Troubles in Paradise "In the Beginning" James Downard
1.1 • At the Starting Gate (Last updated 16 August 2015)

1.1 Section 1—Figuring out how people believe things that aren't true.

Oh dear—another work on creationism! Hasn't enough been done on that already? Hasn't every top gun from Richard Dawkins and Jerry Coyne and Ken Miller and Eugenie Scott and Niles Eldredge and Stephen Jay Gould, let alone dozens of other ventures in sundry books and articles, slain the antievolutionary dragon so completely that we can just cite them and move on? Well, the topic doesn't seem to be going away. The many hydra-like efforts of the retooled Intelligent Design (ID) movement to "teach the controversy" or show the "strengths and weaknesses" of evolutionary theory show just how robust (and troublesome) the creationist subculture remains, so maybe it is time to rethink both the issue and what might be done about it.

This work endeavors to take a fresh look at the creation/evolution controversy, from top to bottom. My proposition is that the roots of the debate lie not (amazingly enough) with the "usual suspects" of religion and politics. Although those factors obviously play a tremendous role in the superficial textures of the landscape, the root problem lies much deeper than popular apologetics. Rather they stem from truly fundamental cognitive processes, ones which we fail to appreciate and deal with at our cultural peril.

At heart are basic questions that any serious philosophy must recognize and have a workable opinion on.

Starting with: **How do people believe things that aren't true?** We can't dodge that question. Unless you're claiming that *all* beliefs are in fact true, and that one just won't fly. To take just one obvious example: the earth cannot simultaneously be considered the center of the solar system *and* be revolving around the sun. Or, if you'd like a nonscientific issue, that the historical figure known as Homer either did or not exist as a real human being. While the Homer case is for all practical purposes an unsolvable one, the heliocentrism thing is a different matter. Though in case any readers are of the opinion that this at least is one of those fully settled issues in science, a truly dead horse, we'll be seeing the unsettling reality is that certain biblical creationist *geocentrists* have had (*and continue to have*) a surprising influence on the contemporary antievolution scene. Not all dead horses are in fact completely *dead*.

Which brings us to a second great question of thought imbedded in the first: **How do you figure out that something is *true*?** Are there really standards for such things? If so (and I definitely contend there are) are these truly universal rules, that all self-aware beings must adhere to independently in order to qualify for the "clear thinking" label? Right up front I will declare my conviction that there is only *one* method for rigorous thought, not a plethora of context sensitive methodologies open to the squishy interpretations of time and circumstance. Sound thought is the same for us today as for an inhabitant of a Pleistocene savanna—or for any hypothetical beings that might populate alien realms.

One standard, all the time, for all things. No exceptions.

That should be simple enough. But there's more.

I further contend there is also only one way for people who manage to believe things that aren't true to pull that trick off. And that flawed methodology turns out to lie very deeply in cognitive processes by no means restricted to faulty thinking. Indeed, they are probably ultimately inherent to our success as a species. Dumb ideas in general, and the creationism that is the specific focus of this work, have not come about because their believers have devised some extraordinarily novel way of thinking badly. Nor that the general way of their thinking badly is somehow utterly unconnected from what they are doing when they are *not* thinking badly.

No, my argument is that creationism is symptomatic of what happens when entirely natural and normal information processing in the brain gets applied to areas to which they were not originally adapted—namely, the more recent human constructs of history and science. Scientific and historical reasoning, where the goal is to try and understand what actually is or has happened, regardless of how much you may desire it to have been or not, turns out not to be a skill we humans fall into easily. It takes conscious vigilance to keep the process on track, and some people are naturally poorer at that calibration than others.

Because there isn't actually a term to describe what we can see is going on here, I have had to opt for a neologism: the *tortucan* mind. I define that term fully in Downard (2010), and offer some proposals about how the dynamics of that process may be identified (or confuted) by future scientific investigation, but for now all you need to know is that I've plucked the term from the Latin for *turtle*, and that the concept will get a *lot* of use in the pages to come.

Another key concept underlying my analysis of how people should go about thinking through things to figure out what are the true and false bits concerns *application*. You can make any pronouncement you like, define a topic in any manner you please, clever or stupid. But whatever meaning those propositions may actually have is only to be discovered by how they are *applied*. You figure out what something means by *doing* it, embodying it in specific examples. This runs from material things like what a chair or an elephant is, to immaterial (but nonetheless very important) notions like beauty or goodness. Thus the *utilitarian* test of a proposition is at the front of any sense of meaning. What good is any idea if you can't apply it anywhere—or, if you do try to use it, you keep stumbling on absurd contradictions or have to sweep too much inconvenient information under the rug to make the idea seem to hold up.

