Troubles in Paradise "In the Beginning" James Downard
1.3 • Quote Mining and the Case of Punctuated Equilibrium (Updated 6 August 2017)

1.3 Section 1—Parasitical authority quoting, the crack addiction of sloppy secondary "scholarship".

For all the reasons previously outlined, those called upon to actively defend the hard-won scientific position are not always sufficiently skilled in the rhetorical techniques necessary to make their case clearly to a public already suspicious of them. A dandy example of this occurred just as I began work on *Troubles in Paradise*.

In April 1998 a new science education guideline on the teaching of evolution was being proposed by the *National Academy of Sciences*, and sparked the by now customary creation/evolution media debate. PBS's *News Hour* duly assembled a quartet of appropriately balanced guests to thrash out the issue, Donald Kennedy (1998). Kennedy represented the *NAS*, countered by someone from Jerry Falwell's Liberty University, while from the "front lines" of high school education came two science teachers. One was a pro-evolution biology instructor, the other an earth science teacher from a Christian high school who expressed at least an open mind towards creationist views (actually a *very* open mind, as it turned out).

What struck me most about their exchange was how quickly the creation advocates launched into certain specific claims, and how slow the evolutionists were to respond. Practically the first words out of the Liberty University spokesman's mouth concerned how the evolutionary paleontologist Stephen Jay Gould (1941-2002) had supposedly admitted to the lack of transitional fossils in the geological record. Likewise the creationist-ready earth science teacher noted how he found it difficult to believe in the evolution of whales because there were no known intermediate forms.

In the study of the debating tactics of creationists, the Gould matter is particularly notorious. Gould most emphatically did *not* believe there were no intermediate forms in the fossil record, as even a casual reading of his monthly columns in *Natural History* magazine would have demonstrated, and was downright annoyed at how often his views were misrepresented by creationists. Gould (1983, 259-260; 2002a, 986-990) showed no reticence in making his views known here, nor did Godfrey (1987) or Ecker (1990, 158-159). Just how many highly specific transitional fossils there are I have touched upon in Downard (2003b; 2004).

Misrepresentation of Gould and his colleague Niles Eldredge by creationists has been rampant, involving around 40% of the instances encountered initially in the "The Quote Mine Project" undertaken at *Talk.Origins Archive* (2005m). The limpet-like tenacity with which evolution critics latch onto such remarks in the first place illustrates something important about what's going on inside their heads. The *American Family Association's* Bryan Fischer (2011f) represents an illustrative nadir here: "Harvard's Stephen Jay Gould said, 'The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology' (Note" 'extreme rarity' is Harvard-speak for 'nada, zilch, zippo.')."

Apart from the trivial goof of typing a quote mark after *Note* instead of the colon (they're on adjacent keys on the standard QWERTY keyboard) the fact remains that for someone like Gould (as big a stickler for terminological precision as ever there was in science) "extreme rarity" meant exactly that: rare but *not* nonexistent. It's hard to get plainer than Gould (1983, 258-260) noted by John Pieret at *Talk.Origins Archive* (2005m): "[T]ransitions are often found in the fossil record. Preserved transitions are not common—and should not be, according to our understanding of evolution (see next section) but they are not entirely wanting, as creationists often claim."

After offering the extensive pre-mammal therapsids and assorted human precursors as explicit examples, Gould concluded: "Transitional forms are generally lacking at the species level, but they are abundant between larger groups." (That "next section" dealt with the Punctuated Equilibrium

explanation for that pattern that is our current topic.) All of which meant that (know it or not) the hectoring Mr. Fischer was on this occasion *bearing false witness*—which Fischer (2014) only compounded when he lazily reprised the piece for Alan Keyes' conservative Catholic *Renew America* with a new date but the same unfounded claim, further abetted when creationist Michael Snyder (2014) reprised Fischer's "nada, zilch, zippo" quote.

Fischer could confuse things this way so easily if he lacked any real concept of **Deep Time** to put the data set that he didn't examine into perspective. Not that it's that hard of a concept to grasp. Most people encounter practical distinctions about rare circumstances in their daily life. While it is "rare" for my yard to have three feet of snow on it (in fact, most of the days go by year after year without that happening, especially in the summertime), my shovel and I are all too aware that *on occasion* (and not even every winter) there has indeed been that much white stuff to rearrange so I can get my car out of the driveway. The inability to distinguish between "rare" and *never* seems so basic a mistake that one can wonder whether such a person could be trusted on anything. Such as a realtor trying to sell me property in Spokane claiming that because three-foot snowfalls were an "extreme rarity" here (true enough) that this meant I would *never* have to worry about shoveling snow ("nada, zilch, zippo"). Even should such people venture a correct opinion now and then, might this only have been due to an inadvertent stumble onto the truth?

That's the methodological implication of Fischer's remark: a diagnostic glimpse into a mind not merely willing to rely on a secondary redaction of someone's belief, but precipitously capable of not even being able to understand what little it is they are claiming to pay attention to. And, by extension, into the minds of anyone who teases their audience with Gould's "trade secret" quote as though it meant what they imagined it did. This can run the gamut from legislative proposals (Timothy Macko put it into his New Mexico **House Bill 1321** in 1997) all the way up the apologetic food chain to Phillip Johnson repeating it when lecturing in that state in 2001, reported by David E. Thomas (1997a; 2001) following the New Mexico antievolutionary scene.

But more fundamentally: who should care what Stephen Jay Gould or any other person (scientist or otherwise) thinks about a matter? The pertinent question should be what are the *facts*? If a scientist ventures an opinion, that is relevant to assessing their expertise or conclusions, but not as an excuse to bypass whatever data there might be underlying the statement in the first place. So why bother with the authority quote when you can just go to the information? That is, unless you don't actually know any of the information, because all you have ever read *are the authority quotes*. Thus the persistence of quote mining in the creationist debate—a venerable practice dating back at least to the early 1880s regarding pro-evolution physicist John Tyndall (1820-1893), Michael Barton (2010)—tells us far more about the mindset of the apologist than it ever could about what is or isn't found in the fossil record.

Because most current antievolutionists come from a conservative Christian background, their propensity for quote mining comes quite naturally to them, as the technique of defending doctrine by "proof text" is a long-standing practice of apologetics. The invocation of "As Isaiah saith…." for a Bible believer primes them to do the same thing when they put on their antievolution hat: "Thus spake Stephen Jay Gould." For a believer, any seeming admission "out of their own mouths" is too tempting to resist, no matter how superficial and misleading the addictive practice may be from a methodological standpoint. Consequently there is a sizable antievolutionist literature (particularly among Young Earth creationists) devoted entirely to compiling—or more accurately, *repeating*—those scientific quotations deemed to undermine the credibility of evolutionary theory.

The practice is certainly not new—William Williams (1925) and Leander Pickett (1926) resorted to little else, Glenn Branch (2015l-n; 2016f-g), including Williams dutifully copying a quote along with the misspelled name of the author, as Branch tracked down. Representative wordy examples of more recent creationist "saturation quotation" are Morris & Parker (1987, 2-26), Gish (1993a, 367-386), Ankerberg & Weldon (1994) and Bert Thompson (1995, 11-87). Whole books appear in this mode, from

the two-volume Wendell Bird (1989) to the apologetics of Vance Ferrell (2001; 2006f). The idea that a secondary quote is not the same as the facts about which the quote is directed simply never occurs to them.

Not surprisingly, so disingenuous but popular an approach to "evidence" readily spills over into antievolutionary apologetics on the Internet. Whole websites consist of nothing but strings of well-worn authority quotes, such as Warren Johns (2014) at the *Genesis File.* Repetitive usage is rampant, such as the frenzy of on-the-same-day web posting by California creationist Bill Morgan (2005m) deploying several pages of "Actual Quotes by Evolutionists"—and the same again as "Amazing Quotes By Evolutionists," Morgan (2005s). At least he gave a nod to the secondary source from which he vacuumed them (Henry Morris), but others are not so fussy. The tendency runs from the local, such as *Northwest Creation Network* (2011), to the international, like David Loughran (1996) in Scotland.

Politics enters the fray via the *Conservapedia* website (at conservapedia.com). Founded in 2006 by Andy Schlafly, son of conservative icon Phyllis Schlafly (1924-2016), as an alternative to the supposedly left-leaning *Wikipedia*, *Conservapedia* routinely recycles quote-mined nuggets in its many creationist entries—giving an unintended irony to their definition of "accuracy" in *Conservapedia* (2013n) as "conservatives strive for accuracy, while many liberals are masters of deceit." The inappropriately named lobbying group *Texans for Better Science Education* (2012c) is also prone to quote mongering, though arguably the Mount Everest of apologetic rehashing lies in Turkey with the venerable Harun Yahya (2008c)—no less confident of his Islamic veritas, of course, than Morgan, Loughran or Schlafly are for their Christian ones.

Once your scholarly eye is attuned to the practice, parasitical quote mining can be spotted in many ways, from telltale spelling errors copied from one to the next to the sporadic absence of relevant details, such as the lack of dates for many of the quotes shoveled out by Jay Seegert (2013f) at his *Creation Education Center* in Wisconsin. Quote-plucking also runs the risk of being unaware of the provenance of the statement or the background of its author. Thus the ostensibly *Intelligent Design Idea Center* (2011) effortlessly glommed onto a quote on mammal evolution secondarily from Young Earth Creationist Duane Gish (1995, 155-157). As we'll see, Gish is a master of manipulative citation, invariably neglecting to mention any contrary evidence when he offers up a creation-spun text, so anyone relying on him for ammunition was repeating Gish's defects without even realizing it. Authority quoting minus any connecting data continued in *Idea Center* (2015a-h).

Another example occurred in Texas when the YEC creationist dentist turned education activist, Don McLeroy, became chairman of the Texas school textbook board, Beil (2008). As documented by Kansas biology teacher Jeremy Mohn (2009a-b), in his campaign to undercut evolution in Texas schools McLeroy (2009a) compiled a handout of what he thought constituted incriminating evidence against evolution, but which simply consisted of a flurry of out of context snippets gathered from a quote mining website *Genesis Park* (2009; 2011a-ae), including material which *Genesis Park* had in turn lifted secondarily from a cherry-picking review of (guess who!) Stephen Jay Gould (2002a) in an *Answers in Genesis* article, Moeller (2004). Mohn had been able to track down and confirm this particular scholarly daisy chain because Moeller had made a telltale typographical error regarding the page number in a quote culled from Gould, which *Genesis Park* (2009) duly copied, as did the final parasitical destination of McLeroy. (McLeroy's pedagogical hijinks will be encountered again later in section **1.7**.)

Since it is the very idea of apologetic quote mongering that is at methodological issue, though, it is interesting to compare the blithe Bert Thompson (1998) or *Think & Believe* (1990d) enthusiastically endorsing the practice, compared to Sean Pitman (2004d) the unrecovered quote-addict who salved his qualms by strongly recommending the responses at the Talk Origins Archive (*talkorigins.org*) and cautioning that the examples should "only be used as occasion for further review" before plowing ahead with 50 pages of the favored claims, all devoid of any explanatory context.

The attraction of secondary quotation as a surrogate for sources is understandably strong, and all the more so for dedicated Internet dilettantes, where brevity all too easily dislodges space-hogging context. Thus Julie Haberle defends her use of authority quotes on the website she runs with her husband, *Who Is Your Creator*, as well as on the antievolution billboards she has put up around Minnesota, Myers (2007h) and Florien (2009).

Completely lost in such a shuffle are the facts that ought to be the focus of all the attention. The moment you actually start paying attention to those niggling details, though, you can see (a) how challenging it is for science defenders to get traction in this area with evolution skeptics, and (b) start getting a sense on where the problem lies as to how antievolutionists get to be (and resolutely stay) so fuddled up.

In the Gould case it was the matter of identifying transitional fossils and assessing the rate and dynamics of evolutionary change. Examples of this were covered concerning many specific cases in Downard (2003b, 2004), especially regarding the inability of creationists to get a grip on the specifics of their purportedly created "kinds." But here it is relevant to note what Gould's discussion of the "absence" of transitional forms was about: the *pace* of evolutionary change as detectable in an inevitably incomplete fossil context, not its *occurrence* when all the available data are brought to bear (from forms both living and extinct).

The inherent problem facing paleontologists is that the apparent rate of speciation (also known as *cladogenesis*) seen in living forms, while pretty darned slow when studied by a field researcher tracking down individual variations in the wild, is still blindingly fast when it comes to how likely it is for any particularly visible change in bones to be trapped by the sporadic process of fossilization. Charles Darwin (1809-1882) grasped the essential problem in Chapter IX of *Origin of Species*, and while there has been a lot of paleontological work since to fill in many of the gaps known in 1859, the speciation versus preservation issue remains a critical one to grasp when dealing with any particular slice of geological time. As Gould (1980b, 184) himself put it: "In describing the speciation of peripheral isolates as very rapid, I speak as a geologist. The process may take hundreds, even thousands of years; you might see nothing if you stared at speciating bees on a tree for your entire lifetime."

Or Eldredge & Tattersall (1982, 59): "Speciation can occur very quickly. In perhaps a few hundred years, new reproductively isolated species can form." Indeed, some speciating wild sunflower hybrids appear to have pulled this off in only 60 generations, Ungerer et al. (1998). But the process can be far less frisky, as when Eldredge (1995, 99) reminded that his ballpark bracket of "five to fifty thousand years" was "consistent with some of the events we believed we had some direct data on from our own studies." Eldredge's fossil focus are trilobites (where his own doctoral dissertation on trilobites had initiated the Punctuated Equilibrium concept in the first place, remember), but for mammals, "speciation has typically required one hundred thousand to a few hundred thousand years," Lister (2004, 221). Throw the far more abundant birds into the mix and the average rates for warm-blooded critters looks even slower: "speciation in birds and mammals generally takes about 2 Myr (million years)," Futuyma (2004, 30).

On this matter of scale, critic of YEC Frank Sonleitner (1987, 26) dryly reminded that "Fifty thousand years may be an 'instant' in the geological record, but in human terms it is a *very long* time. In creationist terms, it is *five times* the age of the universe!" And 2 million years is considerably longer, of course.

While creationists get bogged down on the pacing issue, they get even more muddled if they try to move on to what Gould and other advocates were talking about when they proposed an explanation for why species transitions weren't being detected very often in their fossil data: *Punctuated Equilibrium* (Punk-Eek or P-E for short).

Paleontologist George Gaylord Simpson (1902-1984) had laid out much of the fossil speciation issue in Simpson (1944), but backed off from the implications, Eldredge (2009b) and Milner (2009, 387). By

the late 1960s, when Gould and other P-E proponents arrived on the scene, paleontology had yet to incorporate the neo-Darwinian lessons on how population biology affected species formation, while the non-paleontologists of the Modern Synthesis had tended to constrain Darwin's original concepts into a narrower gene-centered "panselectionist" framework of natural selection driven adaptation largely divorced from the organism's ecological dynamics or developmental constraints.

In practical terms, the non P-E view of things at the time was a "phyletic gradualism" that saw speciation primarily as the transformation of a parent A *into* a later species B, meaning that the old A form would end up gone (called *sympatric* speciation in the evolution lexicon). Though Darwin had recognized that changed forms could also migrate into a new range and give the illusion of a more rapid transition than had actually taken place, he tended in *Origin of Species* to frame things in a stricter A-B replacement context, and by Gould's day this view got extrapolated into the expectation that the Bs would keep on going into later Cs and Ds in a nice ladder of progressive change.

By the time Gould and Eldredge came along an important new concept had been added to the speciation debate (or *old*, if you remember that Darwin had touched on the essentials of it in 1859): Ernst Mayr (1904-2005) built on ideas pioneered by Theodosius Dobzhansky (1900-1975) in the 1930s and later geneticists to propose that most speciation occurred by geographical isolation, Provine (2004)—a "founder principle" whereby local variation in a population that had spread more widely could hit genetic bottlenecks causing subpopulations to fission off as separately breeding *allopatric* (Greek for "other parentage") speciation events.

