2012-08-21

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http://hdl.handle.net/2144/3953

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The author examines two different traditions of nineteenth-century natural theology and their reappearance in a modern work. Michael Denton's Nature's Destiny is used as an example of modern natural theology, showing how current writers attempt to resurrect the classical arguments of William Paley and William Whewell. The stance taken here is that, due to the heavily historical character of Paley's and Whewell's work, it is inappropriate to use their traditions uncritically as windows into religious understandings of science.

Despite the often-proclaimed secularization of modern science, the natural theology project endures today. Within a large wave of recent works in the genre is Michael Denton's Nature's Destiny, which incorporates many of the premises and arguments characteristic of this new generation of natural theologians. This book claims to hold a privileged place atop the twentieth century's impressive scientific achievements, from which the author can provide a new and persuasive argument for design that was unavailable to his predecessors. However, a careful reading reveals that Denton is doing little that is new. The crucial elements of his argument can be found in both William Paley and William Whewell (of whom he is well aware). Novelty is apparent only in a synthesis of the very different styles of those writers. But this reintroduction of their arguments is not unproblematic: Paley (1743-1805) and Whewell (1794-1866) were historical figures, and their work is understood best in the context of their production. Therefore, one should be wary of simply transplanting their ideas into the twentieth century. The object of this essay is to demonstrate how the thinking of Paley and Whewell was the product of particular historical contingencies, and to problematize the uncritical use of their works in modern natural theology.

The Natural Theology of William Paley, Archdeacon of Carlisle, published in 1802, set the agenda for both natural theology and its opponents in the nineteenth century. His metaphor of the watch, representing indisputable contrivance, multiplied through myriad examples, remains a fundamental part of the design argument. Around this central core, Paley constructed an elaborate and impressive proof of an intelligent creator. His proof relied on the complexity of biological life to induce awe and reverence for a designer. Paley's arguments represented the pinnacle of Enlightenment natural theology, which achieved great importance in the eighteenth century as a focal point for intellectual consensus.

Paley began his Natural Theology by presenting as obvious the difference between the reactions of a passerby to a rock and to a watch. The stone, of course, calls no particular notice to itself, whereas the watch evokes insistent questions. How did it come to be here? How did its parts come to work together? Who made it? For Paley, that series of questions was an inevitable progression: recognition of the watch demanded an inquiry into its origin, and its origin was in a contrived manufacture, which forced the "invincible" conclusion of a manufacturer. The salient difference between the watch and
the stone was the recognition that the existence of the watch was dependent on multiple elements arranged together to create some effect. This formed the foundation for the rest of the book in that all of the manifestations of the natural world described by Paley would be analyzed in this way: What are the parts? How do they work together?

It is this contrivance that testified to the existence of a creator. But not all constructions were of equal value for the argument. He established that the mechanical parts of organisms were the most valuable for showing design, despite their relatively crude nature. Their value came from the visibility of their mechanism: since they worked through the principles of levers, ropes, and balances (which were understood well), the complexity of their arrangement was obvious. The relationships between musculoskeletal elements were specific, efficient, and useful:

[Alt the shoulder and the hip, where the ball and socket joint allows by its construction of a rotary or sweeping motion, tendons are placed in such a position, and pull in such a direction, as to produce the motion that the joint admits. For instance, the sartorius or taylor’s muscle, arising from the spine, running diagonally across the thigh, and taking hold of the inside of the main bone of the leg a little below the knee, enables us, by its contraction, to throw one leg and thigh over the other; giving effect, at the same time, to the ball and socket joint at the hip, and the hinge joint at the knee. There is, as we have seen, a specific mechanism in the bones for the rotary motions of the heads and hands: there is, also, in the oblique direction of the muscles belonging to them, a specific provision for the putting of this mechanism of the bones into action.]

