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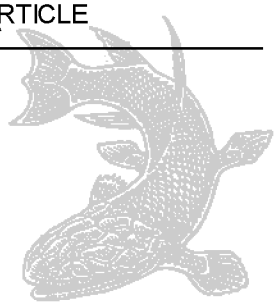

Denton Becomes a (Teleological) Evolutionist:

Rejects Special Creationism and Evolution

Nature's Destiny: How the Laws of Biology Reveal Purpose in the Universe by Michael J Denton. New York: The Free Press, 1998. 454 p.

Review Essay by Philip T Spieth

In the tree of intellectual genealogies, natural theology and natural science share a recent common ancestry. As recently as 150 years ago natural theology played a prominent role in British biology, especially in the debates between the teleological "adaptationists," who saw purpose and adaptedness as the organizing principle of biology, and the anti-teleological "structuralists," who looked to homology and Unity of Type as the central principle (see Amundson 1996: 22-7). The famous Bridgewater Treatises marked a high point for the teleological adaptationists.

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The work of Charles Darwin changed the situation dramatically and irreversibly. While drawing upon the insights of the structuralists to provide evidence for the fact of evolution, Darwin firmly established adaptation at the center of biology. However, he did so "in the most radical way possible—by naturalizing the concept of adaptation, thus removing from it all implications of finalism, reversed causation, and intelligent contrivance. Adaptation was restored, but in a way which made it useless to its old theological champions" (Amundson 1996: 49). Divergence between natural theology and natural science was firmly established. Ancestral concepts such as teleological explanations, anthropocentrism, and purposefulness were no longer part of natural science.

Michael Denton wants to undo the divergence between biology and natural theology, and he wants to impose once again the teleological worldview of natural theology upon the methodology of biological science. Destiny is his attempt to do so. He ends the book with the wish:

> As I hope the evidence presented in this book has shown, science, which has been for centuries the great ally of atheism and skepticism, has become at last, in these final days of the second millennium, what Newton and many of its early advocates had so fervently wished—the "defender of the anthropocentric faith" (p 389).

In addition to his general purpose of attempting to impose "a rapidly emerging new teleological worldview" upon evolutionary biology, Denton has a more specific (and astonishing) agenda item. He sets it forth in the following statement from his "Note to the Reader" and reiterates it at the book's conclusion:

> I believe the evidence strongly suggests that the cosmos is uniquely fit for only one type of biology—that which exists on earth—and that the phenomenon of life cannot be instantiated in any other exotic chemistry or class of material forms. Even more radically, I believe that there is a considerable amount of evidence for believing that the cosmos is uniquely fit for only one type of advanced intelligent life—beings of design and biology very similar to our own species, Homo sapiens (p xiii; see also p 389).

Destiny is Denton's second book. In 1985 he published Evolution: A Theory in Crisis which was characterized by outmoded typological thinking, bashing Darwinism in a form and style typical of the "creation science" literature of the 1980s, and by Denton's development of a spurious concept of "equidistance" based upon a misunderstanding of genealogical relatedness (Spieth 1987). It has become a staple of anti-evolutionists who use it as "proof" that "scientists are rejecting evolution". Destiny differs from Crisis in a remarkable way: although remaining a staunch

anti-Darwinian, Michael Denton has become an evolutionist!

Design and Adaptation

In Destiny Denton fully accepts the genealogical relatedness of all organisms, including Homo sapiens, and even titles one chapter "The Tree of Life". Judging from his unabashed anthropocentrism, Denton's "tree" is an old-growth redwood with humans represented by the apical meristem at the top of the main trunk. In any event, the fact of evolution is stipulated. Denton's issue is entirely with the processes of evolutionary change. When it comes to the processes of biological evolution, Denton has problems with the contingencies of evolutionary change, and biologists will have problems finding Denton's alternative explanations to be either adequate or convincing.