With quite amazing consistency, seen throughout Downard (2003b; 2004), this application issue lies at the heart of how the tortucans of the world (and there are lots of them) strut onto the scientific or philosophical stages and make such a recurring nuisance.

1.1 Section 2—Formative times for my thinking, from Sunday School to High School.

Jumping down from rarified philosophy to the personal side, I slid into this issue quite incrementally, not because I was exposed to the subject of creation or evolution either by outside influences or domestic indoctrination. To the contrary, while early on I took to reading the family copy of the *World Book Encyclopedia* for routine entertainment, none of my family was especially scientific or scholarly minded to have guided my thought processes one way or another.

When the first shoe did drop, though, it was a tiny one. While we weren't a churchgoing family (though we had squads of Mormons in the family tree) and my politically conservative mom nonetheless thought all religious "sky pilots" were only in it for the money, she also thought it completely appropriate to send us kids to Sunday school, where we could decide for ourselves if we had a further taste for religious thinking. None of us ultimately took to religion from this process, by the way, which may signify an upper limit on the utility of parochial schooling as a way of recruiting converts. But whereas my brother and sisters wafted through their Sunday school teachings with blithe indifference, when I was sent to the local Methodist church in Ontario, California in the early 1960s I showed a particularly skeptical turn of mind that got me into trouble in a way they never had. Exactly like Ellie Arroway in Carl Sagan's *Contact*, I got summarily kicked out for asking one too many pesky questions about Noah's Ark and the Flood story.

Sunday school was not the place for me to ask such questions, I was firmly told as I was being packed off home. Which struck me as odd: where exactly would be a *better* spot for that, if not in a study explicitly devoted to it? Clearly what got me into trouble was the idea of my questioning the Bible stories in a truly *questioning* way—not an inquiry to clarify my understanding of what the teaching was

supposed to be, and resting at that, but a real question about whether there were plausibility issues with the story to begin with, and thus whether it might not be something to actively *disbelieve*. Thus fatally for any lasting piety on my part, I came away from my childhood Sunday school experience thinking that my questions weren't so much of a problem as the utter inability of the instructor to come up with even mildly convincing answers for them.

After the lame Sunday school teacher, the next corrupting influence on my thinking came from my early conversion to the rigors of mathematical logic. That phase began with my geometry teacher, drilling into us how it wasn't good enough just to get the right answer. You had to have arrived at it through a correct line of reasoning; otherwise you had "proven" nothing at all. Then, many years later, there was that impish college professor who took a day out from advanced matrices to maliciously warp our minds and demolish all notions of "common sense" by demonstrating how parallel lines can meet, and some infinities are bigger than others. Hovering over all, of course, like the smile of the Cheshire cat, was the insidious mathematician Kurt Gödel (1906-1978), who undermined smug certainty itself by establishing how even the most carefully defined logical systems might nonetheless generate menageries of inherently undecidable propositions. Maor (1987) gives a tidy introduction to Georg Cantor (1845-1918) and the merry world of transfinite mathematics. For a breathtaking foray into the many implications of Gödel, Hofstadter (1979) remains a must (if daunting) read.

Brain fog from those higher-level matrices persuaded me to drop the double history/math majors and focus more on my primary interest of history. Mixing my natural skepticism with a craving for historical sequence (what exactly happened first, and then what) I began to clarify what it means to use sound scholarly analytical method. Hypotheses are only the beginning. Can you *prove* it? How *does* one go about "proving" things, anyway? What are the standards of evidence? And most importantly, how exactly would you know if you were *wrong*? Such is the creed of the devout methodologist.

I was still a long way, though, from thinking as carefully as I believe I do now, and the process of cognitive weeding that removed some really dippy ideas from my mental toolkit came about along a very curious path, changing, from a not particularly stupid person who nonetheless was capable of believing quite a few really stupid things, to a much more careful analyst where at least I try consciously to define reasonable standards for a problem and apply them consistently. Seeing how such a method is assembled and used in real cases other than creationism also makes it clearer to see what happens when this non-double standard is turned to the evolution of life and to see how otherwise bright people are so capable of not believing a word of it.

