Another devastating critique of neo-Darwinism

Evolution: Still a Theory in Crisis
Michael Denton
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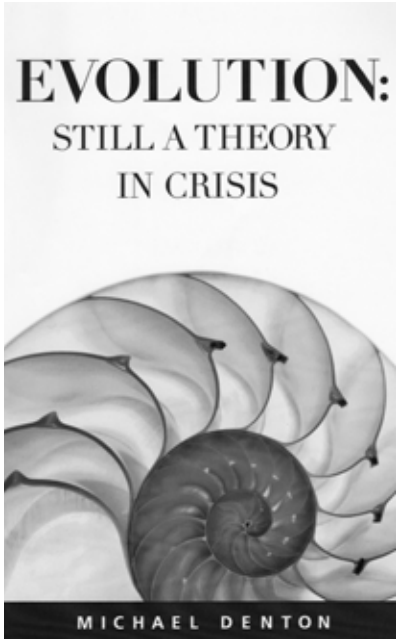

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Michael Denton is a Senior Fellow at the Discovery Institute's Center for Science and Culture. He read medicine at Bristol University in the UK and subsequently gained a Ph.D. in biochemistry from King's College in London. In 1985 he published *Evolution: A Theory in Crisis*[1] in which he demonstrated that the living world is fundamentally discontinuous and shows no evidence of the functional continuum predicted by Darwinian theory. The major taxa-defining characteristics, such as mammalian hair or avian feathers, he argued, are not led up to via a series of functional intermediates, and this undermines Darwinian adaptive gradualism at its heart.

Denton is a 'typologist', holding that there are deep, unbridged divisions in the order of nature. As argued by eminent biologist D'Arcy Wentworth Thompson, "Nature proceeds from one type to another ... and to seek for stepping-stones across the gaps between is to seek in vain, for ever" (p. 12). Similarly, Denton rejects as wholly unsupportable the Darwinian mantra, "*Natura non facit saltum*" (Nature does not make leaps).

His new book, *Evolution: Still a Theory in Crisis*, provides much additional material and demonstrates, with even greater clarity, how the natural world is characterised by discontinuity and what he describes as 'taxon-defining homologs'—unique biological traits shared only by members of a particular group. Examples include the enucleated red blood cell and placenta found only in mammals, the insect body plan, the pentadactyl limb shared by all tetrapods, and the amniotic membrane found only in reptiles, birds and mammals. As Denton makes clear, these 'types' are undeniably real and isolate one group from another. They are not, and could not have been, led up to via a series of intermediates, and their distinctiveness actually provides the basis for classification.

Despite his rejection of neo-Darwinism, Denton is still a 'molecules to man' evolutionist (p. 116), and subscribes to 'descent with modification' as the explanation for homology (pp. 111, 112). He is, however, an advocate of 'structuralism' rather than 'functionalism', believing that, primarily, biological order has arisen from the self-organising properties of biomatter, rather than from adaptation. The latter, he claims, played only a minor role in determining the forms of plants and animals. Hence, he understands major evolutionary novelties and the taxon-defining homologs to have originated *per saltum*, i.e. in leaps without any intervening stages. In his thinking, these would not have arisen from random macromutations, producing something akin to Goldschmidt's 'hopeful monsters',[2] but would have been directed by natural laws. According to Denton:

> "Just as a crystal of common salt arises when a solution of sodium chloride ions evaporates, a snow crystal forms when water freezes, or a new atom arises when two nuclei collide and fuse in a stellar interior, so the basic homologs or Types (the 'atoms' of biology) should arise, from the cellular to the organismic level, from the self-organising properties of particular classes of matter" (p. 251).

These paths of evolution, he believes, are "part of nature's deep causal structure, prefigured into the order of things from the beginning" (p. 116).

Unsurprisingly, very little of the book is devoted to justifying this claim, and the details of these hypothetical processes are conspicuous by their absence. Whereas the laws by which salt and ice crystals form are observable in the laboratory, there is no evidence that matter contains the information needed to reorganise the genome and generate novel complex biological structures—either in small steps or in leaps. Moreover, it would seem remarkable that natural processes capable of originating something as complex as the human brain could have escaped the notice of researchers for so long.

