

Just-so-stories for the punctuated evolutionist

A review of
**Structure of Evolutionary
 Theory**
 by Steven J. Gould
 Harvard University Press,
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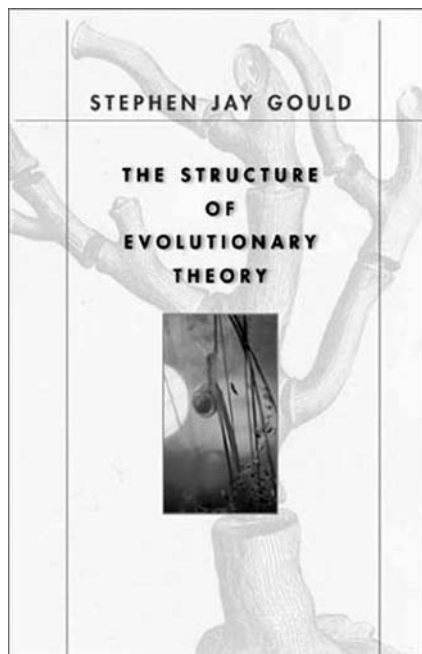
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Those willing to wade through Steven J. Gould's massive 1,400-page, *magnum opus*, will find that it is long on rhetoric but lacking in scientific detail. It is informative in its evidence against classical Darwinian gradualism, but is lacking in evidence for Gould's theory of Punctuated Evolution. The book is a litany of unsupported assumptions, contradictory and logically inconsistent statements and non-sequitor conclusions.

Avoiding origin of life questions

From the start, Gould engages in a ploy of deception, deviating from the expected and ordinary definition of *structure* (the arrangement or interrelation of *all* the parts of a whole),¹ by purposefully excluding numerous components of essential evolutionary theory.

On page 102, in conjunction with a footnote swipe at creationists, Gould eliminates any discussion of biochemical evolution stating 'We may first, however, specify the kinds of questions that *cannot* be answered.' Considering the massive amount of biochemical research which has occurred in the last sixty years, it is deceptive for Gould to ignore the intractable problems encountered with the biochemical origins of life. Without a doubt, when the work of Miller and Urey was unveiled it was prominently touted as one of the final



missing pieces in evolutionary theory. Almost every biology textbook to this day still includes the primordial soup arguments complete with the diagrams of Miller and Urey's apparatus. Gould however, chooses to completely ignore the problem now that scientific experimentation has demonstrated its impossibility. Sadly, Gould does not provide even a theoretical explanation for the biochemical origin of life; he just assumes it must happen.²

The problem is so intractable that Gould does not even venture to elaborate on the incredibly obvious question: 'which came first the enzyme or the protein?' The more complex the question of biochemical structures becomes the quieter Gould becomes. For example, in chapter 10 (p. 1025) Gould relies heavily on *hox* genes (homeoboxes) and modification of the developmental cascade (utilizing heterochrony etc.) as a major component of his argument for rapid speciation. In a nutshell, these are the complex mechanisms which link an organism's genotype to its phenotype. Nowhere does Professor Gould even attempt to

explain how such a linkage could have formed. It falls into the 'which came first, the enzyme or the protein' basket of intractable problems.

Since Gould *a priori* assumes that the origin-of-life questions 'cannot be answered' he then boldly proceeds by slight of hand to stack on the discard pile of unanswerable questions: origins of enzymes, nucleic acids, cellular organelles, nuclear membranes and all other cellular components. He acknowledges that life resists change, but has no explanation for why his assumed primal cellular prototype became so stable. His explanation for the origin of cellular division is limited to a presumption of how *meiosis* evolved and lacks any experimental evidence.

Gould repeatedly assumes the *a priori* existence of a complex existing entity, i.e. a functioning prokaryote and then proceeds to fabricate trivial explanations how additional complex processes arose, devoid of any quoted laboratory research. On pages 694 and 695, Gould takes the reader from a prokaryote to a mammal in two paragraphs but fails to mention he has no experimental data supporting the creation of an increasingly complex organism or an increase in cellular informational content.

