behaviour only after development in a C57 uterus.

Ridley's historical tour of several disciplines is a delight: the pivotal players in ethology, neurobiology, anthropology and psychology are brought to life in engaging pen-portraits. We encounter anthropologist Franz Boas in 1884 during his first field season among the Inuit of Baffin Island as he notes in his diary: "These are the 'savages' whose lives are supposed to be worth nothing compared with a civilized European. I do not believe that we, if living under the same conditions, would be so willing to work or be so cheerful and happy." Konrad Lorenz appears both in his best-remembered guise, pursued by a string of adoring ducklings, and in an altogether more sinister one. While working as a military psychologist in Poland in 1942, Lorenz participated in SS-sponsored research designed to distinguish between inferior Polish and superior German characteristics in 'half-breeds'. Nor does J. B. Watson of behaviourism fame fare too well in retrospect: his fall from grace was occasioned by an extramarital love affair, and he ended up, appropriately enough, applying his skills in pavlovian conditioning to advertising Johnson's baby powder. The human detail enriches *Nature via Nurture*, but Ridley by no means subscribes to the modern dumb-it-down school of science writing, in which the science itself becomes a sideshow to the serious business of prying into the scientists' personal lives.

Ridley's book reminds us of the importance of good science writing. Because he is not a professional scientist, Ridley is not stuck deep in a disciplinary trench and has the freedom to range across huge swathes of intellectual territory. In doing so, he has given us a rich overview and a compellingly integrated picture of a great deal of science, both old and new. Make *Nature via Nurture* part of your nurture. ■

Andrew Berry is at the Museum of Comparative Zoology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts 02138, USA.

The evolutionary blackbird

The Story of Life
by Richard Southwood
Oxford University Press: 2003. 272 pp. £19.99

Carl Zimmer

The poet Wallace Stevens wrote about 13 ways of looking at a blackbird. Perhaps someday another poet will write about 13 ways of looking at the history of life. I can certainly think of 13 different scientists who have written books on the subject, each of which is coloured by its author's expertise. Books by vertebrate palaeontologists are dominated by animals with bones, despite the fact that vertebrates make up a tiny proportion of the world's biodiversity today — not to mention the fact that they didn't exist for the first 3 billion years or so of life's history. The Precambrian expert Andrew Knoll has looked at those first 3 billion years in great detail in his new book *Life on a Young Planet* (to be reviewed in *Nature* shortly), leaving the details of dinosaurs and mastodons to others. For yet another take, try *The Major Transitions in Evolution* by John Maynard Smith and Eörs Szathmáry. For them, the essence of life's history is the emergence of new kinds of complexity. Instead of fossils, you get equations.

In *The Story of Life*, Oxford ecologist Richard Southwood takes his own look at the evolutionary blackbird. Southwood is a leading figure in ecology, thanks to his seminal work on insects and his landmark book *Ecological Methods*. For 18 years he taught an introductory course on the history of life, and out of that experience has sprung *The Story of Life*. Not surprisingly, Southwood sees the history of life in an ecological light, not as a single-file parade of new life forms but as a network of species whose links are being perpetually reworked.

This network first took shape over 3 billion years ago, as early microbes cooperated to harness the energy in their environment. The network grew more complex as animals and other multicellular organisms evolved, and as reefs offered new ecospaces for species to colonize. Southwood recounts how dry land was transformed over hundreds of millions of years, as bacterial crusts gave way to forests that offered a new ecospace as vast as that of coral reefs. Over time, ecosystems change like gently tapped kaleidoscopes, Southwood writes, although mass extinctions give them a good shake from time to time.

Southwood displays an impressive sweep of knowledge about life, from the fauna of hydrothermal vents to the anatomy of plant-eating birds' digestive tracts. For the most part, he has kept abreast of the latest developments in evolutionary research, although from time to time he slips back into comfortable textbook explanations. Describing the great domains of life, for example, he writes: "The Archaebacteria also fall into two groups, both of which have lifestyles that are very unusual, but which could have been maintained on the ancient earth." These microbes (which are now generally called Archaea, not Archaebacteria) can indeed be found in strange places, such as geysers and oxygen-free swamps. But they can also be found in ordinary places, such as grassland soil and the open ocean, where they outnumber bacteria. Archaea got a reputation for being bizarre only because scientists discovered their more unusual members first.

A more serious shortcoming in *The Story of Life* is the scant attention paid to DNA, which has revolutionized our understanding of evolution's course. The ecological changes that Southwood details were made possible by changes to genes, and scientists are starting to get some hints of what those changes were, from the promiscuous gene swapping between early microbes to the recruitment of old genes to make new structures such as jaws and fingers.

Despite these grumbles, I recommend *The Story of Life* to those looking for a swift, efficient delivery of the most important information we have on how life has blossomed on Earth. Southwood is succinct and clear, and his narrative rarely gets bogged down with historical digressions or personal anecdotes. Although this style has its strengths, it also has its weaknesses. At the beginning of his book, Southwood claims that the story of life "provides a benchmark for judgments on the environmental problems of today". But when Southwood finally reaches our own age, he seems almost

indifferent as he zips through the ways that we are altering the climate and the planet's ecosystems. A little more passion would have been welcome. After all, these days the evolutionary blackbird is beginning to look more like a canary in a coal mine. ■

Carl Zimmer is a freelance writer who lives in New York. His most recent book is Evolution: The Triumph of an Idea.