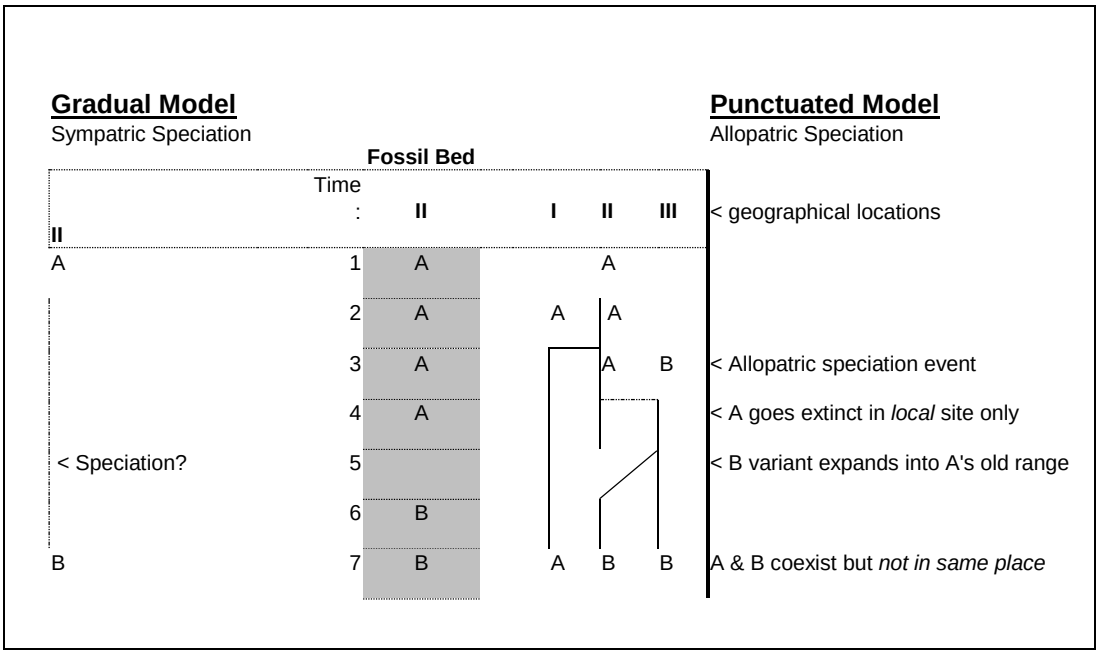

Figure 3. "Gradual" or "Punctuated" change—and how can you tell? In this simplified schematic, a few slices of preserved geological time in horizon II showed A's presence in times 1-4, then a gap with no examples, followed by the "sudden" appearance of the new B at time 6. Where a *sympatric* gradualist view might think a speciation event took place during 5-6, the actual *allopatric* speciation event took place back at time 3 (and in location III that wasn't preserved as II was), with B persisting and then *replacing* A in its old location II following A's local extinction (such as due to environmental changes rendering site II less suitable for A than its sibling B). Note that A continued to get along quite nicely in adjoining location I, which may even have been preserved, only to be eroded away as III was (say by glaciers) before human geologists could get a chance to see it. Besides the issue of where the As and Bs lived at any given time, there is the matter of how much of the fossilized time layers actually end up preserved for paleontologists to put a spade to. Had layers 4-5 been eroded (an entirely possible prospect) B would appear to have even more "abruptly" replaced A in zone II. A further "map of time" issue to remember here: this schematic puts the layers from 1-7 in time sequence, earliest at the top—but real deposits would appear the other way around, with the oldest (1) on the bottom, and the youngest (7) on the top.

Though a textbook of the period like Paul Moody (1962, 319, 472, 505-506) was aware of the allopatric model for speciation (peripatric is another term for the process) and suggested how rapidity in isolated populations could produce a sparse sampling of intermediates, the idea was not connected forensically to the prospect that *slower* speciation over a broad geographical range could produce a similar effect. It was left to Gould & Eldredge to recognize that if allopatric speciation was a common state of affairs, it couldn't avoid generating punctuated patterns in the fossil record. Newman *et al.* (1985) suggested punctuated patterns would emerge naturally under the Neo-Darwinian processes of mutation plus natural selection.

As illustrated in **Figure 3** above, the allopatric idea that the parent A wouldn't have to disappear in order for there to be a new B (as it would have in the simpler conception of the sympatric model) meant that there was no necessary reason for the As (or the new Bs) to be caught on some continuously changing evolutionary escalator. It was just as possible for individual species to remain in a stable mode for any length of time (either before a speciation event or continuing on unchanged after a sibling species split off in a regional isolate). It was the frequency of just such "stasis" periods in the fossil record that was the "dirty little secret" that paleontologists like Gould were reminding their non-paleontologist colleagues of.

The inevitable consequence of this for fossil preservation was a punctuated structure that looked more like a staircase than a ramp: new allopatric species appearing alongside (or supplanting) their parents rather than a parade of localized sympatric replacements. Unless you had an extremely detailed fossil record to go on, though, with layers representing a near continuous deposition over a relatively short period (spacing only thousands of years apart or less) the odds of capturing the occasional allopatric speciation blips in spatially diverse populations that remained comparatively stable most of the rest of the time were would be low enough that their preservation would be taking place only rarely.

But "rarely" doesn't mean *non-existent*, and no one in the gradualism/P-E debate was claiming there weren't any examples of speciation in the fossil record (by which we mean new forms appearing as similar variations on a previously existing form). Indeed, while bigger animals like land vertebrates tend to speciate in a punctuated pattern of stasis-speciation-stasis—though with exceptions, such Rose & Bown (1984) on gradual change in early primates—for little critters like marine protistans (diatoms, for example, that live in huge populations that conveniently rain their secreted shells down on the seafloor for millions of years) the known fossil record for them shows that phyletic gradualism is their norm, not the exception.

Paleontologist Robert Prothero (1992) provides an excellent summary of the technical issues and major players pro and con, and Thanukos (2008b) neatly illustrates how P-E plays out in fossil contexts. See also Eldredge (1991a, 34-58; 2005, 176-182; 2008b; 2015), Gould & Eldredge (1993) or Gould (2002a, 745-1024) for P-E from the horses' mouths, and Sonleitner (1987), Schwartz (1999, 320-330), Shermer (2001, 97-116) or Asher (2012c, 73-78) for further takes on the "controversy". The evaluation of foraminifera by Ellen Thomas (1986) and David Jablonski (2000) exploring macroevolutionary trends on a broader paleobiology scale illustrate that the hardest thing to determine when a new species first appears in a particular fossil ensemble is not whether it is a legitimate offshoot or a previous form, but rather distinguishing whether it has evolved locally or has migrated from an originating population elsewhere, exactly the issue Eldredge and Gould were trying to stress in their P-E argument (and which I highlight in **Figure 3** above).

The further perspective of Gould & Eldredge (1977, 121) is informative here, as they reminded their readers and critics of the need to assess the data at the appropriate scale of resolution: "The model of punctuated equilibria does not maintain that nothing occurs gradually at any level of evolution. It is a theory about speciation and its deployment in the fossil record." However gradual the individual allopatric speciation events may be "in ecological time" Gould & Eldredge reminded that this would still

involve only "a geological microsecond." Likewise Gould & Eldredge (1993, 225) reminded: "Phyletic gradualism has been well documented, again across all taxa from microfossils to mammals."

One may further examine the "shop talk" in the *Journal of Evolutionary Biology* concerning C. Wu (2001a-b) by Bridle & Ritchie (2001), Britton-Davidian (2001), Mallet (2001), Mayr (2001b), Orr (2001b), Rieseberg & Burke (2001), Rundle *et al.* (2001), Shaw (2001), van Alphen & Seehausen (2001) and Vogler (2001). Representing quite a spectrum of current thinking about how to pin down the genetic, adaptive, and ecological factors affecting speciation, none of the pros and cons of Wu's "genic view" of speciation involved any apparent anxiety or uncertainty over the *rate* of speciation in geologic history. Similarly the two papers on outstanding issues in the process of speciation in the National Academy of Sciences Sackler Colloquium for the Darwinian Bicentennial, Schluter & Conte (2009) and Via (2009).

1.3 Section 2—Primary source case study, Old Earth Creationist Fazal Rana trips over his own sources.

That Punk-Eek is thus way less revolutionary than it sounds (and no threat to the notion of natural evolutionary common descent) is seen by going beyond Gouldian authority quotes to look at how the idea has been received (and more importantly *used*) by scientists since. The subject of speciation pacing will be surfacing many times in the chapters to come, but it has become clear that modern evolutionary thinking is incorporating the supposedly dreaded P-E without falling apart in the way the creationist sideline imagines.

Illustrations of the progression of P-E acceptance are not hard to find. While traditional morphology-grounded paleontologist Van Valen (1982b) warily included P-E among a range of competing concepts in working out biogeographical speciation dynamics, geneticist Parsons (1983) incorporated P-E into his framework without a bump. Later general evolution guides Gamlin & Vines (1986, 18-19), Whitfield (1993, 178-181) and Hickman *et al.* (2001, 121) matter-of-factly covered the principles regarding the remarkably detailed 4.5 million year showcase of fossil invertebrates at Lake Turkana in Kenya stemming from Williamson (1981). By the time of the technical back-and forth of Coyne *et al.* (1996) re Elena *et al.* (1996), punctuated equilibrium had become part of the common scientific nomenclature (in that instance, concerning how beneficial mutations generate punctuated patterns at the bacterial level, and whether these findings can be applied to aspects of the vertebrate fossil record).

A later aside in Eldredge *et al.* (1997) reflected some of the turf wars at this early stage (in this case between paleontologists and geneticists trying to grapple with interacting processes operating in the past): Eldredge & Gould thought Coyne & Brian Charlesworth "perpetuate several incorrect perceptions of the original notion," while Coyne & Charlesworth shot back that "Eldredge and Gould have proposed so many different versions of their theory that it is difficult to describe it with any accuracy."

Young Earth Creationist Emerson McMullen (2002) subsequently deployed the Coyne/Charlesworth opinion (he may have been unaware that Eldredge and Gould had something to say here too) to glibly dismiss P-E as "not a scientific idea." The problem for this logic is that Eldredge *et al.* (1997) is not the whole of the matter. One can track the actual trajectory of P-E's usage all over the place. Just follow Levinton & Futuyma (1982), Simpson (1983, 171-176), Dawkins (1986, 223-252) and Berra (1990, 48-50) prior to the Prothero (1992) summary, and subsequently K. Miller (1999, 111-121), Jablonski (2000), Eldredge *et al*. (2005), Fortey (2009, 185-186), Milner (2009, 361-362), Tattersall (2009a, 151-156), and C. Zimmer (2009g, 217-220), Nye (2014, 120-123), with P-E inevitably filtering to educational venues far and wide, from McComas & Alters (1994) for student exercises to Saylo *et al.* (2011) explaining P-E thinking from a school in the Philippines.

The many technical papers and the fossil taxa discussed in them are as available to antievolutionists as they are to me, but antievolutionists pay no attention to them. And I mean this *literally*. No attention whatsoever. This is so even when they deliberately *bring up* the subject of Punctuated

Equilibrium, which they do solely for its apologetic utility, as the obligatory talking point on how evolutionists are supposedly so reluctant to accept the evidence of their own study. And that is how an issue of allopatric *vs.* sympatric speciation and how that relates to the odds of getting preserved in the geologic column, gets transposed into an iconic "problem" for evolution at the *macroevolutionary* level.

Old Earth creationist (OEC) Hugh Ross (1998, 50-51, 201) represents one of those rare "exceptions that proves the rule" when he dipped down into a concrete example when asserted that the evolution of whales "changed far too rapidly for either Darwinism or punctuated equilibrium to explain." According to Ross, P-E was ruled out here because it suggested, "that dramatic genetic changes occurred in sudden jumps propelled by severe environmental stress. The period from 48 to 52 million years ago, however, appears to have been remarkably tranquil, far less stressful than such a scenario demands."

Ross neglected to document what genetic changes were involved (to assess their magnitude and relevance) or that punctuated equilibrium mandated such a climate change link (in the case of whales or any other) in the first place, or just how "remarkably tranquil" the period was. Oh really? That time frame actually fell smack in the peak of the Paleocene-Eocene Thermal Maximum (PETM) discussed in module **1.2** earlier. It certainly impacted *ocean biotic chains*, which is after all where the early whales would have been swimming—there is more on whale evolution and Intelligent Design proponents have dealt with it in **Chapter 4** of Downard (2004).

The gossamer Ross scholarly style regarding punctuated equilibrium continues at his *Reasons to Believe* website, as evidenced by a sequence of 2008 posts by Fazale Rana trying to hijack P-E into a creation context.

Rana (2008a) trotted out Greg Hunt (2007b), a technical paper *confirming* that P-E was real and that the theory was correct in suggesting that directional change in fossil life was fairly rare, occurring only about 5% of the time (with the remaining 95% of traits divided between "random walks" and outright stasis) though more prevalent in planktonic (upper oceanic) organisms than benthic (deep sea) ones. It was *not* specifically addressing the issue of species origination, but rather assessing which of the three modes were more in play regarding the microevolutionary shifts of traits within the studied lineages (shell size and width in assorted molluscs, for instance). Subsequent work by Hunt *et al.* (2015) suggest the dynamics of evolving life show even more variety than the three modes studied in the 2007 paper, though still no less natural and evolutionary.

Rana's effort to co-opt Hunt for creationist apologetics was a study in his own befuddlement. Evidently with some perfectly created original in mind, Rana couldn't see how the traits of size and shape being measured in the Hunt paper were indicative of animals *not* created optimally to begin with. In a design context this meant repeatedly jumping in to tweak the model to render it fitter—how is this any different from the unguided natural processes creationists are so keen to banish from nature?

In any case, the stasis examples in Hunt were not instances of an *absence* of change, but simply whether the observed variations showed selective trends or varied more randomly or remained within a static range, a difference Hunt had quite clearly explained. Starting with directional evolution, "When operating in directional mode, evolutionary divergence accrues steadily, and descendants are readily discriminated from ancestral populations of the same lineage." He illustrated this specifically by the shell conicity seen in the foraminifera *Contusotruncana* that gradually increased over the last 3 million years of the Late Cretaceous. The original paper Kucera & Malmgren (1998) had noted that this change in shell shape shouldn't be viewed in isolation: there was a marked decrease in the abundance of that lineage over the same period, suggesting selection pressures were at work (remember that a mass extinction was looming, and the Cretaceous oceans were being affected first).

"Unbiased random walks are intermediate in pattern," explained Hunt, "they are not inherently directional, but phenotypic differences accumulate so that expected divergence increases with elapsed time." Hunt's illustration was shell width in a recent island snail *Mandarina chichijimana*, drawing on

Chiba (1996). Over 40,000 years it had first undergone a rise to a higher stable state, then a more pronounced drop of around 15% until a few thousand years ago when it has undergone some upward blips again, though still well below its prior peak.

"At the opposite extreme, stasis allows for fluctuations between populations but predicts no net change within evolutionary sequences." Hunt's example here was drawn from Kelley (1983), concerning changes in shell convexity in the extinct Miocene bivalve *Chesapecten nefrens* over four million years. Starting about 14 Mya, *C. nefrens* exhibited jumps of around 10% above and below its starting mean (at the low end of the 10-20% fluctuation range for the molluscs observed by Kelley). The mollusc wasn't changeless over that time, just "static" in the narrow sense Hunt used (ending up with roughly the same initial features showing up at the end). To mistake this for stasis in the way creationists use it is understandable: they don't bother to investigate the specific examples or then progress to specifying what variation means in *their own design framework*.

Only because Rana never discussed any of the data in Hunt's paper did he escape seeing how the two were not addressing the same subject (P-E microevolutionary issues for Hunt—the supposed absence of evolutionary change for Rana). This situation only got worse in the follow-up of Rana (2008c): "Even though punctuated equilibrium can explain the troubling features of the fossil record, one key question remains. Does the mechanism undergirding punctuated equilibrium actually work? Research results published in 2001 indicated, no." For which claim Rana cited two more papers.

According to Rana, Higgins & Lynch (2001) "shows that the essential processes making up punctuated equilibrium's mechanism lead to extinction, not evolution. These scientists demonstrated that risk of extinction significantly increases for a species when its population becomes disconnected. Moreover, environmental changes and habitat fragmentation exacerbate population's susceptibility to extinction. Population and habitat fragmentation, along with an altered environment, stand at the center of punctuated equilibrium's mechanism." And for confirmation, Rana asserted A. Templeton *et al.* (2001) "showed that habitat fragmentation doesn't drive speciation, rather it leads to extinction."

