

book reviews

worked through to modern creationism, and if that is indeed the prime source of the scourge, why it migrated from New England (where creationism is not today a menace) to the South.

Meanwhile, Eldredge's book, readily accessible to any educated reader, deserves to be widely read. ■

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Martian chronicles

In Search of Life on Mars

by Malcolm Walter

Perseus/Allen & Unwin: 1999. 170 pp. \$25, £8.99

Dead Mars, Dying Earth

by John E. Brandenburg and Monica Rix Paxson

Element: 1999. 306 pp. £16.99, \$26.95

Kenneth Nealon

The search for extraterrestrial life has traditionally focused on Mars, often with acrimonious results. The 'pro-life' groups claim that unquestionably there is, or has been, life on Mars. The 'pro-choice' groups take a more cautious view, often paraphrasing Carl Sagan ("Extraordinary claims require extraordinary results") and Richard Feynman ("Unfortunately, you are the easiest person [for you] to fool"). The acrimony often arises because the pro-lifers view such caution as an anti-life stance, while the pro-choice group would gladly be convinced by high-quality data.

In these two books, we have some classic examples of these views. Malcolm Walter explains the difficulties of ascertaining with certainty the nature of life, even on this planet, and suggests some cautious approaches to getting the right answer. Brandenburg and Paxson, on the other hand, accept that life has been discovered on Mars and elsewhere, and wonder (often loudly) why the rest of the world cannot agree. It is a classic case of the believers losing their scientific perspective — seduced by their own ideas — and the questioners being accused of irrationality.

How can the search for life on Mars be framed and focused by Earthly studies? This interesting question has been addressed by palaeontologist Malcolm Walter in his short, readable treatise. Walter has worked for more than 35 years on fossils from our planet, focusing mainly on the ancient stromatolites of Western Australia. When such fossils are properly collected and analysed they sometimes reveal 'footprints in the sand' of past life on our planet. More often they yield difficult-to-interpret data that do not prove the existence of life. With this background, Walter discusses the frustrations that we now



Down to Earth

Building Planet Earth: Five Billion Years of Earth History (Cambridge University Press, \$39.95, £25.00) by Peter Cattermole details the geological evolution of Earth. Through a range of colourful diagrams and photographs the book explains the mechanics behind the planet's development. Sampling fossils and

lava on the way, the book reveals the origins of the continents and discusses what causes modern-day natural disasters. Familiar features, such as Ayers Rock (above), are described and their genesis detailed. The book also looks at the methods used in geophysics and geochemistry.

face with the current Mars meteorite analyses, and perhaps will face with returned Mars samples.

Walter is pro-choice: he has a healthy scepticism about the existence of life on Mars and spends a good deal of time discussing why one should have such a view. Yet he maintains an open mind. In particular, there are discussions of the problems encountered in dealing with samples that have sat on our planet for many years. Contamination by both organic materials and living organisms is virtually impossible to prevent. These problems, coupled with the use of structures to infer life (and the ability of many mineral forms to mimic structures), make the unambiguous interpretation of structural data difficult. As Walter points out, the return of pristine samples from Mars would be a huge step forward, although negative results from a few sites will not prove that life does not exist, or has never existed, on Mars.

A key to this book, and a major difference between it and the following book, is Walter's appreciation of the prokaryotes (microbial cells and ecosystems). He makes strong arguments as to why searching for microbes should be part of the strategy for life-detection, how one might do it, and how this relates to studies of ancient Earth. To Walter, finding microbial life would be as significant as finding any other kind, and the nature of that life, if found, would have major impacts on many facets of Earthly life.

Throughout, Walter expresses his feelings about the joy of science, the thrill of the hunt, the difficulty of being sure about any-

thing in the complex geobiological setting, and the frustrations of being half-right, or even wrong, as the work has proceeded.

In almost every way imaginable *Dead Mars, Dying Earth* represents a stark contrast to Walter's book. I found it difficult to read: it moves from subject to subject distractingly. It is actually two books in one — the first a discussion of the history of Mars and the arguments for and against life there. The pro-life arguments are readily accepted, while those against are largely dismissed. The authors make a number of claims without showing any evidence to support them. By the end they have 'established' the history of Mars, the existence of life on the planet, how it was discovered, how and when it was extinguished, and how this relates to the present global-climate situation on Earth today.

The second part is a discussion of the global CO₂ and oxygen problem, and an attempt to suggest some ways out of the dilemma. This was much more palatable. I could not agree more with the authors about the importance of the problem, the apparent apathy of humans towards it, and some of the suggestions for improving the situation. There is overwhelming evidence of the seriousness of this issue, some of which is presented by the authors.

The authors' view of life is interestingly eukaryote-centric. Their entire discussion ignores any microbial life that might escape UV radiation by being a few metres underwater, and the potential role of such non-oxygen-breathing life in maintaining the planetary balance. I would have appreciated

some nod to the microbes in recognition of their ability to produce oxygen, consume CO₂ and generate other gases, but the authors ignore them both on Earth and on Mars. Maybe what is being discussed here is just another species extinction (this time, humans) on a planet that will do perfectly well without them.