Denton, of course, is not alone in advocating self-organisation as the means by which evolution could have progressed, and supporters of this idea include a growing number of leading

biologists.[3] However, although they have no doubts about the inadequacy of Darwinian explanations, they are clearly unable to present a scientific case for such an alternative. One of their number, cognitive scientist Professor Jerry Fodor, for example, confessed, "I don't think anybody knows how evolution works."[4]

Despite Denton's naturalistic worldview, *Evolution: Still a Theory in Crisis* contains much information useful for creationists, particularly as it is clearly written and largely accessible to the non-specialist. Drawing from a wide range of biological disciplines, he demonstrates, beyond all reasonable doubt, the scientific bankruptcy of neo-Darwinism.

Non-adaptive order

Denton argues that a great deal of biological order has never been shown to be adaptive, in either extant or ancient forms, and therefore "the whole of the Darwinian edifice stands on sand" (pp. 75–76). What selective advantage is found in the concentric whorls of flowers? Why do nearly all mammals have seven neck vertebrae (including the giraffe)? Why do Longicornia[5] beetles have eleven joints in their antennae? Darwin's explanation—that such homologs once functioned in an unknown ancestral form—Denton regards as no more than a weak "*ad hoc* legitimation" (p. 74). Descent with modification, he says, can explain *why* all members of a clade[6] share a homolog, but it cannot provide a causal explanation for *how* the homolog originated.

Another interesting example is the bones in the skull of the human foetus. These have gaps (fontanelles) which enable the head to compress as it passes through the birth canal. However, the same construction is found in the head of the kangaroo embryo, which is born as a tiny joey, and also in birds which hatch from an egg (p. 66). What function did this serve in the putative common ancestor of mammals and birds? Even the great icon of evolution, the pentadactyl limb, Denton argues, has no adequate Darwinian explanation. Just as a fashion designer's initial concept has to be tailored to an individual, so the pentadactyl limb is not adaptive in itself and must first be tailored to facilitate a particular function—as the arm of a man or the wing of a bat or the leg of a horse (p. 65).

He also asks how neo-Darwinism can explain why/how such a limb design changed from being evolvable to immutable: "If the homolog was 'fluid' during the transition, why and how did it become fixed when the pentadactyl pattern finally emerged?" (p. 79). In a later chapter he observes:

> "It is surely the 'best kept of all evolutionary secrets' that the inference to descent with modification depends on the fixity of the Type—or more properly, the invariance of the taxa-defining homologs ... . How ironic that for Richard Dawkins and other defenders of the Darwinian faith the very notion of *evolution* depends on the fixity of the Type [emphasis in original]" (pp. 106–107).

The fossil record

Denton quotes Stephen Jay Gould:[7]

> "Can we invent a reasonable sequence of intermediate forms—that is, viable, functional organisms—between ancestors and descendants in major structural transitions? ... I submit, although it may only reflect my lack of imagination, that the answer is no" (p. 107).

While Denton would agree that the fossil record supports the view that tetrapods evolved from lobe-finned fish, he accepts that the rocks do not contain transitional forms. The explanation, he says, is that intermediate species never existed and the new structures arose suddenly. This, he argues, is true of evolutionary novelties generally—a view also held by a number of leading researchers such as Professor Gareth Nelson (formerly curator of vertebrate zoology at the American Museum of Natural History), geneticist and philosopher of science Professor Massimo Pigliucci, and evolutionary biologist Professor Günter Wagner (p. 109). Denton opines that the fossil record is consistent with fish evolving into people, but is emphatic that "there are *no transitional forms leading to the actualization of each novelty* [emphasis in original]" (p. 109).

The enucleate red blood cell

One taxa-defining homolog, characteristic of all mammals, is the enucleate red blood cell, on which Denton writes with considerable authority, this having been the subject of his Ph.D. thesis. Most organisms retain the nucleus in their red blood cells, but mammals are an exception. Towards the end of its development, the mammalian red blood cell ejects this, resulting in an enucleate cell. Denton writes:

> "Cells cannot have a nucleus 'half-in' and 'half-out' of the cell. The intermediate position is not only unknown in the whole domain of nature, but is self-evidently unstable ... . So here is one of the defining traits of the class Mammalia that is definitely *not* led up by any known functional continuum ... . In addition, the process is extremely complex ... [and] it is clear that much of the cell's basic cytological machinery is co-opted in absolutely unique ways to 'push' the nucleus to the side and eventually out of the cell ... . Between a nucleate and an enucleate cell is a quantum jump ... a process involving a host of biochemical and cytological mechanisms, which necessitates re-engineering the entire cyto-architecture of the cell to that end

[emphasis in original]" (pp. 130–136).

One must also wonder why mammals bothered to evolve an enucleate erythrocyte, since reptiles and birds manage fine with red blood cells that keep their nuclei.