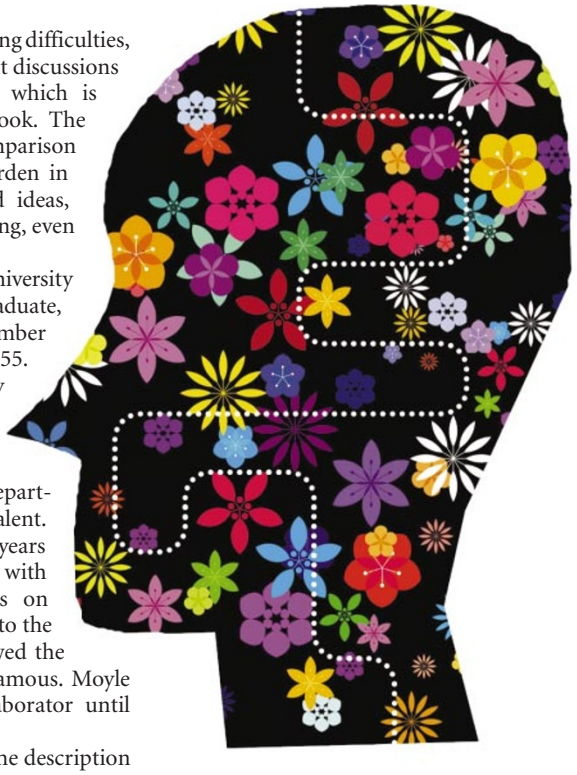
Metabolic gardening

Wandering in the Gardens of the Mind: Peter Mitchell and the Making of Glynn
by John Prebble and Bruce Weber
Oxford University Press: 2003. 344 pp. $65, £45.50

E. C. Slater

Peter Mitchell was an outstanding theoretical biologist who had what Leslie Orgel has characterized as a counterintuitive idea that led to a fundamental shift in the way that biochemists viewed energy metabolism. The story of the gradual replacement of the chemical hypothesis of energy transduction, which involved a non-phosphorylated high-energy intermediate (not a phosphate compound, as stated in this book), with the chemiosmotic theory has become, for historians of science, a classic example of how a paradigm shift occurs.

In this biography, the story is related again, primarily from Mitchell's viewpoint. Because of ill-health and hearing difficulties, Mitchell preferred to carry out discussions by lengthy correspondence, which is extensively quoted in this book. The title refers to Mitchell's comparison of the human mind to a garden in which are planted facts and ideas, which one keeps on rearranging, even when asleep.



Mitchell worked in the University of Cambridge as an undergraduate, research student and staff member for 16 years from 1939 to 1955. He did not have a particularly distinguished academic record, nor does he seem to have been completely at home in the biochemistry department, despite its wealth of talent. However, in his last few years there he published, together with Jennifer Moyle, experiments on the transport of phosphate into the bacterial cell that foreshadowed the work for which he became famous. Moyle remained his scientific collaborator until her retirement in 1983.

There are some errors in the description of the Cambridge environment concerning the Molteno Institute of Parasitology and Biology, headed by David Keilin, where Mitchell is described as having found "shelter" (possibly in late 1945 to early 1946). E. F. Hartree was not a member of the technical staff, as stated in this book, but a PhD from the University of London and co-author of most of Keilin's classic papers for over 20 years. I am described as an "occasional post-doctoral researcher" in the institute, which is surprising, considering that I worked there from late 1946 to 1955, during which time I published the chemical hypothesis of oxidative phosphorylation in *Nature* in 1953. It is the overthrow of this hypothesis by Mitchell that is a major theme of this book.

In 1955, Mitchell moved to the University of Edinburgh, where he developed the first version of the chemiosmotic theory, which was published in *Nature* in 1961. Illness soon caused him to move to Cornwall, where he converted a derelict manor house called Glynn House into a private laboratory as "a quiet haven for untrammelled scientific work and thought", as he wrote to me in 1964. The story of Glynn is the second strand in this biography. In 1966, Mitchell published, in what became known as 'The Grey Book', a modified version of the chemiosmotic theory in which he introduced the concept of proton motive force and 'loops' in the electron-transfer chain.

It took about ten years for the chemiosmotic theory to be generally accepted, and in 1978 Mitchell received the Nobel Prize in Chemistry. Mitchell was so confident that oxidative phosphorylation was solved that in 1976 he resolved to cease biochemical research and move into a new field, perhaps economics. The following year the decision was reversed when he considered that his theory was again under attack. It is worth noting that when the chemiosmotic theory became the new paradigm, Mitchell was just as resistant to attacks on parts of the theory as the supporters of the old paradigm had been.

The first assault came from Mårten

History in the making

It was one of the most momentous moments in the history of science, but even those people involved didn't know for sure just what its impact would be. *50 Years of DNA*, published by Palgrave Macmillan this month, tells the story of how the structure of DNA was discovered, and describes its subsequent impact on science, medicine and culture.

The book includes facsimiles of the landmark paper by James Watson and Francis Crick (pictured far left), along with those by Maurice Wilkins and Rosalind Franklin (pictured centre) and their colleagues that first appeared in *Nature* on 25 April 1953.

Introductory chapters take the reader on a journey from the early days of molecular biology through to the sequencing of the human genome, incorporating interviews with some of the key players. The book concludes with a collection of essays by prominent experts giving their views on the history and significance of Watson and Crick's discovery, along with their predictions of what genetics might achieve in the next 50 years. Edited by Julie Clayton and Carina Dennis, both former editors at *Nature*, the book celebrates the triumph of the DNA double helix.