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...The Only Game in Town—A Review of *The Greatest Show on Earth:*

The Evidence for Evolution

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Only a Theory?

Richard Dawkins's *The Greatest Show on Earth: The Evidence for Evolution*, is not only an elegant exposition of the evidence for the scientific fact of evolution, but also a clear and creative explanation of the theory, and the stumbling blocks to its proper understanding. Theory should not be confused with hypothesis, and Dawkins is adamant about referring to evolution as a fact. We agree with him. When scientists and evolutionary scholars refer to “evolutionary theory” among themselves, there is no need to explain that a scientific theory is a framework that describes and predicts processes in the physical world based on mutually supportive, empirical evidence. Outside of scientific circles, however, scientists should be cautious when using the term theory, because anti-scientific interests are eager to confuse theory with guess. There is more than enough evidence to cement evolution as a fact—more evidence than there is for other commonly accepted facts. Thus, it is logical to refer to evolution as both a scientific theory and an uncontested fact. Dawkins plays wordsmith by borrowing the mathematical term theorem, to coin “theorem.” He suggests that scientists might use “theorem” in lieu of the more pernicious “theory” when referring to scientific laws and facts that no rational individual would deny, such as the heliocentric theory of the solar system, the theory of gravity, and the theory of evolution.

The History Deniers

At a time when science seems to be increasingly under attack by fundamentalist religious interests, it is important to understand what motivates such opposition. Those who reject evolution do not base their attacks on any logical or scientific foundation, and Dawkins calls them “history deniers,” akin to Holocaust deniers. History deniers base their objections on

ideological grounds that have nothing to do with the facts. To them, resistance to evolution is a self-righteous cultural crusade for which the truth does not matter. In his interview with Wendy Wright, President of Concerned Women for America, partly transcribed in this book, Dawkins repeatedly mentions *Australopithecine* and *Homo* fossils as clear evidence for human evolution, but Wright stubbornly refuses to acknowledge the existence of these fossils, and instead says “...that so many of us who have seen your information still don’t buy into your ideology” (p. 201). For Wright and other fundamentalists, the battle over the teaching of evolution is about ideologies and worldviews. For Dawkins and the scientific community, it is about the truth.

Dawkins’s Softening Up Approach

Dawkins skillfully renders the process of natural selection easy to grasp. He begins his “softening up” approach by patiently guiding the reader through a logical progression of the various forms of selection in nature. Via a “step by step seduction of the mind” (p. 45), Dawkins draws parallels between artificial selection of domestic plants and animals, sexual selection, and agentive selection of flowers by insects, and angler fish by their prey. By so doing, Dawkins readies the reader for the power of natural selection to build complex adaptations that appear beautifully well designed. His approach and writing is fresh and illuminating. As in his previous books, Dawkins has the treasured ability to present scientific facts in a way that renders them vibrant and new, for the scientist and non-scientist alike.

The Evidence

Dawkins’s presentation of the evidence for evolution is at once fascinating and commanding. Instead of tirelessly listing fossil after fossil as evidence for evolutionary change (and there is plenty), Dawkins explains why the battles over nomenclature in paleontology may do more harm than good. The fact that paleontologists and anthropologists disagree over fossil

classification is itself evidence for the mutability of life. Ironically, if every bony animal had fossilized, the classificatory system itself would be obsolete. The reason for this is that evolution is gradual. Monkeys did not give birth to humans, and if every transitional form were fossilized, there would be taxonomic confusion due to the lack of proper demarcations for classification. Rather than dwelling on names, Dawkins focuses on a gradation of fossils that document the major transitions in the history of life, including the invasion of land by sea dwelling creatures, the return of mammals such as whales and sirenians to the sea, and the multitudinous fossils documenting human ancestry. Likewise, his description of radiometric and dendrochronological dating methods for fossils is interesting and lucid. In what may be the clearest recent account of the atomic process of radioactive decay, Dawkins shows how preposterous are the contortions that creationists make to account for the congruency of different dating methods in establishing timelines.