Denton's transformation from biological typologist in 1985 to anti-Darwinian evolutionist in 1998 is not as surprising as it might seem at face value. In actuality he is in step with the group of neocreationists whose tenets are denoted by the term "Intelligent Design" (Scott 1997: 279-5). The themes, tone, and style of Destiny are characteristic of other "Intelligent Design" works.

Although the book is fundamentally about evolution and is filled with fascinating scientific facts from the physical sciences and molecular biology, the first thing to be recognized is that Destiny is not a scientific treatise. Rather, it is a book about natural theology. As a treatise on natural theology it is flawed by its (deliberate?) failure to comprehend and incorporate modern evolutionary biology.

Destiny begins with an exposition of the "anthropic principle" that has recently received substantial treatment by natural theologians coming from the perspective of physics. The anthropic principle is based on the notion that the physical properties of the universe and its components are incredibly finely tuned to the point that if they were even slightly different from what they are the world would be a very different place, and we would probably not exist. Denton carries his exposition of the anthropic principle into the realm of biology, and the result is that Destiny becomes what Denton personally describes as "an essay in natural theology in the spirit and tradition of William Paley's Natural Theology or the Bridgewater Treatises" (p xii).

Destiny is divided into two parts. Part 1, entitled "Life", is devoted to an elaboration of the anthropic principle. In it Denton provides extended and detailed descriptions of the critical properties of a long list of physical, chemical, and biological entities that play significant roles in organic life as we know it. The catalog begins with the physical constants of the forces of nature, moves on to the properties of water, light, carbon, DNA, and so forth, and continues all the way to the ability of humans to manipulate fire. For those who crave technicalities, a 20-page appendix adds more details. Actually, this part of the book makes fascinating reading. Denton does an excellent job of providing illustration upon illustration of how amazing and awesome nature in general and life in particular truly are. The value of Destiny will be determined by the degree to which it enhances the general public's awe and appreciation for nature.

The difficulty in reading this section arises from the repeated references to the "fitness" of A that is attributable to A's having property x, where the concept of being "fit" refers to being valuable or essential for biological life (for example, water is uniquely "fit" for life because of its anomalous expansion below 4ºC). The words fit, fitness, and adaptation are used ad nauseam. Never have so many paragraphs owed so much to so few words.

This difficulty is more than a simple matter of literary aesthetics. In the first place, Denton's concept of fitness is different from the biological concept. Second, there is a problem of polarity. Does A have property x in order that life might exist in its current form (Denton's view)? Is life the way it is in part because A has property x (a biologist's view)? Is the human nose an adaptation for the purpose of supporting spectacles (Dr Pangloss's view)? Reading Destiny requires an ability to endure 428 pages of pan-adaptationism at it worst.

> From reading Destiny one would have no clue that evolutionary biology has progressed one whit from the time Darwin published Origin.

Part 1 of Destiny takes up two-thirds of the book. Nevertheless, it is only the introduction. Part 2, entitled "Evolution", is the heart of Denton's contribution. In it he attempts to make the case that "if the laws of nature are so finely tuned to facilitate life's being in the form of a unique set of carbon-based organisms [the anthropic principle set forth in Part 1], ...then it seems conceivable that their becoming through the process of evolution might have been determined also by natural law" (p xiv; italics in the original). In other words, he suggests that organic evolution is a pre-ordained consequence of "natural law". He dismisses out of hand the Darwinian concept of evolution through natural selection on the grounds that organisms are so complex and so "finely tuned" to their environments with such incredible adaptations that their evolution can only be explained as a directed, purposeful process. Natural selection and "non-directed models of evolution" are not up to the job in Denton's view. In this respect he echoes the views of "Intelligent Design" advocates such as Behe (1996) and Morris (1998).

Denton's arguments need to be assessed on two distinct levels. First, what is the basis for his categorical rejection of the explanations provided by modern evolutionary biology? At least 3 problems in this book bear on this question: Denton ignores modern evolutionary biology. He has a naive view of adaptation. He does not think "probabilistically". Second, what are the merits of the

alternative mechanisms that he suggests?