This was compared to the effect of digestion, which, while certainly complex, acted by principles unknown in Paley’s time. Therefore, the skill of design was not apparent, whereas any natural philosopher versed in mechanics could see the fantastic complexity and efficiency of the muscles and skeleton. Evidence for design came from multiplicity and interrelated function:

[It has been] reckoned up, in the human body, four hundred and forty-six muscles, dissectable and describable; and hath assigned an use to every one of the number...there are, at least, ten several qualifications to be attended to in each particular muscle, viz. its proper figure, its just magnitude, its fulcrum, its point of action supposing the figure to be fixed, its collocation with respect to its two ends the upper and the lower, the place, the position of the whole muscle, the introduction into it of nerves, arteries and veins. How are things, including so many adjustments to be made; or, when made, how are they to be put together, without intelligence?

It was no accident that Paley relied so heavily on biological examples. He spent much of his free time in the countryside, collecting plants and animals and even attempting his own dissections. Further, he read heavily in published natural history works, especially anatomy. He was fascinated by the appearance of life as a vast machine, built piece by piece such that all the elements worked together without impedence. This demonstrated careful forethought and planning for the role of every animal, plant, and blood vessel.

This theme of the harmony of complex interactions placed Paley in the mainstream of eighteenth-century natural religion. The value of complexity was manifest in all aspects of his writings. For example, he hailed the British constitution as the pinnacle of government, because of its “intricate network of checks and balances, each with its own particular purpose and each contributing to the efficient functioning of the whole.” This theological view asserted that every element of the natural world, from plants to Parliament, was individually designed by God to fit perfectly into a system that would bring the maximum happiness to human beings.

It was this “cosmic optimism” that brought Paley under criticism in the early decades of the nineteenth century. The British evangelical movement had gained momentum during the years of war with France

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and the upheavals resulting from adjustment to a peacetime economy. For many in England, the world seemed to be tottering on the edge of complete disaster, and Enlightenment natural theology was too complacent for such times. Instead, a new generation of clerics was calling for a new perspective on Christianity that recognized the grim realities of a world of revolution, war, and human depravity.

Bishop Butler was an important pioneer in the new evangelical theology, arguing that the natural world was full of suffering and that the image of a world where God’s beneficence was immediately evident was no longer sufficient. Following in this mode of thought was a group at Cambridge University, including Adam Sedgwick and William Whewell. They were representative of a general shift away from Paley’s specificity and towards hidden generalities. Along with scientists in many disciplines, biologists in this period began looking for structural unities underlying apparent differentiation. The task of this new evangelical-influenced natural theology was to find the evidence of God’s design that lay underneath the chaotic appearances of the natural and social worlds. In the same way that theology needed to look beyond the apparent human suffering to see a divine plan, natural theology had to search for the laws and regularities that both explained and reached past the varieties of observed phenomena.

This holds close conceptual ties to the development of Whewell’s theories of scientific induction, emerging from Cambridge in the 1820s and ’30s. For Whewell, the progress of science was driven by those who were able to develop systematic and regular laws, exemplified by Newton’s law of gravitation, in which the movements of all celestial and terrestrial bodies were unified. The inductive project asserted that such laws could be found in all things:

The changes of the winds and skies, seemingly so capricious and casual, are produced by the operation of the sun’s heat upon air and moisture, land and sea; and though in this case we cannot trace the particular events to their general causes, as we can trace the motions of the sun and moon, no philosophical mind will doubt the generality and fixity of these rules by which these causes act.

These laws were ubiquitous, because they were the means by which God governs the universe. Induction, in effect, allowed one to reverse engineer God’s designs. For this new methodology, natural theology needed to look for hidden laws. Divine evidence was seen in simple means doing things “so extensive and so beneficial.” Thus, it was not simplicity in itself that reveals the creator, but the ability of simple laws to govern myriad phenomena.

For Paley, it was the vast interrelations between these phenomena of the natural world and the demonstration of their complexity that provided the best evidence for a creator. It was on these grounds that he rejected astronomy as useful: the motion of the planets and stars is too simple, without any observable mechanism to demonstrate complex design. Natural laws were not useful for natural theology, because they do not show a “correspondence of parts.”

William Whewell took up Paley’s challenge to the utility of astronomy in the very first pages of his Bridgewater Treatise on Astronomy and General Physics. It is revealing that beyond responding to an attack

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on the discipline, Whewell seemed compelled to defend the fundamental premise of Newtonian astronomy—the existence of natural laws—because he was setting out an improvement for advancing the argument from design. His agenda was to demonstrate how the astronomer’s view of the world better harmonizes with belief in a governing deity. He implicitly rejected the sufficiency of the natural theology of complexity.