Just-so stories

An example of Gould's skill for creating 'just-so stories' is seen on page 697:

'The initial features of the nascent [newly formed] level must originate in synergism, or positive interaction, with selection at the level just below, which formerly stood topmost, but will now be superseded (in the literal sense of "sat upon") by the newly-emerging style of organization. New levels must begin with such a helpful boost, for the initial tentative and unformed steps cannot yet possess enough power to suppress or regulate a well-established level beneath.'

Reality takes hold and Gould

continues with:

‘... since we have no direct data for key transitions that occurred so long ago and left no fossil evidence ... such entirely speculative scenarios must be understood within their acknowledged limits—that is as hypothetical stories “cartoons” in Buss’s words, invented to illuminate a potential mode and not as claims about any historical accuracy’ (p. 698).

With reckless abandon and facts to the wind, Gould continues:

‘Suppose that a variant cell lineage arose in such a loosely-knit hollow sphere of cells, causing the members of the new line to enter the sphere’s centre, where the proliferation could continue. In this way, a new cell lineage (and the beginning of cellular differentiation for the organism) could originate and proliferate by selection at the cell level.’

Gould seems to specialize in entering theoretical biological box canyons and providing no explanation for their exit. In one such example he continues:

‘In stabilizing the organismic level with such effective devices to suppress cellular and other forms of suborganismic selection, organisms have greatly reduced their flexibility for future evolutionary change of more than a superficial nature’ (p. 699).

‘This style of integrity enables the organism to be particularly effective in suppressing selection against its interests by potential evolutionary individuals dwelling within and forming its parts’ (p. 700).

Not only does Gould give no indication of how this information’s selective or stabilizing epi-phenomena evolved, he gives us no clue as to the manner in which this hypothetical ‘cellular watchdog’ is able to fine tune cellular needs, specifically regulating cellular organelles. This type of rhetoric without laboratory evidence severely strains the author’s credibility.

Gould essentially ignores the incredible complexity of the cell and rides roughshod over the entire domain of cellular biology. A few minutes spent examining any substantial textbook of cellular biology will acquaint the reader with the thousands of intricately balanced subsystems Gould is purposefully glossing over. Gould’s generic rhetoric on cellular function would have had great appeal in the mid-nineteenth century, but not in 2002.

A treasure trove for creationists

Chapter nine, ‘Punctuated Equilibrium and the Validation of Macro-evolutionary Theory’ is a Trojan horse for creationists. Although unintended, in this chapter Gould provides a completely updated and superbly annotated treasure trove (almost three hundred pages) for creationists to foil arguments from any scientist who claims that there is ample evidence for gradualism in the fossil record. On the lack of change in the fossil record Gould states:

‘... the tale itself illustrates the central fact of the fossil record so well—[the] geologically abrupt origin and subsequent extended stasis of most species ... Anatomy may fluctuate through time, but the last remnants of a species look pretty much like the first representatives’ (p. 749).

Quoting none other than George Gaylord Simpson (p. 755):

‘... the greatest and most biologically astute paleontologist of the 20th century ... acknowledged the literal appearance of stasis and geologically abrupt origin as the outstanding general fact of the fossil record and as a pattern which would “pose one of the most important theoretical problems in the whole history of life” (p. 755) [emphasis added].

Gould provides additional creationist evidence stating:

‘The long term stasis following a geologically abrupt origin of most fossil morphospecies, has always

been recognized by professional paleontologists’ (p. 752).

‘The great majority of species do not show any appreciable evolutionary change at all. These species appear in the section (first occurrence) without obvious ancestors in underlying beds, are stable once established and disappear higher up without leaving any descendants’ (p. 753).

