Keeping an Eye on Evolution:
David Berlinski

Richard Dawkins, a relentless Darwinian spear carrier, trips over Mount Improbable.

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Climbing Mount Improbable, Richard Dawkins, W. H. Norton & Company, Inc.
1996, 288 pages, $32.99) Note: U.S. price is $25.00

The theory of evolution is the great white elephant of contemporary thought. It is large, almost entirely useless, and the object of superstitious awe. Richard Dawkins is widely known as the theory's uncompromising champion. Having made his case in *The Blind Watchmaker* and *River out of Eden,* Dawkins proposes to make it yet again in *Climbing Mount Improbable*. He is not a man given to tiring himself by repetition.

Darwin's theory has a double aspect. The first is the doctrine of descent with modification; the second, the doctrine of random variation and natural selection. Descent with modification provides the pattern; random variation and natural selection, the mechanism. Dawkins' concern is with the mechanism; the pattern he takes for granted.

Biological structures such as the mammalian eye are complex in the sense that they contain many parts arranged in specific ways. It is unlikely that such structures could have been discovered by chance. No one, the astrophysicist N. C. Wickramasinghe once observed with some asperity, expects a tornado touching on a junkyard to produce a Boeing 747. This may suggest---it *has* suggested to some physicists---a disturbing gap between what life has accomplished and what the theory of evolution can explain. The suggestion provokes Dawkins to indignation. "It is grindingly, creakingly, crashingly obvious," he writes, mixing three metaphors joyously, that the discovery by chance of a complex object is improbable; but the Darwinian mechanism, he adds, "acts by breaking the improbability up into small manageable parts, smearing out the luck needed, going round the back of Mount Improbable and crawling up the gentle slopes...."

This is a fine image, one introduced originally by the American bio-mathematician Sewell Wright. Random variation offers the mountaineer an allowance of small changes. Chance is at work. Natural selection freezes the successful changes in place. And this process owes nothing to chance. In time, the successful changes form a connected path, a staircase to complexity.

The example that Dawkins pursues in greatest detail is the eye. Darwin himself wondered at its complexity, remarking in a letter to an American colleague that "the eye...gives me a cold shudder." That shudder notwithstanding, Darwin resolved his doubts in his own favor; the eye, he concluded, was created by a single-step series of improvements, what he called 'fine gradations.' Where Darwin went, Dawkins follows. It is one thing, however, to appeal to a path up Mount Improbable, quite another to demonstrate its existence. Dawkins has persuaded himself that because such a path might exist, further argument is unnecessary. Impediments are simply directed to disappear: "There is no difficulty"; "there is a definite tendency in the right direction"; "It is easy to see that..."; "it is not at all difficult to imagine...." In fact, the difficulties are very considerable. A single retinal cell of the human eye consists of a nucleus, a mitochondrial rod, and a rectangular array containing discrete layers of photon-trapping pigment. The evolutionary development of the eye evidently required an increase in such layers. An inferential staircase being required, the thing virtually constructs itself, Dawkins believes, one layer at a time. "The point," he writes, "is that ninety-one membranes are more effective...than ninety, ninety are more effective that eighty-nine, and so on back to one membrane, which is more effective than zero."

This is a plausible scheme only because Dawkins has considered a single feature of the eye in isolation. The parts of a complex artifact or object typically gain their usefulness as an ensemble. A Dixie Cup consists of a tube joined to a disk. Without the disk, the cup does not hold less water than it might; it cannot hold water at all. And ditto for the tube, the two items, disk and tube, forming an

irreducibly complex system.

What holds for the Dixie Cup holds for the eye as well. Light strikes the eye in the form of photons, but the optic nerve conveys electrical impulses to the brain. Acting as a sophisticated transducer, the eye must mediate between two different physical signals. The retinal cells that figure in Dawkins' account are connected to horizontal cells; these shuttle information laterally between photoreceptors in order to smooth the visual signal. Amacrine cells act to filter the signal. Bipolar cells convey visual information further to ganglion cells, which in turn conduct information to the optic nerve. The system gives every indication of being tightly integrated, its parts mutually dependent.

The very problem that Darwin's theory was designed to evade now reappears. Like vibrations passing through a spider's web, changes to any part of the eye, if they are to improve vision, must bring about changes throughout the optical system. Without a correlative increase in the size and complexity of the optic nerve, an increase in the number of photoreceptive membranes can have no effect. A change in the optic nerve must in turn induce corresponding neurological changes in the brain. If these changes come about simultaneously, it makes no sense to talk of a gradual ascent of Mount Improbable. If they do not come about simultaneously, it is not clear why they should come about at all.

The same problem reappears at the level of biochemistry. Dawkins has framed his discussion in terms of gross anatomy. Each anatomical change that he describes requires a number of coordinate biochemical steps. "[T]he anatomical steps and structures that Darwin thought were so simple," the biochemist Mike Behe remarks in a provocative new book (*Darwin's Black Box*), "actually involve staggeringly complicated biochemical processes." A number of separate biochemical events are required simply to begin the process of curving a layer of proteins to form a lens. What initiates the sequence? How is it coordinated? And how controlled? On these absolutely fundamental matters, Dawkins has nothing whatsoever to say.

In addition to the eye, Dawkins discusses spiders and their webs, the origin of flight, and the nature of seashells. The natural history is charming.

Dawkins is a capable if somewhat dry prose stylist, although such expressions as 'designoid' and 'wince-makingly' are themselves wince-making. The science throughout is primitive. Difficulties are resolved by sleight-of-hand. "In real life," Dawkins remarks in a representative passage, "there may be formidable complications of detail." Yes? What of them, those formidable complications? "These emerge simply and without fuss."

Is the elephant's large nose truly the result of an evolutionary progression? Then some demonstration is required showing that intermediate-sized noses are valuable as well. None is forthcoming. "If a medium sized trunk were always less efficient," Dawkins writes, "than either a small nose or a big trunk, the big trunk would never have evolved." Indeed. The emergence of powered flight is treated as an engaging fable, one in which either arboreal animals glided downward from the tree tops or a primitive dinosaur hopped upward toward the sky. "The beauty of this theory," Dawkins affirms, commending the hopping scenario, "is that the same nervous circuits that were used to control the center of gravity in the jumping ancestor would, rather effortlessly, have lent themselves to controlling the flight surfaces later in the evolutionary story." It is the phrase "rather effortlessly" that gives to this preposterous assertion its antic charm.
A final note. In a book whose examples are chosen from natural history, it is important to get the details right. Hawks may soar or sail, but they cannot hover like helicopters. Not all organisms share precisely the same genetic code. And Gary Kasparov was defeated by IBM's Big Blue, and not a program entitled Genius 2.

David Berlinski has taught mathematics and philosophy at universities in the United States and France. He is the author most recently of *A Tour of the Calculus* and three novels, the latest of which is *The Body Shop*. He lives in San Francisco.

Related Reading

*Darwin's Black Box*by Mike Behe (The Free Press, 1996)
Full House, by Stephen Jay Gould (Harmony Books, 1996)
*Darwin's Dangerous Idea*by Daniel C. Dennett (Simon & Shuster, 1995)
*Evolution: A Theory in Crisis*by Michael Denton (Adler & Adler, 1986)
Reinventing Darwin, by Niles Eldredge (John Wiley & Sons, 1995)
*Black Mischief: Language, Life, Logic and Luck*by David Berlinski (Harcourt Brace Jovanovich, 1986).

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