At this point, apart from my brief childhood collision with Noah's Flood at Sunday school, none of my life experience had caused me to think much about either the evolution of life or the creationist opposition to it. Indeed, it wasn't until well after college that I became sufficiently familiar with the available data that I realized that naturalistic evolution was the only workable explanation for the broad body of observed facts of life. That issue first began to percolate in my mind, though, with the drop of another shoe, this one quite a bit bigger than the Sunday school expulsion one.

Set the Wayback Machine to the late 1960s, and my high school physics teacher up where we now lived, in Spokane, Washington.

At my school there existed a notorious, though completely good-natured, rivalry between the physics instructor and calculus teacher, who were an entertaining bookend set of diminutive gentlemen in chalk-encrusted white lab coats. Anyone taking the physics elective soon discovered mathematics existed simply as a convenient tool for that discipline, while calculus students were equally assured physics was merely an example of "applied mathematics." While those hapless enough to take both courses in the same quarter felt a bit like a badminton shuttlecock, in the end I am still impressed at how their good natured ribbing generated an interdisciplinary crossfire that helped considerably in comprehending things such as gravitational acceleration.

It was one thing to be taught that in the absence of atmospheric drag the second integral of acceleration quantifies how far an object will fall over a specified time. It was quite another to see how a chalkboard plotting (remember this was way pre-computer) of the changing velocity produces a diagonal line (shallower for lunar gravity, steeper for Jupiter). At any given moment, the acceleration is the slope of that line, which happens to be a constant value, while the accumulated area beneath the line represents the distance covered. Thus there was a *graphic* aspect to these seemingly abstract formulas that was for me a most exhilarating moment of connective discovery.

Both of these teachers were clearly very good at their work, exactly the inspirational sort you naturally admired and desired to emulate. For that reason it was a striking moment in my education when one day, out of the blue, my physics teacher interrupted the assigned lesson plan to digress on something called the "ice canopy" theory, which purported to offer a physical rationale for the reality of the Biblical Flood. Remember, I probably hadn't given more than a few passing thoughts to the Noah story in the half a dozen or so years since being kicked out of Sunday school, so running into it now functioned more as a curious prodding than any reinforcement or rejection of deeply held conviction.

The idea being floated, as it were, by my physics teacher that afternoon was that an ancient orbital layer of atmospheric ice had once existed around the earth, and that its collapse onto the earth resulted in a terrible watery catastrophe that ended up recounted in the book of Genesis. Although offered as a strictly scientific speculation, the religious implications were obvious—the Bible was on the mark after all—though the class discussion remained congenially free of sectarian intensity. It was nonetheless a singularly odd topic for our physics class (as distinct from earth science), and therefore as diagnostic to come up as it did unprompted as it would have been for a social studies teacher to suddenly veer off on the "proletarian struggle against imperialist hegemony."

That afternoon's foray into Ice Canopy theory suggested that some external agenda might have been knocking around in my teacher's noggin. But as this was the only time this topic was ever brought up, I have no idea to what extent my amiable physics instructor was in fact a "creationist" as opposed to someone merely overly keen to discuss a new theory about the past. That he could be characterized as "creationist friendly" though is much more certain, as I would realize years later when I discovered from where he had got this "ice canopy" idea. He must have just read Donald Patten's 1966 work, *The Biblical Flood and the Ice Epoch*. Besides the fact that Patten came from our state of Washington, the revealing feature was that he specified an *ice* canopy for his deluge source, when the preferred creationist term by then was *vapor* canopy. In his detailed history *The Creationists*, Ronald Numbers (1992, 254) noted Patten's efforts at formulating a purely "scientific" explanation for the Flood failed to impress the more theologically fastidious creationist. Thus my physics teacher's digression that day had been tiptoeing our budding little minds straight onto a pseudoscientific minefield.

1.1 Section 3—Enter the dinosaurs, a jumpstart for my scientific imagination.

I might never have given this isolated episode another thought were it not for the seemingly unrelated fact that, like so many kids before and since, I had avidly collected dinosaur models. But not just *any* models. While there were the standard brightly colored clunky dino toys still available in grocery store packets today, in the early 1960s a series of particularly well-crafted replicas were being issued, based on the spectacular paleontological mural, "The Age of Reason," painted by Rudolph Zallinger decades before for the Peabody Museum at Yale University. Gould (1993b, 8-9) illustrates the famed dinosaurian segment, while the full panorama is available at the Peabody Museum website (peabody.yale.edu/mural). I still see the molds for many of the "Yale series" being used today, though rarely executed with the comparative precision of the originals in my collection.

