only the common parent of horse and tapir but also the common ancestor of two major divisions (suborders) of mammals.” Cf. Radinsky (1969). Of theoretical interest is Simpson (1953, 340-351) on identifying higher taxonomical categories in the fossil record. Simpson noted that *Hyracotherium* and *Homogalax* did not especially resemble their distant descendants, horses and tapirs. Would anyone stepping back in time and doing field work on either of those taxa have the slightest inkling of what their descendants might become? Or would any baraminologist have predicted that the typological cousins of horses would include tapirs or collie-sized animals that don’t look like horses?

For comparison, ID typology appears to be still in the definitional stage, as indicated by Siegfried Scherer at the 1996 Mere Creation Conference on “Basic Types of Life: Evidence for Design from Taxonomy?” (abstract at origins.org/menus/abstracts.html).

³⁴⁴ Kenneth Miller (1999, 95). Figure 4.3 was taken from Shoshani (1997, 38). Miller showed a more detailed chart on page 98 to focus in on further detail, indicating that even the upper tier of recent elephants embraced four genera involving 22 species living over the last 6 million years. Hunter (2001, 83, 183n; 2003, 80, 95, 159-160n) triple-dipped Miller (1999, 97) on fossil elephants rather than the passage I have quoted, but the logical problem remains the same. Hunter never committed himself to whether he thought all those species were the same type or not, or venture how they fitted into his own studiously vague Creation framework. Indeed, it isn’t clear from his two books even whether Hunter accepts natural speciation—and, if so, where he proposes to draw the taxonomical line in the sand. For example, Hunter (2003, 145) skirting past an issue posed by Mark Ridley, “that if the evidence is against the species originating independently, then the evidence is for evolution.”

³⁴⁵ Berlinski (1996b, 23) rejected an evolutionary origin for “the elephant’s sensitive nose with nerves” (condensing the process to “sheer dumb luck”). As with whale nares, the trunk may be traced in fossils by the distinctive “large, broad, keyhole-shaped nasal opening” where it joins the skull and the infraorbital canal below the eye socket enlarged for nerves and blood vessels, Lister & Bahn (1994, 19, 21) and Shoshani (1998, 482). Cf. Gaeth *et al.* (1999) on embryology, and Witmer (2001a) with note 38 (chapter three) on noses. An interesting parallel concerns the evolution of the curious snout of the star-nosed mole, Catania *et al.* (1999) & Catania (2000).

³⁴⁶ Pinker (1994, 350). Pinker (1994, 332-333) also used the elephant’s remarkable trunk as a cogent analogy about the debate over the evolutionary origin of our own linguistic specialization. No less than human language, elephant trunks are unique among *living* animals—meaning the search for obvious extant intermediate analogues misses much of the lesson of historical contingency, where such “unique” adaptations really are *unique*. The inability of our closest relatives (chimpanzees) to handle human syntactical language should be no more surprising than that the nearest living relations of elephants (hyraxes) do not possess rudimentary trunks. Parenthetically, Pinker (1994, 359-360) took a few jabs at Gould and Lewontin’s criticism of ultra-Darwinism (re note 328 above), and tended to follow Dawkins’ *Blind Watchmaker* conception of the problem of “complex design.” (Dawkins repaid the compliment with a favorable review reprinted on the back cover.) Hayashi (1999) comments on the Pinker-Gould dispute, as does a survey by James Schwartz, “Oh My Darwin! Who’s the Fittest Evolutionary Thinker of Them All?” in *Lingua Franca* (November 1999), available online via Pinker’s website (at mit.edu/~pinker/darwin_wars.html). Cf. also Shermer (2000, 157-158, 214-238).

³⁴⁷ Pinker (1994, 350). Under the “new word” category: “frobbling” is what one does to adjust stereo equipment. McCrone (1999, 279): “As far as the genetics go, producing the human brain could hardly have been simpler. Whatever our mental abilities depend upon, it does not seem to have been the development of any radically new brain structure.” Cf. Gannon *et al.* (1998), Nimchinsky *et al.* (1999) and Gusnard *et al.* (2003) on primate brain circuitry. The frontal cortex “spindle” neurons (focused in Brodmann’s Area 24 implicated in consciousness, note 266 above) are shared by humans and great apes (bonobos show the most human configuration). We have distanced the primates in accelerated expression of our common genes, Pennisi (2002a) re Enard *et al.* (2002)—or misexpression, as with interneuron cells, Tan (2002) re Letinic *et al.* (2002).

Work since Pinker’s 1994 quote relates language to gesture after all via the movement processing features of Broca’s area, Rita Carter (2002, 189-195). Apes also sport an asymmetrical homologue to Brodmann’s Area 44 in Broca’s area devoted to gesturing, Cantalupo & Hopkins (2001), with language exapted from left hemisphere circuitry used for planning precision hand movements, Budiansky (1998, 128-130) reflecting Calvin (1994), and Corballis (1999). Our hands and mouth have the most cells devoted to their control in the cortex, by the way, as vividly illustrated by the gnome-like motor and sensory homunculi in Greenfield (1996, 84, 100; 1997, 38), Rita Carter (1998, 75) or Ramachandran & Blakeslee (1998, 25-26). The brain as exaptation is supported by Wendy K. Wilkins & Jennie Wakefield, “Brain and evolution and neurolinguistic

preconditions” (bbsonline.org/documents/a/00/00/04/61/bbs00000461-00/bbs.wilkins.html), with special focus on the growth of Broca’s area in *habilis*.

³⁴⁸ For example, biologists John Gerhart & Mark Kirschner relate multicellularity to a bacterial ancestor shedding its external cell wall, Ward & Brownlee (2000, 101). See also Maynard Smith & Szathmáry (1999, 59-78), as well as note 106 of chapter four on symbiosis.

³⁴⁹ Maddox (1999, 65-66). Incidentally, the pop view that human & chimpanzee DNA are 98.5% identical requires several grains of salt, Paul Ehrlich (2000, 71, 354n) or Marks (2002, 32-42). The recent study by Britten (2002) indicates the difference is more on the order of 5%. But even if the divergence were only 1%, that would still involve about 10 megabytes of DNA information: “big enough for Universal Grammar with lots of room left over for the rest of the instructions on how to turn a chimp into a human,” as noted by Pinker (1994, 351); cf. Pinker (2002, 74-78). With the Human Genome Project completed, work is only now beginning on which genes differ from the primates, Zimmer (2001e) re Fay *et al.* (2001), Zimmer (2002f), and Rieseberg & Livingstone (2003) on Navarro & Barton (2003). For further comparison, Lapin (1999, 66-67) offered this antievolutionary prophecy: “After the completion of the human genome project, some explanation will be needed to account for the fact that there are inadequate resources within the genome itself to assemble all the separate components of the language system.” Although differences in even a few hundred regulatory genes could have profound effects, some have argued that chimps are sufficiently similar to humans genetically (cf. note 28 above) that they should be included in our genus *Homo*, Castresana (2001). UCLA physiologist Jared Diamond (1992, 25) favors such a position, as does Wayne State University molecular anthropologist Morris Goodman. Cf. Edey & Johanson (1987, 356, 362), Swisher *et al.* (2000, 138-139), Camilo J. Cela-Conde, “Hominid Taxon and Systematics of the Hominoidea,” in Tobias *et al.* (2001, 271-278), Marks (2002, 261-262) and Uddin *et al.* (2004).

This issue underlies an unreferenced confusion in Lapin (1999, 54): “Most people are unaware that the Peabody Museum at Yale University recently reclassified *Homo sapiens* (men and women) so that certain species of chimpanzees are included in the same genus.” LaHaye & Noebel (2000, 247) in turn relied on Lapin secondarily for this nugget. But one possible reason why “most people” might not be aware of this incident is that it hadn’t happened. Like Richard Milton with that British Museum “Brontosaurus,” an e-mail inquiry to the Peabody in January 2001 confirmed that their small primate exhibit hasn’t changed in 15 years. Meanwhile, my query to Lapin’s website (towardtradition.org) only got me placed on their junk mailing list, receiving a packet of Toward Tradition’s motivational social criticism aimed at stimulating sympathetic financial contributors. But museum exhibits were not on the mind of program director Adam Pruzman’s enclosure on “Esau’s Delusion: Moral Consequences of the Estate Tax.” Toward Tradition favors abolishing it on the religious grounds that wealth is a “sacred trust” whose moral and social benefits can only be properly husbanded by individuals and not the state (there is an ironic twist to this next chapter).

³⁵⁰ Gazzaniga (1998) on cortical specialization; cf. R. L. Holloway, D. C. Broadfield, & M. S. Yuan, “The Parietal Lobe in Early Hominid Evolution: New Evidence from Chimpanzee Brains,” in Tobias *et al.* (2001, 365-371) on the comparative reduction of the primary visual striate cortex in humans. See Pennisi (2004b) re Stedman *et al.* (2004) on primate jaw muscles.

³⁵¹ This argument is more fully explored by Mithen (1996). Cf. also notes 191, 227 & 256 above.

³⁵² See Hauser (2000b, 59-60, 230-232). Further studies with macaques showed they were also able “to incorporate new empirical evidence into a new theoretical perception of the world” and override their instinct, provided only the correct answer was rewarded. Interestingly, Page (1999, 114) referred to the initial ape inhibition study, but didn’t hit on the more important symbolic numerical aspect. Such experiments were also featured in the *Scientific American Frontiers* series on PBS a few years ago.

³⁵³ Jentsch *et al.* (1997) with commentary by Pennisi (1997). This was learned in a study on the lack of behavioral inhibitions symptomatic of schizophrenia (recall its dreamlike associations!) and prefrontal cortex damage. Animal rights advocates (re note 288 above) could object that the study involved experimentally mimicking cortical damage in vervet monkeys by decreasing their

dopamine function via doses of PCP (“angel dust”)—though the authors noted the neurological effects were temporary. Another example of gaining by something lost is mentioned by Normile (2001) concerning recent studies of which genes are present in human brains and how they are expressed compared to apes. Apparently our immune system has benefited by a mutation that has deactivated the Neu56Gc enzyme, which in other mammals acts as a handy binding site for pathogens; cf. Chou *et al.* (2002).