Gould provides additional testimony for predominant stasis in numerous species, and to eliminate any possibility of confusion he hammers on with ‘...but stasis is data’, and ‘Say it ten times before breakfast every day for a week, and the argument will surely seep in by osmosis: “stasis is data; stasis is data” ...’ (p. 759). Gould then debunks the

‘... exceedingly few cases that became textbook “classics” of the coiling of *Gryphaea* and the increasing body size of horses etc. ... (p. 760). (Interestingly, nearly all these ‘classics’ have since been disproved, thus providing another testimony for the temporary triumph of hope and expectation over evidence).’

He continues:

‘Indeed proclamations for the supposed “truth” of gradualism—asserted against every working paleontologist’s knowledge of its rarity—emerged largely from such a restriction of attention to exceedingly rare cases under the false belief that they alone provided a record of evolution at all! The falsification of most “textbook classics” upon restudy only accentuates the fallacy of the “case study” method and its root in *prior expectation* rather than objective reading of the fossil record’ (p. 773) [emphasis added].

Trivial changes

Gould considers the peppered moth (p. 835) and poses an interesting question, ‘what then is ordinary geological gradualism after all? How



The dark and light peppered moths are trivial phenotypic changes easily accounted for by heterochrony.

can such a miniscule directional effect persist through all the swings and giggles?’ On page 800 he states:

‘Rapid evolution in local populations of guppies and anoles illustrates a fascinating phenomenon that teaches us many important lessons about the general lessons of evolution.’

It certainly does, anoles are still anoles and guppies are still guppies. He then in characteristic style continues a litany of trivial changes in: foramina (p. 803), planktonic foraminifera (p. 805), scallops (p. 826), stickleback fish (p. 828), *E. coli* bacteria (p. 809) and dozens of other animals. Apparently, without realizing it, Gould is preselecting trivial phenotypic changes easily accounted for by heterochrony (timing changes in the developmental cascade) within single trait characteristics. He later tries to develop an all encompassing theory which accounts for major multi-trait changes in polygenic systems, however his logic is *non-sequitor* at its best. The entire ninth chapter is a careful cataloguing of only trivial changes which may be caused by environmental conditions, and Gould admits as much (p. 872).

The developmental cascade as foundation of Punctuated Equilibrium

Gould’s ultimate undoing comes in chapter ten. After ensuring that

he has established that stasis is unequivocally documented in the fossil record, albeit in support of his Punctuated Equilibrium theory, he then builds his argument on the alteration of complex processes in the developmental cascade as the operational foundation of his theory.

‘The data of evo-devo [evolutionary developmental biology] constitute the largest and most exciting body of novel empirics to support this book’s general thesis’ (p. 1062).

Unfortunately, Gould has placed too much confidence in the plasticity of the developmental cascade, the genetic ‘speed’ of cascade change, as well as failing to understand the well researched and documented effects of pleiotropy (the ability of a gene to manifest itself in more than one way) and polygenetic effects (complex interaction of genes) on this cascade. Dawkins as quoted by Gould (p. 630) states:

‘So it is with single genes in the development of an embryo. Embryonic development is controlled by an interlocking web of relationships so complex that we had best not contemplate it.’

Gould ignores Dawkins’ warning and launches headlong into the giant sea of speculation. Gould supplies many examples to support his theory, one of which is dentition. He could have not chosen a more disastrous example for his theory.

To his own peril, Gould refuses to acknowledge the complexity of the systems he is evaluating. Specifically, the dento-maxillary system is not to be evaluated on single tooth morphology, which Gould in his ignorance has done, but on the combination of numerous subsystems, (jaw arch size coordination, eruption timing, spacing, sequencing, periodontal support, tooth-arch and condylar height, deciduous

dentition, etc.)³ There is no genetic or fossil evidence which supports the gradual or rapid modification of any one of the numerous dento-maxillary subsystems. In fact there is no gene which can discretely and specifically modify tooth morphology or any of the other numerous subsystems in the dento-maxillary complex.

Gould provides no explanation for the evolution or gradual change of enamel microstructure.

