

development of palaeoanthropology (the Neander Valley, Dubois' "*Pithecanthropus*", Piltdown, Dart's *Australopithecus* and so on). But there are also excursions into less standard territory such as Krech and Rosenzweig's psychological experiments on rats, the bacterial ancestry of mitochondria, Muller's ideas on eugenics, Dobzhansky's research on fruitfly chromosomes and Kimura's neutral theory. While these certainly make fascinating reading for the uninitiated, it is not always clear how they relate to the main theme of the book.

Wills supports the concept of a multi-regional evolution of modern humans and treats Coon's generally discredited notions of separate racial origins from the *Homo erectus* stage with some sympathy. He believes that most of our evolution had occurred before *Homo erectus*, and run-away cultural and brain evolution would already have been set on its course in the different *H. erectus* populations, programming them to become *H. sapiens* independently (following Coon's model) or semi-independently (with gene flow). I think he considerably weakens his case by restricting the term 'human' to 'modern' *H. sapiens*, instead of using it in the wider sense as synonymous with members of the genus *Homo*; for Wills, even the Neanderthals are not fully 'human', creating a sharp division which he otherwise seems to imply does not really exist. Part of his support for multiregional evolution stems from his reanalysis of mitochondrial DNA data, concentrating on the rarer transversions which are otherwise usually swamped by transitions. His resulting recalibration of the age of the hypothetical 'mitochondrial Eve' to 600,000–1,000,000 years is about four times the better known (and now hotly disputed) estimates of workers such as Cann, Stoneking and the

late Allan Wilson.

Wills's discussion of the complexities of genes and brains is clear, although the symbolic power of language to change dramatically the way humans thought could have been given more emphasis. But Wills is sometimes less successful in dealing with the fossil evidence. For example, it is arguable whether the australopithecines "resemble us much more closely than they do apes", and there is no strong evidence that Africa lagged behind the rest of the world during the later parts of the Old Stone Age. (Some data suggest quite the opposite.) His assessments of dating are sometimes also faulty: the bones of the "First Family" are not younger than Lucy's, nor is the Laetoli site very close to her in age; and electron-spin-resonance dates from Kebara are not double the thermoluminescence dates (in fact they match well).

Overall, this book provides a distinctive perspective on human evolution, although ultimately it is not very different in its conclusions from the familiar views of palaeoanthropologists such as Milford Wolpoff and Phillip Tobias. Wills certainly puts too much store by his recalibration of the age of 'Eve' in reaffirming the reality of Coon's and Wolpoff's models; and, having been critical of those who put too much reliance on previous work on mitochondrial DNA, it is a pity that he does not take a wider view of genetic reconstructions of recent human evolution from nuclear DNA as well. Nevertheless, the volume is an interesting, if at times idiosyncratic, addition to the continuing flow of books on human evolution. □

Chris Stringer is in the Department of Palaeontology, Natural History Museum, Cromwell Road, London SW7 5BD, UK.

## Elements on disc

Tony Cox

**Interactive Periodic Table on CD-ROM.** ATTICA Cybernetics, Oxford, UK, in association with the Department of Chemistry, University of Southampton. £116.33. US distributor, Compton's New Media Inc. (619 929 2555).

THE chemical elements are fascinating in their diversity. Even within the organizing framework of the Periodic Table, their properties can show startling differences between one element and the next. All good books and courses on inorganic chemistry try to bring out this diversity, and an interactive teaching aid on CD-ROM would seem to be an ideal medium to help students to explore it on their own. The contents of this package are themselves bewilderingly diverse. They include Tom Lehrer's 'The Elements' song, video excerpts and poems, a brief tutorial guide to the Periodic Table and the discovery of the elements, and a huge amount of hard data, which can be displayed in all sorts of ways. My first reaction was that the product does not hang together very well. A more charitable interpretation is that the authors have included material that will be useful to students at different levels.

The more elementary parts, suitable for school chemistry or the first year at university, work fairly well. Whether one really needs this kind of audiovisual material on a CD-ROM, rather than say a videotape, is less clear. The CD format does make it much easier to work interactively, scanning through elements in a chosen order, rather than one imposed by the producer. But the quality and scope of the visual material suffers. I have greater reservations about the data intended for more advanced students. Many kinds of display are possible; for example, one can plot the ionic radius of elements against their abundance in the Earth's crust if one really wants to, although the visual quality of the graphs is disappointing. Also, the contents of the database are somewhat erratic, giving for instance an ionic radius for  $Ni^{5+}$  but not for  $Br^-$ .

Personally I prefer a good book, but I am aware of a generation gap here, and a computer-based medium like this undoubtedly has a growing role to play in the teaching of chemistry. As an introduction to the Periodic Table and to some descriptive aspects of the elements, the package is attractive. As a database and means of displaying more quantitative relationships, it probably needs more work before it can be really useful. □

Tony Cox is in the Department of Inorganic Chemistry, University of Oxford, South Parks Road Oxford OX1 3QR, UK.

### New in paperback

**Complexity: The Emerging Science at the Edge of Order and Chaos** by M. Mitchell Waldrop. Penguin, £6.99. See *Nature* **361**, 507 (1993).

**Complexity: Life at the Edge of Chaos** by Roger Lewin. Macmillan Publishing Company, New York, \$10. See *Nature* **361**, 507 (1993).

**Creation Revisited: The Origin of Space, Time and the Universe** by Peter Atkins. A defence of extreme reductionism and militant rationalism, and the subject of much debate when first published in 1981. See *Nature* **294**, 595 (1981). Penguin, £6.99.

**The Origins of Chemistry** by Robert P. Multhauf, first published in 1966 and described in *Nature* as "a professional's book for professionals, but . . . it will bring great pleasure to anyone who can claim to be scientifically educated". Gordon & Breach, \$48, £31.

**Bright Air, Brilliant Fire: On the Matter of the Mind** by Gerald Edelman. A Nobel prizewinner's attempt to present his controversial theory to a general audience. Reviewed in *Nature* **360**, 426 (1992). Penguin, £7.99.

**Uncertainty: The Life and Science of Werner Heisenberg** by David C. Cassidy. One of the best scientific biographies published in recent years. Reviewed in *Nature* **354**, 365 (1991). W. H. Freeman, \$19.95, £15.95.

**On Methuselah's Trail: Living Fossils and the Great Extinctions** by P. D. Ward. "As unputdownable as any airport-lounge thriller" (*Nature* **355**, 600; 1992). W. H. Freeman, \$12.85, £11.95.

**Taming the Atom: The Emergence of the Visible Microworld** by Hans Christian von Baeyer. A lucid history of atomism from the Greeks to the present, favourably reviewed in *Nature* **361**, 215 (1993). Penguin, £7.99.