It should have rung warning bells for Rana that neither of these two papers mentioned punctuated equilibrium at all, or even cited any papers relevant to it. The fact that neither claimed their work undermined any P-E mechanisms might have been a clue that they didn't think they had done that.

Higgins & Lynch were working out the parameters of extinction threats in populations. It was clear that populations that fall below a certain threshold become exceptionally vulnerable to extinction, especially if their habitat is disrupted, as by human activity. Since population size is a primary variable, Rana could invoke their paper in this service only if he could show that the population sizes of candidate P-E groups fell within that fateful low level. This Rana certainly did not do.

The role of human intervention in species extinction was specifically the subject of the Templeton paper, which contrasted the unnatural conditions of the lizard they were studying (human logging in its range had significantly altered the habitat) with the natural evolutionary system of organisms moving into a vibrant and expanding ecological niche (which they note can induce macroevolution of groups via the founder effect—Ernst Mayr's concepts being applied, by the way—where an animal entering a new environment can have novel variations favored in a way different than back home). Again, in order for Rana to invoke the Templeton paper for his apologetic purpose he would have to show that the ecological conditions of the candidate P-E cases were fragmented in the way Templeton characterized for his lizard sample. Otherwise founder effects could play a role and P-E move ahead unhindered. And once more, Rana completely failed to make that essential link.

Both papers were discussing a different field than the one Rana wanted to drag them onto. So while they did not "create a serious problem for the evolutionary paradigm" they did expose a "serious problem" in the way Rana approached technical literature, which he only compounded by going on to offer a prior post of his to further support the claim that "strict Darwinian evolution lacks the necessary corroboration from the fossil record and cannot be declared a fact."

This turned out to be Rana (2008b) trying to undermine the idea that humans descended from the australopithecines in Africa millions of years so. But the paper Rana cited, Lockwood et al. (2007), wasn't addressing which lineage we stemmed from, let alone offering problems for it, but rather the characteristics of one species *outside* that group, *Paranthropus robustus*. As Gibbons (2007c) explained in her commentary, the paper identified a sexual dimorphism (males much larger than females) that was consistent with that species having a harem-style mating strategy comparable to silverback gorillas today. Fine and dandy, but how does this have any bearing on what is happening with other completely separate species, or even genera, pertaining to our track through the hominid landscape?

What Rana was doing here was as though he were trying to prove that the *Titanic* didn't sink by an iceberg in 1912 solely because the *Andrea Doria* sank in 1956 by ship collision. As the two aren't related to begin with, the comparisons are irrelevant.

In the very rare "exception to prove the rule" department, an even fuzzier example involves Ray Bohlin of *Probe Ministries*, a YEC-friendly apologist who helped get the ID movement started (much more on that in section **1.7** later). While Herr & Bohlin (2005) were content with invoking the Gould "extreme rarity" quotation as tactical ammunition in an assault on the Quammen (2004) article on evolution in *National Geographic*, in "The Natural Limits to Biological Change" Bohlin (1994b) had decided that for Eldredge and Gould, "where there is lots of speciation, there should be lots of morphological differences. Where there is little speciation, there will be few morphological differences," and that consequently P-E *required* that "groups of organisms that contain large numbers of species should also display large morphological differences within the group."

Bohlin then went on to give animal examples contradicting this proposition—unfortunately, what Bohlin failed to do was document exactly where Gould and Eldredge supposedly made these connections in the first place, so readers could evaluate whether Bohlin's ammunition was relevant or not. Bohlin plowed on, though, to pronounce P-E

> is of little use to evolutionary biologists because they cannot imagine a way to make it work with real organisms. Gould and Eldredge admitted as much in their review of punctuated equilibrium's progress in the journal, *Nature*, in 1993 when they lamented that: "But continuing unhappiness, justified this time, focuses upon claims that speciation causes significant morphological change, for no validation of such a position has emerged."

Incidentally, that particular quote has percolated through the creationist/ID subculture, the *Expelled Exposed* (2008) website noting a metastasized misquoted version ("There is no validation of the position that speciation causes significant morphological change") was trotted out along with a bevy of creationist canards in slide lectures by "intelligent design" promoter Caroline Crocker—one of those purportedly persecuted Darwin critics extolled in Ben Stein's boldly selective 2008 documentary *Expelled* (more on which in due course). Crocker (2011) pressed for "Integrity in Science," and she has taken her "bunk science" claims about evolution and climate change into the *Kulturkampf* antievolutionist subculture, lecturing the *Creation Science Fellowship* in September 2012, *Creation Science Fellowship* (2014), and including ID-themed postings at the *American Institute for Technology and Science Education* website, such as *AITSE* (2011) and Crocker (2013).

Alas, for Bohlin (or the painfully secondary Crocker), Gould and Eldredge had by that point in their 1993 review moved on to another topic, but Bohlin hadn't noticed. For Bohlin the acknowledgment that there was a legitimate debate about the degree to which speciation was the primary *generator* of major change (by which animals would be changing *because* they were speciating, as opposed to elements of change occurring less frequently along a path of *many* incremental speciation events) got conflated with the original P-E issue of how the quite observable allopatric speciation mechanism (without or without

morphological change) could be reflected in a fossil record whose geological processes were typically far too slow to trap them.

That there was still an observable correlation between speciation and morphology (that visible changes in animals understandably reflected their having diverged so far that they now represented distinct species or genera compared to their predecessors) should have been clear enough to Bohlin, though, given how Gould & Eldredge (1993, 226) had concluded the very paragraph he had mined for his quote: "the association of morphological change with speciation remains as a major pattern in the fossil record."

1.3 Section 3—Creation Science drops the ball on Punk Eek, again & again & again, 100% failure rate.

Fazale Rana and Ray Bohlin did at least try to bump into some of the issues, bungled though their efforts may have been, but overall their creationist compatriots fall completely flat. This is particularly noteworthy when it comes to Young Earth Creationism, who offer a much longer parade of hit-and-run allusions to P-E with even fewer "exceptions that prove the rule" to spice up the mix.

The overall pattern is clear enough: just claim P-E is a problem for "evolution" and move on without any analysis at all. Older examples run from an anonymous Jehovah's Witnesses volume, *Watch Tower* (1985, 23), Old Earth Creationist Alan Hayward (1985, 18-19), or the extensive interview jabs by Luther Sunderland (1988, 12, 99, 111, 113-119, 122-126). Dave Nutting's *Alpha Omega Institute* has posted several hit-and-run swipes: *Think & Believe* (1985c; 1989b), with Michael Shaver (1995) getting points for *Kulturkampf* succinctness when he apparently conflated Gould's left-leaning politics with the scientific issue by dubbing P-E as "the Marxist attempt to explain away the problem."

Moving into the 1990s, Don Batten (1994b) spooled out authority quotes over seven pages in the AiG *Journal of Creation* without mentioning any concrete examples—and as editor of the creationist *Answers Book* it is that piece alone that was cited in the single page allusions to P-E in the Ham *et al.* (2000, 130) and Catchpoole *et al.* (2007, 121) secondary iterations. In the course of repeating Luther Sunderland's very popularly quote-mined distillation of paleontologist Colin Patterson (1933-1998) on the pitfalls of identifying fossil intermediates using cladistic systematics (a story to be covered later concerning taxonomy), End Times satanic UFO aficionado Gary Bates (2006) secondarily riffed off Batten's 1994 version of the P-E story for *Creation Ministries International* to offer a terse footnote assessment that the concept "would not have been invented if not for the fact that the fossil record does not fit the predictions of Darwin and subsequent evolutionists." Farther down the daisy chain, a perennially confident creationist on Twitter extoled a link to Bates' piece in a May 2015 exchange as "must reading"—and yet another Twitter creationist lobbed Bates at me in June 2015.

For those who missed Batten's version of P-E, there were ample hit-and-run artists to fill in: Trevor Major (1996a) in *Reasons & Revelation*; examples 91-92 among *301 Startling Proofs & Prophecies Proving That God Exists* in Canadian creationists Peter & Paul Lalonde (1996); Scott Huse (1997, 89-90); Ankerberg & Weldon (1998, 223-224); while Russell Leitch (1999c) and the more recent Eric Blievernicht (2002) defended the YEC ramparts at the ironically named *Lutheran Science Institute*.

Kent Hovind (1999e) claimed in one of his video lectures that P-E was devised to explain why no "missing links" existed. In a later video debate with cultural anthropologist Terry Prewitt, Hovind & Prewitt (2002), Hovind insisted that P-E was trying to explain macroevolution by saltational jumps. A sign of how Hovind's dated apologetics circulates on the Internet, a Twitter creationist offered a 2013 YouTube posting of the debate (without checking any of its content, of course). Unfortunately, Hovind's debating foil operated too often in potted plant mode, letting most of Hovind's rapid fire assertions go unchallenged.

Should the likes of these peripheral creationists be thought unrepresentative, the heavy hitters of traditional creationism fare no better. Henry Morris (1985, vii-viii, 90) dropped the customary authority

quotes and suggested P-E relied on "mysterious hypothetical processes" without any mention of allopatric speciation and its interplay with geological context (but then as a YEC founder, geological sequencing would not be his long suit in any case) or any examples of its application, such as the C. *nefrens* from Kelley (1983) above. Adding Gary Parker only made matters worse, as Morris & Parker (1987, 150) blathered that P-E not only claimed multiple stages (for *speciation*?) but even "involved organisms so *unfit* to survive that they existed only in small populations that left no fossil remains." No documentation was proffered to permit an observer to identity how the two creationists could manage to get the basics of the idea so fuddle headed wrong, while Parker (2006, 173) solo opted for vague generality.

The venerable Duane Gish (1993a, 229) similarly insisted P-E claimed to operate "by some as yet unknown mechanism" without reference to its allopatric roots. In his final main work, *Evolution: The Fossils Still Say NO!* Gish (1995, 39) promised P-E "will be discussed in some detail in the final chapter of this book." Gish (1995, 160) dangled it again: "This idea will be discussed in a later chapter" but assured his readers that it "is totally without merit." When Gish (1995, 353-356) did get around to it was just to repeat his mantra about "unknown mechanisms" (still no Mayr/allopatric connection) and addressed not a single specific example of what P-E advocates were exploring. Appropriately enough, though, Gish's *own index* didn't even include this main section as an entry under punctuated equilibrium. In turn, the parasitical Hank Hanegraaff (1998a, 40-45) confidently vacuumed up Gish's slapdash treatment without blinking—a trick Hanegraaff would repeat with more perilous scholarly consequences regarding the *Protoavis* case concerning bird evolution, in **Chapter 2** of Downard (2004).

Someone else of the Hanegraaff "copy what you don't know enough to ferret out on your own" stripe is James Perloff's *Tornado in a Junkyard: The Relentless Myth of Darwinism*. As we'll see in the chapters to come, Perloff scooped up broad arguments (citations and all) from the likes of Morris & Parker (1987) and Gish (1993a; 1995), and Perloff (1999, 116) tried to build on that shaky foundation to flush P-E down the drain because it "cannot account for the missing links between larger classifications (genus, family, etc.). It does not explain, for example, the complete absence of transitional fossils between invertebrates and fishes—a span that supposedly took 100 million years. Nor does it illuminate how complex organs evolved."

Right off the bat he was committing the familiar category error so many creationists make: punctuated equilibrium is about tracking *speciation* events in an imperfect fossil record, and thus not *in and of itself* some magic crowbar to pry higher-level taxonomical origins or metazoan organ development off the table. That would require a different body of technical argument, which none of those creationists managed to offer—meaning the sundry mistakes of Morris, Parker & Gish became by parasitical infection Perloff's own.

Curiously, the most glancing blows in the early P-E parade were by Kurt Wise. A rarity in the creationism biz, Wise has a legitimate paleontology degree (with fitting irony he studied under Stephen Jay Gould at Harvard, which must have been an educational experience for them both). As a dedicated Young Earth Creationist, though, there are sizable speed bumps as to how much of the paleontological evidence Wise can acknowledge without doing injury to his theological spinal column. Brilliant and enthusiastic, Wise landed at Bryan College in Tennessee to teach paleontology. His iconoclastic career is described in Numbers (1992, 281-282); see also K. R. Miller (1999, 173-174, 187) and Witham (2002b, 52-53, 103-107).

Initially Wise (1989) tried to shoehorn the P-E debate into a Flood Geology framework, as though punctuated jumps in forms followed by periods of stasis somehow supported the simultaneous deposition slosh-and-mush environment implied of the Flood. He alluded to some technical literature on one page, such as Kellogg (1975) and Williamson (1981), but didn't explain how any of these fossil examples could be successfully integrated into the still exceedingly vague Flood model. That this might be a serious difficulty has been borne out by what he has (and hasn't) penned since. While Batten

(1994) was citing the 1989 article favorably, Wise (1994, 220) restricted himself to citing Gould & Eldredge (1977) but only to support a general claim that interspecific transitional forms were "rare" in the fossil record and not to evaluate anything more about P-E or try to co-opt it for Flood Geology. The proposition has been gathering dust in the decades since, all the way down to our age of instant Internet access when YEC blogger (and non-paleontologist) *Justification by reason* (2012) apparently came across Wise's 1989 piece fresh. Didn't it seem a tad odd, though, that there was nothing further to report on this fine apologetic insight after over *almost a quarter of a century*?

Part of the reason for this may well stem from the fact that Wise also happens to be part of the baraminology movement, a dedicated band of recent creationists who, flush with their academic degrees, have been trying to nail down how many created kinds (AKA *baramins*) God really had generated during the Creation Week 6000-odd years ago. Along the way the baraminologists have had to concede that many extinct animals were actually related by natural evolutionary descent (dubbed *monobaramins*) occurring within the created baramins, noted in **Appendix III** of Downard (2003b)—which opened yet another taxonomical Pandora's Box, as they have had to accommodate astonishingly rapid evolution of the kinds post-Flood (presumably under the very noses of an assortment of literate BCE cultures, going about their business in Mesopotamia, Egypt and China).

One of those monobaraminic groups turns out to be the venerable horse evolution sequence, acknowledged by T. Wood & Cavanaugh (2003, 4-5) and more fully by Cavanaugh *et al.* (2003). So it was rather amusing to see the YEC *Answers to Evolution* (2004) pamphlet boldly claiming that P-E "theory suggests that evolution occurs during short periods of sudden, drastic change with long periods of little or no change," and illustrating this with only four examples culled from the fifty-million-year-plus fossil record of *horses*, contrasting the "SLOW, STEADY CHANGE" of regular evolution with the "SHORT PERIODS OF SUDDEN, DRAMATIC CHANGE" expected in P-E.

Tactically, had the pamphlet creators deliberately selected so sparse a sampling (rather than the whole parade of known fossil examples) to support the claim that the changes seen were too "drastic" or "DRAMATIC" to be accounted for by natural evolutionary means, or had they simply not realized there were more fossils to evaluate? In either case the fact remains that without specifying just what "drastic" or "DRAMATIC" were supposed to mean it was an exercise in stage managing, not science, that only got worse once you realized that their own side had just thrown in the towel on the very example they thought to use. Oops!

What makes the *Answers to Evolution* pamphlet stand out, though, is precisely that they did try to illustrate their P-E claim with *something*, even if it misfired without their realizing it. The vast bulk of creationist takes on the subject never get any farther than quote mining, from *The Interactive Bible* (2000a) to the apologetics of David Noebel explored by critic Jeffery Lowder (2000b).

Walter ReMine's 1993 book *The Biotic Message* devoted a whole chapter to P-E composed of dueling quotations without ever once exploring any of the available fossil evidence directly, ReMine (1993, 326-338). ReMine (1993, 326) was especially obtuse in complaining about P-E's "peculiar emphasis on speciation," wandering off on a tangent of whether "species selection" (where selection acts at a higher taxonomic level than individuals) plays a role in P-E. By then far removed both from the basics of speciation issues and the fossil data, ReMine (1993, 338) finally accused: "Punctuationists did not get their notions of speciation by observing it in the living or fossil word. Instead, their notions were invented to destroy phylogeny." Missing from this was poor Ernst Mayr, who came up only on p. 335, but only for a few authority quotes, not apropos allopatric speciation, a concept ReMine never mentioned.