³⁵⁴ Chittick (1984, 201). Christopher Lane’s *Tonopah* novel (p. 59) had his creationist protagonist remark how Adam’s naming of the animals indicated he “was apparently quite knowledgeable in the area of veterinary biology.” Del Ratzsch (1996, 187), who ostensibly falls somewhere over on the Moreland side of the landscape, also affirms how ingrained such views are. In a discussion of the implications of probabilistic physics (of all things), Ratzsch noted how the design believer might invoke “guidance and planning” at a higher level than stage-managing all the molecular fiddly-bits. He then opined: “Of course, one might argue that there is something in God’s nature that would prevent God’s plan from having any such looseness. His concern, after all, extends to the number of hairs on our heads. But keep in mind that God brought the animals to Adam to see what Adam would call them, and the original term for ‘see’ has the sense of ‘discover.’ That certainly makes it sound as though the plan had space to accommodate a wide range of names that Adam might have come up with.” Assuming, that is, there ever was a unique “Adam” who was in a position to initially name anything.

³⁵⁵ The Noah’s Ark crunch per note 196, chapter three.

³⁵⁶ Morris & Morris (1996a, 88). Leaving aside whether “sin” really can impair intellect, we have one more bob on the creationists’ typological seesaw—the opposite end being the identification of types with species (re note 236, chapter four). Like Johnson’s Proboscidea, though, hummingbirds are quite diverse, e.g. nectar feeders specialized for host plants, Altshuler & Clark (2003) re Temeles & Kress (2003). Cf. their learning capacity in note 218 above. So if hummingbirds are a measurement of how a “kind” may be defined, on what basis are the diplodocid or hominid families to be so distinguished when sorting out the guest list for Noah’s Ark? Some additional data points from Feduccia (1999b, 326-327): there are apparently only “some 322 species” of hummingbird. And, understandably, given their tiny size: “Other than modern species from the Quaternary, there is no fossil record of hummingbirds.”

³⁵⁷ The reader may recall notes 53 (chapter one) and 17-21 (chapter four) on the troubles creationists have with even the few species of Darwin’s finches.

³⁵⁸ Michael Behe’s position on the antievolutionary landscape is actually quite equivocal, posing for Intelligent Design much the same challenges as Marsh in the Deluge Geology Society half a century earlier (re note 343 above). Behe has described himself as a “theistic evolutionist” precisely because he accepts “common descent”—objecting only to the extension of “Darwinism” as an explanation for it (though cf. note 72, chapter four, on Behe’s curiously restricted palette of Darwinian options). With William Dembski hacking away at theistic evolutionists (note 315, chapter three) and Phillip Johnson predicting the imminent demise of common ancestry (note 310, chapter three), it will be interesting to see how long the theoretical cracks represented by Behe’s public position can be papered over. One conservative Christian radio personality, Gregory Koukl, objected to Behe’s argument in 1996 on exactly these grounds (at his “Stand to Reason” website, str.org). Given the “poster child” prominence of Behe presently, one might think his views would be tolerated at least until evolutionary materialism is out of the way—but the history of creationist infighting suggests tactical prudence rarely stays the preferred course of action for long. Where the motivating philosophy is not science but religion, in which fiddly compromise is deemed to imperil your soul, there are a lot of steadfast crusaders in this arena. Indeed, parked just outside the Intelligent Design exhibition hall is D. James Kennedy’s “Reclaiming America for Christ” road show, dedicated to establishing full-blown Young Earth creationism as the exclusive educational playbill. Or as Morris & Morris (1996c, 183) put it with particular bluntness: “But can’t we be *Christian* evolutionists, they say. Yes, no doubt it is possible to be a Christian *and* an evolutionist. Likewise, one can be a Christian thief, or a Christian adulterer, or a Christian liar! Christians can be inconsistent and illogical about many things, but that doesn’t make them right.”

³⁵⁹ Though Henry Morris apparently appreciated one aspect of the slippery slope of “creation” in the early 1970s. Numbers (1992, 242): “In stressing that public schools should teach only ‘the basic scientific creation model,’ stripped of all allusions to its biblical origins, he hoped simultaneously to preempt the field for flood geology and to disqualify competing creation myths. If overt biblical creationism were taught, he feared that it ‘would open the door to a wide variety of interpretations of Genesis,’ and produce unwanted demands for the inclusion of non-Christian cosmogonies.” The downside risk was to alienate the evangelically minded who wanted public profession of who was doing the creating, as Numbers (1992, 246) noted of John Whitcomb.

³⁶⁰ There are two main ways for an antievolutionary methodology to spill over the apologetic boundaries set by Creation Science or Intelligent Design. One is typified by the “Creation Outreach” organization (website at ior.com/~kjc/creation.html) in my neck of the woods, Spokane, WA. Besides accepting the Paluxy tracks and Gentry’s polonium halos at full credit, Creation Outreach relies on some truly antiquated secondary sources that plainly intersect the paranormal and ancient astronaut set. For example, a 1979 booklet from Walter Lang’s Bible Science Association (re note 41 above) on “Strange Relics from the Depths of the Earth” by J. R. Jochmans. The citations there included Bergier (1970), Berlitz (1972), Charroux (1971a,b), Donnelly (1883), Fort (1919), Pauwels & Bergier (1968; 1972), Steiger (1974) and Tomas (1971) as though these were even remotely legitimate scholarly references. According to a Talk.Origins posting by Pierre Stromberg and Paul Heinrich on “The Coso Artifact,” Jochmans was also a ghostwriter for Noorbergen (1977). See McIver (1988b, 195-196) on Noorbergen’s position on the antievolutionary landscape. The other side of scholarly credulity is for groups sharing none of Phillip Johnson’s Presbyterian sensibilities to appropriate the “scientific” fruits of Intelligent Design for their own purposes. This is a pitfall which William Dembski briefly took note of when appearing on Hank Hanegraaff’s “Bible Answer Man” radio show in August 2001, commenting on UFO believers who pick up on ID reasoning. To forestall such things was why Dembski staked out his Christian position in *Intelligent Design* (the 1999 book offered as a contribution bonus by Hanegraaff’s ministry).

Whether non-Christians are going to bow out so quietly remains to be seen. For example, harunyahya.org (“Harun Yahya” is the pseudonym of ICR-inspired Turkish creationist Adnan Oktar) includes Michael Behe in his fusillade of antievolutionary arguments, to the glorification of Allah. There is also a more unsettling element of anti-Semitism and Holocaust revisionism (cf. note 79 above) to the creationism of Harun Yahya, as noted by a 2003 piece by Michael Hopkins at talkorigins.org/faqs/organizations/harunyahya.html. Edis Taner, “A World Designed by God: Science and Creationism in Contemporary Islam,” in Kurtz *et al.* (2003, 120-124) puts Oktar and his followers into a social and political context: conservatives as upset at the secular thrust of Turkish public policy as their American creationist counterparts. Oktar has also benefited from support by Islamists in the Education Ministry. This *Kulturkampf* aspect has been the chief interest of Harun Yahya, which has paid scant attention to Flood Geology or affirming Genesis accounts.

The website of fledgling British antievolutionist Tim Harwood (closed at the time of this writing, but originally at geocities.com/Area51/Rampart/4871/index.html) might have seemed conventionally ID by recommending Denton (1985), Johnson (1991) and Behe (1996). But the presence of UFOs and Milton (1997) signaled a different set of priorities. Harwood embraces Sheldrake’s morphogenetic fields (re note 241 above), by which “consciousness” somehow guides the course of macroevolution rather than stuffy adaptive micromutations. Interestingly enough, Denton (1998, 365, 440n) offers Sheldrake along with Lyall Watson’s highly dated *Supernature* as suggesting “that life may be more than our current science admits.” Which would presumably include Watson (1973, 49-68) on the “scientific” astrology of Michel Gauquelin (see note 37, chapter six). As for Phillip Johnson’s Wedge plan to soften up recalcitrant materialists for Christian revival, Harwood seems an unlikely prospect (in a recent e-mail to me, he described Johnson’s religious goals as “misguided”). The weird Raelian cult also wholeheartedly endorses ID theory (prweb.com/releases/2002/11/prweb50443.php)—though the “designer” they have in mind is unequivocally extraterrestrial. Aliens informed their leader “Rael” in 1973 that he was actually God’s second effort at personal procreation ... and thus Jesus’ half-brother (though Jay Leno

thought the robed former racecar driver resembled more “a pimp on the Jetsons”). See Pennock (1999, 234-242, 250, 276) for a comparison of the Raelian movement with creationism. The Raelians’ plan to engineer a successor race to humans brought their “Cloneaid” operation into the news late in 2002 when its CEO Brigitte Boisselier announced they had successfully cloned a human baby. Though poles apart philosophically and theologically, the Raelians, Harwood, “Harun Yahya” and Creation Outreach operate in methodological lockstep when it comes to ignoring the available physical evidence for evolution—as oblivious to the existence of the reptile-mammal transition or the implication of homeobox genes as are the disparate sources they so avidly ingest.

³⁶¹ All the quotations from “The Mysterious Origins of Man” (henceforth, MOM) were drawn from the soundtrack. As with Kent Hovind’s lecture tape, specific punctuation and sentence parsing are my own. I have discovered that the accessibility of the official MOM website varies: check bcvideo.com/bcvideo or plaza.interport.net/bcvideo ... or somewhere else (search engines willing). A more permanent ensemble critical of MOM remains anchored at Talk.Origins.