The book is a curious attempt to discuss two major subjects that appear to have at best a tenuous connection. It ends with the authors sitting on Mars, breathing the oxygen-rich atmosphere that has been created, and discussing how good it is that they have saved the Earth. I appreciated this ending, as it put the entire treatise in a fictional mode; I was now free to take it all less seriously. However, I doubt that this is what the authors intended. ■

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Bad eggs

Cuckoos, Cowbirds and Other Cheats

by N. B. Davies

Academic: 2000. 310 pp, \$29.95, £24.95

Robert C. Fleischer

To many people, even some who profess a deep love of nature, brood-parasitic birds such as cuckoos and cowbirds are evil creatures that do not deserve to exist, merely because they deceptively manipulate songbirds into incubating their eggs and rearing their young. For example, William Dawson, in his 1923 book *The Birds of California*, poetically describes the cowbird as “a blight upon the flower of Progress” and “the unchaste mother of a race gone wrong”.

There is apparently something extremely distasteful about birds that forgo their parental responsibilities and dump their offspring in the nests of innocent strangers. However, to me, and obviously to Nick Davies, the author of this wonderful new book on brood parasitism in birds, the 100 species of brood-parasitic birds provide some of the most fascinating and intricate examples of the workings of natural selection. The interactions of each species with its hosts produce a profusion of little “miracles of evolution”.

This charming and well-written volume gives a remarkably complete compendium of information on avian brood parasitism and comes up with answers to the major questions in parasitology and evolutionary biology that its study provokes. The book is filled with novel ideas and logical, incisive interpretations of empirical results. Every twist and turn of an argument is laid out clearly and precisely.

Davies begins by briefly introducing the six groups or lineages of obligate parasitic birds: the Old World and New World cuckoos, New World cowbirds, honeyguides, African finches and one South American duck. Each of these groups has attributes beyond their parasitic habits and adaptations that make them interesting. For example, the honeyguides in Africa have evolved a mutualism with honeybadgers and primates (including humans), in which they guide these mammals to honeybee nests. The mammal opens the nest, making the honey available to itself and the bee larva and waxy honeycomb available to the honeyguide (special bacteria in their gut allow the honeyguides to digest the beeswax).

Davies then delves deeper into the parasitic habits of these groups. He concentrates mostly on the Old World cuckoos and the cowbirds, the taxa for which we have the most detailed information. The book also contains a short and less satisfying section on conspecific brood parasitism (“Cheating on your own kind”). This topic really requires a book of its own.

Davies himself specializes in the common cuckoo (*Cuculus canorus*) of the Old World. Clearly, his best stories and speculations concern this species, and his treatment is comprehensive and enthusiastic. But what a remarkable species the common cuckoo is, with its host specificity, gentes (host ‘races’ based on egg coloration) and egg mimicry. There is the strange behaviour of its day-old nestling, which uses its back to push all of the host’s eggs or young out of the nest; and the ridiculous images of relatively massive cuckoo fledglings being fed by tiny warblers or robins.

Davies relates in detail the coevolutionary ‘arms race’ between the host (which should continuously evolve better defences against parasitism) and the cuckoo (which

should constantly counter with better ‘trickery’). For example, hosts should evolve the ability to recognize and reject cuckoo eggs that do not match their own. Many, but not all, hosts do this by ejecting the cuckoos’ eggs or deserting their nest.

In turn, rejection provides strong selection for cuckoos to evolve eggs that look like host eggs. In some cases, Davies points out, they may evolve eggs that are even more attractive to the host than the host’s own eggs! And, although the evidence for this is not definitive, it may be that the parasite places unique constraints on its host. The ‘mafia hypothesis’ involves cuckoo species whose nestlings do not typically eject host eggs. One of these, *Clamator glandarius*, will return to destroy the nests of hosts that reject its egg. This ‘offer you cannot refuse’ forces a host to accept the *Clamator* egg so as to avoid total loss of reproductive success (by accepting, at least some of its young may survive). Davies carefully presents the evidence for such adaptations and counteradaptations, and never oversimplifies or falls into the trap of describing ‘just-so’ stories.

Davies courageously and successfully describes the molecular methods that may elucidate how gentes have evolved in cuckoos and parasitic finches. He relates preliminary studies using DNA which show that gentes may evolve only along female lines (females are the heterogametic sex in birds), and may have evolved very recently in some groups of brood parasites. This is an important area of future research, from which we may be able to locate the particular sex-linked genes that control egg coloration, and quantify the sequence changes required to evolve gentes. The markers are also useful for determining the behaviour of individual female brood parasites.

The book is illustrated with lovely line drawings by David Quinn, but there are too



The stranger among us: the cuckoo’s egg in this nest will present the brood with an unwelcome guest.