Given this major effort, it was natural for ReMine (2001) to argue in much the same (albeit) shorter vein when responding to a debate with evolutionist Massimo Pigliucci. Courtesy of a review of ReMine (1993) by Don Batten (1997b), ReMine made it as an even more secondarily derived authority source for the quote-mining *Conservapedia* (2012c), thereby missing the Mayr connection due to distance and

lethargy. Then again, *Conservapedia* was keener to taint P-E with Marxist connotations, confusing the politically leftist leanings of Gould personally instead of wandering off and actually thinking about any of the many relevant fossils that might otherwise have cluttered up their political axe-grinding with a scintilla of concrete data.

Continuing on in the 21st century antievolutionary P-E parade, Bert Thompson & Brad Harrub (2002a) double-dipped the same quote mine nuggets on adjoining pages at *Apologetics Press* in the course of complaining about the list of "creationist nonsense" John Rennie (2002b) called attention to in *Scientific American*. Fred Heeren (2002) performed a similar P-E trick at Hank Hanegraaff's *Christian Research Journal*—though subsequently Heeren has apparently shifted to a theistic evolutionist and general science writer, such as Heeren (2004; 2008; 2011).

The creationist version of P-E has filtered on to some school classes via teachers inclined in that direction, such as the painfully derivative information packets passed out under the radar to his students by Virginia biology teacher Larry Booher (2005) thinking that P-E "is 'macroevolution' on a rapid pace" without any reference to any of the considerable science literature bearing on the issue by that time. More on Booher in section **1.7**.

Creationist organizations with newsletters that continue for some period may not be able to resist the temptation to repeat the P-E canard either. That was the case with Dave Nutter's *Alpha Omega Institute* noted above, and (maybe not coincidentally) also true of an organization much impressed with Nutter's contribution to creationist apologetics, the *San Antonio Bible-Based Science Association*, from the quick stab by Scott Lane in *SABBSA* (2001f) to George Grebens (2005) sloughing off P-E in a reprint piece on "understanding the issues" which included exposing the "pantheistic" roots of the New World Order. *SABBSA* (2006i) then managed to erase Niles Eldredge from the picture altogether: "With the passing of Stephen Jay Gould, Dr. Stanley is now the foremost authority in the field of punctuated equilibrium." While Steven Stanley is a fine and respected paleontologist, how the *SABBSA* managed to promote him to such prominence on this issue is a mystery (it may have been due to his work on extinction dynamics and macroevolutionary processes, subjects about which creationists have another long record of misunderstanding).

The sloppy secondary scholarship continued in *SABBSA* (2012l), a riff on David Letterman's *Late Show* Top 10 Reasons skits ("Cool Things about Being an Evolutionist") offering as the No. 10 example: "You can call 'punctuated equilibrium' a scientific theory, then explain why scientific evidence for it cannot be found." The *SABBSA* attributed this *bon mot* to *nwcreation.net*, but the piece they linked to—British Columbia public school teacher David Buckna (1996) from the *ICR*—contained no such listing among its 33 questions that "would make good classroom discussions." As Buckna diligently framed the mistaken claims of creationists on paleontology (likely culled from Duane Gish) and cosmology without any supporting documentation, one can imagine what manner of freewheeling science instruction his Canadian students were exposed to.

Moving on in our chronicle of P-E confusion, college freshman Craig McClarren (2002) confidently recycled piles of YEC arguments, to the eventual consternation of critic Frank Steiger (2012), but in another rare example of sober reevaluation, McClarren (2012) had come to oppose creationist thinking after realizing how little he had actually known about the facts when he was 18. As someone who went through a comparable maturation process regarding the crackpot theories of Immanuel Velikovsky, I can sympathize.

Would that creationist dentist Jobe Martin (2002, 97) had followed the McClarren track before he declared "the slow, gradual evolution of millions of years idea is passing out of favor," citing only the obligatory Gould, and adding Richard Milton (1997, 215), who hadn't gone into any more detail in his dismissal than Martin had. Milton is a prickly British neo-catastrophist who exported his 1992 book, *Facts of Life*, to America in a 1997 edition, *Shattering the Myths of Darwinism*, and Martin revealed far more about his own limited understanding of the players when he described Milton as "Atheist and

evolutionist" as well as "England's premier evolutionary science journalist." As we'll see in subsequent chapters, the irreligious contrarian Milton's consistently *antievolutionary* writings have put him about as far from respected science journalism as you can get without bumping into Erich von Däniken, and about the only people who highlight Milton are confused YEC authors like Martin or Tom Willis (2008b)—more on him later. See Østman (2009a) for further perspective on Jobe Martin's claimed "expertise" in matters biological.

And the P-E juggernaut rolleth on in YEC apologetics: the superficial "Science Lesson Plans" of the British creationist group *Truth in Science* (2005m) and the addenda offered by Charles Voss (2006a,c-h,j; 2012a-b; 2013) to undermine American science textbooks. There's Dutch creationist Ben Hobrink (2005, 152) in hardcover, Bill Morgan (2005j) online, the quirky Atlantis groupie James Nienhuis (2006, 179-180), Vance Ferrell (2006f, 57, 356) in a top-heavy 800-page tome, and by *Creation Ministries International* (2011) in a slim pamphlet. Richard Peachey (2002) summarized the (quite transitory) scientific controversy over P-E well enough for the *Creation Science Association of British Columbia*, but ironically did not link any of it to Ernst Mayr (who Peachey had just brought up regarding the Neo-Darwinian Synthesis) and of course discussed no examples of forms living or fossil to ground the discussion in concrete terms.

The *Institute for Creation Research* has not been able to resist the P-E cliché either, with John Morris (2010a, 12) and Frank Sherwin (2010) as more recent outings in their *Acts & Facts*, as has Mike Gray (2013a) from *Bob Jones University*. Australian creationist Philip Rayment has entered the fray as well at *A Storehouse of Knowledge* (2012c-d), the online "encyclopedia with a biblical worldview" for people finding *CreationWiki* and *Conservapedia* too wishy-washy, critically observed from afar at *RationalWiki* (2014).

Naturally P-E jabs pop up among peripheral conservative blog axe grinding. At David Horowitz's *FrontPage Magazine*, Robert Locke (2001a) decided "for punctuated equilibrium to have occurred, a very precise set of conditions have to have obtained throughout the entire past period represented in the fossils, and this is unlikely." Though substantially more likely than Locke's bothering to document any of this—his piece being a credulous review of Denton (1985) and Behe (1996a), neither of whom were paleontology resources of note.

Alan Keyes' conservative Catholic *Renew America* website has fielded several examples of P-E fishing, from Robert Meyer (2004a-b) to the late Fred Hutchison (1950-2010). Evidently under the misapprehension that evolutionists have been suppressing word about P-E for fear of its dire anti-Darwinian import, Hutchison (2005b) emphatically warned: "the evolution establishment has enough clout to prevent school children from hearing about punctuated equilibrium." Not that his targets were limited to evolution: Hutchison (2005a; 2006; 2007; 2008) was a veritable mini-mart of fringe beliefs, opposing the Big Bang and the Relativity Theory of Albert Einstein (1879-1955) along with the One World Cult and the more usual *Kulturkampf* suspects of abortion, gay marriage and global warming. Never one to mince words once his dander is up, P. Z. Myers (2006d) offered a predictably unflattering assessment of the oeuvres of this "Renaissance fool."

P-E potshots surface also at *Federal Way Conservative* where Jonathan Gardner (2012a) affirmed "Why I Believe in Creationism," as well as *Texans for Better Science Education* (2012c,g,k) in their defense of creationist Don McLeroy's revision of Texas school standards, the ignorance drain spinning full circle at that point given the aforementioned 2009 McLeroy chaining of Moeller (2004) via *Genesis Park* (2011ad-af) noted above. Anthony Carrola (2015j) took superficial aim at P-E on his *Christian Conservative Life* website, chockablock with *Kulturkampf* tropes, from homosexuality to the Civil War not really being due to slavery.

In May 2015 a creationist on Twitter showed how impressed he was with superficial quote-mining by lobbing a link to traditionalist *Kulturkampf* Catholic Christopher Ferrara (2015) at me. Ferrara had done nothing more sophisticated than copy quotes and talking points nicked from an assortment of

secondary sources, including Steve Meyer (2009a, 20) for a Francis Crick (1916-2004) statement: "Biologists must constantly keep in mind that what they see was not designed, but rather evolved." To which Ferrara snarked: "In other words: don't believe your lying eyes. And this, they tell us, is science." When it came to P-E., Ferrara was in full laundry list mode, minus the documentation or apparent comprehension part:

> In an attempt to keep Darwinism alive, neo-Darwinians have grafted various ad hoc hypotheses onto Darwin's creaky old theory, including "genetic drift," Gould-Eldredge's "punctuated equilibrium" (abrupt mutational leaps, leaving no fossil intermediates), Gould-Lewontin's "spandrels" hypothesis, and so forth.

Genetic drift is a measurable property of allele variations in natural populations, subject to experimentation as well as observation, and so no more "ad hoc" than the DNA in which it manifestly occurs, Masel (2011). Spandrels relates to how biological novelty can arise as spinoffs from existing systems (much more to say on that in later chapters). Which leaves Ferrara's common antievolutionist misconstruing of P-E's paleontological application of allopatric speciation as involving either "mutational leaps" or the non-existence of "fossil intermediates." On such shaky ground do some enthusiastic Twitter creationists so confidently stand.

Ever since mouse met Internet, people prone to such superficial analysis have discovered the easiest way yet to generate cataracts of credulously parasitical "scholarship" is to simply copy it. A broad example of cut and paste erudition occurred in August 2010 when Glenn Charles Jackson (2010) at the *American Family Association* (at *afa.net*) re-tread an undated *Creation Truth* piece (nipped via creationtruth.com) that presumably was trying to follow in the footsteps of David Letterman (recall the *SABBSA* in this department noted earlier) by laying out the "Top Ten Reasons Why Darwin is Wrong." No. 5 on this Jackson's list was "Stasis of Living Things," which consisted solely of an isolated quote from Stephen J. Gould (1993a, 15), part of the late paleontologist's regular (and non-technical) column for *Natural History*, which Jackson further gussied up with plenty of ***bold*** *italics*:

> Stasis, or ***nonchange***, of most fossil species during their lengthy geological lifespans was tacitly acknowledged by all paleontologists, but almost never studied explicitly because prevailing theory treated stasis as *uninteresting nonevidence for nonevolution*. …The *overwhelming prevalence* of ***stasis*** became an ***embarrassing feature*** *of the fossil record*, best left ignored as a manifestation of nothing (that is, nonevolution).

Jackson's quote mining had excised where Gould had explained that the paleontologists prior to 1972 had specifically defined evolution "as gradual transformation in extended fossil sequences," thus leaving the reader in the dark about what "gradual" and "transformation" was involved and over how "long" a time (or how this related specifically to *speciation* processes). For Jackson, though, it wasn't the long parade of definitely transforming organisms that Gould has spent his career investigating and writing about at length (consider Gould's *The Book of Life* from that same year of 1993) that stuck in the creationist tunnel vision, but rather the very isolated "living fossils" like the coelacanth that Jackson proclaimed "look exactly like their fossils do!" and, moreover, that these are "not rare. They are 'overwhelmingly present' in the fossil record. They are the rule, not the exception."

This is an attractive trope for creationists—Chuck Missler (2012n) at *Koinonia House* in Idaho takes a similar tack. Only that isn't even slightly true: if you consider how many things have slid across the fossil landscape over the last half a billion years, not only are "living fossils" totally the exceptional case, *never the rule*, they only rarely qualify as possibly the same *species* as their modern counterparts (and usually not even in the same genus). They are "exactly like" one another only for people who are unfamiliar

with taxonomy and never specify what *different* might mean to them in a context of continuously speciating life (which we'll see in section **1.5** concerning Benjamin Wiker and crocodiles).

The antievolutionary muddling got even worse when Jackson (and the very trusting *AFA* copyist) also insisted (without corroborating documentation of course): "Evolution-believers don't like to talk about this problem—so they usually don't mention stasis." A position that should have been hard to defend based on Gould's own article, since he had written only three paragraphs later how times had changed since 1972 when he and Eldredge had proposed P-E: "Now such studies are routinely made and published, and we have a burgeoning literature to document the character and extent of stasis in quantitative terms."

That situation has only ballooned in the many years between Gould's 1993 article and the 2008 pirouettes of Fazale Rana around Greg Hunt, or the *AFA* channeling of Jackson in 2010. Vermeij & Dietl (2006) extended the dynamics of ecology into the P-E area, Vermeij (2010, 199) noting of this work that adaptations taking place among the majority of a source population that relocates "is sufficient to account for punctuated evolution." With fitting irony apropos Fazale Rana's claims about his scientific activities, Greg Hunt (2008) has continued to advance the field by laying out criteria to determine when P-E factors are playing a role in particular situations. Folmer Bokma (2008) has done similar work. Old cases have also been reassessed using newer evidence and these improved analytical techniques, such as Hull & Norris (2009) regarding our old pals, marine foraminifera, or Van Bocxlaer & Hunt (2013) on how "stasis" figures in gastropod radiations in Lake Malawi.

Peeking under the hood of the species level that creationists get so befuddled about, there is the working machinery of the genes and microevolutionary changes there can be viewed along a *stasis/punctuation* scale as well. Viewed down at that level, while gradual change is regularly observed at the genetic level, P-E type clusters still accounts for around 22% of DNA changes, occurring twice as frequently in plants and fungi than in animals, Pagel *et al.* (2006). Nor is our own DNA excluded from this process, Z. Jiang *et al.* (2007) with perspective by Birney (2007). And on the flip side of P-E, Ellegren (2010) investigated stasis in the structure of bird chromosomes.

More ironically, at least for antievolutionists anxious to use P-E as a shoehorn to force it into a supposedly ill-fitting macroevolutionary boot, Pennell *et al*. (2014) pointedly argue that macroevolution is one area where P-E dynamics have their *least* utility, which shouldn't be all that surprising. Macroevolution plays out over millions of years, as long strings of what are otherwise microevolutionary speciation events (whether bumping along by allopatric P-E or not) pile up into lineages that do sometimes (but by no means have to) display major transformation (mammals and birds being two prominent examples at the vertebrate class level that will be examined in detail in **Chapters 7** & **11**).

In other words, there has been a lot of work in this field that core creationist critics pay no attention to, usually because they are not scientists themselves nor do their insular networks easily encounter them. It is even more difficult for the likes of the *American Family Association* farther down the *Kulturkampf* trail to run into such technical detail when they demonstrate an inability to heed even the content of the article their apologist Jackson did bother to "quote" from.

1.3 Section 4—Intelligent Design doesn't fare much better, including Stephen Meyer's *Darwin's Doubt*.

This sorry situation doesn't get any better over in Intelligent Design Land.

Hit-and-run P-E coverage crops up in peripheral jabs by George Sim Johnston (1995; 1997), Patrick Glynn (1997, 48), Henry Schaefer (2002), Geisler & Turek (2004, 152), the fringe pseudoscience-monger James Hogan (2004, 407), and John Walton (2005) replying to Dawkins & Coyne (2005). Despite his many years of research on the Intelligent Design issue as science correspondent for the *Christian Broadcasting Network*, Gailon Totheroh (2005) still thoroughly mangled the microevolution/macroevolution distinction when he imagined P-E "posits great leaps forward in

evolution in a geologically short time span." Or Josh Greenberger (2015) insisting (in a cover posting briefly up on his website promoting his antievolution book *Fossil Discoveries Disprove Evolution Beyond A Doubt*) that "A theory like punctuated equilibrium actually makes for more comedy than science." In a piece assailing modern climate science, Paul Benedict (2015) filed P-E under "The Marxist Sciences" as somehow refuting "neo-Darwinism."

Climate skeptic Roy Spencer (2005) took a swipe at P-E when he claimed it was devised by Gould to account for the fossil record, which in his view "is almost (if not totally) devoid of the transitional forms of life that would connect the supposed evolution of amphibians to reptiles, reptiles to birds, etc." At William Dembski's *Uncommon Descent* Dave Scott (2008) congenially welcomed Spencer as one more credentialed float for the Intelligent Design parade.