Endometrial stromal cells

The endometrium is the inner membrane of the mammalian uterus. During the menstrual cycle, this grows to a thick, blood-vessel–rich glandular tissue layer into which a fertilised egg can be implanted. An essential step in this process involves the conversion of what are called 'stromal fibroblast cells' into 'endometrial stromal cells' (ESC), which are unique to placental mammals. This transformation is extremely complex and requires extensive reprogramming of many cellular functions. Denton comments, "[I]t is hard to believe that the various proteins and other biochemicals synthesized in the ESC ... could have been of any adaptive utility individually in preparing the uterus for implantation" (p. 138). He continues:

> "In an attempt to elucidate the likely complexity of the new gene circuits and novel gene expression patterns associated with the origin of a novel cell type they [Günter Wagner's group at Yale University] documented the genetic changes associated with the evolution of the ESC. They 'found that 1,532 genes were recruited into the endometrial expression in placental mammals, indicating that the evolution of pregnancy was associated with a large-scale [unique] rewiring of the gene regulatory network'" (p. 139).

Unsurprisingly, Professor Wagner concluded, "It is questionable whether the origin of complex novelties—such as the origin of new cell types, which involves the recruitment of hundreds of genes—can be achieved by ... small-scale changes" (p. 140). The idea of Denton and others that new cell types could evolve *per saltum*, however, is surely even more absurd.

Orphan genes

'Orphan genes' (also referred to as 'ORFans') have no homologs in other lineages and, in evolutionary thinking, must have originated *de novo* from non-coding sequences, rather than as modified forms of existing genes. Recent research indicates that these are found in all genomes and make up a significant proportion of protein-coding genes—perhaps up to 30% (p. 143).

To evolve a protein-coding sequence from a non-coding sequence, however, is not all straightforward. For example, a gene requires an open reading frame (i.e. a stretch of DNA without any 'stop codons'), a promoter capable of initiating transcription and a sequence that encodes a protein serving some useful purpose. It must also be present in a region of the open chromatin structure that permits transcription. Professor Adam Siepel asks, "How could all of these pieces fall into place through the random processes of mutation, recombination and neutral drift—or at least enough of these pieces to produce a proto-gene that was sufficiently useful for selection to take hold?" (p. 142). Denton comments:

> "That new protein-coding genes can originate *de novo* is certainly one of the most 'unexpected tales' of the new era of genomics ... . The terms used by researchers in the field—terms such as 'enigmatic', 'mystery', 'unclear' and other such expressions of amazement—capture something of the challenge the ORFans are seen to pose to traditional gradualistic notions of gene evolution" (p. 144).

Moreover, in an evolutionary scenario, after a new gene has arisen, it would be necessary for an associated gene-control system to evolve. However, as pointed out by Denton,

> "the mere 'turning on' of a gene is accompanied by a vast complex of regulatory mechanisms to ensure the expression of the gene in the right place at the right time and in the right amount. Such controls are obligatory to avoid molecular chaos in the cell" (p. 226).

More on the pentadactyl limb

The 'autopod' is the hand/wrist in the forelimb and foot/ankle in the hindlimb. In evolutionary thinking, the same patterns are found in amphibians and amniotes because the basic structure was inherited from the fish fin. Denton, however, quotes recent researchers[8] who make the following remarkable admission:

> "... although fish have the Hox regulatory toolkit to produce digits, this potential is not realised as it is in tetrapods, and as a result we propose that fin radials—the bony elements of fins—are not homologous to tetrapod digits" (p. 160).

Günter Wagner would agree and argues that the autopod is "a novel homolog without any antecedent in any fish fin" (p. 160). Moreover, the challenge for evolutionists is surely compounded when it is considered that there are also "fundamental differences" in the embryonic development of autopods in different tetrapods, i.e. salamanders, frogs, and amniotes (p. 163). Furthermore, the pentadactyl limb is supposed to be proof of a pentadactyl common ancestor. But the creatures that evolutionists claim were the closest to this ancestor were not pentadacytl! E.g. *Acanthostega* was octadactyl, *Ichthyostega* was heptadactyl, and *Tulerpedon* was hexadactyl, and they were rough contemporaries.

Epigenetics and self-organisation

Denton discusses the demise of the increasingly discredited 'gene-centric'

view of life, i.e. that DNA is the sole or primary determinant of higher organic form. Rather, genes generally "act as suppliers of the material needs of [embryonic] development ... [but not] as 'controllers' of developmental progress and direction" (p. 253). Genes do not provide a complete set of instructions for building an organism, and this is made clear by the discovery that their 'meanings' are context dependent, being determined to a significant degree by the environment in which they are expressed. Just as the

> "English sound 'rite' may mean a variety of things from a direction to a legal term depending on the context ... [so] the cytoplasmic context in which the gene is expressed acts downwardly on the 'gene' to confer upon it biological meaning" (p. 254).