Denton's View of Biology

Michael Denton is a molecular biologist. When he discusses topics involving the physical sciences or molecular biology, he does reasonably well and presents current information. On the other hand, when the discussions turn to biology above the organismal level or to the theoretical basis of molecular evolution, he appears to be out of his league and is out of date. From reading Destiny one would have no clue that evolutionary biology has progressed one whit from the time Darwin published On The Origin of Species By Means of Natural Selection. The three major architects of the New Synthesis—Ernst Mayr, Theodosius Dobzhansky, and George Gaylord Simpson—receive exactly one trivial citation each. JBS Haldane gets two citations, neither of which directly relates to evolutionary biology. Sewall Wright and RA Fisher are not mentioned, nor are Ledyard Stebbins or EB Ford. He does manage a brief mention of Eldredge and Gould's theory of punctuated equilibria (p 297). However, his discussion is devoted to the typical anti-Darwinian tactic of presenting punctuated equilibria as a "problem" for Darwinian evolution.

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When Denton introduces specific topics of molecular evolution, he ignores contemporary theory. For example, he introduces the phenomenon of molecular clocks (p 290-2) but never mentions Motoo Kimura or John Gillespie. Elsewhere he discusses the topic of genetic redundancy (p 337-9) but makes no reference to current theoretical treatments by Thomas (1993) or Nowack and others (1997).

Adaptation is the central theme of Destiny, woven throughout the entire fabric of the book. The view of adaptation that Denton presents is, however, the naive view that was espoused by pre-Darwinian natural theologians such as Paley and Whewell. After Darwin, however, biologists changed the way they think about adaptation:

> Natural theologians had always studied adaptation, but only (so to speak) after the fact. On theological understanding the cause of adaptation (divine contrivance) had occurred at inaccessible times and places. Darwinians could study adaptations as a process and inspect the bits and pieces of which that process was made. Darwin did not invent the study of adaptation, but he invented a way to study adaptation from within (Amundson 1996: 32).

Modern biology, especially in the last few decades, has further refined our thinking about adaptation and has brought substantial rigor to its study. The complexities of genetic systems—pleiotropy, epistatic interactions, redundancy, and so forth—as well as concepts such as design constraints and empirical phenomena such as the widespread conservation of underlying genetic mechanisms are recognized and incorporated in contemporary views of adaptation (see, for example, Rose and Lauder 1996). Uncritical adaptationism, whether invoked in the name of natural selection or divine contrivance, is inappropriate to modern biology. Destiny abounds in uncritical adaptionism.

Probability and Determinism

In Crisis Denton repeatedly used the phrase "mere chance" when discussing Darwinian evolution. In Destiny his adjective of choice is contingent. In both cases, the context in which Denton uses these words gives them a pejorative connotation. He clearly abhors any suggestion that "chance" played a significant role in human evolution. This may well be Denton's Achilles' heel. Regardless of one's views about adaptations or the efficacy of natural selection, a fundamental, indisputable, fact of the world we live in is that life is a chancy business.

Many important processes are stochastic: their outcomes can be predicted only in terms of probabilities. Genetic recombination and Mendelian segregation are classic examples. If that is not bad enough, many fundamentally deterministic processes are chaotic: minute variations in current conditions can lead to widely divergent future results. Five-day weather patterns are examples with which everyone is familiar. Humans typically are uncomfortable with uncertainty (Perhaps the result of an evolutionary trade-off in the processes that led to a mind capable of discerning patterns, organizing information, and doing science?). Nevertheless, thinking in terms of probabilistic outcomes is essential in many arenas of human endeavor, not the least of which is evolutionary biology.