A look at some of the sources drawn on by the hit-and-run artists here helps explain how technical scientific issues could regularly get so mushed together. Roy Spencer wrote he had "intensely studied the evolution versus intelligent design controversy for about two years" twenty years earlier—which would be the mid-1980s. Unless he was cribbing some YEC literature, the salient ID work available at the time that purported to undermine the evolutionary implications of the fossil record was Denton's singularly inadequate *Evolution: A Theory in Crisis* (1985).

Then there is antievolutionary mathematician (and Deacon at the Baptist Tabernacle of Los Angeles) Christopher Cagan (2003), who magnified Gould's argument about "stasis" versus "sudden appearance" at the *species* level into a sweeping refutation of general evolution. Part of a remarkably belated snit over the criticism of Young Earth Creationism way back in Philip Kitcher (1982), Cagan accused Kitcher of relying on "outdated science" because "In the last twenty to thirty years, more and more scientists, Christian and non-Christian, have given up on the outdated nineteenth-century theory of evolution in the face of the scientific evidence." This surging scientific consensus consisted of exactly *two* witnesses: some extensive quoting from biochemists Michael Denton (1985, 77, 328-329) and Michael Behe (1996, 39, 65. 168-169, 192-193), neither of whom ever disputed that Darwinian speciation takes place or discussed any details of the mechanisms involved (the point about which Gould was concerned, remember).

In 2005 Jody Sjogren, Robert Lattimer and Douglas Rudy prepared a slim and derivative volume for *Science Excellence for All Ohioans* (an offshoot of the *American Family Association*) then trying to inveigle those slim and derivative ID arguments into Ohio's science education. Without stopping to document even a single instance of actual fossil ensembles to back up their assertions about the import of P-E, Sjogren *et al*. (2005, 28) pronounced: "whereas the theory of evolution would predict that there would be the strongest evidence for linking the highest level groupings (because they are the most dissimilar and would require vast numbers of transitional forms) the fossil record demonstrates the opposite: The gaps between the higher-level groupings are universal and complete."

Or Thomas Woodward (2003, 40-42, 124-125, 127-128), who dribbled so many pages of authority quoting (including praise for the philosophizing of Phillip Johnson in the Denton-inspired *Darwin on Trial*) that the connection of P-E to speciation issues rather than the macroevolutionary emergence of major biological changes should have been apparent even to him. Rushing too fast to ponder the import of the scientists he was quote-mongering, he easily settled on the familiar creationist trope that Woodward (2006, 101-102) would more concisely abstract to the broad generality of the "*sudden appearance* of new forms, bursting onto the scene without identifiable ancestors."

By the early 21st century Jonathan Wells' *Icons of Evolution* (2000a) had joined Denton and Johnson as exemplars of ID argument. But how could Spencer, Cagan, Woodward or Sjogren *et al* think they could understand the fossil record by proxy, drawing only on a succession of non-paleontologists rather than the voluminous paleontological literature none of them bothered to consult? Lacking any concept of what genuine intermediates might have looked like (so they might have recognized them as such were they to have inadvertently stumbled over one or two on some adventure in a natural history

museum) they were clueless to the reality of the past, where those many "new forms" appearing over millions of years (including a bevy of reptiles, mammals, dinosaurs and birds covered in the chapters to follow) were *not* "bursting onto the scene without identifiable ancestors." Quite to the contrary, some of these have so rich an ensemble of possible progenitors (the first mammals especially, as even Johnson disingenuously recognized in *Darwin on Trial*) that the difficulty is trying to parse which among the many prospects might lie closest to the root of the tree.

So we end up with the likes of Woodward marching in lockstep with the coverage of P-E in Johnson (1991, 50-53, 58-61), where Johnson (1991,52) declared, "Punctuated equilibrium explains the prevalence of stasis in the fossil record by linking macroevolution with speciation," and Johnson (1991, 53) questioned "whether this mechanism can explain more than a relatively narrow range of modifications which cross the species boundary but do not involve major changes in bodily characteristics." Paul Chien (1997) in turn followed the *Darwin on Trial* P-E cue sheet, by which time Philip Johnson (1997b, 61-62) had ricocheted off the topic again by parsing the fossil change arguments of Niles Eldredge (1995, 95)—more on that below.

P-E has swirled around that creationist drain of "stasis" and "sudden appearance" ever since, as though Intelligent Design was the default option for anything supposedly unresolved in fossil history. Thus James Le Fanu (2009, 117-120) took his time to circle the traditional antievolutionary "stasis" talking points without ever venturing a view of his own about what may have been happening in the actual fossil past. Donald Ewert (2010e) briefly flirted with the P-E issue while arguing that the vertebrate immune system poses a problem for Darwinism—a topic explored in **Chapter 4** of Downard (2004), citing only fellow-ID friendly non-paleontologists Lönnig & Saedler (2002) as to how much the fossil record supposedly supported what they imagined "stasis" to be (and without, of course, specifying whether any of that makes any sense in a *design* context). And Andrew Wilson (2017) dangled the P-E matter in his pithy diatribe recommending "It's time Charles Darwin was exposed for the fraud he was."

Ann Coulter (2006, 225) had apparently been too quick to distill what she thought she knew about the subject when she summarized the issue thus: "Gould and Eldredge hypothesized that evolution could also happen really fast and then stop happening at all for 150 million years. Basically what happens is this: Your parents are slugs and then suddenly—but totally at random—you evolve into a gecko and your brother evolves into a shark and your sister evolves into a polar bear and the guy down the street evolves into a porpoise and so on—and then everyone relaxes by the pool for 150 million years, virtually unchanged."

Where Coulter came up with "150 million years" to pick on is anybody's guess. It was certainly not by reading Gould or Eldredge. Whether any of her science tutors noted in Coulter (2006, 303), "Michael Behe, David Berlinski, and William Dembski, all of whom are fabulous at translating complex ideas," did anything to slow her sprawling miscomprehension of P-E is a matter for future scholarly detective work. Behe and Berlinski certainly hadn't covered the topic, nor had Dembski, apart from stray potshots like Dembski (2001a) dropping the term without offering any sources or detailed discussion. Dembski & Wells' equally vague joint effort in *The Design of Life* will be covered below.

Trying to be evenhanded in their *The Complete Idiot's Guide® to Understanding Intelligent Design*, Carlisle & Smith (2006, 115-116) brought up P-E as an example of "just how fiery the conflict is within mainstream science." But Christopher Carlisle is a chaplain and W. Thomas Smith a journalist, which could explain some of their "summarize from afar" limitations, such as offering no documentation when they contended "adherents to 'punk eek' see evidence of the theory in the fossil record in a marine micro-fossil, in the trilobite, and in the beloved Tyrannosaurus Rex." As Carlisle and Smith capitalized the species part of *T. rex* their understanding of the details might be less than tight (I made the same mistake many years ago and was promptly corrected by a geology prof whose grip on nomenclatural etiquette was better than mine).

They may have been referring to Horner *et al.* (1992) but, if so, this was not much help in defending a non-evolutionary view of life, since that paper had not only affirmed P-E dynamics in an ensemble of Cretaceous dinosaurs—they had also identified quite a few *transitional specimens*, such as the ones discussed it in **Chapter 3** of Downard (2004). Beyond that, given the importance of migration dynamics in the P-E argument it is relevant that Horner *et al*. concluded "that the evolutionary pulse coincided with a marine transgression," and subsequent work has uncovered more of the zonal shifts driven by climate change that unsettled their habitat, Eberth *et al.* (2013). Thus yet another case where looking more closely at the spotty examples being brought up evolution critics only reveals more of what they are strenuously resisting: the past life on Earth running along a thoroughly natural track of evolutionary change relating to their environment.

Such niggling details played even less a role for Kenneth Poppe, where *Kulturkampf* concerns kept leaking into "paleontology" instruction. As a "paleontology teacher" at Trail Ridge Middle School in Colorado, reported by Ready (2007), Poppe promoted his global warming skepticism to the kids, landing him on the P. Z. Myers (2007c-d) critical radar. William Dembski (2006n) recommended Poppe as "competent in the relevant science" in an introduction to Poppe's *Reclaiming Science from Darwinism*, never spotting Poppe's penchant for glib overstatement (as we'll be seeing on fossils and human origins) that put him on a par with the vacuous dinosaur musings of Mike Riddle from *Answers in Genesis* or the paleontologically naïve Native American creationism of Vine Deloria (1933-2005). As for P-E, in *Exposing Darwinism's Weakest Links*, Poppe (2008, 134) summarily decreed (without burdening the reader with undo documentation) "that the fossil record, hominid or otherwise, does not support either Darwin's phyletic gradualism or Neo-Darwinism's punctuated equilibrium, the only two games in town." For further perspective, Poppe (2009) had grand aspirations of revolutionizing science and social education in a Christian direction via his *International Foundation for Science Education by Design*, but as of 2013 the IFSED had evidently passed from the scene.

Breakpoint, the website of Nixon Watergate scandal alumnus Chuck Colson (1931-2012), is another venue where the *Kulturkampf* campaign presses on. Allan Dobras (2009) thought to dispose of P-E there by waving an unfavorable 1990 review of Gould (1989) by none other than Richard Dawkins, who had called one of Gould's book "a mess." Except the book was Gould's *Wonderful Life* on the Cambrian Explosion, which wasn't about punctuated equilibrium (as we'll see in **Chapter 9**) so even if Dawkins' snarky assessment of it were valid it would have no bearing on the factual validity or practical utility of P-E.

Gould was posthumously mugged again by Rabbi Shmuley Boteach in a January 2008 debate with atheist firebrand Christopher Hitchens (1949-2011): Boteach declaring that Gould didn't believe in evolution *at all* because now he was into punctuated equilibrium—a gobsmacking confusion that drew comment from P. Z. Myers (2008c) who had attended the exchange. Paleontologist Robert Asher (2012c, 77-78) later offered the episode to illustrate how P-E had become "the mother lode for creationist quote-mining."

In a more recent defense in *The Jerusalem Post* of Texas Governor Rick Perry's electioneering doubts about evolution being only "a theory," Boteach (2011) tweaked his misunderstanding somewhat by saying Gould had been:

> arguing that the large gaps in the fossil record make a mockery of a theory of gradual evolution, which is why Gould advocated "punctuated equilibrium" – a variation on Darwinism in which evolution takes place in dramatic periods of change followed by long eons of stasis. Gould maintained this position precisely because, as Perry said, the theory of evolution has "some gaps in it" – in the case of the fossil record, quite literally.

One may notice again how easily antievolutionists bandy about those "long eons" without ever grounding it in the known realities of **Deep Time**.

In a curious instance of "convergent evolution," like Walter ReMine's *The Biotic Message* above, Stephen Meyer's much-touted *Darwin's Doubt* on the Cambrian Explosion devoted a whole chapter to "PUNK EEK!" and Meyer (2013a, 136-152) turned out to be just as clumsy a digest. Like ReMine, there were only authority quotes, no examination of the technical evidence, but Meyer didn't even get the big picture straight. Despite the historical progress of P-E thinking in paleontology, one subsection was titled "BURST OF INTEREST AND GRADUAL DECLINE" and Meyer (2013a, 137-139) went so far as suggest it was *Gould and Eldredge* who came up with the allopatric speciation idea, making it seem as though they were inventing it as an *ad hoc* way to salvage their fossil data, rather than their having applied Mayr's already developed theory (in turn based on the genetics of living animals as well as observations about natural living populations).

Indeed, Meyer did ReMine one better by not mentioning Mayr at all in the chapter, leaving the two authority quotes Meyer (2013a, 171, 339) extracted from Mayr's work to other sections (one to note his attendance at an evolutionary science conference, and later for a quote on the importance of natural selection in Darwinian thinking). For ironic scholarly contrast, Young Earth Creationist Kurt Wise (1989, 15-16) managed better than either ReMine or Meyer, at least recognizing Eldredge and Gould's debt to Mayr, and paleontologist Kevin Padian alluded to it when cross-examined at the Dover Intelligent Design trial in 2005 (covered in section **1.7**), *Talk.Origins Archive* (2006b).

Tom Bethell, whose 2005 book *The Politically Incorrect Guide™ to Science* confidently bought into a cornucopia of *Kulturkampf* favorites (from ID and global warming to AIDS not being caused by HIV), sounded a lot like Henry Morris and Duane Gish above when Bethell (2013e) extolled the contribution of *Darwin's Doubt* to the P-E issue over at the conservative magazine *The Spectator*: "More formally, Meyer shows that 'pink eek' doesn't work out as hoped. Not only have those fleeting ancestors not appeared anywhere, the proponents of punctuated equilibrium never came up with a mechanism that could plausibly produce so much anatomical change so quickly." Not knowing of Mayr's role in all this, or the true facts of the paleontological record, was a perfectly understandable (albeit hardly *justifiable*) lapse for pay-attention-to-just-one-source Bethell given that Meyer hadn't mentioned any of it himself for Bethell to have read and so trustingly absorb.

Another indication of how out of touch Meyer's "BURST OF INTEREST AND GRADUAL DECLINE" version of P-E was regarding working science (and by parasitical connection, Tom Bethell's notions about how fossil ancestors have "not appeared anywhere") came along just as *Darwin's Doubt* was gestating. Paleontologist Robert Prothero (2012a) discussed how the P-E concept had revolutionized thinking in paleontology by integrating the fossil data with a proper understanding of allopatric speciation dynamics. Along the way he happened to note how unresponsive the fauna preserved in the La Brea Tar Pits were to climate fluctuations, alluding to one of his own recent technical papers, Prothero *et al.* (2012), and off in the fertile hothouse that is Intelligent Design this innocent mention of stasis sparked some confident authority quoting by *Uncommon Descent* (2012j) and by David Klinghoffer (2012c) and Douglas Axe (2012d) at *Evolution News & Views*.

The idea that animals should be reacting to climate change is not an unreasonable one (for example, growing more robust limbs or larger size), but Prothero rightly noted how this wasn't true all that often, especially when larger populations get involved, rather than isolated groups (such as on islands). Nor was he the first to notice this, such as Barnosky (2005) contrasting climate driven "Court Jester" models with the "Red Queen" approach (where coevolutionary competition dominates and climate variation operates more as "background noise") regarding mammal evolution during the twenty-odd Quaternary Period glacial advances and retreats over the last two million years. Which of the two processes predominate depends on the spatial and temporal scales involved, Benton (2009).

Faced with a rapidly changing environment, the luck of mutation is simply too rare a factor to prompt "Court Jester" adaptation. Natural selection can favor instead more resilient stable species whose dynamic "Red Queen" combinations allow them to weather more than one crisis or simply pack up and move, Barnosky (2005, 259) or Raia *et al.* (2012)--though when adjusting for sampling limits, increasing temperatures appear to promote more diversity overall, Mayhew *et al.* (2012). Hull (2015, 946) similarly suggests "Red Queen" dynamics inevitably dominate the immediate post-extinction reshuffling, requiring time before things settle down and environmental "Court Jester" factors can reassert among the evolved descendant lineages.

Prothero's *Quaternary Science Reviews* paper was a discussion of these larger adaptive ecological patterns, not a manifesto of the inadequacy of natural speciation, let alone the "complete absence of evolutionary change," as the title of Axe's posting put it. Speciation events were going on all through that period, as Barnosky (2005, 255) noted of Lister (2004), just that the rate of that speciation was not apparently *elevated* except in the most extreme periods of climate shift, and even then only in isolated cases. Prothero's analysis wasn't claiming no changes at all were taking place either: dire wolves got significantly smaller over the measured time frame, for example, but likewise noting how this change didn't correlate with the climate fluctuations. Nothing in the Prothero paper invalidated the separate issue of the evidence for their earlier evolution from *Canis armbrusteri*—another of those speciation events antievolutionists are so confident never occur—whose "intergrading morphologies" are surveyed at length by Tedford *et al.* (2009, 4-5, 137-148) showing "the transformation to the more hypercarnivorous giant form" of *Canis dirus*.

Syverson & Prothero (2010) had previously spotted a similar situation for prehistoric condors, larger predecessors of the modern California condor (members of the same genus but separate species). The anatomical changes separating the two were modest but distinct (morphs in limb dimensions or skull protrusions), but while the prehistoric model did show fluctuations in size these didn't correlate with climate shifts, and the speciation drop to the smaller modern condor didn't occur until afterward, sometime between 9000 and 7000 years ago.