³⁶² This gig put Heston in that rare club of actors and personalities who have associated themselves with the flaky fringe—including Rod Serling on the Bermuda Triangle, Orson Welles for Nostradamus, and even Star Trek’s Jonathan Frakes introducing the infamous Alien Autopsy hoax. Heston is more prominently known these days for his steadfast advocacy of gun ownership rights as president of the National Rifle Association—a venue with its own vast orbiting constellation of contentious critics and defenders (about which I shall say absolutely nothing).

³⁶³ The Talk.Origins section on MOM has an unintentionally revealing riposte by the show’s producer Bill H. Cote, whose idea of affirming the scientific credibility of his witnesses consisted of repeating them (this may be thought of as the larval stage of the Skinner/Johnson Gambit). Cote neglected to offer any defense for such prominent MOM contributors as Carl Baugh, or “geologist” Don Patton (whose geology degree was pending from the unaccredited Queensland Christian University in Australia, as noted in Kuban’s Talk.Origins discussion of the Paluxy tracks). Milton (1997, 267) and the attendant alternativescience.com website remain insouciant over his involvement with MOM, praising NBC for its “rare and honorable exception” in bucking Darwinian orthodoxy by airing the show. I discovered in my e-mail exchange that not only was Milton as unaware of the gossamer credentials of his fellow interviewees (like Baugh) as he was of diplodocid stats—Milton didn’t much care one way or the other. The Mensa editor has rubbed shoulders with a fresh set of overtly creationist characters as a “Commentator” for Eternal Productions’ video *A Question of Origins* (advertised at morethanwords.net/origins.htm). “This video *exposes* the fallacies and complete ignorance of the theory of evolution to the point that **you will marvel** that the world still accepts and defends a theory that modern science has proved to be false.” Among those contributing to this marvel were Duane Gish, Chuck Missler, Dave Hunt ... and Malcolm Bowden. Evidently the primary significance for Milton of shows like MOM or *A Question of Origins* was that the producers had taken the trouble of interviewing *Milton*.

³⁶⁴ In his review of MOM at Talk.Origins, Jim Foley catalogued Childress’ publication trail: “They cover a wide range of topics such as free-energy devices, anti-gravity devices, artificial gravity, anti-mass generators, gravitational pulse drive, vortex propulsion, how to build flying saucers, the flying saucer technology of Nazi Germany, flying saucer propulsion, government UFO conspiracies, Roswell, death rays, ozone generators, thought machines, crystals and their role in levitation, inhabitants and structures on many planets and moons of the solar system, lost cities in Africa, the Americas and Asia, living dinosaurs and pterodactyls, crystal skulls, Irish Incas, Atlantean ruins, King’s Solomon’s mines, the Ark of the Covenant, Jesus’ tomb, Moslem Illuminati, Noah’s Ark, the Hollow Earth, Nazca lines, Yetis, giants, megaliths, ley lines, acoustic levitation, and more!”

³⁶⁵ The relevant segment: “I think that one of the solutions to the paradox of dinosaurs and people together and the vast discrepancy in *time*, this—the whole timeline of, of millions of years versus only thousands of years—can be explained in a cataclysmically [*sic*] geological view of the past, where rather than geological events taking place over millions of years they take place more quickly, and what is a million years on a geological time scale is in fact only say a thousand years. And therefore it’s going to bring all this dating much closer to us, and make it possible so that in a scientific way man and the dinosaurs *can* have existed together in the past, and in fact dinosaurs can

still be alive today in small numbers in remote areas of the world. For instance, in 1977 a Japanese fishing boat off New Zealand brought up out of the water the carcass of what appeared to be a pleiosaur [*sic*], an animal that should have been extinct for millions of years.” In transcribing the text from the show soundtrack I tried to plot the grammar of Childress’ run-on sentences as best I could; there was no hint of the “s” necessary for *Plesiosaur*.

³⁶⁶ Heston’s narration brushed aside all critical doubts about provenance or technicalities with an artfully worded circumlocution: “Although the authenticity of this photograph has never been disproved, skeptics have claimed it’s merely the body of a decomposing shark.” Of course no one needed to claim that the photograph wasn’t “authentic” (in the sense of it having been doctored or faked in some way). The dispute was over what the dangling hunk of meat was supposed to be. And since tissue analysis had clearly identified it as a shark nearly *twenty years* before MOM got into the act, the scientific side of the argument had long since passed the skeptical “claimed” category (cf. notes 50-51, chapter three).

³⁶⁷ Given Johnson’s treatment of Susman & Stern (re note 106 above), it is interesting that when Roger Lewin (1987, 38-39) mentioned their work on australopithecine arboreality, he quoted Susman & Stern’s view that *A. afarensis* was “very close to a ‘missing link.’” One may also note how Johnson arrived at the same conclusion as Milton and the Morrisises regarding the species status of Darwin’s finches (notes 18-20, chapter four).

³⁶⁸ Cf. note 32 above on the “gibbon” connection, and Shipman (2001, 203-205) on Dubois’ comparison of Java Man with chimpanzees. With sublime indifference to the facts, Morris & Morris (1996b, 88) claimed that “Peking man and Java man, once believed to be in this [*Homo erectus*] group, are now mostly ignored.” By whom, they didn’t say—but Eldredge & Tattersall (1982, 83-86), Tattersall (1995a, 59-67) and Johanson & Edgar (1996, 188-190) are rather prominent examples of evolutionists who seem not to have known they weren’t supposed to be paying attention to these specimens. Toss in Swisher *et al.* (2000) or Tattersall & Schwartz (2000, 148-156) for more recent good measure.

³⁶⁹ MOM drew on Richard Thompson for its take on Java Man, but this only mirrors the cursory treatments by Biblical creationists (cf. notes 138-139 & 150 above, along with Phillip Johnson’s Javanese doubts induced by Malcolm Bowden). Gary Parker in Morris & Parker (1987, 154-155) relied on Gish’s 1986 account from *Evolution: The Challenge of the Fossil Record* (though no page numbers were specified) to cast doubt on Java Man and Peking Man without ever noting that new *Homo erectus* finds had turned up since. Indeed, the term “*Homo erectus*” was never even used. That *erectus* was the accepted term by then is attested by the discussion in Leakey & Lewin (1977, 120-136) or Lambert & The Diagram Group (1987, 116-131). Though the revised Gish (1995, 280-305) picked up on some of the recent anthropology, most of his account was still aimed at the earlier Java and Peking man finds as in Gish (1978, 113-134). It wasn’t until the mid-1990s that the Morrisises (in *The Modern Creation Trilogy*) opted to discuss *erectus* proper, though with some customary backspin (as per the previous note 363). The contemporary Huse (1997, 135-136) remains just as vague as Gary Parker was from a decade earlier. On the subject of Javanese minutia, Jim Foley examines (at talkorigins.org/faqs/homs/wadjak.html) another of Duane Gish’s hobbyhorses: a joust with Loring Brace over Dubois’ supposed “suppression” of the existence of a human skull from nearby deposits (the Wadjak specimen). Cf. Shipman (2001, 118-120, 336, 350-351).

³⁷⁰ This may be compared with the “many” supposedly doubting *Archaeopteryx* according to Gary Parker’s rendition of Michael Denton, re note 40, chapter one.

³⁷¹ Again the MOM viewer got the evidence Zeno-sliced out of all recognition. Re note 65 above, the 1996 anthropological consensus on australopithecines as semi-arboreal *bipeds* was far from their being “simply an extinct ape.” Even the latest articulation of Lucy by Peter Schmid, highlighting the arboreal features, still shows the animal as fully upright, Tattersall & Schwartz (2000, 90). The chief difference is a slightly wider pelvis and rib cage. Cf. Lincoln (1998) and Berger & Hilton-Barber (2000, 217, 219). On the matter of misconstruing fossil reconstructions, Cremo & Thompson (1993, 732) picked up on a remark by Donald Johanson and Maitland Edey, where aspects of an early australopithecine skull reconstruction reminded them of a female gorilla.

Merging that with the australopithecines' arboreal features, Cremo & Thompson jumped their conclusion: "So thus far we have in *A. afarensis* a gorillalike head, an upward-pointing shoulder joint indicating that the arm was used for suspensory behavior, and a hand with a powerful wrist and curved fingers, suitable for climbing. One can just imagine the effects of a painting or model of Lucy engaged in suspensory or other arboreal behavior. This would surely detract from her image as a creature well on the way to human status. Even if one believes Lucy could have evolved into a human being, one still has to admit that her anatomical features appear to have been misrepresented for propaganda purposes." Incidentally, Johanson & Edgar (1996, 84-85) illustrate skulls of both male and female mountain gorillas, which may be compared to the very different Australopithecine skulls in the same volume (pp. 127, 129, 135, 139-141, 143, 145-146, 150, 153-154, 157, 159-161) involving the seven species then known of the genus.

³⁷² Another creationist tempest relates to the 1973 discovery of an australopithecine knee joint at Hadar by Donald Johanson's team, described at length by Johanson & Edey (1981, 150-163). Creationists have dismissed its anatomical implications as though Johanson had claimed the specimen was Lucy's own knee bone. For example, Huse (1997, 139): "it should be mentioned that the knee joint that was used to 'prove' that Lucy walked upright was found more than 200 feet lower in the strata and more than two miles away!" Jim Lippard has an interesting survey of the Lucy knee claims at Talk.Origins. The story got started in 1987 by Tom Willis of the Creation Science Association of Mid-America. For physical context, an overview of the stratigraphy and dating of the Hadar formation may be seen in Johanson (1996, 102).

