

## Contingency or Inevitability? What would happen if the evolutionary tape were replayed?

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Simon Conway Morris, *Life's Solution – Inevitable humans in a lonely universe*. Cambridge University Press, 2003, ISBN 0-521-82704-3, \$30, 464 pages.

Fifty years before Darwin defended his theory of evolution by natural selection in *The Origin of Species*, the French biologist Jean Baptiste Lamarck put forward an evolutionary theory of his own. According to Lamarck, life has an inherent tendency to develop from simple to complex through a pre-ordained sequence of stages. The lineage to which human beings belong is the oldest, since we are the most complex of living things. Present-day worms belong to a lineage that is much younger, since they are simpler. For Lamarck, the human beings and worms that exist today do not share a common ancestor, even though human beings derive from worm-like ancestors.

Darwin's theory was radically different. First, all the organisms alive today trace back to a common ancestor. And second, Darwin found no merit in the vague idea that lineages have an "inherent tendency" to develop through a set sequence of stages. Rather, Darwin proposed a concrete mechanism – the process of natural selection -- to explain why lineages change through time and why they diverge from each other as each responds to different environmental circumstances. No wonder he was irritated when some of his contemporaries dismissed his theory as a mere restatement of Lamarckism.

Darwin's successors further developed the idea that evolution has no pre-established sequence of stages. Lineages evolve in response to the accidental circumstances they happen to experience. Where Lamarck's theory sees the history of life as the unfolding of an inevitable pattern, Darwinism gives pride of place to the idea of contingency. In his book *Wonderful Life*, Stephen Jay Gould provided a vivid metaphor for this idea, drawn from the Jimmy Stuart movie in which the main character gets to see that his world would have been profoundly different had he not existed. Gould contended that the life we see around us would have been profoundly different if conditions at the start of the evolutionary process and along the way had been only modestly different. Human beings, and the features of our species that we most prize, are radically contingent. Replay the tape and there would be no human beings, and nothing remotely like human intelligence and language. Indeed, there would be no mammals and no vertebrates, either.

Simon Conway Morris' bold new book, *Life's Solution – Inevitable Humans in a Lonely Universe*, challenges this Darwinian orthodoxy by extending ideas he developed in his *Crucible of Creation*. He is a booster of inevitability, not a purveyor of contingency. Replay the tape, he says, and the same broad patterns will emerge. Morris is also an emphatic adaptationist; he insists on the ubiquity and power of natural selection as a determinant of evolutionary outcomes. Lamarckism is a dirty word in present-day biology, so it is no surprise that Morris does not choose to describe his theory as Lamarckian. But there is an additional reason why the L-word goes unspoken in Morris' book. Morris builds his case for the inevitability of numerous evolutionary outcomes mostly on a Darwinian foundation.

Morris' crucial observation is something that Darwinians have always known about, but, he thinks, have never properly appreciated: the pervasiveness of *convergence*. Sometimes two species are similar because they inherit traits from a common ancestor, in which case the similarity is said to be a "homology;" at other times, they are similar because their separate ancestors independently evolved the same novel features. This is convergence. The kind of eye found in vertebrates (the so-called "camera" eye) has independently evolved in other groups – in squid, in some marine worms, jelly fish, snails, and spiders (p. 157). In addition to this and other standard examples of convergence (like the remarkable similarities that unite placental and marsupial mammals), Morris' book ably describes scores of less familiar but no less fascinating examples. The lesson is clear. The living world is peppered with recurrent themes; it is not an accumulation of unique events.

Morris argues that convergence is a decisive objection to the thesis of radical contingency. He is right: we *should* reject the claim that the evolution of the camera eye in the vertebrate lineage depended on *all* the historical circumstances being precisely as they were. The lineage leading to squid was able to accomplish the same result, but with a different set of starting conditions. However, it is a further step to show that the evolution of the camera eye was *inevitable* (or even highly probable). You can't show that an event was inevitable or highly probable just by pointing out that it has happened numerous times. To estimate the probability of the camera eye's evolving, you need to know how many times it evolved *and how many times it failed to do so*. The problem is that Morris never describes how often convergences *failed* to occur.

Even if the probabilities of different evolutionary transitions could be estimated, a second obstacle confronts claims of inevitability. Imagine a long sequence of evolutionary transitions, stretching, as Morris humorously remarks, from the prebiotic soup all the way to shopping. Even if each transition in this chain -- from the first to the second, from the second to the third, and so on – were highly probable, it would not follow that the transition from the first to the last is highly probable. The problem is that probabilities multiply; multiply a big probability like 9999/10000 by itself enough times and you obtain a probability that is very small indeed.

In the penultimate chapter of the book, Morris ventures beyond the narrow confines of Darwinian theory. He calls for the development of new biological ideas to explain how life manages to repeatedly discover the tiny islands of adaptedness that exist in a vast ocean of biological possibility. He apparently does not believe that the theory of natural selection suffices. The chapter also includes bitter remarks about the self-congratulatory atheism of many popularizers of evolutionary theory. Morris thinks that the large-scale features of the history of evolution "are congruent with a Creation (p. 329)" though they do not "prove" (p. 330) that God exists. He finds it significant that our universe "seems strangely well suited for us (p. 327)" without pausing to consider the fact that this is the only kind of universe we could possibly observe. Morris' recommended "path to recovery" from the corrosive naturalism that he deplores involves facing up to the fact that "it is reasonable to take the claims of theology seriously (p. 328)." Lest the reader misunderstand, he repeatedly emphasizes that he has no respect for creationism or for its current repackaging under the heading of "intelligent design theory." Morris clearly indicates which philosophical and theological ideas he opposes, but he provides few details about the ideas he endorses. The direction of his yearning, however, is plain.

**Elliott Sober** is a philosopher of science whose most recent book, coauthored with the biologist David Sloan Wilson, is *Unto Others – the Evolution and Psychology of Unselfish Behavior*.