

# Without Miracles

## Preface

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One of the most remarkable aspects of the universe in which we find ourselves is that this universe has somehow acquired awareness and knowledge of itself. Between 10 and 20 billion years ago, the universe made a dramatic appearance after the Big Bang. As the resulting swarm of leptons, bosons, and quarks condensed into atoms, galaxies containing stars and planets slowly took shape, resulting in the dazzling display that the heavens provide on any clear night. And somehow, on at least one of these planets, living organisms emerged, the continued evolution of which eventually produced a creature who would not only marvel at the stars and planets, but also create theories of their origin, the birth and process of life, and the growth of his own knowledge about the universe and the objects, forces, and life within it.

But it is not only our species that has somehow acquired knowledge of its environment. The fish's streamlined shape suggests functional knowledge of the physical properties of water. The design of the eagle's wings reveals sophisticated knowledge of aerodynamics. The deadly effectiveness of the cobra's venom shows useful knowledge of the physiology of its prey. The functioning of the bat's remarkable echolocation system depends on knowledge of the transmission, reflection, and speed of sound waves. In all these instances we notice a puzzling fit between one system and another, an adaptation of an organism to some aspect of its environment. Indeed, knowledge itself may be broadly conceived as the fit of some aspect of an organism to some aspect of its environment, whether it be the fit of the butterfly's long siphon of a mouth to the flowers from which it feeds or the fit of the astrophysicist's theories to the structure of the universe.

But how did such remarkable achievements of fit arise? How did the animate world obtain its impressive knowledge of its surroundings? And how do organisms continue to acquire knowledge and thereby increase this fit during their lifetimes?

In this book we will explore various attempts to provide an explanation for the emergence of the knowledge demonstrated by the fit of living organisms to their environments. Chapter 1 provides a quick tour of some striking puzzles of fit, ranging from the biological world of single-celled organisms to the technological world of jet aircraft. The four chapters of part II contrast three approaches to explaining aspects of biological fit and show why natural selection, operating either over the course of many generations or over the course of a single organism's life, is today considered to provide the best explanation for such fit. Part III then extends natural selection by proposing selectionist explanations for other types of fit demonstrated by living organisms, with special emphasis on our own species. Here we will see how, in many different fields from philosophy to technological development, evolutionary solutions involving variation and selection are being increasingly proposed and accepted as explanations for the growth of many different types of knowledge. The two chapters of part IV show how the evolutionary technique of cumulative variation and selection is now being used in the applied sciences to facilitate the function of machines, molecules, and organisms. Finally, part V introduces and argues for *universal selection theory*, the bold conjecture that all knowledge and knowledge growth are due to a process of cumulative blind variation and selection.

Although many and varied disciplines are encountered in this book, they are organized around just two quite

simple underlying themes. The first is that in all these fields of inquiry, three major types of explanation have been proposed for the origin and growth of knowledge, that is, for the increase in fit between an organism or product of an organism and its physical or social environment. These three explanations are referred to as *providential*, *instructionist*, and *selectionist* theories. The second theme is that in the many diverse disciplines of knowledge we are about to explore, the first two types of explanations have repeatedly been replaced by the third. Keeping these two themes in mind should help the reader keep his or her bearings as we now commence our excursion through several important and fascinating fields of knowledge.