It is revealing that not one of the three riffs on Prothero by the *Discovery Institute* pundits bothered to relate any of the information underlying Prothero's argument to their own Intelligent Design model, which would have seemed a perfectly natural thing to do if they actually *had* an ID model to deploy here—one which explained the base data in a more informative and productive way. For example, does ID explain anything at all about "the union of the optic and anterior lacerate foramina in a common pit"? Those distinctively modified skull openings are just some of the diagnostic features linking *C. armbrusteri* to *C. dirus*, per Tedford *et al.* (2009, 148), a taxon explicitly mentioned as among the "static" La Brea critters in Prothero's *Quaternary Science Reviews* paper. Unless ID presented a positive case for such features being examples of design rather than evolution, the dire wolf "stasis" (or any of the other "static" prehistoric beasts toddling about tens of thousands of years ago) would suggest nothing at all in favor of a design option, or pose any threat to the efficacy of evolutionary explanations to account for them.

Sounding a lot like Fred Hutchison above, though, *Uncommon Descent* (2012j) nonetheless asked: "why does the Darwin lobby oppose allowing students to learn about stasis?" This linked at the word "oppose" to fellow *Uncommon Descent* poster Denyse O'Leary (2011a), who was complaining how the *Texas Freedom Network* (2011d) was warning against efforts by antievolutionists in that state to use "stasis" arguments as a means "to introduce discredited, scientifically falsified accounts from intelligent design/creationist publications." In other words, exactly what *Uncommon Descent* and the *Discovery Institute* were doing in their authority quote invocations of Donald Prothero. Sigh.

It is instructive to contrast this superficial quote-driven Intelligent Design coverage of Prothero's work with the takes of evolutionists. Creationism critic Larry Moran (2012g-h) took note of Axe (2012c) to remind his readers how the last people who should be surprised by the Prothero findings would be

evolutionists, since the idea that change wasn't obviously driven by climate shifts had been known and debated among them for years. Indeed, Moran (2012e) had only just prior been exploring the finer points of what these stasis periods meant for applied evolution, particularly the role of neutral drift in speciating populations versus active adaptive selection.

Here Moran noted the Jerry Coyne (2011n) web posting (with assorted shop talk in the comments section) critically assessing the proposition in Josef Uyeda *et al.* (2011) that changes in animal body size as followed over a span of ten million years tended to run in two modes. Short-term bursts of change occurred when animals encountered a new niche (such as a bird discovering a new island habitat), but once adapted to that, if that environment remains stable they will be too, and can settle down into a fairly boring "bounded" track. If the groups hang on long enough, though, past a million years, a new dynamic can take hold should changes in selection pressures occur in ways that can affect many groups simultaneously (such as the introduction of new predator/prey competitive relationships) and so prompt bigger changes that previously were selected *against* when the group operated only in its isolated "bounded" frame. The effect of such realignment would appear in a fossil ensemble as a macroevolutionary burst capping a long period of comparative stasis.

Uyeda's work has been part of the ongoing scientific process, of course, with others approaching the stasis issue from varied directions: such as Polly (2012) re Evans *et al.* (2012) confirming the overall bounded then burst pattern for mammal size evolution, or Sallan & Friedman (2012) suggesting some fossil fish groups have undergone more multiple pulses of evolutionary change than the basic Uyeda model would suggest. That's how science works—which may be compared to the cloud of nothing orbiting the ID version of the Prothero material during that same period.

1.3 Section 5—And then there's Casey Luskin & Phillip Johnson, overlooking those invertebrates.

Flying at too high an altitude to identity the inhabitants below is a problem also for the Discovery Institute's web posting star, the prolific Casey Luskin. Like other antievolutionists, Luskin (2008m) cannot resist fielding the obligatory Gould and Eldredge quotes, but Luskin (2004b) has also followed the Fazale Rana path of veering onto technical turf. Luskin went Rana one better though by coming perilously close to some actual data by naming a few of the fossil examples being discussed by his evolutionary target, but at no point did he dwell on what was changing about them or how any of this related to any design explanation.

The one example Luskin may have thought he really was putting under the microscope concerned the variation in an Antarctic radiolarian *Pseudocubus vema* (which Luskin slightly misspelled as "Pseudocobus") that lived two to five million years ago. Reprinting a chart from the aforementioned Gould & Eldredge (1977, 126), Luskin appended in red "very rapid rates of change" notations to indicate two spurts in the graph that he obviously deemed to be the critical points for the ID case. He acknowledged that it did show a pattern, but "a pattern is not a process—what is the process which can account for this pattern? Is this pattern more consistent with the process of intelligent design, or Darwinian evolution. On its face, intelligent design is capable of infusing large amounts of information into the biosphere rapidly, which could result in this rapid morphological change."

On its face the chart Luskin reprinted had plenty of relevant information, starting with the label on its left axis: it was measuring the "mean thoracic width (microns)" of that one radiolarian species. Microns being a *thousandth of a millimeter*, this meant the study had tracked the quite miniscule shifts in the girth of the aft end of its silicate exoskeleton, which resembled a lumpy raspberry, as Luskin might have discovered had only he taken the scholarly step of consulting the primary source of Davida Kellogg (1975, 362-363) instead of riffing off Gould & Eldredge secondarily, to find out more specifically what the two paleontologists might have been talking about.

Over the sample period of *three million years* the value at first fluctuated steadily over a small range (86-95 microns). When you included the range of the individual samples that comprised each data point, though, measured as "coefficients of variation" by Kellogg (1975, 364), the early sample COVs ran around 12-14. Thus it would appear that a 10% shift in the dimensions represented some fairly basic genetic mechanisms governing that parameter, and would naturally raise questions about what environmental or other factors may have been stimulating that fluctuation in the sea around Antarctica.

We already encountered that connection above concerning the extinction pulse radiolarians went through as the seawaters cooled (a trend in turn connected to broader tectonic factors in this instance, as the growing separation of Australia from Antarctica altered the circumpolar circulation patterns). Kellogg (1975, 368) specifically noted that living radiolarian species tend to develop larger skeletons in colder water, so the overall increase in the size of *P. vema* over the whole period of cooling would hardly be a biological shocker. And the more recent analysis by Crampton *et al.* (2016) correlated diatom speciation pulses over the last 15 million years with periods of significant global cooling and glaciation that decreased open-ocean habitat.

From the fluctuating initial condition, Kellogg's paper identified a jump upward though a wider intermediate (99 micron size)—though again that represented only about a 5% increase over the already present variation range and actually involved a *lower* coefficient of population variation (around 8). These lower COVs (8-11 range) prevailed over the next *million years* as the population oscillated around a still higher spread of thoracic size (104-110 microns). Interestingly, a resumption of the higher earlier coefficients set in during this time, which may well have contributed something to what happened next: a return to a fluctuating phase but this time showing a persistent upward trend in thoracic size. Yet again this involved individual increments of change only in the 5-10% range, but the result was that by the end of the sampled period the back end of *P. vema* had enlarged into the 130s (or about 50% bigger than its ancestors had been several million years earlier) with a correspondingly reduced front end.

Looked at in detail (which Luskin clearly did not) this "process" looked like a nice mix of phyletic gradualism with punctuated burps, but one (big irony alert here) not actually involving even an explicit *speciation* event, since it was *P. vema* all the way through. Which makes one wonder what it was that Luskin thought was going on with these wee radiolarians all those millions of years ago. Did he really think this heralded some massive "design" intervention here?

Without realizing it, Luskin was denying the existence of *microevolutionary* processes by suggesting that this quite modest illustration of punctuated modes in the adaptive strategies of ocean critters somehow illustrated the macroevolutionary design mythologies of antievolutionism. When I apprised Luskin of this oversight at a Seattle lecture he gave in June 2013, Luskin said he had dealt with the example because a critic of Intelligent Design had brought it up in a debate with him over macroevolutionary issues. Maybe so, but if that critic was under the impression that this represented anything other than microevolutionary wiggling, he too had blundered.

Which still left Luskin in his own pickle, which stems from a studied reluctance to dive below the surface detail to fully understand what it was he was looking at. Antievolutionists like Luskin may say they accept microevolutionary change, only objecting to radical atheist Darwinian macroevolutionary extrapolations, but in effect they don't acknowledge any such thing—just as most modern antievolutionists profess to accept that speciation takes place, but when the rubber hits the road they hunker down and concede nothing.

Let's look at the details overlooked in Luskin's glancing blow. Plausibly related to the adaptive requirements of a consistently cooling habitat, the increase in *P. vema* certainly did not signal some extraordinary influx of "large amounts of information"—whatever that may have entailed, as Luskin offered no specification. The DNA of that extinct fossil being unavailable for review, Luskin would have needed to venture into the study of extant radiolarians had he been disposed to turn his vision of an

intelligent designer's putative genetic tinkering of one Miocene radiolarian's waistline into something more substantial than a bumper sticker.

One may compare Luskin's non-analysis with what goes on in actual scientific work, such as Baker (1983) distinguishing hybridization episodes in fossil taxa. Radiolarians have posed a long-standing challenge for taxonomists, like Blueford (1984), Petrushevskaya & Swanberg (1990) and Swanberg *et al.* (1990), because their fossil forms are so very diverse and (living as they do in a very big tank of water way down deep in the cold) their biology and habitat are difficult to study. Only recently have molecular analyses begun to sort out their deeper relationships, Zettler *et al.* (1997), López-García *et al.* (2002), Nikolaev *et al.* (2004) and Kunitomo *et al.* (2006).

To add a couple of cherries atop Luskin's P-E parfait, Luskin (2008q; 2012r) invoked Luskin (2004b) as showing "the failure of the fossil record to provide support for Darwinian evolution." Even more baldly, responding to a critical comment from Robert Camp (apropos Luskin's "A Positive, Testable Case for Intelligent Design") Luskin (2011o) affirmed that he had "written extensively on the inability of Darwinian evolution to explain abrupt appearance of new life-forms, this is not just a 'feeling' but a strong scientific argument that needs to be dealt with. So if you wish to respond, please respond to the scientific arguments at links like" … Luskin (2004b)!

That Luskin actually thought that piece contained a useful presentation of any "scientific arguments" only serves to illustrate how elastic the ID conception of "scientific" is (and how exciting education might become should such standards be adopted outside the *Discovery Institute* preserve). For one more parfait cherry, Luskin (2015s) cited Newman *et al.* (1985) solely regarding mutation and natural selection as defining features of modern evolutionary thinking, but characteristically failed to touch on the significance of its title ("Neo-darwinian evolution implies punctuated equilibria"). This bodes ill for Intelligent Design's ability to connect any dots at all.

If Luskin represents a pinnacle of the ID investigative regimen here, mathematician Granville Sewell (2005; 2006) fell far lower on the slope when he repeatedly drew on Rensberger (1980), a perfectly fine report for the *New York Times News Service* on a confab on developments in macroevolutionary thinking at Chicago's Field Museum of Natural History, to commandeer Niles Eldredge (addressing the then very new P-E issue) as his sole poster child counterexample to the view "that no serious scientists harbor any doubts about Darwinism." Snippets of Rensberger's article have appeared in creationist quote-mining for some time, such as *Talk.Origins Archive* (2005m) concerning horse evolution—interestingly, extracted from the same specific *Houston Chronicle* syndicated version Sewell used, suggesting a common Texas genesis for that apologetic thread.

Sewell (2014b) rolled Rensberger out again concerning the "academic freedom" measures that had become the latest antievolutionary initiative: "Sharing with students this type of mainstream scientific criticism of Darwinian theory is precisely the kind of speech that academic freedom laws seek to protect." David Klinghoffer (2014m) promptly pounced on this to tweet Zach Kopplin (the student critic of antievolution campaigns in Louisiana and elsewhere) asking: "Should a Teacher Be Punished for Telling Students What the New York Times Said About Evolution in 1980?"

The short answer to his tweet would be *no*, of course a teacher shouldn't be *punished* over a thing like that. But should there be no *reaction*? Why would a teacher in 2014 feel the need to trot out a *1980* newspaper article (even one from someone as competent as paleontologist Boyce Rensberger)—antiquarian interest? No one at the Field Museum conference in 1980 could have told anything about the role of *HOX* genes in macroevolutionary body plan changes, since they wouldn't be discovered for decades. Nor could they have evaluated the many exciting fossil finds on whales and birds and tetrapods that *only later* filled in so many of the "gaps" paleontologists were talking about when Ronald Reagan (1911-2004) was running for president. Consequently, any 21st century teacher presenting that 1980 chestnut as representing "doubts about Darwin" in the way antievolutionary ideologues see it could honestly be accused of *educational malpractice*, no less than someone thinking to sow "doubts

about media technology" by waving a faded dot-matrix fax bulletin on audio cassette decks and *Betamax* VCRs (needlessly distracting their students intently texting and googling on their tablets and cellphones).

Moran (2014a) cited Gould (2002a, 981-986) on the Chicago conference and subsequent creationist mischaracterization of Punctuated Equilibrium's relation to evolutionary processes as evidence that "Granville Sewell and David Klinghoffer are at least a dozen years behind in their readings about evolution." What Moran had to say about Sewell could be applied to legions of antievolutionists:

> You would think that by now the creationists would have learned something about punctuated equilibria so they would understand that it's a possible extension of evolutionary theory and that it has nothing to do with the Cambrian explosion, saltation, or the major transitions observed in the fossil record. That's clearly not the case as Granville Sewell demonstrates. He is as ignorant today as he was in 1980.

The *Discovery Institute* was still running off this old steam in their "Discussion Guide" on the P-E chapter of Meyers' *Darwin's Doubt*, *Discovery Institute* (2014c, 11, 13), offering that "Cambrian paleontologists James Valentine and Douglas Erwin concluded that punctuated equilibrium cannot explain the origin of new body plans" and posing a Discussion Question: "Do you find that punctuated equilibrium provides an adequate explanation for the absence of transitional fossils in the Cambrian and Precambrian, and the rapid production of new body plans?" This was a citation to Valentine & Erwin (1987), a pre-*HOX* era study that was trying to tease out the developmental history of life before the genes and regulatory systems generating morphological novelty were discovered. The outlines of this new perspective were starting to take shape by Valentine *et al.* (1999), a work Meyer was aware of.

Valentine & Erwin's old piece has been a quote-mined nugget for some time, from Henry Morris (1989) to Harun Yahya (2007c, 160). Davis & Kenyon (1993, 94, 113) cited only the larger Raff & Raff (1987) anthology of which it was a part. So how come Valentine & Erwin found P-E and phyletic gradualism (which dealt with "change at the species level") wanting when it came "to the origin of new body plans"? At it happened, the *Talk.Origins Archive* (2004) "Quote Mine Project" addressed that very point in "Quotes #4.4" by reprinting what Valentine & Erwin had gone on to state:

> A difficulty with each of these models is their concern with the generation of diversity. The models differ in the degree to which they associate morphological change and the acquisition of genetic isolation, but all share a common view of morphological novelty as a by-product or consequence of specialization. The seeming paradox of abundant new body plans evolving during a time of relatively low species diversity may be a key to the Metazoan radiation. What may be required is a theory for the evolution of novelty, not diversity, which explains abundant individual transitions occuring in 1 to 5 million years or less and leading to new phyla and classes without the production of easily fossilized intermediates or of numerous species. *Valentine & Erwin (1987, 96).*

The origin of that phyletic novelty turns on the deployment of a suite of genes that predate the Cambrian Explosion by a wide margin (and were unknown when Valentine & Erwin were writing in 1987), so the "mystery" of that was ultimately irrelevant to the speciation dynamics that allopatric P-E and sympatric phyletic gradualism were grappling with. Instead, the interesting question is why organisms underwent their adaptive spurt *when they did* and what conditions and triggers pertained in that process. That is a grand story of an adaptive landscape disrupted by climate change and oceanic chemistry conditions far removed from the authority quote terrain of Intelligent Design.