Evolution moves one step at a time, and each change is conditional upon the current state of affairs. Each move, however, changes the existing state of affairs and thereby changes the possibilities for subsequent changes. The conditional probabilities are constantly changing. The result is that evolution is a cumulative process with its history heavily embedded in its present state. The polarity of adaptation is crucial. The evolution of biological entities is conditional upon their environment and their history—not the other way around! It makes no sense to speak of physical factors' being uniquely "fit" for organisms whose evolution was conditioned by those very factors. Denton's attempt to extend the anthropic principle into the realm of organic evolution reflects his failure to recognize the cumulative

nature of evolutionary change and his inability to think in terms of conditional probabilities.

One of the things about probabilistic processes is that rare events do occur—rarely. In cases for which the law of large numbers applies—for example, most cases of natural selection or a casino's profits from its roulette tables—rare events have little importance. Statistical means and variances are what count. On the other hand, in a historical science such as evolutionary biology there are many cases in which our interest is in one, or a few, specific realizations of a stochastic process, no two of which are ever identical. In such cases the law of large numbers is inapplicable, and unique events, especially if they are of low probability, can have a significant impact upon the trajectory of the particular stochastic process in which they occur. A reigning example is the extinction of the dinosaurs as the apparent consequence of the earth's collision with a large extraterrestrial object. Had that particular event not occurred the history of life on earth would certainly have been different. Advocates of "Intelligent Design", including Denton, who believe that "replaying the tape of evolution" will produce the same song are invoking the law of large numbers in a situation to which its application is, at the very least, questionable.

The principal theme in Destiny is the assertion that teleologically directed evolution can better explain evolutionary phenomena than can contingent, non-directed Darwinian evolution by natural selection. We should note that in Denton's usage "directed" implies direction but is not synonymous with "directional", since he refers to natural selection as an "undirected evolutionary mechanism." (see, for example, p 364).

Evolutionary Mechanisms

The concept of directed evolution raises several questions. What precisely is Michael Denton's notion of directed evolution? What mechanisms provide the direction? At the beginning of Part 2 Denton states:

> The laws of nature...give every impression of having been pre-ordained for life as it exists on earth. The concept of directed evolution is therefore no longer an anomaly in a nonbiocentric world. On the contrary, it is merely a logical deduction from a rapidly emerging new teleological worldview (p 275).

It seems, therefore, that directed evolution, in Denton's scheme, is the product of some external agent that has a purpose and a goal for life on earth. He never specifies what that agent is; the reader is left to fill in the blank with the name of some entity of choice.

Denton does provide some clues about possible mechanisms by which directed evolution supposedly occurs; however, he is vague, and the situation is a bit confusing. In Chapter 12, "The Tree of Life," he advances the notion that everything was preprogrammed:

> The revolutionary new DNA world revealed by modern genetics...is a world which provides the basis for relatively detailed and plausible speculation as to how the whole pattern of evolution might have been written into the DNA script from the beginning (p 275; emphasis added).

This statement will come as a shock to anyone who has thought seriously about the amount of information that can be stored in the DNA of primitive prokaryotes. Soon thereafter he states:

> If genes can direct developmental changes, there is no reason why, at least in principle, they cannot also direct evolutionary change....Many other types of programmed genomic reorganization are utilized during development in different species....There is no compelling reason why similar types of changes could not have been genetically programmed to occur during the far longer time course of evolution....It is premature to reject out of hand the possibility that during the course of evolution specific preprogrammed genetic re-arrangements have occurred at specific times (p 280).

It seems, therefore, that directed evolution, in Denton's scheme, is the product of some external agent that has a purpose and a goal for life on earth. He never specifies what that agent is; the reader is left to fill in the blank.

These statements have some interesting, and heretofore unthought of, implications concerning the mechanisms of gene action. Is Denton suggesting that molecular geneticists need to rethink the subject?