³⁷³ Narrator Heston mentioned that dinosaurs were first discovered in the 18th century—somewhat inaccurately, since the first fossils so identified actually turned up in the 1820s, William A. S. Sarjeant, "Early Discoveries," and Brent H. Breithaupt, "First Golden Period in the USA," in Currie & Padian (1997, 340-350). Heston then intoned that, "Today many of the so-called human prints have fallen victim to erosion and the hands of vandals, but Carl Baugh is in possession of one of the most compelling prints ever found. What we're about to see is the most controversial artifact in his collection." Ironically, "artifact" was just the right word to describe the Burdick print—but the discouraging words of Glen Kuban or other scientifically trained investigators who examined it were nowhere to be found (cf. notes 60-63, chapter three). Instead, after Baugh had his say, Dr. Dale Peterson, M.D. and Don Patton testified in support of the authenticity of the Burdick print. Over on the Native American side, Deloria (1995, 240-244) strung pictographs and monster tales together with equal enthusiasm, and saw "no reason to hesitate suggesting that some of the creatures, described as animals or large fish by observers, were surviving individuals of some presently classified dinosaur species," Deloria (1995, 241). Which lends a certain humor to Deloria (1995, 232): "I am not a scientist and can only determine the state of our scientific knowledge by reading scholarly articles and popular writers to see what they say science knows."

³⁷⁴ Cremo & Thompson (1993, xxiii); this was the very first paragraph in their "Introduction and Acknowledgements." An article at their "Forbidden Archaeology" website also stresses the Tuttle piece. The authors followed up several spoors more commonly pursued by literal Young Earth creationists, Conrad (1981). Cremo & Thompson (1993, 454-458, 810-813) discussed the curious Carboniferous prints and the "sandal" mentioned in note 59 of chapter three. On the former, they quoted a 1938 article by geologist W. G. Burroughs that referred to the spread of the toes being "about six inches." Although this would seem rather a wide splay for any human, the authors promptly concluded: "These humanlike tracks are thus quite distinct, unlike the more famous but indistinct Paluxy 'man tracks' reported in Biblical creationist literature," Cremo & Thompson (1993, 455). That was their only reference to Glen Rose—a curious omission of what would seem just as viable a set of evidence for human activity as the questionable finds they did report. Re the "sandal" print, Cremo and Thompson offered up the straw men of professors (supplied "from private correspondence supplied to us by George F. Howe of Los Angeles Baptist College, who requested that we quote from it anonymously") who expressed doubts without having actually inspected the print. "We do not necessarily accept the Meister print as genuine, but we believe it should be evaluated on its own merits, rather than on the basis of inflexible preconceptions," Cremo & Thompson (1993, 811). A chain of selective investigation was recounted on the next page: "In

1984, one of us (Thompson) visited Meister in Utah. Close inspection of the print revealed no obvious reason why it could not be accepted as genuine.” As mentioned on p. xxxvi, Thompson is a mathematician with experience in remote sensing, not marine geology or paleontological taphonomy—cf. the critical C. Brown (2002, 97-99). Further on down the page: “Stokes (1974, pp. 139-140) concluded that the Meister specimen was the result of spalling, a natural fracturing of the rock, and stated that the geology department of the University of Utah had in its collection several products of spalling, some resembling footprints. One would have to see these specimens to judge if they really resemble footprints to the extent the Meister specimen does. The shape of the Meister print, as shown by our visual inspection and computer analysis, almost exactly matches that of a modern shoe print,” Cremo & Thompson (1993, 812). The reference was to “Stokes, W. L. (1974) Geological specimen rejuvenates old controversy. *Dialogue*, 8: 138-141.” Why Thompson didn’t follow this up by including the University of Utah on his field trip to Meister remains to be seen. Incidentally, Conrad (1981, 33) noted the 1974 edition of *Scientific Creationism* fielded the Meister print—and Morris (1985, 122) still retains an oblique reference to “human footprints in ancient trilobite beds.”

³⁷⁵ Lockley (1999, 239-247) and Tattersall & Schwartz (2000, 88-91) particularly cover the pros and cons of australopithecine feet and the Laetoli prints. General discussions of the prints may be found in Roger Lewin (1988, 50-58), Gore (1997a, 78-80, 92) and McKie (2000, 12-17); Agnew & Demas (1998) describe the efforts to preserve them for future scientific investigation. Possibly because the Laetoli tracks relate to the australopithecine timeframe (where no genus *Homo* resides) Richard Leakey has been curiously diffident—the prints got only a passing paragraph in Leakey & Lewin (1992, 103).

³⁷⁶ A relevant scholarly observation is that Tuttle (1990) had not gone into any detail concerning his view that the australopithecines known at the time were inconsistent with the Laetoli tracks. To realize the nature of that missing information would have required the creationist to undertake further research. This is not something a Zeno-slicer is primed to do, such as Thompson & Harrub’s continued specialized invocation of Tuttle in their online rejoinder to Rennie (2002b) at apologeticspress.org/docsdisc/2002/dc-02-sa03.htm. As for MOM, newer information had come along by the time they entered the picture, thus compounding the scale of the Laetoli omission. In 1994 four bones of a 3.3-million-year-old australopithecine instep and big toe (“Little Foot,” found by Ronald Clarke and Phillip Tobias in 1980) were reevaluated, Clarke & Tobias (1995) with commentary by Oliwenstein (1995). See also John Noble Wilford, “Tiny Bones May Show a Giant Leap for Mankind,” in Wade (1998a, 187-190), Schwartz (1999, 20-26) or Tattersall & Schwartz (2000, 93, 95)—and Berger & Hilton-Barber (2000, 229-232) for the scientific and personal clashes attending the find.

³⁷⁷ Among living great apes (orangutans, chimpanzees, and gorillas) and humans, the difference is not so much in the hand as in the feet. Where the big toe is placed in a thumb-like position on the orangutan, it is closer to the toes in the less arboreal chimps and gorillas, as illustrated by Linden (1992, 16-18) or Jennifer Lindsey (1999, 14). Incidentally, Duane Gish has undertaken some scholarly housecleaning regarding australopithecine locomotion. McGowan (1984, 176) noted how Gish had relied on an outdated paper by Richard Leakey suggesting australopithecines might have knuckle walked in the manner of many modern apes (remember, Leakey at that time was pressing his ancient *Homo* case). There was actually no evidence for that notion, and Leakey subsequently dropped it—as did Gish himself, since it doesn’t appear in Gish (1995, 233-237). The australopithecine wrist does have some features that might have been inherited from a knuckle-walking common ancestor with chimps and gorillas, but resolving that through fossils is problematic given that it would have lived 5 million years ago (and thus during one of the Bermuda Triangle “gaps”).

³⁷⁸ Gary Parker in Morris & Parker (1987, 161) decided “that the foot looks pretty much like yours or mine.” Lubenow (1992, 168, 174-175) is similar; Lubenow (1992, 170) included the subsequent Koobi Fora prints as human, but did not otherwise discuss them. Gish (1996, 274-276) also attributes the Laetoli pedestrians to humans. Like Cremo & Thompson, not one of them showed illustrations. As for text-only resources: John Morris maintained in 1995 (BTG No. 83b) that the

Laetoli prints “were indistinguishable from human footprints.” Morris & Morris (1996b, 81, 86-87) invoked them as the “considerable evidence that *Australopithecus*, *Homo erectus*, and *Homo sapiens* have all lived contemporaneously in the past.” John Morris continued these themes in 1997 (BTG Nos. 98b & 106b).

³⁷⁹ Tuttle (1990, 63). Besides Cremo & Thompson, Gish (1995, 275) and Morris & Morris (1996b, 86) cited Tuttle (1990). None remarked on the toe spacing.

³⁸⁰ White (1980) indicated that the prints ran from 18.5-21.5 cm in length. Gish (1995, 275) and Morris & Morris (1996b, 86) cited White, but did not highlight the stride analysis. Incidentally, the Morrisses incorrectly identified the author as “P. H. Busse and K. E. Heikes”—Heikes and F. H. Busse contributed a comment on fluid convection dynamics immediately preceding White’s piece. This mistake presumably stems from how *Science* appends the authors in the contributing section to the end like a letter, rather than at the front as in their feature articles. Evolutionist Edward Wilson (1998, 307n) made a similar slip when he attributed Gutin (1995) to Elizabeth Culotta, who authored the work preceding Gutin’s.

³⁸¹ Debate over how “human” or bipedal the Laetoli printmakers were will likely continue in the paleoanthropological community until a broader sampling of australopithecine extremities becomes available. Johanson & Edey (1981, 250-251) quoted Tim White on Laetoli, that the big toe ran straight ahead, not out to the side as in an ape . . . but that is a relative term (re note 374 above). The pressure points illustrated in Lambert & The Diagram Group (1987, 94) indicate whatever made the Laetoli prints had a sizable big toe compared to an anatomically modern human. Indeed, the placement of the big toe and the furrowing of the other front toes vary interestingly from one step to the next. Various views and drawings of one or more of the prints may be seen in Tattersall (1995b, 38-39), Palmer (1999, 145), Jordan (1999, 145) and Dunbar & Barrett (2000, 211). As shown in Lockley (1999, 18, 243), what is presently known of the australopithecines suggests they had a toe arrangement midway between the gorilla/chimp and human positions. This may be compared to the more conventionally human *H. habilis* foot in Lambert & The Diagram Group (1987, 106) or the Neanderthal print in Jordan (1999, 49). Michael Cremo, “Forbidden Archaeology,” in Kick (2001, 314) has stuck to his guns. Regarding a question he posed to Ron Clarke on recent (1998) australopithecine finds: “He said that it was his *Australopithecus* who made the Laetoli footprints, but he was walking with his big toes pressed close in to the side of the foot, and with his other toes curled under. I did not find that to be a very satisfactory explanation.” This falls under the category of what Richard Dawkins and Kenneth Miller like to call the argument from “personal incredulity.”

³⁸² Much like Henry Morris with the meteoric dust rate, MOM bracketed the chronology in the most congenial light. Cremo & Thompson (1993, 368-385) covered the Table Mountain finds at length. A list of dates on p. 371 indicated the bedrock was older than 55 million years, with gravel and volcanic material younger, topped off by a volcanic deposit about 9 million years old. It was in the gravel that the artifacts were supposedly found. The question of course was whether they were found in situ or planted, and there is reason to believe the latter, as explained by Paul Heinrich in a piece on the topic at the Talk.Origins MOM site.

