BOOKS & ARTS

Chronicle of cybernetics pioneers

Rodney Brooks enjoys an account of the freewheeling group of post-war British researchers that sowed the seeds of robotics through a desire to imitate animal brains and behaviour.

The Cybernetic Brain: Sketches of Another Future
by Andrew Pickering
University of Chicago Press: 2010.
536 pp. $55, £35.50

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A time-lapse photo records the wanderings of W. Grey Walter's 1940s robots Elmer (left) and Elsie.

I have something of a shrine in my living room — a shelf of books that have been pivotal in my life. Next to Isaac Asimov's 1950 volume *I, Robot* is W. Grey Walter's *The Living Brain* (1953). Asimov let me glimpse what intelligent machines could eventually become. Walter showed me the practicalities of how to build an artificial creature that could move around in the real world.

Neither the positronic brain of Asimov's fictional robot, Robbie, nor the valve-based brains of Walter's real robots, Elsie and Elmer, were digital. Robbie was imagined around 1940 and preceded computers, and Walter's inspiration for Elsie and Elmer, built in 1948, came from nervous systems. Walter viewed his three-wheeled wanderers — dubbed tortoises because of their domed cases and ponderous movements — as electronic models that demonstrated some attributes of real animals. They responded to their environment by avoiding obstacles, heading towards a light or finding a recharging station when low on power. Their performance was beaten by digital robots only in the 1980s. The fictional Robbie has yet to be surpassed.

Walter was instrumental in setting up the field of cybernetics, the subject of science historian Andrew Pickering's entertaining book. The field was named by Norbert Wiener of the Massachusetts Institute of Technology (MIT) in Cambridge, and it developed simultaneously in Britain, the United States and the Eastern bloc from the 1950s onwards. Cyberneticians were inspired by how animals work at both the neural and behavioural levels. They built mathematical and mechanical models to investigate such control systems and to explore how machines interacted with their environments.

This approach differed from that of the field of artificial intelligence, which developed at the same time but emphasized information processing. Proponents of this field — Alan Turing and Donald Michie in the United Kingdom, and US advocates John McCarthy, Marvin Minsky, Allen Newell and Herbert Simon — embraced symbolic search as the key component with which to construct intelligent systems. They built programs to play chess and prove theorems, in which the next steps were decided by searching a tree of possible moves and following logical rules.

The Cybernetic Brain is the first book-length account of UK cybernetics pioneers. Working in parallel with Walter and his three-wheelers was Ross Ashby, whose early efforts were inspired by research in psychiatry. Later, Gordon Pask and Stafford Beer developed practical applications for cybernetics, ranging from architecture to management. Each of Pickering's characters is unconventional in personality, research topics and academic trajectory. In the early 1970s, for example, Beer applied his system to the development of a nationwide data network in Chile to control factory operations; later he used it to model cosmic consciousness.

Pickering draws comparisons between the British and US cybernetics institutions and funding; the related work in Moscow, Prague and Warsaw is left to others to untangle. The UK pioneers were inspired by biological systems and were essentially amateurs — they held

scientific appointments but their cybernetics work was secondary and was published in popular books rather than in academic journals.

By contrast, the US work was conducted at major universities, heavily funded by the US defence department. Some cyberneticians at MIT, such as Warren McCullough, had a background in neural modelling, but the mainstream research carried out under Wiener arose from his work on the automatic aiming and firing of anti-aircraft guns. David Mindell's book *Between Human and Machine* (Johns Hopkins University Press, 2002) provides a US counterpoint to Pickering's account.

With neither institutional nor government masters to answer to, the British cyberneticians were free to concentrate on what interested them. In 1949, in an attempt to develop a broader intellectual base, many of them formed an informal dining society called the Ratio Club. Pickering documents that the money spent on alcohol at the first meeting dwarfed that spent on food by nearly six to one — another indication of the cultural differences between the UK and US cyberneticians.

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The work of the British pioneers was forgotten until the late 1980s when it was rediscovered by a new generation of researchers. They too were inspired by biological processes to propose computational models that differed from those of the mainstream. A vibrant community has since developed the old ideas and added new ones from evolutionary theory.