‘Surely, if a doubling of tooth size (say) requires 2 million years to reach completion, then the process must be providing so small an increment of potential advantage in each generation that natural selection couldn’t possibly ‘see’ the effect in terms of reliably enhanced reproductive success on a generational basis. Can a tooth elongated by a tiny fraction of a single millimeter possibly confer any evolutionary advantage in a selective episode ... ’ (p. 835).

In fact Gould states, ‘In other words, gradualism should be viewed as a problem and potential anomaly, not as an expectation. Gould relies on rapid (geological) speciation for his punctuated equilibrium model, however, he ignores laboratory science. The fossil record of dento-maxillary remains documents no transitional forms (which would be represented by pathology) of any subsystem. If evo-devo had been operating, it is inconceivable that geology would have not captured even a single fossil intermediate. Gould is assuming, as did Osborn in 1897:

‘My study of teeth in many phyla of Mammalia in past times has convinced me that there are fundamental predispositions to vary in certain directions; that the evolution of teeth is marked out beforehand by hereditary influences which extend back hundreds of thousands of years. These predispositions are aroused under exciting causes’ (p. 1085).

Unfortunately for Gould and Osborn, there is no evidence for rapid

speciation in complex coupled systems and there is no genetic mechanism to support it. The reason why there are only minor changes observed in the fossil record is that God created the 'kinds' to maintain stability. Darwin acknowledged early on, '... that teeth should be so stable within species—for the same features vary so greatly *among* the species' (p. 748) [emphasis added]. This is evidence for the operation of pleiotropy and polygenic systems if Gould would look at the evidence. In fact evo-devo is providing untold evidence for the creation argument. A specific example is the Bat (Chiroptera). It appears suddenly in the fossil record, has no precursors of any type, and has all the echolocation⁴ and flight characteristics of a modern bat. According to Gould, the enormously complex systems and sub-systems for echolocation and flight arose in small populations outside the resolution of the 'fossil microscope'. To further complicate his argument Gould admits that the developmental cascade hox genes may only be switches and not provide any new information for phenotypic development. He admits, 'Of course the eyes which are induced by the mouse gene are *Drosophila* compound eyes, since the mouse gene is only the switch gene and another 2,500 genes from *Drosophila* are required to assemble an eye' (p. 1124) [emphasis added].

Gould, however, provides no explanation how *these* 2,500 genes gradually arose by modifying hox genes. Gould fails to explain how the *specific* information for the *drosophila* eye structure arose originally. Once again, he simply uses existing complex systems to explain other existing complex systems.

Conclusion

Gould did a good job destroying the constructs of evolutionary gradualism, however his efforts in support of his own theory of Punctuated Equilib-

rium lacks mechanistic and quantitative evidence. The stories may sound good to an atheistic ear, but they lack substance and scientific support.

It is interesting to read the straw-man arguments that Gould erects against creationism (p. 109), which even a basic reading of creationist work would answer. Gould had ample opportunity to defend his theory, considering the texts massive size.

Lacking any significant scientific insights, *Structure of Evolutionary Theory* belongs to a long bygone era where rhetoric held sway over evidence. After giving careful consideration to Gould's arguments it would be more appropriate to say ten times before breakfast 'In the beginning God created'

References

1. *Webster's New World Dictionary*, (Third College Edition), Neufedt, V. (Ed.), Simon and Schuster, Inc., New York, 1988.
2. Thaxton, C.B., Bradley, W.L. and Olsen, R.L. *The Mystery of Life's Origin*, Lewis and Stanley, Dallas, 1992. Thaxton *et al.* thoroughly and expertly repudiate any legitimate scientific basis for the necessary spontaneous occurrence of life.
3. Moeller, D., Dental fossils and the fossil record, *TJ* 17(2):118–127, 2003.
4. The ability of bats to emit very high frequency sound waves to determine the status of their surroundings. Similar in function to modern-day radar in aircraft.