As long as sales held up, whoever was responsible for the set kept issuing new ones, and might presumably have eventually modeled every animal shown on the Yale mural. That didn't happen, but

the ones they did get to included many that were distinctly not dinosaurs, such as the flying reptile *Pteranodon*, nor even contemporary with them (though in this regard you can imagine what I might have believed had I been reared on the Young Earth creationism—YEC for short—of Henry Morris (1918-2006) or Duane Gish (1921-2013) instead of the *World Book Encyclopedia*). While the woolly mammoth and sabertooth tiger in the set were clearly more recent than *Brontosaurus* or *T. rex*, they makers included reptiles not so popular in modern prehistoric life series, creatures far more ancient than the dinosaurs. These were *Dimetrodon*, *Sphenacodon*, and *Moschops*, which lived during the Permian period just preceding the Mesozoic "Age of Dinosaurs."

That trio represented some of the early eccentric therapsid reptiles that will figure so prominently in the creation/evolution debate (per **Chapter 7** below), though conspicuously absent in the Yale mural were many of the most important protomammals then known, as noted by Peter Ward (2000, 49-51). Assuming Zallinger knew of them and consciously elected to exclude them, size may have played a role, as he would have had to either show the small transitional therapsids out of scale in the foreground, or shown them hunkered down almost invisibly amid the increasingly massive dinosaur stars.

The fin-backed *Dimetrodon* shown in the mural would, of course, become a familiar cliché from many a prehistoric beast movie, when before the era of facile computer graphics the only alternative to laborious stop-motion animation was to stick a fin on some cooperative Gila monster and call it a *Dimetrodon*. That was what was done for the geologically preposterous but nonetheless highly entertaining 1959 film version of Jules Verne's *Journey to the Center of the Earth*. That very familiarity has served *Dimetrodon* well, for it still gets included in a lot of "dinosaur" sets along with *Pteranodon*.

But those two other Permian creatures, *Sphenacodon* and *Moschops*, were dull indeed compared to my mighty dinosaurs. Low-slung quadrupedal predator *Sphenacodon* might have been a terror in its Permian heyday, but the herbivorous *Moschops* was a complete disappointment to me. Looking much like an overgrown frog, it had splayed legs and a congenitally dippy expression I could barely tolerate. Fortunately they belonged to an earlier age, which meant my budding sense of historical sequence permitted me to segregate them on chronological grounds, so they would never need to actually hobnob with the noble dinosaurs during imaginative maneuvering of critters among the miniature palm frond dioramas I assembled on my bedroom desk.

Beyond the pressing concerns of reptile esthetics, though, I had even more trouble grasping the matter of dinosaur *size*. It was apparent the *Tyrannosaurus* model was much too large compared to *Brontosaurus*, but my encyclopedia reading only compounded the problem by illustrating another sauropod instead, *Diplodocus*, which was supposedly even longer. Was *Diplodocus* the same size as *Brontosaurus* but with longer neck and tail? Or was it a smaller animal that only ended up being longer due to proportionally lengthier appendages? Without a way to scale to them together, I couldn't tell. Nor could I keep clear in my mind what it meant to be a "lizard-hipped" Saurischian dinosaur as opposed to the "bird-hipped" Ornithischian ones, since both had examples that stood upright while others were on all fours. Without scale models representing all these types, I simply couldn't keep any of it straight, and for years there the problem rested.

I grew up, learned geometry and history, began to believe some silly things, attended college, added some more silly things, began to figure out why I was wrong on all that, and finally invaded the job market, by which time it was the 1980s and there was a very big dinosaur revolution going on. A comprehensive series of uniform scale models appeared, far more accurate than my old Yale set. Based on the specimens at the British Museum (now known as the London Natural History Museum), they were joined later by equally detailed editions representing the Boston Museum and Pittsburgh's Carnegie collections. With these in hand I could see that my second hypothesis about *Diplodocus* was the correct one: smaller than *Brontosaurus* but with a really long neck and tail.

As easily as observing zoo specimens, I could now draw on the insights of torrent of profusely illustrated works by a new generation of highly articulate dinosaur paleontologists. Hence my

aestivating interest revived with a bang and in two shakes of a theropod tail I had become a dedicated student of the Dinosauria. I must commend the excellent dinosaur encyclopedia, David Norman (1985a), which particularly ignited my imagination. A world authority on the large Cretaceous herbivores, the iguanodontids (which also turned out to play a recurrent role in this present work), Norman concisely described both the fine details and legitimate controversies of modern paleontology, while John Sibbick's stunning illustrations captured the vitality of these long lost creatures.