³⁸³ Concerning fellow travelers on the methodological road of creationism, a third of the citations against human evolution in Deloria (1995, 66-72) were to *Forbidden Archaeology*, which work he described as “impressive.” Moving onto more traditional YEC turf, Richard Paluxy “mantrack” boosters Henry Johnson (omniology.com/K-ManInGeoCol.html) and Kent Hovind (as stated in a squabble with AiG, answersingenesis.org/docs2002/1011hovind.asp) also draw on Cremo & Thompson. At least insofar as reliance on *Forbidden Archaeology* is concerned, I find the dynamic equation “1 Johnson = 1 Deloria = 1 Omniological Society/Hovind” both illuminating and rib tickling.

³⁸⁴ Cremo & Thompson (1993, 816) drew on Steiger’s 1979 book, *Worlds Before Our Own*, for several supposed *Permian* human artifacts. The more familiar beat of Brad Steiger (1968; 1974; 1976a,b) and Steiger & White (1975) concern UFOs and the paranormal. Cremo & Thompson (1993, 395) cited Jeffrey Goodman over a dozen times for an assortment of early quotes and finds, e.g. Cremo & Thompson (1993, 633) using Goodman’s 1993 book, *The Genesis Mystery*. Recall

note 222 (chapter three) on Goodman's Olmec "camera" lenses (his geological cataclysm and prophetic writings will turn up next chapter). Like Johnson re Bowden, Cremo & Thompson didn't focus on Goodman's background philosophy, which is rather like Vine Deloria on steroids. Goodman (1981) has modern man originating in North America and then invading Eurasia 35,000 to 27,000 years ago (dates rendered useless by the time Cremo & Thompson entered the picture, where subsequent finds had pushed our species back long before that in Africa). Goodman believed the Paleo-Indians originally migrated from lost Atlantis and Lemuria, as examined by Kenneth L. Feder, "American Disingenuous: Goodman's 'American Genesis'—A New Chapter in Cult Archaeology," in Frazier (1986, 274-284). Goodman (1981, 200) suggested there "is even some evidence for the now-sunken Pacific homeland" mentioned in Hopi legends of past worlds. This consisted of a brief *Science News* piece (June 18, 1977) about a possible eighth continent of "Pacifica" that might have existed 200 mya next to Antarctica and Australia, lost to subduction and amalgamation with other landmasses by the end of the Cretaceous. Hardly a help to the Hopi case. More prosaically, Mertz (1972, 41-46) related Hopi legends to Chinese voyages to America. On this point, Deloria (1995, 97) waxed broadly: "Some tribes speak of transoceanic migrations in boats, the Hopis and Colvilles for example, and others speak of the experience of a creation, such as the Yakimas and other Pacific Northwest tribes. Some tribes even talk about migrations from other planets." He supplied no references.

³⁸⁵ Cremo & Thompson (1993, 813-814), citing *Weekly World News* (July 27, 1982). The tabloid drew on a South African geological museum curator, who supplied the authors with a picture of one of the spheres (evidently the only one with really neat grooves on it) which indicated to them an intelligent origin. Paul Heinrich explores the geological side of these spheres in another of the Talk.Origins MOM pieces. The image of anatomically modern humans incising grooves in a single metal sphere 2.8 billion years ago, for no evident purpose, and without leaving any other trace of their existence, is "misplaced concreteness" in spades. Indeed, why not attribute them to hyper-intelligent tool-making pre-Ediacarans? Cremo & Thompson manifest the "gee whiz, it's a Mystery!" attitude that Charles Fort had, except they trim it out in more "meticulous" referencing. The *Weekly World News* should be familiar to anyone who has tarried in the checkout line at a typical grocery store. Printed on cheap black-and-white stock, it is fond of proclaiming invariably faulty eschatological predictions supposedly gleaned from Nostradamus, the Vatican archives, or the Dead Sea Scrolls. Occasionally imaginary survivors of the *Titanic* have been rescued—a February 2001 example concerned a baby found in a life preserver, mysteriously still a baby even after 89 years (the magazine intimated a time warp was involved). My fondest *Weekly World* favorite occurred some years ago: the astonishing telescopic observation of a WWII-era B-17 bomber on the moon!

³⁸⁶ Cremo & Thompson (1993, 591-625). I must confess to harboring an attitude here not unlike that of Captain Renault (Claude Rains) in *Casablanca*, who speculated on why Rick (Humphrey Bogart) didn't return to America: "I like to think that you killed a man—it's the romantic in me." It would be delightful if the Loch Ness monster really was a school of surviving "pleiosaurs." Likewise, if some of the "wild men" tales turned out to be due to contact with a remnant cousin of *Gigantopithecus*, a huge extinct Asiatic primate described by Ciochon (1991), Norman (1994, 218-219) or Dunbar & Barrett (2000, 32). This would have looked for all the world just like what the legends describe—and up until about half a million years ago at least, *Gigantopithecus* actually lived in the very region where the Chinese tales are strongest. *Gigantopithecus* could have bumped into *Homo erectus* during this period, but getting the critter across to North America to fill the Bigfoot bill is a tougher stretch. The whole case is fatally circumstantial, of course, as Lockley (1999, 262-268) cautions. As for the idea that Neanderthals may have hung on in isolated enclaves long enough to inspire the legends of Almas or Yeti, Stringer & Gamble (1993, 196) are similarly dubious. Cf. also Fairley & Welfare (1998, 11-35) and Dunbar & Barrett (2000, 178).

³⁸⁷ Cremo & Thompson (1993, 591). Why the existence of such animals would pose any more of a scientific challenge than coelacanths remained unclear. It does remind me, though, of Johnson's equally puzzling cavil about evolutionists and the "mere existence of fossils" (note 183, chapter four).

³⁸⁸ Although unwilling to criticize any salient aspect of fringe creationism in print, Johnson has nonetheless shown a persistent familiarity with their output, from Malcolm Bowden and Robert Gentry to the Cremo & Thompson blurb. Recall also Johnson's contribution to Moreland & Reynolds (1999), noted in chapter three. Johnson (2000, 39-40, 177n, 180n) adds to the pot by drawing on "Answers in Genesis," which he describes simply as an "Australian creationist organization." First, Johnson commented on a 1997 AIG video interview with Richard Dawkins, in which the British evolutionist was evidently nonplussed at being challenged to provide evidence of natural selection creating new genetic information. Johnson directed the reader to the jabs pro and con at answersingenesis.org and Australian skeptics' rival "No Answers in Genesis" website (onthenet.com.au/~stear), which included Dawkins' response (more on this in the last chapter). Johnson also alluded to a 1990 quote book by Young Earth creationist geologist Andrew Snelling, supporting the propriety of the antievolutionary cottage industry of tactical authority quoting. Whether Johnson would have shown as much merriment with AIG cofounder Ken Ham's herbivorous tyrannosaurs (re note 303, chapter three) or Bowden's squib affirming the recent age of the moon is quite another matter. Johnson clearly regards the materialism of Dawkins as dangerously objectionable in a way the pseudoscientific blather of Bowden and Ham is not. On Johnson's Australian connection, it is possible Michael Denton has kept Berkeley apprised of the latest local ammunition—much as Johnson obtained Douglas Dewar's whale quote secondarily from *Evolution: A Theory in Crisis*. Interestingly, at No Answers in Genesis non-creationist geologist Alex Ritchie wryly documents the compartmentalized double scholarly life Snelling has led. While one Janus face publishes uncontroversial papers in his discipline that accept the conventional dating framework, Snelling's AIG religious persona absolutely rejects that chronology in favor of unadulterated Flood geology. Such equivocation renders him an ironically appropriate resource for Phillip Johnson, the reigning Grand Master of the "meaningless concession."

³⁸⁹ Cremo & Thompson (1993, 413-415) used this logic to support acceptance of an 1896 find of a fully human skull cap supposedly found in Pleistocene deposits dating over a million years old. Yet *Forbidden Archaeology* had covered all the clues needed to raise warning hackles. Aleš Hrdlicka had expressed considerable doubts about the find in 1912 after he discovered the dubious circumstances under which it was found (the original workmen who supposedly found it couldn't be identified, and hadn't been properly questioned at the time). Cremo & Thompson (1993, 439-446) even defend the Calaveras Skull hoax (re note 163 above). Fringe creationists continue the small cottage industry of discovering discordant "human" fossils. Andrew MacRae (at geocities.ucalgary.ca/~macrae/t_origins/Carbbones/carbbones.html) relates how Ted Holden and Ed Conrad misinterpreted sandstone as the bone of "Carboniferous" man. Even Kurt Wise dumped cold water on their claims, and Ed & Ted had shut down their website links by the time I encountered the fracas. Conrad is one among many eccentric players on the human origins field (Jim Foley lists a sampling of "Fossil Hominids: On the Fringe" websites at Talk.Origins).

³⁹⁰ This issue in turn relates to how historical information is assessed generally, and will be seen to play a similar threatening role next chapter when it comes to the tendency for historical glossing among certain politically conservative creationists.

³⁹¹ MOM prominently featured the case of US Geological Survey geologist Virginia Steen-McIntyre, who was supposedly "silenced at the height of her career" for dating a human artifact site in Mexico at 250,000 years old (rather than the expected 20,000 or less) back in 1966. Heston: "According to Dr. McIntyre, because she stuck to the facts all of her professional opportunities were closed off. She's not worked in her chosen field since. The site was closed and permission for further investigation was denied—forever." Cremo & Thompson (1993, 354-366) cover the Steen-McIntyre case. Although McIntyre was interviewed, nothing in her statement or the background narration would have given the viewer any clue that (1) McIntyre was not the leader of the team involved—she was then only a young grad student working on the case. (2) That the actual expedition leader (Cynthia Irwin-Williams, since deceased) did not have her career ruined, and that even McIntyre published several papers in the decades since (devoted to defending the accuracy of her original dating). But most importantly, that (3) those datings were not of the artifacts itself, but of the volcanic material overlaying and intermingling it, where potential

contamination is possible (thus falling into the same area of gray area of interpretation as the KBS Tuff controversy noted in chapter three). See Frank Steiger's discussion of this episode in his review of MOM at Talk.Origins (it was Steiger's piece which prompted the wrath of producer Cote's rejoinder).