But the failure of antievolutionary scholarship to get their players straight didn't stop with misinterpreting Gould or Valentine & Erwin. Seven years before Gould's *Structure of Evolutionary Theory*, the other half of P-E had this to say in *Reinventing Darwin* about how their concepts related to the Neo-Darwinian picture their views were supposedly so against:

> When lecturing to new audiences, I like to present myself as a "knee-jerk" neo-Darwinian, at least when it comes to the matter of adaptation and natural selection. It's true enough, and comes as something of a surprise to some who suppose that I will promulgate some wild new theory to supplant traditional canon. People tend to equate punctuated equilibria with some alternate notion of how evolutionary change—adaptive evolutionary change—occurs. *Eldredge (1995, 55)*.

This paragraph evidently did not pass under the gaze of a trio of Intelligent Design advocates (David DeWolf, Stephen Meyer and Mark DeForrest) when DeWolf *et al.* (2000, 49-50) brazenly listed *Reinventing Darwin* among tomes that supposedly "have cast doubt on the creative power of neo-Darwinism's mutation/selection mechanism." Meyer (2008, 6) repeated the claim solo. Then again, DeWolf *et al.* (2000, 52) went on to locate P-E a long way from the allopatric speciation issue that was its actual subject:

> the fossil record shows long periods of stability "punctuated" by abrupt changes, resulting in entirely new organisms. Punctuated equilibrium reduces the conflict with the fossil record, but does so at the cost of abandoning a sufficient explanatory mechanism for the appearance of biological novelty—the very thing that made Darwin's theory initially so attractive as a designer substitute.

A firm grip on the content of Eldredge's book similarly eluded Phillip Johnson (1997b, 59-61) when he mined it for a trimmed quote that evolution "never seems to happen" in the fossil record (adding also an assertion that paleontologists were under "pressure for results" that I have yet to find anywhere in the book). Johnson's first use of the "never seems to happen" quote appears to have been in his 1995 review of Daniel Dennett's *Darwin's Dangerous Idea*. As reprinted in *Objections Sustained: Subversive Essays on Evolution, Law & Culture*, Johnson (1998a, 63) remarked, "Whatever is motivating Eldredge to give all that fervent lip service to Darwinism, it obviously is not anything he has discovered as a paleontologist." *Talk.Origins Archive* (2005m) noted how Johnson's "never seems to happen" extract from Eldredge has subsequently circulated in antievolutionary apologetics.

But Johnson never ventured beyond the Eldredge "quotes" to examine any of the relevant data that might have informed the paleontologist's opinion, and his scholarship had only grown sloppier (a most troubling affliction for someone previously trained in the meticulous rigors of the law) when he hit the topic again in an essay that appeared in *First Things* (November 1997) and reprinted in *Objections Sustained*. Lamenting the primacy of materialist philosophy for Darwinists like Richard Dawkins, Johnson (1998a, 73) pronounced, "That is also why Niles Eldredge, surveying the absence of evidence for macroevolutionary transformations in the rich marine invertebrate fossil record, can observe that 'evolution always seems to happen somewhere else' and then describe himself on the very next page as a 'knee-jerk neo-Darwinist.'"

In a 1998 e-mail response to my inquiry on the nature of speciation and what Johnson had thought on the matter, he again tossed off the Eldredge quote and added: "Yet Eldredge describes himself on the next page as a 'knee jerk neo-Darwinist.'" But the "knee-jerk" remark hadn't occurred "on the very next page" but *thirty pages earlier*. Nor was it precisely as Johnson quoted it, and when taken in context only undermined his polemical point.

Had Johnson thought to direct his laser-like attention to some of the data there would have been no shortage, starting with a work Johnson (1991, 170) was apprised of already: Laurie Godfrey's *Scientists Confront Creationism*. Godfrey (1983b, 209) cited Eldredge's own trilobite work and the Lake Turkana mollusks of Williamson (1981) as "some of the best known cases" of observed morphological intermediates. One might then move on to the likes of Levinton (1992, 89-90) illustrating shell modifications over 10 million years as *Chesapecten* (touched on above regarding Kelley's 1983 paper) changed anchoring habits, where "The chain of ancestors and descendants in the strata is nearly unbroken."

The layout of mollusk and cephalopod shells show natural trends, of course, Dando (1996, 183-186), with changes among the shelled cephalopods particularly relating to internal buoyancy and balance, Doyle & Lowry (1996, 169-179). The tiny bivalved crustaceans, the ostracods, have similarly shown "a decrease in size from the giants of the Palaeozoic; the number of adductor muscle scars has also been reduced, while the complexity of the hinge has increased," Doyle & Lowry (1996, 298). How such shifts might measure on an antievolutionary "typological stasis index" is, of course, considerably hampered by the fact that antievolutionists have never deigned to develop one.

Shell changes in a Jurassic oyster and two Cretaceous echinoid lineages suggested phyletic gradualism rather than punctuated development, Doyle & Lowry (1996, 83, 214-215), especially in one of the echinoid examples, where there were many intermediates linking the starting and end genera. Another case of marine invertebrate gradualism would be the four successive species of the Silurian brachiopod genus *Eocoelia* that graded smoothly into one another (also over a 10 million year span), Simpson (1983, 160-161), and brachiopod shell configuration understandably correlates with their marine environment, Doyle & Lowry (1996, 192-197).

Regarding eight case studies of microevolutionary change in fossil invertebrates (Ordovician trilobites, Silurian graptolites, Carboniferous rugose corals, Jurassic bivalves and ammonites, Cretaceous echinoids, and bryozoans) Doyle & Lowry (1996, 321) concluded they were about evenly split between phyletic gradualism and punctuated equilibrium. Though the evolution of graptolites is harder to study because their frail internal anatomy seldom prevents their being squashed into a fossil blur, even at that there are instances where the data are sufficient to trace modifications over time, such as a streamlining of the feeding aperture in the Silurian-Devonian monograptids, Doyle & Lowry (1996, 260-262).

A punctuated shift has also been supported by a study of the Miocene-Pliocene bryozoan *Metrarabdotos*, Jackson & Cheetham (1990; 1999), summarized by Kerr (1995a) along with studies of Miocene snails, and later also by Gould (2002a, 784-789, 843-845, 867-870). The pattern was especially distinctive in *Metrarabdotos* where the static branch species tended to have overlapping geographical ranges (a specific prediction of the punctuation model), Doyle & Lowry (1996, 341-343), though as the study period (3.5 to 8 million years ago) had sampling horizons separated by intervals running from 20,000 to a *million* years, one can't assume a lot of gradual change wasn't going on below the coarsely grained depositional radar.

If the extent of invertebrate preservation was supposed to be a measure of how unsuccessful "Darwinism" is, then the incessant rain of planktonic detritus on the ocean floor ought to have been part of Johnson's first line of defense. But that would have required him to transcend Eldredge's authority quote and do some research on his own. Had he done so, he might have learned that the radiolarian genus *Eucyrtidium* branched into two over a million years in the Pleistocene, Simpson (1983, 172-173), following exactly the pattern described by Eldredge in *Reinventing Darwin*.

Or there is the evolution of the late Miocene foraminifer genus *Globorotalia*, where the fossil record was full enough to document speciation in both gradual sympatric and allopatric modes, Lazarus *et al.* (1995) and Norris *et al.* (1996). Malmgren *et al.* (1983) described the "punctuated gradualism" whereby *G. plesiotumida* evolved into *G. tumida* over 600,000 years, while *G. tumida* showed punctuated bursts of morphological change over the next half a million years down to the present, but not enough to

warrant a new species designation. Drawing on newer data, Hull & Norris (2009) subsequently identified a cryptic intermediate dominating the shift from *G. plesiotumida* into *G. tumida*, indicating the speciation process in that case was more punctuated than previously thought. And then there's *G. conomiozea*, where over about a million years the temperate branch of the population tracked through the intermediate *G. sphericomiozea* to become *G. puncticulata* while something else happened down in the tropics:

> The main, temperate, populations display a gradual transformation of *G. conomiozea* during an interval of 0.2 million years, with all measured variables during the interval showing continuous and steady changes. This contrasts with populations in the peripheral, warm tropical sections which showed rapid transition to a new species, *G. pliozea*, within an interval of 0.01 million years. After speciation, *G. pliozea* exhibited morphological stasis for a further 0.6 million years. This suggests that at the Miocene-Pliocene boundary, the peripheral tropical populations of *G. conomiozea* became isolated from the main temperate populations, possibly by the separation of water masses, and that from this point the two main population groups adopted different modes of microevolution. *Doyle & Lowry (1996, 86-87).*

Two speciation transitions for the price of one!

Was this what Phillip Johnson had in mind when he proclaimed the static character of the invertebrate fossil record? But then, surveying the seas from high atop the Intelligent Design tepuí, he had managed to turn the whole issue inside out, hadn't he? The extent to which species "stasis" helps the creationist cause depends not on the duration of the subsequent rut, but whether or not there are recognizable intermediates leading up to them from some previous species track. It's the existence of those intersections, and not the mileage on the side roads, which should have been engaging Johnson's attention—things like the many transitional sequences described by Patrick Doyle and Florence Lowry in their work on invertebrate evolution that I have drawn on:

So one final witness from Doyle & Lowry (1996, 84, 283): the genus of Neogene foraminifer *Globigerinoides* looking like a cluster of spheres to start with, but shifting through three transitional species in the genus *Praeorbulina* before ending up as a plain ball in yet another genus, *Orbulina*:

> Gradualism can be credibly defended where the record is complete and sufficient representatives of the group under study are available for study. Marine plankton, such as planktonic forms of the foraminifera (Chapter 16), are particularly useful in this regard. Their small size, abundance and widespread distribution make them useful subjects in evolutionary studies. The evolution of the genus *Orbulina* in the Miocene is an example of rapid change over a relatively short time span of 0.5 million years, in which all intermediate forms are known in an exceptionally complete stratigraphical sequence (Figure 4.7). Following this short, rapid burst, *Orbulina* remained unchanged to the present day, a span of 16 million years of stasis. Should the fossil record have been less complete, this event may have been represented by a sudden speciation event followed by a period of stasis. *Doyle & Lowry (1996, 84).*

The relatively tight geographical and temporal range of the transitioning *Praeorbulina-Orbulina* bunch has proven useful in exploring the way climate change impacted organisms, Rossignol *et al.* (2011).

Now you might well wonder what Johnson would make of this information, contradicting as it did his generalization that marine invertebrates posed an intractable problem for Darwinism. In the normal

world of scholarly logic a "generalization" is supposed to rest at some point on actual examples. And where it is so grounded, anyone offering the opinion should be easily motivated to trotting out illustrative instances (if only to show up any critic with the temerity to challenge the validity of said generality). But in my e-mail correspondence with Johnson on this matter in the summer of 1998 I learned that he had no intention of acquainting himself with the specifics, or of defending his scholarly logic when it came to his selective interpretation of *Reinventing Darwin*. He simply repeated the Eldredge stasis quote, as if that constituted an examination of the evidence itself.

I then brought up the *Orbulina* example in a last-ditch effort to prod him into addressing at least one corporeal marine invertebrate among those abstract creatures populating his giddy generality. At that point Johnson abruptly rolled up his end of the conversation. His response (in its entirety): "Well, I see you don't get it, and you aren't going to get it. When you are in a Darwinian way of thinking, everything looks Darwinian—even stasis. You have to step outside before you can see the other side. Have a nice day."

Moving beyond the smiley face of his salutation, here I have to agree with Johnson. I *don't* get it, and never will. I will never be able to ignore the details in the way Johnson has been able to do so effortlessly.

In this regard, it is interesting to note some of the ID icons burnishing Johnson's reputation on the dust jacket of *Objections Sustained*. Michael Denton declared that "Professor Johnson combines a broad knowledge of biology with the incisive logic of a leading legal scholar to deliver a brilliant and devastating attack on the whole edifice of Darwinian belief." And Michael Behe hailed Johnson as "our age's clearest thinker on the issue of evolution and its impact on society." A melancholy state of affairs indeed—were it but true. Two years after reading of *Orbulina*, though, Johnson replied to a questioner on Hank Hanegraaff's *Bible Answer Man* show (December 2000) that marine invertebrates showed only "change within the type, there's no change of one thing step by step into something completely different."

So I assume he needed to see a bivalve turn into a houseplant in order to exceed his typological expectations. And with this Johnson has walled himself up behind exactly the barricade already so heavily populated by his YEC counterparts, the failure to think about how evolutionary transitions would come about and precisely how they would appear in the process of doing it in a fossil preservation context where some taxa (wee critters whose innards aren't easily fossilized) are less likely to get sampled than others. We'll be seeing examples of this when it comes to speciation, biogeography, and the details of the fossil record, but in a fundamental way it is only a variation on what Granville Sewell or Casey Luskin were doing in their own treatments: playing off their secondary sources as though they represented (or could substitute for) primary ones. What you have here is the core of a reliably diagnostic *tortucan* trait.

While speciation events (today and thus putatively in the fossil past) can involve some interesting bursts of genetic change at the molecular level, surveyed by Venditti & Pagel (2010), this certainly doesn't require large changes in the deep DNA architecture of the regulatory and structural genes involved in overall morphology. Conversely, animals that maintain a quite monotonous external look over millions of years of speciation cannot be taken as meaning that they have remained genetically frozen inside. P-E falls through that conceptual gap for many antievolutionists, such as Anquinette Jones (2014), a creationist high school science teacher in Atlanta, Georgia, who defined P-E in a PowerPoint class lectures as "Rapid bursts of genetic change cause species to diverge quickly."

Similarly, the entry on "Punctuated Equilibrium" in the International Society For Complexity, Information, and Design's online *ISCID Encyclopedia of Science and Philosophy* (2005) got the overall thesis of P-E via Stephen Jay Gould (2002a) and Douglas Futuyma (1998) close enough, but couldn't resist jumping further to claim that P-E held "that genetic change occurs relatively rapidly on a

geological timescale." A confusion the *ISCID* companion entry on "Evolutionary Stasis" only compounded:

> Evolutionary stasis occurs when one or many species remain the same genetically with little change over long geological periods of time; periods of evolutionary stasis are often punctuated by periods of energetic evolution. This pattern is referred to as punctuated equilibrium. Species that have remained unchanged for hundreds of millions of years include the cyanobacteria, coelacanth, the lungfish, and some species of crocodiles.

How easy it was for the *ISCID* to waltz down the same well-trod garden path dead end that Jackson at the *AFA* had above regarding "living fossils" as being *unchanged* (see section **1.5** for just how crocodiles measure up in this department).

Such systemic confusion on the part of antievolutionists when it comes to punctuated equilibrium is only a reflection of a much larger conceptual problem when it comes to evaluating the fossil record in general: a persistent inability to wrap their minds around the rather simple concept that a species A and its offshoot B can *coexist* through time afterward, and how that might play out when the fossil preservation sieve only captures pieces of the puzzle. Ironically creationists are making the *same conceptual mistake* as the old selectionist evolutionists Eldredge and Gould were working against!

Knowing this background, the cavalier way the antievolutionists appearing on the PBS *News Hour* back in 1998 riffing off such statements as the rarity of intermediate species in the fossil record was only a symptom of how they got to be antievolutionists in the first place. As tortucans they are never bothered that they don't pay attention to the available data. It as easy for them to do as it is for people in the checkout line at the grocery store not to be aware of the *PNAS* issues that aren't under their noses to begin with.

Couple that with the fact that active antievolutionists are rarely (ok, that's not quite true—they are *never*) the people who actually dig up the bones or study the morphology of animals on a technical level (even creationist paleontologist Kurt Wise isn't an active fieldworker). As they don't generate any of the data themselves, and don't intrinsically care one whit about any of the material that does get rammed in their faces by pushy critics of creationism, the dilettante antievolutionist can all too easily conflate the issue of *speciation*, by which individual breeding populations fission off distinct ones, with *macroevolutionary* events—changes in form in a lineage of descent sufficiently distinct that they are hardly likely to be the result of any single speciation blip, but instead the result of a long cascade of otherwise entirely *microevolutionary* speciation episodes.

The actual rates of change taking place in evolutionary time can be quantified, by the way, in terms of standardized units of "darwins" and "haldanes" per Hendry & Kinnison (1999), and as Jablonski (2000, 26) noted of a many technical papers documenting rates in fossil and living species: "microevolution can occur as rapidly as needed to account for virtually any speed observed in the fossil record," so that "The more challenging question then becomes, why are evolutionary rates generally so slow in the fossil record?" Recognizing how functionally slow evolutionary changes can be in the real world has practical consequences—such as Andersen & Brander (2009) noting how current over-fishing occurs far too fast for adaptive changes to keep up with it.