Also, pay close attention to Dawkins's account of Richard Lenski's longitudinal experiments with *E. Coli* bacteria, and David Penny's work in reconstructing genetic relationships based on common descent. Dawkins clearly conveys the intricacies of these experiments with patience and wit. Nearly every major mechanism for adaptive evolutionary change is demonstrated by Lenski's research, and Penny's work in establishing phylogenetic trees based on molecular genetics is a direct blow to anyone claiming separate creation. Equally as persuasive is Dawkins's treatment of the biogeographical distribution of species, homologous and rudimentary structures, and cases of "bad design" in nature. Dawkins presents helpful analogies throughout, such as likening the process of comparing the genomes of different species to establish genetic relatedness, to the process of comparing similarities and differences between the letters, paragraphs, and overall texts of different versions of the book of Daniel. Likewise,

Dawkins contrasts the process of natural selection in building complex adaptations by modifying the materials already present, to the process of designing a new type of aircraft from scratch.

No Choreographer

In what may be the most creative and illuminating chapter, titled “You did it yourself in nine months,” Dawkins pinpoints the core of what makes the full implications of Darwinian evolution so hard for people to grasp, including scholars. He does so by drawing a parallel between phylogenetic adaptation across evolutionary time, and the embryological development of an individual organism following a genetic recipe. Dawkins explains with diligence and care how complex traits and behaviors emerge out of simplicity, and analogies with origami and computer programming clarify an often-misunderstood topic of blind and unthinking natural processes being responsible for complexity and apparent design. Dawkins’s examples, such as the elegant and complex flight patterns of a starling colony, and the fascinating process of the genetic construction of enzymes, show how complexity arises via a bottom-up process, having no choreographer, and following simple local rules at every stage of development.

In keeping with this theme, Dawkins’s examination of arms races and competition in nature is effective in dispelling any notion of central planning or design to benefit entire ecosystems or species. Trees do not strategize on how tall they need to be to benefit the rest of the forest, and lions do not form committees to help fellow lions by limiting predation on zebras. As obvious as these examples are, some evolutionary scholars still harbor such group selectionist tendencies, albeit cloaked in more sophisticated jargon. Organisms that sacrifice themselves for the benefit of unrelated conspecifics are vulnerable to exploitation by more selfish rivals. If group-level effects can be explained by individual-level genic selection, it is superfluous to posit selection at any higher level. There is no overarching economist to maximize efficiency in

ecosystems, and the tragedy of the commons is, sadly, all too common. In effect, Dawkins explains how waste and suffering in nature only makes sense in light of evolution, and not as the result of some sadistic intelligent designer.

Conclusions

According to Dawkins, this book is targeted not only at history deniers, a whopping 42% of the United States citizenry, but also at those who could use more ammunition in educating family and friends on the fact of evolution. We highly recommend that scholars in evolutionary fields also read this book. With wit and occasional humor, Dawkins masterfully synthesizes the evidence for evolution from a variety of disparate fields of research, while composing apt metaphors that aid in the proper understanding of natural selection. By grasping the book's central themes, academics and non-academics can add to their conceptual foundations for the scientific fact of evolution.

The Greatest Show on Earth is more than a presentation of the scientific evidence for evolution. It is also a magnificent defense of a naturalistic account for all phenomena. Dawkins brilliantly communicates the poetry and parsimony of a self-sustaining universe that requires no divine input. He shows how the non-random accumulation of randomly varying information is responsible for all life on Earth. Originally, Dawkins intended to add "...*The Only Game in Town*" to the primary book title (after a slogan on a t-shirt he was sent from a well-wisher), and he demonstrates why Darwin's idea is the only viable explanation for life that is supported by massive amounts of evidence. As stars die out, and the universe slowly spirals toward its heat death, temporary aggregations of complexity will degrade into the cold desolation of the cosmos. How humbling and uplifting it is to be able to understand ourselves in the short span allotted us.