³⁹² As to how careful real paleontologists are in identifying problematic fossils, the personal cases described by Niles Eldredge, "The Elusive Eureka," in Eldredge (1987, 133-136), McMenamin (1998, 47-59) and Conway Morris (1998, 53-60) are illustrative. One of Conway Morris' examples was his own mistake in interpreting the Cambrian arthropod *Hallucigenia*. The name reflected an oddity of its preservation in the Burgess Shale: the specimen showed paired spines on one side of the animal, and a row of tentacles dangling from the other. Although it looked like a strange hallucination, the Burgess example seemed to be an animal that got around on its spiny legs while feeding with the tentacles along the top. Only later on, when new Chinese specimens were found in the Chengjiang *Lagerstätte*, did it become clear that *Hallucigenia* had paired tentacles, and thus Conway Morris had got the animal upside-down. Thus inverted, the tentacles were its likely legs, with dorsal protective spines. At his 1998 Whitworth "Creation Week" lecture (re note 69, chapter two) Paul Chien tossed off an aside suggesting that Conway Morris' error was due to incompetence rather than an understandable goof based on the information available at the time. Chien did not mention the limited leg view of the Burgess specimen.

³⁹³ The ecumenical inclusion of Baugh *et al.* made the show seem like a stalking horse for Biblical creationism, of course, when he was only on hand as a temporary prop to support the *Forbidden Archaeology* version of the Antiquity of Man. Which was appropriately ironic, since such selective use of Baugh's Paluxy tracks was only the sort of apologetic maneuver creationists had been practicing for years. MOM as aired made no mention of Cremo & Thompson's Hare Krishna religious affiliation—but when Ken Ham found out, he was not amused, Pennock (1999, 220-221). With the Noah's Flood act thus denied first (and exclusive) billing, Ham was just as affronted as skeptic Gerald Larue had been with his experience as a talking head on "Ancient Secrets of the Bible" (re chapter three on Jammal's teriyaki flavored Ark timbers).

³⁹⁴ Tracking down some of MOM's more obscure witnesses exposed further illuminating citation trails. Consider "meso-American archaeologist" Neil Steede, opining that Tiahuanaco in the Andes had to be 12,000 years old instead of a contemporary of Byzantine Constantinople, as conventional dating would have it. Residing on Lake Titicaca, the largest freshwater body in the region, Tiahuanaco was uniquely positioned to benefit during the disastrous climate blip (occasioned by the Sumatran volcanic eruption, re note 197 above) that crippled its coastal neighbors in drought, Keys (1999, 227-234). All the while that a lot of legitimate archaeology was going on here, as reflected in Morell (2002a), Steede orbited a different tradition, summed up by Nigel Davies (1979, 178) a generation ago: "Writers who seek bizarre explanations of America's past are drawn to Tiahuanaco as bees to honey." Such honey oozed from a June 2001 TLC special ("Atlantis in the Andes"). A glimpse of the "unbiased" Steede at work (online at viewzone.com) concerns "pre-Columbian" pots featuring dinosaurs like *Triceratops*. Though Steede found a living artist churning these things out, he considered their quality inferior to the supposed originals (and lacking the "black varnish or patina" that attested to the antiquity of the genuine ones). ViewZone is a grab bag devoted to "A look at life from different angles." One angle recommends turning yourself on with Neil Slade's "BRAIN MAGIC!" Others parallel the interests of Vine Deloria, like Hopi prophecies or whether there were "Ancient Celts in Oklahoma." And then there's the heroic resuscitation applied to the preposterous "Philadelphia Experiment" (where the U.S. Navy supposedly invented a dangerous invisibility field during World War Two). The Philadelphia Experiment myth stemmed from the Allende letters hoax, which scientist and UFO buff Morris K. Jessup credulously lapped up back in the 1950s, Story (1980a, 24-28; 1980b, 11-13). Incidentally, Barrett (2001, 6) noted that L. Sprague de Camp, Isaac Asimov and Robert Heinlein all were doing war work at the Philadelphia Navy Yard at just the time the Experiment supposedly took place. Now there was a trio of inveterately curious chaps who, one might conjecture, could not possibly have failed to have noticed odd goings on there (had anything odd actually been going on there).

³⁹⁵ Hancock, who resembles a more gracious edition of Richard Dawkins (!), started out as a journalist plying the African beat for the *Economist*, turning out books on social themes like the AIDS epidemic and Ethiopian famines. Then Hancock (1992) took on the Ark of the Covenant (which he suspects is tucked away in an Ethiopian shrine). Around this time Bauval & Gilbert (1994) argued that the pyramids were laid out to illustrate the three stars visible in Orion, a constellation figuring prominently in the Osiris legend (as well as locating the throne of God for Robert Gentry, re note 287, chapter three). But it is their re-dating of the Sphinx that captures much of the controversy, and hauls in another character: turn of the century Alsatian philosopher and Egyptian buff, Schwaller de Lubicz. His idea was that Egyptian civilization had been founded 30,000 years ago, building on a legacy of Atlantean Sacred Science. Schwaller de Lubicz also decided that erosion on the Sphinx was actually due to water, not wind, and had taken place much earlier than conventional Egyptology would have it, John Anthony West (1993, 184-232). West figured in the MOM presentation and Hancock & Bauval (1996, 9-10), and through him Schwaller de Lubicz intersects New Age “scientific” astrology, as in West & Toonder (1970, 275-281). Back to the Sphinx: geologist Robert M. Schoch subsequently became convinced at the site that West and Schwaller de Lubicz had been right, though modifying the medium to actual rain erosion. Debate over the Sphinx and pyramids has its nemesis: Mark Lehner, who started out a follower of Edgar Cayce, but ended up seduced by the more interesting reality of contemporary Egyptology in the course of obtaining a degree in that discipline, to the chagrin of Hancock & Bauval (1996, 14-22). Cf. Lehner (1997, 107, 127-132). As for Schoch, he figures also as a more skeptical witness concerning the likely geological origins of the cyclopean submerged Yonugani “terrace” at Iseki Point in Japan, recounted in Hancock (2002, 596-625)—which concerns in turn the BBC *Horizon* fracas per note 402 below. Cf. Shinn (2004) on the Bimini beachrock mistaken for submerged Atlantean paving by Peter Tompkins and others.

³⁹⁶ With Hancock & Bauval (1996) the threads of the grand view started coming together, gathering along the way a body of MOM habitués like Childress, Rand Flem-Ath (“co-author *When the Sky Fell*” according to MOM), and Steede, showing up in Hancock (1998, 207, 209-211, 305-307). The idea that the Great Pyramid might have been built by the locals as part of a tradition of supplying semi-divine monarchs with a suitably splashy tomb has never set well with Lost Civilization groupies (cf. notes 100 & 181, chapter three, on the similar creationist views). A sampling of uninformed opinion: Braghine (1940, 235-236), von Däniken (1970a, 79; 1973b, 52), Drake (1973, 145; 1974, 73), Landsburg & Landsburg (1975, 61), Mooney (1975, 253-255), Berlitz (1981, 19-20), and Warren Smith (1975, 7)—Smith liberally recycled his arguments under pen names, notably “Eric Norman,” Story (1976, 134). Of interest is Edgar Cayce (1972, 142-143, 150, 153), who attributed the Great Pyramid to between 10,490 and 10,390 BC, cozily adjacent to the magic date of Hancock *et al.* Hancock & Bauval (1996, 101-108) and Hancock (1998, 103) do hint at problems with dating the Great Pyramid to Khufu. But all this ought to have been a dead letter, since even the mystery-friendly Tompkins (1971, 59-69) covered the evidence clinching the Khufu identification. During the late 1830s an addled British amateur Egyptologist and martinet by the name of Richard Howard-Vyse grew so certain there were hidden chambers in the Great Pyramid that he started blasting into the walls. He inadvertently discovered a series of spaces above the “King’s Chamber” (there purely as a way to minimize load, since the roofs of earlier pyramids had cracked under the weight of the stones above). Inside one of those relieving chambers, unseen from the day it was painted to when Howard-Vyse copied it down for translation, was a quarry mark indicating the stone had been prepped during Khufu’s reign (the block was plopped into place with the cartouche upside-down). Cf. Peter White (1974, 47-50) and Lehner (1997, 111, 114) on the practice of quarry marking.