The theological fingerprint in physics and astronomy was to be found in the conclusion that physical laws were of the “best” form possible, perfectly adapted to the role they played in the universe. There were two aspects to the characterization of laws as better or worse: the nature of the connection between the laws and matter, and the magnitude of that connection. The latter claim is simply that if parameters such as the gravitational constant were to hold values different from what they actually are, the universe would be unfit for life (for example, the solar system as we know it would be unstable). The precision and constancy of these values was said to demonstrate the conscious choice of a designer.

Magnitude was dealt with quickly, and Whewell spent most of his energy discussing the nature of physical laws. A law was revealing of intelligent design when it manifested the greatest possible simplicity. He argued that Newton’s law of gravity, for example, appeared to have been “established by an intelligent and comprehensive selection” out of all possible gravitational relations, because it allows for stable, aesthetic and simple orbits. Further, it allowed spherical masses to be treated as point particles, making analysis far simpler than if each mass element had to be treated separately. Simplicity also appeared in the universality of laws. A law of gravity that held true everywhere in the universe, for all stars and planets, was clearly superior to, say, a pair of laws applicable to different situations. Whewell wanted to evoke the reader’s admiration for a creator that could govern the entire universe with the simplest of rules.

Eventually, Whewell returned to the role of human beings. He noted that the simplicity and efficiency of physical law were vitally necessary for the maintenance of life, especially civilization. His work pointed theologians toward the genius of simplicity instead of epiphenomenal complexity, thus reassuring his evangelical contemporaries that natural religion was a meaningful project, even in those unsettled days.

The split between these two schools of natural theology was firmly historical. Paley was a child of the Enlightenment, and Whewell needed to forge a new path for the darker times of pre-Reform England. Although their arguments were embedded heavily in historical context, they have survived to the present day and reappeared in the current resurgence of interest in the religious significance of science. This upsurge of natural theology at the end of this millennium is fueled by contemporary scientific topics such as genetic science and Big Bang cosmology, which are held up as new and overwhelming proof of a creative designer.
Figure 1. The atomic structure of the protein cytochrome.

What is truly new here? To answer this question, one can look to Michael Denton, a geneticist who provides an excellent example of those who claim a privileged position from which to discuss these issues. He has read both Paley and Whewell, explicitly quoting the former at times and often alluding to the later. However, he wants to set himself apart from his predecessors and claim that his access to modern scientific knowledge allows him to reach conclusions that were unavailable in the nineteenth century. Methodologically, he begins in a manner similar to Paley. He, too, is concerned with mechanisms, but of a biochemical sort. Instead of describing the intricate mechanisms of finger joints and blood vessels, he relates the complexities of DNA replication and protein structure [Figure 1]. He is also fond of the fantastic structure of the brain:

Estimates of the total number of connections in the human brain...revealed that each cell may make up to 10,000 connections with other neurons. The brain of man, for example, contains about $10^{11}$ nerve cells, which make between 10,000 and 100,000 connections with other cells, making a total for the brain of about $10^{15}$ or 1 quadrillion connections. There are certainly more connections in the brain than there are cells in the body.
Like Paley, Denton believes one can see evidence of design in the interrelationship of various components. He shows that the balance of oxygen levels in Earth’s atmosphere is maintained only by a fantastically complex feedback system among plants, animals, and geology. His point is that a randomly evolved planet would not have developed this delicate balance and the suitability of our atmosphere for life and civilization is therefore evidence of design. In a sense, he is simply extending Paley’s classic watch argument to the much more complex world of chemical mechanisms.

However, he also integrates Whewelian elements into his analysis. He examines physical and chemical laws, showing that their operations are perfectly suited for the development of life. This is based on quantitative analyses of possible configurations of biochemistry and biological structure, and demonstrating that the only laws that would allow life are those that actually appear in our universe:

In short, the laws of physics are supremely fit for life and the cosmos gives every appearance of having been specifically and optimally tailored to that end: to ensure the generation of stable stars and planetary systems...to make certain that the great evolutionary drama of life’s becoming will inevitably be manifest sometime, somewhere on an earthlike planet.

