

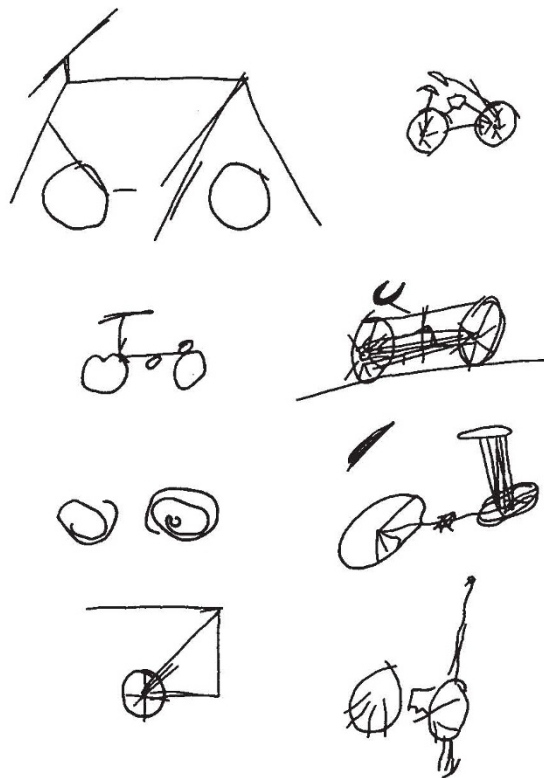
ever written this sentence, or the previous one, before, which makes the point that language generates infinite novelty by combining basic units into sequences. Corballis argues that skilled manual activity or praxis (from Greek, *praxis*, action) does the same. Patients with apraxia find it difficult to do simple tasks, such as picking up and hammering a nail. Both apraxia and aphasia (loss of generative speech) are associated with damage to the left hemisphere (although by no means necessarily together), and this constitutes the principle neuropsychological evidence for GAD. This part of the argument has been heard before, but Corballis extends it in a novel direction, arguing that human visual perception is unique in being able to generate and decompose objects consisting of many different parts. This too is a left-hemisphere skill under the control of GAD.

The perceptual theory relies heavily on I. Biederman's "Geon" theory, according to which objects are composed of geometrical primitives such as spheres and cylinders, combined in different ways. The theory, which may be seen as greatly influenced by computer graphics, is controversial and seems to apply much more readily to human artefacts than to trees and terrain. But perhaps this is the point: is today's technology, with its inexhaustible novelty, an extension of the generative skills of language?

Corballis's argument is stimulating, but is not without its problems. I wonder, in the first place, if there is any evidence that the left hemisphere is innately specialized for praxis, rather than acquiring its superior motor skills through biased practice. That we are born with a right-hand preference is beyond doubt, but is the right hand innately any more skilful than the left? The crucial evidence would come from thalidomide victims who have either a left or right hand: would right-handers be on average more skilful than left-handers? The only study of congenital unilateral aplasia that I know of found no difference. Further evidence against innate differences in skills comes from a recent study by K. J. Connolly and D. V. M. Bishop (*Neuropsychologia* 30, 13; 1992). They studied preferences and manual skills in children from Papua New Guinea, many of whom were unfamiliar with implements such as

pencils or spoons. Their preferences were as marked as those of English children, but the degree of skill asymmetry in the task of moving and tapping pegs was much smaller. This is exactly what we would expect if the greater skill of the right hand is due to practice rather than to an innate GAD in the left hemisphere.

I find even greater difficulty with the evidence that Corballis cites to support a left-hemisphere GAD for the visual representation of objects. Do other animals really have a problem decomposing ob-



Bicycles drawn from memory by patients described by McFie and Zangwill. Drawings on the left and right are by patients with left- and right-hemisphere damage respectively.

jects into parts? Studies of rats and pigeons seem to indicate that this is exactly what they are good at, and the defence that these animals decompose into 'features' rather than 'primitives' is weak. On the neuropsychological side, J. M. McFie and O. L. Zangwill's classic studies of parietal damage (*Brain* 83, 243; 1960) showed that objects drawn by patients with right-hemisphere parietal damage had parts that although well represented, were depicted inaccurately in their spatial relation to other parts; this is surely the reverse of what would be expected from the theory if GAD were in the left hemisphere. Corballis also notes that "mental rotation" is impaired by damage to the right hemisphere; saying that this represents loss of a "holistic" skill rather than of an ability to rearrange the parts seems to

### Hawking revisited

The 'Hawking industry' continues apace with the release of a documentary film of *A Brief History of Time*, which itself now boasts sales of more than five and a half million copies in 30 languages. Directed by Errol Morris and accompanied by an original score by Philip Glass, the film, which takes the name of the book, uses interviews with Hawking's family, friends and colleagues to trace the development of his work and life. The result — better described as a brief history of Stephen Hawking — is released on video by Palace Pictures and will be shown on television in the United Kingdom on Channel 4 on 3 May; it should hit cinemas in the United States in July. And for those wishing to read the book of the film of the book comes *Stephen Hawking's A Brief History of Time: A Reader's Companion* (published tomorrow in the United Kingdom, and in June in the United States; Bantam, £16.99, \$23). The book follows the film closely, borrowing interviews and stills from the documentary, and contains a glossary and further scientific discussions by Hawking. Also issued in the United States in July is John Gribbin and Michael White's biography *Stephen Hawking: A Life in Science* (Dutton, \$23; for a review see *Nature* 356, 25; 1992). Finally, of related interest is last month's issue of *The Cambridge Review: A Journal of University Life and Thought*, in which, among others, John Polkinghorne and Malcolm Longair reconsider *A Brief History*, reflecting on the book's ideas and on the state of popular science writing today. Included is a response by Hawking. The journal is published by Cambridge University Press.

### New in paperback

- *The Genocidal Mentality: Nazi Holocaust and Nuclear Threat* by Robert Jay Lifton and Eric Markusen. Published by Macmillan, price £12.99. For a review see *Nature* 350, 200 (1991).
- *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London* by Adrian Desmond. Published by The University of Chicago Press, price \$22.95, £15.95. For a review see *Nature* 344, 392 (1990).
- *Burning Bush: A Fire History of Australia* by Stephen J. Pyne. Published by Owl Books, price \$15.95. For a review see *Nature* 350, 539 (1991).
- *The Age of Intelligent Machines* by Raymond Kurzweil. Published by MIT Press, price \$22.50, £15.95. For a review see *Nature* 348, 399 (1990).

### Mathematica for Windows

Wolfram Research's *Mathematica 2.0*, the revolutionary general software system for doing mathematics by computer, is now available for use in the Microsoft Windows environment. *Mathematica* handles numerical, symbolic and graphical computations and has a built-in programming language (for reviews see *Nature* 336, 319 (1988) and 351, 437 (1991)). The Windows version costs \$955.