As the book progresses, the situation concerning the mechanisms of directed evolution becomes more murky. In Chapter 13, "The Principle of Plenitude", Denton attempts to make the case that essentially every kind of biological structure that could possibly evolve has done so. Mechanisms are not considered; rather, teleology and the anthropic principle are asserted:

> The possibility that life on earth approximates to the plenitude of all possible biological forms is perfectly in keeping with the teleological thesis that the cosmos is uniquely prefabricated for life as it exists on earth" (p 299).

The implication is that all the emergent properties of life are necessary consequences of the intrinsic properties of our particular physical

world. Denton deserves an award as one of the ultimate reductionists. "The Dream of Asilomar" (Chapter 14) is a treatise on "Intelligent Design" and elaborates upon the complexities of biology at the genetic, developmental, and physiological levels. At the end it returns to William Paley, asserts the alleged inadequacy of natural selection, and affirms the "necessity for direction" in organic evolution but offers no mechanisms.

Structural Anomalies and Emergent Capacities

Chapter 15 ("The Eye of the Lobster") is curious. In it Denton discusses four "problem cases" for evolution: lobsters' eyes, scallops' eyes, marsupial frogs, and avian lungs. The human brain is added for good measure. These are problem cases in the sense that each is atypical and exhibits dramatic, discrete differences between itself and the corresponding situation found in the closest relatives. These cases represent the kind of supposed anomalies that advocates of special creation love to wallow in. In Destiny, however, Denton explicitly distances himself from special creationists. In his "Note to the Reader" he states:

> In large measure, therefore, the teleological argument presented here and the special creationist worldview are mutually exclusive accounts of the world....The more convincing is the evidence for believing that the world is prefabricated to the end of life, that the design is built into the laws of nature, the less credible becomes the special creationist worldview (p xviii).

Following his discussion of the eye of the lobster and similar cases Denton returns to a discussion of the mechanisms of evolutionary change. Presumably, he does so to answer critics from the creationist camp, since the "problems" raised by lobster eyes and other examples apply equally to both directed evolution and Darwinian evolution. Here, however, he waffles on his previous notions of preprogrammed instructions in the "DNA script" and makes a feeble attempt to reintroduce the discredited notion of orthogenesis:

> In the case of remarkable and complex adaptations restricted to small isolated geographical regions, it is not easy to envisage them as being preprogrammed into the order of nature and being part of a "grand design". The question naturally arises, how did such adaptations come about? If neither natural selection nor any other sort of undirected evolutionary mechanism seem plausible, then could they conceivably have been the result of the activities of life itself operating via some as yet undefined type of inventiveness inherent in all life?...The possibility that some degree of adaptive evolution may be the result of an inherent emergent inventive capacity possessed by all living things cannot be ruled out (p 364).

In the concluding chapter, "The Long Chain of Coincidence", Denton declares the anthropic principle fully established for everything in the universe, both organic and inorganic. He thereby demonstrates that "the cosmos is a specially designed whole with life and mankind as its fundamental goal and purpose" (Destiny, p 389; italics in the original). Apparently the Creation is now complete. Evolution has done its job and can now cease?

Denton opens Part 2 of Destiny with a sympathetic attempt to rehabilitate the views presented by Robert Chambers in his famous Vestiges of the Natural History of Creation, published in 1840. Denton clearly considers Chambers a kindred soul for the very good reason that, as Denton recognizes, their teleological views of evolution through natural processes are quite similar. Although Vestiges was highly popular with the general public of its time, it failed to impress or persuade the scientific community. It would now be totally forgotten but for its having become a standard example in the Darwinian literature of a work that recognized the principle of biological evolution prior to the publication of The Origin of Species. The failure of Vestiges lay not so much in its anticipation of Darwin by nearly two decades but rather Chambers's failure to provide acceptable mechanisms to explain evolutionary change (See Mayr 1982: 384). Michael Denton and Robert Chambers have more in common than Denton realizes.

Informed, rational people came to believe in evolution in the first place despite the fact they were strongly inclined to believe in the existence of the supernatural. They did so on the basis of the strength of the evidence. The evidence today is much stronger.

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