The vital distinction between speciation events and the macroevolutionary changes that can (although not inevitably or necessarily) accumulate from long ages of those events utterly eluded the seminal Intelligent Design creationist textbook *Of Pandas and People*, firmly insisting (without—surprise!—bothering with any reference citation): "According to punctuated equilibrium, major evolutionary changes in small populations take place rapidly (say, in a few hundreds to several

thousands of years) rather than slowly (that is, in millions of years) as conventional evolutionary theory holds, " Davis & Kenyon (1993, 86).

Major evolutionary changes, is it? Such as … ah, *Pandas* never gets to that part.

The time frames in this inflated version of P-E may have been more due to Davis than Kenyon, since an affidavit Kenyon (1984) submitted to Louisiana in favor of their antievolution legislation had recognized Gould was talking about speciation events, but supplied no numbers: "But during the actual transition from one category of organism to another the evolving populations are so small and so rapidly changing that they do not leave any fossils to document the transition. In other words, in this new theory, it is postulated that the macroevolutionary process is such that it leaves no direct evidence of its occurrence."

The two Discovery Institute replacements for *Of Pandas and People*, *Explore Evolution* by Stephen Meyer *et al.* (2007, 31-35) and *The Design of Life* by Dembski & Wells (2008, 73-77), have not shown improvement. Like ReMine's *The Biotic Message*, *Explore Evolution* strolled off on the "species selection" tangent—and once again leaving Ernst Mayr unmentioned. "**Let's look at a real-life example**," Meyer *et al.* (2007, 34) asked then in **bold**—only it wasn't an examination of fossil data but an allusion to a *museum display chart* from the California Academy of Sciences dating from the 1990s dealing with how animal phyla were supposed to have branched.

I had seen this one before, though ironically *Explore Evolution* was less detailed than my other sources. I first encountered it at the 1998 "Creation Week" symposium at Whitworth University in Spokane, Washington, where I first bumped into Steve Meyer (then a philosophy professor there). A flier was being distributed criticizing the *CAS* for its supposedly misleading evolutionary wall display positioning 440-million-year-old fossil corals below 550-million-year-old echinoderms. Jonathan Wells (2000a, 54-55) also alluded to it. Phillip Johnson used the *CAS* example in his debate with science historian William Provine, Johnson & Provine (1994), where Provine not only agreed that the display was "terrible"—he went on to add criticism of his own. The *CAS* display (reproduced at the *ARN* website with more detail than the cartoon in *Explore Evolution*) looks suspiciously like it was based on a *cladogram*, a taxonomical technique classifying forms along branching nodes independent of chronology (more on cladistics in due course).

All well and good, but since the contentious end of the *CAS* display involved taxa stretching back around half a billion years, it was of little relevance to a discussion of how viable P-E was for comprehending the more recent swaths of fossil history where you had a lot more data to run off—and certainly no substitute for actually discussing that fossil history, specifically and in sufficient detail to show that ID was more than a flurry of side issues. Whether the chart was even of concern when it comes to evaluating the appearance of phyla back in the Cambrian may be seen the coverage in Downard (2003b) and **Chapter 2** of Downard (2004).

Like the creationists Henry Morris and Duane Gish above, *The Design of Life* version similarly asserted that "without an empirically confirmed material mechanism capable of accounting for these bursts in evolutionary activity, the theory of punctuated equilibrium finds its support not in any positive evidence but simply in the silence of the fossil record," Dembski & Wells (2008, 75). In what by now is an unsurprising refrain, again there was no discussion of any fossil examples—and no Ernst Mayr's allopatric speciation. Once more Mayr turned up in Dembski & Wells (2008, 59, 93, 124) only for a trio of tactical authority quotes: on the necessity of constructing "historical narratives" in thinking about evolution (Dembski & Wells intimating that such practices are somehow divorced from rigorous value), *Darwin's* failure to solve the species problem (a particularly cheeky thing to bring up given Mayr's important role in resolving that "mystery"), and why homology has come to be defined in terms of common ancestry (and hence might be dismissed as merely circular reasoning in Dembski & Wells' designer view, not as an explanatory framework that long ago proved significantly more productive than the typological alternative and so won the race by competitive success).

Because the chronology and physical examples of past life never surfaced in *Of Pandas and People*, or its *Discovery Institute* replacements, or in any other of the plethora of antievolutionary works that dive onto this subject, this way of thinking can easily spiral into hyperbole by followers who don't understand what "major evolutionary changes" are involved in the P-E debate because none of their restricted sources ever discussed it.

Some of these "bottom of the barrel" examples can truly boggle the mind, such as Terry Jackson (1997) thinking with **bold** emphasis that P-E theory called for "**sudden leaps** in animal forms. For example, chickens lay eggs hatching into chickards (*e.g.* half-chicken, half-lizard)." Or Cleone Weigand (1933-2010) addressing the *Wisconsin Lutheran Seminary* in Weigand (1992): "A hen would lay an egg and a duck would hatch out. A dog would have a litter, and what do you know, one in the litter would be a cat. As Jack Carson would say, 'I kid you not!' This is what Gould proposes. Such is the desperation among modern evolutionary scientists."

As it was the old *Tonight Show*'s Jack Parr (1918-2004) known for that catchphrase, not the comedic character actor Jack Carson (1910-1963), Weigand might be allotted a dollop of "desperation" himself for not getting Gould's ideas straight either.

Then there's the cartoon in Vance Ferrell (2004) captioned: "Species change occurs when millions of positive, only beneficial, highly coordinated mutations suddenly occur in identically the same way in two creatures—a male and a female—born just near each other. This is called *punctuated equilibrium*." Ferrell (2006f, 57) upped this to boldface regarding the "astoundingly ridiculous concept that **millions of beneficial mutations occur once every 50,000 years to two creatures, a male and a female, who are living near each other—thus producing a new species pair!**"

Caught in his own vortex of confusion, though, Ferrell (2006f, 886-887) later repeated that it was Gould & Eldredge's specific contention that:

> every 50,000 years or so, a million beneficial mutations suddenly occur—producing a newborn creature which is a totally different species! The classic statement is that a reptile lays an egg and the first bird hatches into existence. Of course, they admitted that, nearby, another multimillion beneficial mutations just happened to produce a mate for this new creature, which they named a "hopeful monster."

Roger Patterson (2009, 99) cribbed a similar argument by Gary Parker (though this *AiG* version only spoke of "exact mutations" occurring "simultaneously and in close proximity" rather than enumerating them so outrageously as Ferrell had). Patterson grew still vaguer attached to the circumspect Mortenson & Patterson (2013), asserting without documentation that "punctuated equilibrium tries to account for the lack of fossil intermediates by appealing to rapid bursts of change interspersed in the millions of years. They still rely on mutations and natural selection, but at a much faster rate." Matt Slick (2011) similarly decided P-E involved "huge increases of speciation in very short periods of time."

I would have loved seeing Jackson or Ferrell (or Patterson, Mortenson or Slick, should they have dropped down from the rafters to the P-E working floor) trying to document this with any actual scientific source claiming such things, Gould & Eldredge or otherwise. Ferrell's confusion turns particularly on his scholarly inability to strain past quote snippets to understand what concepts of saltational change were being bandied about back in the 1940s regarding the "hopeful monster" idea of Richard Goldschmidt (1878-1958) of reptiles laying bird eggs in one saltational jump, or how they relate to current understanding of DNA and their genetic regulation. Goldschmidt was one of the first to try and integrate genetics and development, Dietrich (2000), but as this was before the structure of DNA was identified and half a century before the discovery of homeotic genes, interest in his work tends to be more antiquarian than practical, though his role as a quirky heretic continues to fascinate many in the evolutionary community, Scudallari (2014a).

Texas School Board creationist Don McLeroy (2003, 10) welded these misunderstandings together just as tightly himself when he lobbed the P-E bomb in a typical scattershot parade of creationist claims: "the paleontologists/evolutionists proposed abrupt macroevolutionary changes to account for the lack of transitional forms," and after Goldschmidt in 1940, "Gould and Eldredge followed in 1974 with their hypothesis of 'Punctuated Equilibrium'." That was it. Like Steve Meyer, McLeroy never mentioned Ernst Mayr, or concrete examples of what P-E meant or how it could be applied—though he might be granted a feeble excuse here as McLeroy's piece was in short outline form rather than one with the luxury of space in *Darwin's Doubt* where one could make the same mistakes at leisure.

Thomas Heinze (2002) did much the same thing as McLeroy, except he left out *all the names*, referring only generically to "punctuated equilibrium and these scientists themselves were called saltationists." Heinze then went on to field the common creationist assertion that modern understandings of mutations conflicted with evolution (which we will be contrasting with the all too available scientific literature in the appropriate later chapters). Erik Anderson (2011, 7-11) has noted similar biological lapses relating to P-E on the part of creationists Gary Parker, Jay Wile and Marilyn Durnell.

More tendentiously, in their appendix on "Rational Inquiry & the Force of Scientific Data: Are New Horizons Emerging?" for Moreland (1994a), Ankerberg & Weldon (1994, 283) meandered even further down the secondary path by fielding a 1970 quote from Ernst Mayr disparaging Goldschmidt, as though that automatically had some bearing on the decidedly non-saltational concept of P-E first proposed by Gould and Niles Eldredge only in 1972 (and which had explicitly built on Mayr's own scientific work). Del Ratzsch (1996, 84-85, 208), who otherwise deemed Moreland's *The Creation Hypothesis* a key work in the effort to establish the scientific credibility of Intelligent Design, found the presence of Ankerberg & Weldon's piece "puzzling" (interestingly, not mentioning either author by name, saying only the appendix was "written by two people, neither of whom has an advanced degree in science or philosophy").

As for Terry Jackson's characterization of chickard-laying hens, that goof is both chronologically and taxonomically flawed: in any geologically savvy evolutionary framework the lizards would have come *before* the chickens, not the other way around. But more fundamentally wrong is the notion that P-E (or more generally, modern evolutionary theory) proposed the existence of any such cockamamie chimeras in the first place. As we'll see with Duane Gish's lecture circuit bovine whale and Kirk Cameron's celebrated "crocoduck" later on, some creationists cannot resist the temptation to claim evolution is somehow falsified because the wacky "intermediates" they have concocted out of their own misunderstanding about evolutionary processes turned out never to have existed. Sorry, that's not evolution's problem.

Along the creationist secondary citation grapevine, by the way, Jackson got listed as a "scientist" and his article linked to by the very conservative Roman Catholic *Angelqueen* blogger David Mueth (2010), who distilled Jackson's erroneous technical conclusion to a pithy "Evolutionists put forth much false info." Jackson's view "that evolution is a prime Communist tool" clearly appealed to Mueth's anachronistic *Kulturkampf* view of the world (writing twenty years after the dissolution of the Soviet Block and long after they started putting up fast food outlets in China, Mueth's mental map may have petrified somewhere around 1970).

Such political obsessions aside, these creationist ideas about what Gould & Eldredge thought was solely the product of their own misunderstanding of the work, which hadn't said anything about a *million* mutations being needed to generate a new species, let alone that they would have all piled up at once—or, as in Ferrell's version, that a similar happenstance would have had to have occurred to provide a mate for this isolated accident. At any given time there would be a *whole sub-population* of animals carrying the slightly varied genetic mix that is showing up at the fossil level as an apparent speciation event.

Edging out even farther on the gangplank of taxonomical exaggeration than Ferrell, though, was Frank Sherwin (2010) opining in the ICR *Acts & Facts* how Gould "proposed that species are stable for eons, then transmutate from one body plan to another so fast that the changes are not captured in the rock record." Only Gould explicitly wasn't talking about *eons* of stasis or anything about the formation of new "body plans"—how far from speciation we have come once tortucans release the brakes!

The ease with which the likes of Ferrell and Sherwin toss around "species" or "body plans" as though they had a tight grasp of either is no isolated eccentricity, any more than Casey Luskin trying to invoke "large amounts of information" change creeping into poor *P. vema*. As we'll see in the chapters to come, there is a high degree of both evasion and confusion among antievolutionists on this matter of what constitutes changes large and small in the living world, summed up in the tussle over "microevolution" versus "macroevolution."

1.3 Section 6—When it comes to antievolutionism & sources, *there's a madness to their method*.

In one sense we are seeing in the P-E debate the critical limits of antievolutionary arguments in relief: the consistent inability of their proponents not only to approach anything like a large chunk of the evidence, but even more fatally, unable to integrate even what little they do encounter into their own framework. And that is, of course, because they don't actually *have* a framework. What they do have is a dogma about what the framework should *affirm*: that life somewhere and somehow was made—not evolved—and please don't bother us to supply any more of the details.

And so long as the public debate, the one conducted on news shows or websites, stays at the level of colliding affirmations, the antievolutionist can play the game just fine. But the moment we move back to how all the evidence is supposed to support or refute that affirmation, the general public is lost and the scientist is left to fight a rear-guard action using precise tools, but ones unfamiliar to their audience. No wonder the issue is so hard to deal with for the public.

And should the critic of antievolutionism lose their cool and indulge in a vituperative snap as a shortcut, the rhetoric miners are at the ready to exploit this lapse in etiquette. For illustration, one may explore this thicket circling Jerry Coyne (2011p), P. Z. Myers (2011h) and Jack Scanlon (2011e-g) on the ID critic side, and Barry Arrington (2011c), Douglas Axe (2011b), Ann Gauger (2011d), David Klinghoffer (2011i-j,r) and Casey Luskin (2011l,v,ae,ar,av) on the pro-ID side. Such exchanges can prove very lengthy and singularly unproductive, but such are the pitfalls of tit-for-tat website postings these days.

I have tried to illustrate this larger issue here. As brief as I tried to be in this introductory foray, my explanation of the speciation rate versus fossil preservation odds issue still took *way* more time (try reading it aloud) than any scientific respondent could dish out even with a lightning delivery. Which in turn raises another question: how likely would it be for the viewers of the PBS *News Hour* discussion (let alone the more distinctively *vox populi* demographic of Fox News in the years since) to be sufficiently up on their paleontological speciation concepts to have the slightest idea what was being talked about without diving at least as deep into the background as I had to do here?

Given how persistently this misrepresentation is made by creationists, and how tricky it would be to cover in a snap television response, any evolution defender would need to be up not only on the available facts but primed on a Pavlovian hair-trigger to counter the creationist misrepresentation quickly and decisively. Instead, there intervened a painfully long chasm of airtime before the academic defender got around to it. Although it was admirable for him eventually to note how Gould had participated in drawing up the NAS guidelines in the first place—and so didn't seem to be a particularly good poster child for evolutionary nay-saying—the fact remained that by then much of the advantage of momentum had been lost as the segment clock ticked down.

An even more interesting bungled opportunity for the pro-evolution side in the *News Hour* episode concerned the supposed absence of whale transitionals alluded to by the earth science instructor. Had

this teacher actually read much outside the creationist literature (which you would have thought a "science teacher" ought to) I can't imagine how he could have been unaware of the existence of intermediate whale fossils by 1998. For example, David Lambert's informative compendium, *The Field Guide to Prehistoric Life*, had been available since 1985, which discussed several early whales whose characteristics differed so markedly from modern ones to constitute on their own intermediate aquatic forms. But more significantly, by the mid-1990s a whole bay full of remarkably specific "whales with legs" had turned up to clinch the case for their descent from land mammals, touched on by Lambert & The Diagram Group (1985, 198-199) and Gould (1994c), or at more length by C. Zimmer (1998).

The details of these fossil whales breached fully in **Chapter 4** of Downard (2004), for they are important far beyond the specific issue of how yet another "smoking gun" of evolution has turned up in spite of the best hopes of antievolutionists. Exploring not only how conventional creationists dance around such data, but seeing the equally gymnastic maneuvers of Intelligent Design avatars Phillip Johnson and Michael Behe, will illustrate some prime methodological properties of the tortucan mind.

In an inversion of Polonius' suspicions about the aberrant behavior of Hamlet, we shall see *there is a madness to their method*.