Technological Design as an Evolutionary Process

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The evolution of technical artifacts is often seen as radically different from the evolution of biological species. Technical artifacts are normally understood to result from the purposive intelligence of designers whereas biological species and organisms are held to have resulted from evolution by natural selection. But could it be that technology, too, is really the outcome of evolutionary processes rather than intelligent design? Recent decades have seen the emergence of evolutionary theories of technology, which use concepts and principles drawn from evolutionary biology to describe and explain processes of technological innovation and technological change. In this chapter, I will focus on three prominent theories, by George Basalla, Joel Mokyr and Robert Aunger, and I will investigate to what extent these theories present a truly evolutionary account of technological innovation and change. In the end, I aim to analyze how these theories construe technological design: as a blind evolutionary process, a purposive activity of designers, or a mixture of both.

1 Design and Evolution

Before evolutionary theory presented an alternative viewpoint, it was almost universally believed that biological organisms are creations of an intelligent maker – a God. For centuries, this belief played a central role in a major type of argument for the existence of a God, the Argument from Design. Arguments from Design come in different forms but all revolve around the belief that there must be a God or Intelligent Creator because organisms in nature are too complex and sophisticated to have occurred randomly or naturally.

The most famous Argument from Design is the Watch Argument presented by theologian William Paley in 1802. Paley's argument starts with the premise that living organisms and organs have the same kind of complexity and purposiveness as designed artifacts. An eye, for example, is an intricate organ for vision in precisely the same way that a telescope is an intricate artifact for assisting vision. Paley next

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P. E. Vermaas et al. (eds.), *Philosophy and Design*.

argues that if one finds complex artifacts like a telescope or watch on the ground, one would not believe for a moment that it was the product of natural forces, but rather believe that it must have had a maker. But, Paley argues, since human organs and organisms have the same kind of complexity and purposiveness as such human-made artifacts, it is only plausible to assume that they, too, must have had a designer, or maker, who intentionally created them and gave them a functionality or use.

In his famous exposition of the theory of evolution, *The Blind Watchmaker*, Richard Dawkins explains that the theory of evolution by natural selection provides a compelling alternative to Paley's account. The complexity and functionality found in living beings, Dawkins argues, can be explained as the outcome of a long process in which less complex organic systems gain complexity and functionality in a series of steps involving small variations and selection of the fittest (best-adapted) systems. Dawkins concludes that an explanation of organic life requires no appeal to a creator or designer, but only to blind processes of natural selection. Natural selection, he claims, is completely different from purposive design since it "has no purpose in mind. It has no vision, no foresight, no sight at all. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of watchmaker in nature, it is the *blind* watchmaker." (Dawkins, 1986, 5). The theory of evolution is now well-established in science, and the Argument from Design has become discredited as a result, although it is still used in religious theories of biological life, as in creationism, creation science, and more recently, the theory of Intelligent Design (Dembsky, 1999).

As a result of the new scientific orthodoxy, the origins of organisms and of artifacts are nowadays seen as radically different: blind natural selection versus the purposive, forward-looking, and intelligent activity of designers. In this chapter, I will question whether this radical difference in origins can be sustained. I will not do this by revisiting the Argument from Design, but by questioning whether designed artifacts are best explained as resulting from purposive design rather than evolutionary processes. Recent decades have seen the emergence of evolutionary theories of technology, which use concepts and principles drawn from evolutionary biology to describe and explain processes of technological innovation and technological change (see Ziman (2000) for an overview). In what follows, I aim to investigate to what extent these theories present a truly evolutionary account of technological innovation and change and to analyze how they construe technological design: as a blind evolutionary process, a purposive activity of designers, or a little bit of both.

2 Evolutionary Theories of Technology and Evolutionary Biology

In this section, I will briefly introduce contemporary evolutionary approaches to technology, after which I will analyze the conditions that must be met for a theory of technology to be genuinely evolutionary and the extent to which this requires adoption of central principles of evolutionary biology.