A company that I co-founded has now sold more than five million domestic floor-cleaning robots, whose workings were inspired by Walter's tortoises. In those homes at least, British cybernetics lives on and dominates robotics by sheer numbers if not by recognized intelligence. It is a good example of how unsupported research, carried out by unconventional characters in spite of their institutions, can have a huge impact. ■

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Lessons from Climategate

The Climate Files: The Battle for the Truth About Global Warming
by Fred Pearce
Guardian Books/Random House: 2010.
288 pp. £11.99/$19.95

After three inquiries, thousands of column inches and several death threats, the 'Climategate' affair is now subsiding into the long grass of conspiracy blogs. The rigour and honesty of the scientists involved in the furore sparked last November by the leaking of private e-mails from the Climatic Research Unit at the University of East Anglia in Norwich, UK, have been upheld. But the episode offers wider lessons on the politicization and communication of research.

After the illegally obtained e-mails were posted on the Internet, newspapers and blogs used snippets of them to spin tales of complicity and nest-feathering in climate science, of academics adept at using 'spin' and 'tricks' to keep the world from discovering the grant-sapping truth. The most active mud-slingers were the usual suspects, but phrases in the leaked messages such as "hide the decline" invited misinterpretation. *The Climate Files* by journalist Fred Pearce is a must for anyone who wishes to look further than the headlines to form a view on how much mud should stick, and to whom.

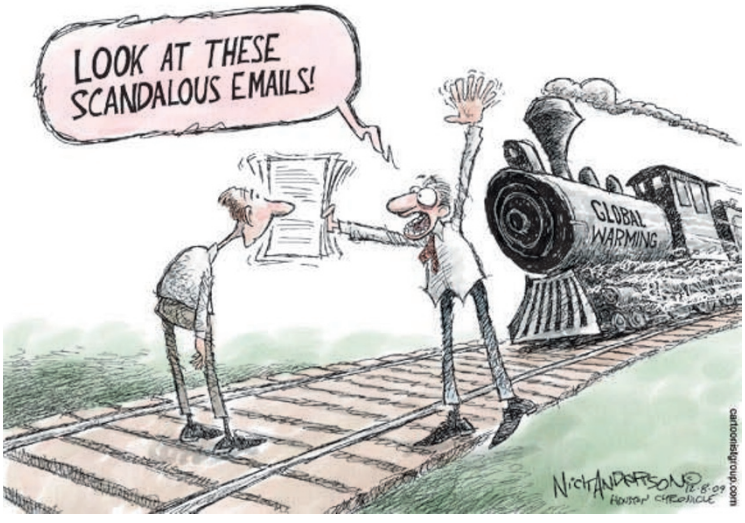
Pearce has long covered the work of the scientists involved and has a good knowledge of the key scientific debates, personalities and uncertainties. Much of the book is drawn from his columns in the UK newspaper *The Guardian*, with the narrative following the decade-long spats that dominate the correspondences. He gives lucid explanations of points of contention, such as the urban heat-island effect, interpretation of tree-ring data and the 'hockey stick' diagram of rising temperature over time.

The human side of the academics caught in the eye of the Climategate storm is handled well. Their frustration with the continual questioning of their methods and requests for raw data prompted many of the most petulant e-mail exchanges. Some scientists are fiery in their dismissal of what they perceive as politically motivated time-wasters; others recognize the need for greater transparency. Their interrogators comprise a similarly disparate group.

Pearce puts the contents of the leaked e-mails into their proper context. It transpires, for instance, that the oft-quoted "trick" to "hide the decline" refers to a graphical technique used to correct for the post-1960s breakdown in the correlation between temperature and tree-ring thickness. No smoking gun there.

For researchers, Pearce's book offers insight into how their work can become politicized and the shortcomings of the peer-review process. The Climategate affair has already changed how science is conducted and communicated. All scientists should welcome the push for improved data archiving and greater transparency. There are also lessons aplenty on how and how not to handle the media.

The abuse endured by the climate scientists at the centre of this storm is inexcusable, but ultimately their experiences may help every scientist. If our future work can deliver greater public trust after we've learned from Climategate, then something good will have come of it. *The Climate Files* holds those lessons. ■



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