Coming back to dinosaurs when I did meant more than just catching up on lost time, though. It was a case of confronting the very nature of scientific inquiry. Being extinct animals, almost everything about their study had an inferential character about it. When I was young, dinosaurs were invariably characterized as brute, sluggish creatures that only managed to lumber on as long as they did because the supposedly "superior" mammals had yet to dislodge them. But that conception was toast by the 1980s, as paleontologists had discovered more new dinosaur genera than in all the preceding century. The structure and distribution of these beasts disposed of old concepts but raised fresh questions.

Were dinosaurs warm-blooded after all? Or did they possess a uniquely "dinosaurian" metabolism? Without living examples, how exactly could you tell? To examine this *one issue alone* required understanding the full range of animal thermoregulation. The implications of body stance and herding characteristics and bone histology (the internal structure of blood vessels) all had to be carefully evaluated. Some dinosaurs turn out to have lived in ancient polar regions. That meant you had to know paleoclimatology to decide just how nippy the Mesozoic Arctic and Antarctic were, in order to infer the metabolic range of the dinosaurs living in those regions.

In the quest to make sense of the dinosaurs, you could *see* the science being done, and exactly *how* it was being done. Clearly on display was the technique whereby any aspect of the natural world might be understood. So while Robert Bakker (1986) defended full blown warm-blooded *endothermy* for dinosaurs, Fastovsky & Weishampel (1996, 328-355), Padian (1997a) and Dingus & Rowe (1998, 224-227) favored a metabolic mix: functionally endothermic predatory theropods versus large herbivores managing quite well on cold-blooded *ectothermy*, and subsequent analyses have trended towards an intermediate "mesothermy" for dinosaurs: Fricke & Rogers (2000), Chinsamy-Turan (2008), McNab (2009), Eagle *et al.* (2011), and Balter (2014g) re Grady *et al.* (2014), with subsequent critical debate by D'Emic (2015), Grady *et al.* (2015) and Myhrvold (2015).

So many disciplines played a part in this debate. Take bone histology, the study of the arrangement of spaces in the bone structure. Growth rates of animals tell tales about their underlying metabolism, and the evidence has supported a non-reptilian growth rate for dinosaurs that in turn related to the potential origin of birds: Chinsamy & Elzanowski (2001), G. Erickson *et al.* (2001), Padian *et al.* (2001), Horner & Padian (2004), Horner *et al.* (2005) and G. Erickson *et al.* (2009). See also Padian (2012) re Köhler *et al*. (2012) on relevant findings apropos mammal bone growth patterns, and for lagniappe, one may compare Dalton (2000d), Stokstad (2001d) and Rowe *et al.* (2001) on the metabolic implications of the problematic *Thescelosaurus* "heart" fossil of Fisher *et al.* (2000).

All this is just the tip of a very big inferential iceberg.

Asking whether dinosaurs traveled in migratory herds, like many an active endothermic mammal today, again carried with it presumptions about their underlying biology, their social behavior, and adaptability to changing local conditions. Learning moreover that mammals had coexisted as seemingly trivial denizens of this dinosaur-dominated habitat only added to the mystery of why these wonderfully successful animals had gone extinct at all. A hundred and fifty million years of success, and then poof! Gone forever. How come? Raising this question naturally brought up the issue of *patterns*, for the dinosaur exit was only the most recent radical gear shifting of life. One system collapses, and the survivors build a new one, only to have it fall apart in turn (albeit many millions of years on). Have the living things that go extinct *en mass* just "worn out," reaping the declining fruit from the seeds of their own decay? Or was it more the luck of the draw, mere contingency?

A sample of perspectives suggests how intriguing the issue has been, as well as how difficult it is to resolve from the vantage of many millions of years later: Gore (1989), Eldredge (1991b), J. Erickson (1991), Raup (1991), Whitfield (1993, 182-187), Glen (1994), P. Ward (1994; 2000), Douglas Palmer (1999, 90-91, 126-129, 196-197), P. Ward & Brownlee (2000, 157-188), Gibbs (2001c), Jablonski (2001), Kerr (2001), C. Zimmer (2001g, 143-186) and Becker (2002).

As we'll see in later chapter modules, the nature and pacing of extinctions (mass and otherwise) and subsequent biological rebounding will figure in a lot of the antievolution debate, but for the moment it's a good idea to get a few of the highlights on the table up front.