Amazingly, genes are regulated not just by the biochemical state of the cell but also by its physiology. For example, even the mechanical tension of the cell membrane can influence gene expression (p. 255).

It is becoming increasingly evident that self-organisation plays a major role in determining both cellular architecture and higher embryonic order. For example, while genes specify the components of a red blood cell's membrane, its biomechanical properties give rise to the cell's final biconcave form (p. 258) (figure 1). The mammalian photoreceptor is one of the most complex cells in the human body and its genetic blueprint is one of the most thoroughly documented of any metozoan cell. Interestingly, Denton argues,

> "No genes or genetic elements have been identified which can be construed as having a specific morphogenic role ... The evidence suggests that the cytoarchitecture of the retinal photoreceptors, although enormously complex, arises from the self organization of the cell's constituents without any regulation or direction from an external genetic blueprint" (p. 259).

Moreover, there is growing evidence that biomechanical and biophysical forces, acting beyond anything specified by genes, actually sculpt embryos (p. 261).

Denton believes that evolutionary novelties were generated by similar epigenetic and self-organising principles. However, while he argues convincingly that these play significant roles in embryonic development, he presents no empirical evidence that they could direct the process of 'molecules to man' evolution. Rather, his argument is based on 'the fact of evolution' and the implausibility of Darwinism. He writes,

> "... what *natural* explanation, what directive natural force is available other than natural law? What explanation other than the fitness-structural paradigm, which sees the forms of life as no less built into nature than the properties of water [emphasis in original]?" (p. 278).

In his thinking, only natural causes can be invoked to explain the existence of the living world and, since cumulative selection has failed, self-organisation must provide the answer.

According to Professor Andreas Wagner,[9] "complex macroscopic innovations, such as the evolution of new body parts, may involve changes in the regulation of multiple molecules, and the evolution of new molecules. Known macroscopic innovations are so complex that we do not yet understand all required changes for any of them."[10] Is it really plausible that self-organising natural laws with such creative abilities have remained hidden from scientists for over a hundred years?

Conclusion

In *Evolution: Still a Theory in Crisis*, Denton shows conclusively that "*Nature is in fact a fundamental discontinuum of distinct Types and not the functional continuum maintained by Darwinian orthodoxy* [emphasis in original]" (p. 219). At the same time he demonstrates, beyond all reasonable doubt, the inadequacy of cumulative selection as an explanation for the living world. However, his contention that complex organisms evolved by natural laws governing the self-organisation of matter has no more of a scientific basis than the neo-Darwinism he so effectively refutes.

According to Denton,

> "If cumulative selection has no functional continuums to traverse gaps ... [e]ither the 'jump' was ... due to internal causal factors according to a structuralist 'laws of form' framework... or it came about as the result of special creation" (p. 229).

Sadly, he appears to adopt the former explanation simply because he rejects the latter *a priori*. Indeed, the book might be better titled *Neo-Darwinism: Still a Theory in Crisis*, as at no point does he question the reality of 'molecules to man' evolution.

References

1. Denton, M., *Evolution: A Theory in Crisis*, Adler & Adler, MD, 1985.
2. Mehlert, A.W., Richard Goldschmidt's monster, *J. Creation* **16**(2):42–45, 2002; creation.com/images/pdfs/tj/j16_2/j16_2_42-45.pdf.
3. Mazur, S., *The Altenberg 16: An Exposé of the Evolution Industry*, North Atlantic Books, CA, 2010.
4. Mazur, ref. 3, p. 34.
5. A superfamily within the order Coleoptera (beetles) containing numerous species with very long antennae.
6. A clade is a grouping that includes a common ancestor and all the descendants (living and extinct) of that ancestor.
7. Gould, S.J., The return of hopeful monsters, *Natural History* **86**(6): 22–30, 1977.
8. Woltering *et al.*, Conservation and divergence of regulatory strategies at *hox* loci and the origin of tetrapod digits, *PLoS Biology* **12**(1), 21 January 2014; plosbiology.org.
9. Andreas Wagner is a full Professor at the Institute of Evolutionary Biology and Environmental Studies, University of Zurich.
10. Wagner, A., *The Origins of Evolutionary Innovations: A Theory of Transformative Change in Living Systems*, Oxford University Press, p. 14, 2011.