

Needless to say, I strongly recommend that all students of mathematics read this book. For the lay person, this is an excellent exposure to mathematics. For the undergraduate student this book serves as an introduction to many beautiful results in mathematics and also an opportunity to learn about the rich history and human drama behind these facts. For the

² See R Sridharan's review of the book *The Crest of the Peacock, Non-European roots of mathematics* by George Gheverghese Joseph in the June 1996 issue of *Resonance*.

River Out of Eden¹

Darwin Goes Digital: Old View, New Metaphor

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River Out of Eden



*River out of Eden:
A Darwinian View of Life*

Richard Dawkins

[Phoenix, Orion Books, London, 1995.
p.196, UK £5.99

Two decades ago, Richard Dawkins unleashed *The Selfish Gene*, an intensely compelling book that reduced organisms to insignificant puppets animated by primeval strings of selfish genes. Just as Samuel Butler observed that a chicken was an egg's way of making another egg, Dawkins sug-

gested that an organism existed only because genes had to make more genes. Organisms were mere carriers of genes from one generation to another. The logic was simple – all bodies die, all genes don't. Genes would survive and march the passage of geological time if they were good at building bodies capable of reproducing to leave more copies of those genes that would make more bodies to make more genes, ... *ad infinitum*. The concept progressed further in the sequel, *The Extended Phenotype*, which proposed that genes do not just manipulate bodies, but extend their control over the world around them shaping it to meet their own reproductive end. It was only incidental that the replicating molecules were packaged for transportation through time in multicellular throw-away wrappings called organisms!

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¹Note that the author of this book was erroneously mentioned as Stephen Jay Gould on p.77 of the January 1977 issue of *Resonance*.

Editor

Dawkins, arguably the most forceful popular writer of neo-Darwinism, expounds his views with eager passion and unassailable logic. With the possible exception of the more rhetorical Stephen Jay Gould, he has done more than anyone to popularize the field of evolutionary biology. With its emphatic advocacy and clear reasoning, *River Out of Eden* is vintage Dawkins. Though, at first glance, the militant vigour of his former works appears a little toned down, the severity with which rival theories and ideas are admonished might suggest otherwise.

If you have not read Dawkins yet, this is a good book to start with before you move on to his meatier works. The book is smaller than any of its predecessors and is less technical. It stands, without doubt, at the popular extreme of the spectrum of all his writings. Devoid of jargon, the language is simple but yet maintains the emphasis and persuasion so typical of Dawkins. Further, the book assumes no advanced knowledge of biology, and examples abound to drive home the concepts. Those already familiar with Dawkins' concepts, will find this a nostalgic reinforcement of the gene's-eye view of life with varied and new substantiation. This book certainly has the potential to accommodate a wide readership ranging from the curious layman, through the novice biology-student, to die-hard evolutionary biologists.

Although Dawkins has conceptually

nothing new to say, the book's central metaphor of the river is appealing in its simplicity and lucid in purpose. Introducing the analogy in the first chapter, *The Digital River*, from which the book borrows its title, Dawkins begins, "There is a river out of Eden, and it flows through time, not space. It is a river of DNA...." The analogy of the river to compare the flow of genetic information in species through time and through bodies serves well, on most counts. All individuals of a species have the same river flowing through them and new species come into existence when the river forks into two branches (caused by, say, geographical isolation of a population). Initially, the branches may remain close to each other allowing waters to mix (inter-breeding between individuals of the two populations), but if the rivers diverge further they may get too far to mingle (reproductive isolation). Some branches may dry up on the sands of extinction. Dawkins discusses the difference between analog and digital systems in their fidelities of information transfer, and maintains that Darwinism can be sustained only by a genetic system that is digital.

The second chapter, *All Africa and Her Progenies*, details the logic of the existence of *Mitochondrial Eve*. For those, like me, more familiar with that phrase than the concept, this is an excellent place to understand the deduction. Using the example of the rate of change in the nucleotide sequence of the protein cytochrome *c*, calculation of evolutionary distances between species is

discussed with such simplicity, that the rationale of using molecular clocks becomes glaringly obvious. *Do Good by Stealth*, the third chapter, is partially an attack on creationism (no book by Dawkins is complete otherwise). Creationists commonly attack gradualism in evolutionary theory by arguing that complex structures, organs or behaviour-patterns that exist in nature could have arisen only instantaneously (created), as intermediate half-formed stages would have been useless. Using examples of orchids, man, sticklebacks, gulls and turkeys, Dawkins obliterates that notion and points to plausible pathways to the evolution of the eye, bee-dances and wasp-shaped orchids. The fourth chapter, *God's Utility Function*, explains how a gene-centered view shows that nature is neither cruel nor caring, but only indifferent, to the phenotype. The utility function (an economist's term meaning 'that which is maximized') of life is 'DNA survival'. The last chapter, *The Replication Bomb*, talks about the possible origin and future of self-replicating molecules. Dawkins takes us through the many thresholds that life has passed through during the course of evolution, and suggests a possible crossing of the next threshold of inhabiting the solar system through space travel. All in our genes!

The river metaphor contains a trivial inconsistency. New branches *leave* Dawkins' evolutionary river as it flows through time and these may eventually have other branches *leaving* them. Many real branches

of water (tributaries) often do not branch away from a river; they start off by themselves, get bigger before *joining* a main river which might *join* a bigger river. The River Out of Eden flows in the reverse direction! As a metaphor, The Tree of Life, more deeply rooted in history, might still stand taller.

In conclusion, *River Out of Eden* is a simple summary of Dawkins' central proposition that genes are the only units that really matter in evolution and that they transcend the significance of the organism. The book hints at a unifying theory of evolution which argues that all of life's grandeur boils down to the process of digital-information transfer. Dawkins at his reductionist best. If you like work-outs at cerebral gyms, this book has weight.

Suggested Reading

Gould S J. Caring groups and selfish genes. In Gould S J. *The Panda's Thumb*. W W Norton. New York, 1980.

Gould S J. What happens to bodies if genes act for themselves? In Gould S J. *Hen's Teeth and Horses Toes*. W W Norton. New York, 1983.

Dawkins R. *The Blind Watchmaker*. W W Norton. New York, 1986.

Dennett D C. *Darwin's Dangerous Idea*. Simon & Schuster. New York, 1995.

(Note: Books by W W Norton are available with Penguin Books in India.)

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