³⁹⁷ The Lost Civilization argument includes the claim that the temples of the Angkor complex in Cambodia (which date primarily to the 12th century AD peak of their civilization) were laid out as a ground analog of the constellation Draco as precisely observed back in (you guessed it) 10,500 BC. Draco is not a particularly bright constellation, but figures in many cultures as a threatening monster circling the pole (due to the earth’s axial wobble, back around 3000 BC the Pole Star was not Polaris but α -Draconis). See Ridpath (1988, 64-65) and Staal (1988, 237-240) for the

mythological background. You can map the temples to match the western version of the constellation in a Draco-shaped way, as Hancock (1998, 124, 126-127, 169) did—but the configuration matches the arrangement of cities in medieval Southeast Asia about as well, *Past Worlds* (1988, 258-259), leaving open the prospect that Rorschach blot data selection is going on. The pseudoscientific tendency to escalate the argument showed up when Hancock, Childress, Berlitz *et al.* appeared on “Atlantis: In Search of a Lost Continent” (hosted by Richard Crenna, it originally aired on CBS but TLC replayed it as recently as June 2000). That show insisted the “legendary” city of Angkor Wat had been discovered through orbital photos taken from the space shuttle! Which would mean my dated *World Book Encyclopedia* must have employed a time machine when they wrote about Angkor in 1958 (let alone the 1933 script of *King Kong* that referred to it). More to the point, substantive French excavations had been carried out there in the 1920s, when Cambodia was part of colonial French Indochina. The stunning monuments were threatened during the 1970s by the homicidal Khmer Rouge phase of their troubled recent history.³⁹⁸ Recall note 210, chapter three, on the Turkish volcano Hasan Dag from the same period as Hancock’s Lost Civilization. In the TLC show, aired as recently as February 2001, Hancock took similar liberties with Teotihuacan in Mexico, which was at its peak around the 7th century AD, Stuart (1995). Hancock declared that, “The base length of the Pyramid of the Sun here is *identical* to that of the Great Pyramid of Egypt. And yet we’re told that these two cultures had no contact.” (My italics, reflecting Hancock’s emphasis in the narration.) As stylistically distinct as the Chrysler Building is from Chartres Cathedral (built less than a thousand years apart), the two pyramids utilized entirely different construction techniques and esthetic proportions. Khufu’s sheer-sided pyramid is 756 ft (230 m) on the side, Lehner (1997, 108). Erected some 3000 years later, the “identical” Pyramid of the Sun is a shallower step pyramid, with a slightly rectangular perimeter: 738 x 728 ft (225 x 222 m), Daniel Lévine & Isabelle Tisserand-Gadan, “Teotihuacan: The City of the Gods,” in Forte & Siliotti (1997, 247). Thanks to Hancock, though, we now know that 728 (or 738) “=” 756.

³⁹⁹ Heston’s allusion to “ancient maps” concerns charts showing real estate that they supposedly shouldn’t. Most prominent is the Piri Re’is map of 1513 (Re’is means Admiral in Turkish, his full name being Piri Ibn Haji Memmed); compiled from earlier portolano charts, it shows a full coastline for South America before that continent had been properly explored. The Oronteus Finaeus world map of 1531 includes the then-undiscovered southern continent of Antarctica, ice free and with navigable rivers. Neither map is really all that close a match, though—even Hapgood (1966, 5-98) conceded that swaths of coastline were either removed or duplicated on the Piri Re’is, and the orientation of Finaeus’ “Antarctica” required a lot of tweaking to fit. There was a distinct cartographic prejudice in favor of a southern landmass to fill the unexplored polar ocean, so the issue turns on how closely any fractal sketch might accidentally match the real situation (especially if you were willing to rotate it to fit). Certainly, pinning a whole advanced civilization on this slim evidence, as Hapgood and his followers tried to do, seems premature. Hapgood’s earth slippage theories (re note 154, chapter three) also played a part in MOM and the Lost Civilization debate. Hapgood (1970) thought the polar icecaps could slide and realign the earth’s axis. Hancock (1998, 209-211) played off Rand Flem-Ath drawing on Kirschvink *et al.* (1997) for an updated argument (which indicates how careful scientists like Kirschvink need to be in watching their scholarly back)—cf. Brass (2002) and note 64, chapter two. Hancock (2002, 272-274, 302-306, 486-487, 508-510, 541-543, 634-639) is only somewhat more circumspect in his coverage of Hapgood, Piri Re’is and other early maps whose amazing accuracy appears chiefly in the eye of the beholder. Cf. the discussion of the 1739 Buache map of “Antarctica” at europeanhistory.about.com/library/weekly/aa030301a.htm. The Piri Re’is map intersects YEC via Erich von Fange (rae.org/ch01tud.html), but its citation history stretches much farther in UFO circles, as a sign of orbiting alien surveyors. See Keyhole (1960, 212-214; 1973, 231-232), Charroux (1971a, 16-18), Berlitz & Valentine (1974, 164), Kolosimo (1975, 252), Mooney (1975, 145-146) and Berlitz (1981, 139-141) ... or Joseph Goodavage (1973a, 70). Which brings further pseudoscientific connections, from Goodavage (1967; 1968) on astrology to Goodavage (1973b) hyping the potential catastrophic threat of comet *Kohoutek* (which glided past the earth

innocuously in 1975). On the other hand, Goodavage (1973a, 68) affirmed that “the Universe we know is *teleological* (has a purpose) in that everything operates within predictable laws.” Though I doubt whether Goodavage’s brand of teleology is likely to make Phillip Johnson especially happy (cf. note 223 above).

⁴⁰⁰ Besides Milton (re note 52 above), Laura Lee’s website sported Michael Cremo on “Rethinking Human Origins.” David Childress expounded on the acoustic levitation of Tibetan monks (Lee herself reported on her party levitation experiments). Rand Flem-Ath waxed forth on Atlantis in Antarctica, while Graham Hancock and John Anthony West respectively dealt with re-dating and finding secret buried chambers beneath the Sphinx. Append a hodgepodge soapbox for New Age beliefs: UFO researchers, John Hogue’s Nostradamus prophecies, Uri Geller’s Mind Power, astronaut Edgar Mitchell’s Noetic Science, von Däniken’s ancient astronauts, a smattering of Velikovsky supporters, Michael Drosnin’s Bible codes ... and, oh yes, a nice link to Michael Behe’s *Darwin’s Black Box*.

⁴⁰¹ A peripheral (albeit posthumous) scholarly player here is Giorgio de Santillana’s *Hamlet’s Mill*, which figures in Hancock (1998, 51-53, 184, 189-190). De Santillana & von Dechend (1969) presented a fascinating circumstantial case that ancient astrologer/astronomers had a conniption when they discovered the immutable heavens *moved* via the precession of the equinoxes. In their view, this horrible secret and the numerical values associated with it (such as cycles of 72) were subsequently encoded in a variety of religious traditions (usually known only to the initiate, provided they were suitably prepared to avoid psychological trauma). And while we’re on the subject of initiates and trauma ... Robert Bauval returns us to the world of Cremo & Thompson via Prabhupāda’s book and CD-ROM set on Vedic cosmology (“Mysteries of the Sacred Universe”) advertised at krishna.com. Bauval praised this as a “Gripping, scholarly, and groundbreaking” work that “deserves to be widely read and discussed.” (Cf. note 85 above on the Apollo moon landing.) Should Theistic Realism ever reach the point where it feels obliged to compile a Recommended Reading list for educational purposes, perhaps Bauval might compare notes with Phillip Johnson on what Vedic resources might be included. Don’t hold your breath.

⁴⁰² Besides the conservative JCLU defending creationist science teachers (more on that in the last chapter) and local school board activists, there is also Graham Hancock to consider. Unlike the TLC joint effort with independent British producers, Hancock has had a more prickly experience with the BBC, which has tended to resist dabbling in fringe topics like creationism, as noted by Numbers (1992, 329-330). When a BBC *Horizon* episode edited Hancock’s remarks more than he considered to his liking, he successfully appealed to their national broadcast standards board, which mandated a revised rebroadcast (details at “The Official Graham Hancock Website” @ grahamhancock.com). independent.co.uk/news/UK/Media/2000-11/horizon091100.shtml has another take on this affair.

⁴⁰³ Ironically, the comparative disinterest in Red Creationism in media treatments of the creation/evolution debate (both pro and con) is a measure of the peripheral status of Indians in American culture generally. And while Phillip Johnson was capable of lending an endorsement to Hare Krishna’s Cremo & Thompson (if only for tactical purposes), the stridently anti-Christian views of Deloria (1995, 21-22) probably won’t get him any back cover blurb from the ID quarter any time soon. For example: “Religion, in any usual meaning of the term, ceased to exist in America long ago.” And that is because “Christianity has been the curse of all cultures into which it has intruded.” Indeed, “Christianity was not designed to explain anything about this planet or the meaning of human life.”

⁴⁰⁴ David Hurst Thomas (1999, 206-208) briefly surveyed Red Creationism’s tenets. These include objections to radiocarbon dating, opposition to the Bering Strait migration (covered below) and the belief in dinosaur and mammoth survival (discussed in the last chapter). Thornton (1999, 149-154) minced no words as he characterized *Red Earth, White Lies* as “a work of astonishing incoherence and zany racism.” Shermer & Grobman (2000, 243-244) related Deloria’s views to the larger question of how revisionism can slide into pseudoscientific extremism when not grounded on a sound method. In this regard, one may recall notes 86 & 155 (chapter three) and note 261 (chapter four) on Deloria’s view of dinosaur paleontology, plate tectonics, and contemporary physics.

⁴⁰⁵ Deloria (1999, xiv). See notes 153 & 285 (chapter three) on Deloria re Velikovsky, and note 263 (chapter four) for the genesis of Johnson's antievolutionism.

⁴⁰⁶ The 1994 revision of *God is Red*, "The Concept of History," in Deloria (1999, 302) was indicative of how little his resource base had changed in the intervening years. Besides extolling Velikovsky, Deloria drew on the dated *Secrets of the Great Pyramid* lore of Peter Tompkins and pre-Columbian Phoenician voyages defended by Cyrus Gordon in *Before Columbus*. Tompkins (1971; 1976) were profusely illustrated and interesting reads on the Giza and Mesoamerican pyramids respectively, but a lot of Nile water has flowed over the Aswan High Dam in the decades since to clarify some of the traditional puzzles. For example, Deloria continued to think in terms of the difficulty of ferrying a couple million limestone blocks across the Nile for the Great Pyramid, when subsequent Egyptology had established that most were quarried on site, right by the work crew's village. These were long obscured because they ended up getting filled in by the sand used for the construction ramps. This newer archaeology is reflected in Lehner (1997, 230-232) on "Pyramid Towns" or Morell (2001). Gordon (1962; 1971; 1974) likewise were thought-provoking works, ranging from the common roots of Greek and Hebrew culture (which Gordon attributed to Sargon's Akkadian empire of the 24th century BC) to defending the authenticity of a "Phoenician" inscription found in Brazil which critics considered a 19th century hoax. The scholarly debates readily turned on minutiae sufficient to daunt all but the stout of heart, as evidenced by Gordon (1968a-c) *contra* Cross (1968). See also the general review by Padden (1973).