Physical laws (such as thermal diffusion and the solar spectrum) are arranged in the precise and unique way that allows humans to exist. He draws the image of a creator able to guarantee the appearance of human-kind by the correct choice of simple (i.e., fundamental) physical relations. Like Whewell, he wants a God that can manifest complexity through simplicity. For Denton, too, the key to unlocking God’s secrets is in finding the underlying unities in disparate investigations:

Advances in chemistry, biochemistry, physiology and molecular biology, commencing at the beginning of the last century but mainly in the last fifty years, have revealed an additional set of mutual adaptations and coincidences in the chemical and physical properties of water and in many other of the key constituents of life.

All three of these authors want to evoke a masterful, omniscient god that is capable of supreme design. Paley’s God is manifest in extraordinary and perhaps unfathomably complex parts working in concert, an idea rooted in both the ideals of the eighteenth century and his own fascination with natural history.
At the time when he was writing, an amazing amount of biological data had been collected, but there were few useful organizing principles to explain the apparent diversity and interdependence. The world appeared as a machine built piece by piece, in which the genius of the designer was in creativity and multiplicity. Divinity was in the precision of complexity.

Whewell and the natural philosophy community, however, were aware of the power of a few (relatively) simple laws to explain the vast range of phenomena. The fundamentals of reality were buried beneath phenomena in inductive explanations that took the form of mathematical laws. Further, the religious context of the 1820s and '30s demanded an explanation of how a benevolent God could have caused such chaos. Whewell's ability to root design in hidden laws allowed a continuation of the natural theology project. These laws were the tools used to build the world, and, therefore, they still provide access to God. While Paley's faith in complexity failed to do so. God's skill in creation lay in achieving maximum effect from minimum effort. Precision in laws was key: simplicity and economy were the hallmarks of divinity.

Denton has access to the intersection of the natural history and natural philosophy traditions in the form of modern genetic theory and biochemistry/biophysics. He tries to recapitulate Whewell's argument with the vastly more powerful physics available to him, and is able to relate the importance of simple, precise physical laws directly to the existence of human beings. He thus brings an immediacy to the argument that Whewell lacked. His writing continuously stresses the astounding precision of these laws and the necessity of that precision for higher life. To this end, he skillfully uses graphs plotting biological fitness against various physical parameters [Figure 2]. These feature a line lurking at zero fitness for virtually all possible arrangements of, for example, biochemistry, and suddenly lurching upward to a peak at the point representing actual human design. These are extremely effective rhetorical tools for evoking the desired sense of astonishment at the uniqueness of human existence.

However, Denton seems unable to resist the appeal of the traditional and powerful structure of Paley's argument from design. He relapses into a classic complexity-implies-design-implies-designer formula, essentially returning to the strategy of the nineteenth century. Despite his claim of modernity, the roots of his work are firmly embedded in centuries of traditional natural theology. He uses arguments that emerged from specific and contingent historical contexts.

If natural theology is to succeed in contemporary times, it must develop strategies tailored to the current intellectual and social realities. While Paley and Whewell were highly influential, their success was tied to environments that are now hundreds of years old, and they make awkward foundations for any "new" natural theology.

In the past, natural theology has been an important force for the stabilization of the relationship between science and religion, and it may prove useful in bridging the current gap between the two. If modern scientists are going to continue this tradition, it will be necessary to follow Whewell's example and discard the strategies of the previous generations in favor of novel arguments better suited to the contemporary intellectual and social climate.
Works cited:


Endnotes:

2. Ibid., p. 90.
3. Ibid., p. 105.
4. LeMathieu, p. 76-78.
5. Ibid., p. 141.
7. Ibid., p. 167.
8. Brooke, p. 221.
10. Ibid., p. 238.
12. Whewell, pp. 1-5.
16. Ibid., p. 347.
17. Ibid., p. 129.
18. Note that this is the reverse of conventional evolutionary thought, in which the structure of life adapts to the prevailing environment.
20. Ibid., p. 17.
21. Ibid., p. 46. Used by permission of Michael Denton.

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