⁴⁰⁷ Deloria's Foreword to David Hurst Thomas (1999, xvi). This may be compared to the casual remarks of Johnson (note 22, Introduction) or Behe (note 107, chapter one) on the claims and methodology of Young Earth creationism.

⁴⁰⁸ Reprinting a 1992 article on "Ethnoscience and Indian Realities," Deloria (1999, 63-71) contrasted those "Indian realities" with conventional science as resolutely as Johnson's Wedge does TR and MN. If scientific findings confirm Indian teachings, such as "controlled fires to ensure the fertility of forests," that is OK ... "from an Indian perspective, it is mere child's play. It is information that traditional people expected youngsters to acquire as a matter of course." Cf. Thornton (1999, 170) on Indian forest management. But Deloria goes beyond only seeing validation of tradition as an option. Deloria (1999, 70-71) carries some cliché methodological baggage along with it: "Within the Western scientific framework, according to which the natural world is lacking intelligence and personality, it would be exceedingly difficult, if not impossible, to discover these kinds of relationships. The idea that nature is mindless and insensate would have precluded the scientist from observing the proper kinds of behavior and drawing the obvious conclusions." His example was that Indians had spotted a certain beetle species whose "antennae always point to the nearest buffalo herd." Deloria offered no citations for this, so we don't know how rhetorical it was. Besides this "Rupert Sheldrake" streak to the metaphysics of Red Creationism, the fact is that conventional scientific observers are by no means prevented from spotting even subtle discernment of signs in nature by indigenous peoples—such as the examples noted from the very bowels of materialist evolutionary psychology by Alcock (2001, 83-85).

⁴⁰⁹ Deloria (1999, xiv). "Anthro" is Deloria's consistent abbreviation for anthropologists, whose discipline Deloria disparages as unhesitatingly as Johnson does paleontology (e.g. Gingerich on whale intermediates, re note 50 of chapter four). See Deloria (1995, 81-107) for his main criticisms, which relied mainly on archaeological data from the 1960s. Red Creationism is not alone in rejecting a non-canonical history: Windschuttle (1996, 273-274) notes some Australian aboriginal activists similarly oppose the mainland source for their ancestors (cf. note 412 below).

⁴¹⁰ Our recurring character mtDNA suggests Asiatic migration during the most recent glacial window open in the Alaskan-Siberian "Beringia" (13,000-25,000 ybp)—but *not* so early as the previous gateway (38,000-50,000 ybp), Sykes (2001, 279-282). Cavalli-Sforza & Cavalli-Sforza (1993, 122-123) and Schurr (2000) generally concur, putting the first arrivals well before the last glacial maximum 18,000 years ago. Y chromosome data tend to confirm that, though adding the wrinkle of several fairly tight waves of migration, Hurtado de Mendoza & Braginski (1999), with central Asia as the primary ancestral region. There appears to be a common paternal ancestor 20,000 years ago for 85% of South American Indians and almost half of North Americans, though

with very wide error margins (13,700-58,700 ybp). See also Roger Lewin (1997, 193-195) and David Hurst Thomas (1999, 172-173) on some 22,000-29,000 ybp DNA dating for the pre-Clovis people. Linguistic analyses (such as those done by Joseph Greenberg) are more problematic, however, as noted by David Hurst Thomas (1999, 171-172). Cf. McWhorter (2001, 287-303) on the difficulties attending another of Greenberg's efforts at linguistic archaeology: reconstructing the vocabulary and grammar of the Proto-Indo-European language group, and Diamond & Bellwood (2003) on early farming expansion.

⁴¹¹ "Clovis" refers to a distinctive arrowhead style, as illustrated by Parfit (2000, 46-47).

Haddingham (1984, 88-90), Roger Lewin (1988, 158-167) and *Past Worlds* (1988, 70-71) variously reflect an openness to various waves of immigration going back as far as 40-45 thousand years ago, with the whole process taking 15,000 years or more. Specific tool technologies known in Siberia 30,000 years ago are not known from the Alaskan side until 15,000 years later, but this may be due to the vagaries of preservation. South American habitation is possible by 30,000 years ago, perhaps involving a pre-Clovis hunter-gatherer people—which certainly gives a long time to settle down and to start thinking you'd always been there (for comparison, all recorded history barely takes us back a fifth of that). Cf. also Brace *et al.* (2001) on the evidence relating to the early stages of Asiatic migration to the Americas. Recent archaeological data are summarized by Roger Lewin (1997, 196-198), Roosevelt (2000), Nemecek (2000), Parfit (2000) and Dalton (2003). Parfit's *National Geographic* piece includes a map insert expanding on the article's text map (pp. 46-47) showing possible migration routes, including more problematic European and trans-Pacific crossings. For complementary illustrations, compare the various maps of migration routes and dates in Roger Lewin (1988, 158), Garrett (1988, 436), Dunbar & Barrett (2000, 221), Roosevelt (2000, 77), Nemecek (2000, 82-83), and Eliot Marshall (2001a). Erickson (2000, 225) and Eliot Marshall (2001b) focus on sea and ice corridor levels. David Hurst Thomas (1999, 157-169) describes the continuing saga of the Monte Verde controversy, concerning Thomas Dillehay and his dating of the site at 14,700 years old (quite early for Clovis settlements, being clear at the tip of South America) and how this may relate to coastal migration using boats. As usual, conflicting personalities and institutional turf wars played a part in the squabble. Cf. Nemecek (2000, 84-87), Parfit (2000, 48-52) and Olson (2002, 196-206).

⁴¹² The idea of coastal migrations playing a part in the settlement of the Americas has grown consistently more attractive in anthropological circles over the last decade because exactly that is known to have occurred during the peopling of Australia some 50,000 years ago. Even with lowered sea levels, there was still a strait of open water 80 miles wide to cross between the islands of Bali and Lombok in central Indonesia. This reflects a quite abrupt transition across "Wallace's Line" in "Wallacea"—so dubbed in honor of Alfred Wallace, who first noticed the faunal divide, Edey & Johanson (1989, 75-76) or Shipman (2001, 61-64, 81). For relevant global sea level maps, see Putman (1988, 446-447), Roger Lewin (1988, 160) or Göran Burenhult, "Towards New Continents," & J. Peter White, "The First New World," in Burenhult & Thomas (1993, 130, 149-150, 153, 160, 172).

⁴¹³ As we'll see in the final chapter, part of Deloria's recalcitrance here turns on a *Kulturkampf* mentality comparable to that offered by conservative Christian creationists. Cf. MacKenzie (2000, 38): "In New Zealand, creationists have gone from zero to a twentieth of the population in the past 27 years after a visit by Henry Morris. Most believers are Maoris and Pacific islanders, with a taste for rejecting the scientific culture they associate with the colonisers."

⁴¹⁴ Deloria (1995, 251). Cf. Indian awareness of the Spokane Flood (re note 103, chapter three) and Vitaliano (1973, 123-125) or David Hurst Thomas (1999, 248-251) on the possible tradition of the eruption of Mt. Mazama (Crater Lake) in Oregon 6500 years ago. Not every Indian myth rests on ageless stability—the Pueblo talk of coming from somewhere in the earth, followed by perpetual wandering. Fagan (1999, 160-167) related this to the long term success of the regional culture in a diverse and demanding environment—unlike those smug centralized regimes of the pre-Inca Andes that were completely obliterated following severe El Niño events. Farming penetrated the American southwest around 1000 AD, during that warm phase which in Europe furthered Norse exploration and a surge of Christian cathedral building. The Chaco Canyon Anasazi slipped on bad

timing, reaching their population carrying capacity in the 12th century just when a cycle of great droughts set in to upset their irrigation-dependent society. See Cheek (1994) or David Roberts (1996) for introductions to the Anasazi and related cultures, and Daniel Lévine & Isabelle Tisserand-Gadan, "Pueblo Bonito and the Anasazi," in Forte & Siliotti (1997, 240-241) for a reconstruction of the Chaco Canyon ceremonial complex at its zenith.

⁴¹⁵ David Hurst Thomas (1999, 251). Deloria operates under as narrow a set of ideological calipers as any in the Creation Science camp. David Hurst Thomas (1999, 252, 256-257) noted Deloria's fury at other Indian scholars who do not see things precisely his way. For example, accusing Roger C. Echo-Hawk of "sucking up" to archaeologists by taking a cautious approach to Indian oral traditions, and castigating N. Scott Momaday (the first Indian Pulitzer winner) for accepting an Asiatic origin. The Smithsonian is not high on Deloria's scorecard, either. Deloria (1995, 77): "in matters that deal with anthropology, and especially pre-Columbian America, the Smithsonian is more often wrong than Immanuel Kant was punctual." Examples of Smithsonian lapses eluded Deloria's source citations, apart from a glancing shot at Aleš Hrdlicka, who a hundred years ago clung to a very recent date for man's arrival in America. For irony, cf. Roger Lewin (1988, 159) on this point—published by the Smithsonian!

⁴¹⁶ Of course, why only Christian or Native American creation myths would get a hearing remains to be seen. Shermer (1997, 129-130), Avise (1998, 24-26) and Pennock (1999, 345-350) variously catalog some of the alternatives. And let's not overlook Graham Hancock's syncretic mythology. Far as we may be from "that golden age" he has chronicled, Hancock (1998, 198) offers a new messianism: "As in 10,500 BC, in other words, the time-keepers of the sky, who stand at the gates of immortality, are poised to go into reverse again. Any initiate steeped in the Hermetic dictum 'as above so below' would be bound to interpret this configuration as a sign that some great change is imminent—a change that could be for the better, or greatly for the worse, depending on humanity's own choices and behaviour." Let Henry Morris and Phillip Johnson arm wrestle over that one.