Not yet the meeting of minds

John Morton

Handbook of Cognitive Neuroscience.
Edited by Michael S. Gazzaniga.
Plenum: 1984. Pp.416. $45, £34.65.

COGNITIVE science is a ten-year-old conglomerate which is still struggling for identity, survival and research funds. Its scope, as the term "cognitive" indicates, includes perception, memory, language, intelligence and reasoning. In general it excludes such topics as motivation, intention, feeling and emotion. The core disciplines are cognitive psychology, theoretical linguistics and artificial intelligence. The links between the three are still rooted in optimism rather than achievement, and the merger with the neurosciences, to form cognitive neuroscience, is a triumph of faith.

The urge towards a unified science of mind is understandable, but the success of a cooperative enterprise depends on the existence of a question that is susceptible to a common interpretation. This is rarely the case. Thus, workers in artificial intelligence often study the same subject matter as cognitive psychologists — for example the problem of object recognition — but the approach is one of finding *any* solution rather than the specifically human solution. When we include the neurosciences there are difficulties of another sort. Given that we believe a particular psychological mechanism exists then we can ask how it is implemented in the brain. But, unless we are attempting causal accounts, it is not clear that there are any constraints on psychological theory from biology except where there is one-to-one mapping between the elements at the two levels. From what is currently believed, such a mapping exists at best for sensory and motor functions.

In practice, then, each cognitive scientist (self-defined) gets what he can from the other disciplines in pursuit of his own objectives. This is profitable in that it can lead to an enrichment of the metaphorical and analogical resources available to the individual. But it is not the same as the creation of a unified science.

By now the reader should have some idea of what to expect from a *Handbook of Cognitive Neuroscience*. Michael Gazzaniga, the editor, is a psychologist best known for his insightful studies of split-brain patients. He has gathered together a collection of 19 articles which well illustrate the diversity of approach that I have already pointed to. The coverage is far from complete, and rather than being a handbook we have a collection of contributions by people, mostly from the north-eastern seaboard of the United States, who happen to be doing interesting work.

The most "neuro" of the chapters concern perceptual mechanisms particularly the contribution on perceptual (perhaps "sensory" would be a better word) development by Berkley. In contrast, the excellent overview of cognitive development by Carey is resolutely psychological in tone. Some of the other chapters display what might be called a pseudo-interaction between disciplines. Gazzaniga and Smylie capitalize on the fact that 5 out of the 50 or so split-brain patients have some language function in their right hemispheres. Gazzaniga and Smylie's studies suggest that the presence of language helps the right hemisphere to perform cognitive tasks. However, tasks involving an abstract treatment of language materials are still out of reach of the right hemisphere, being performed, the argument goes, by other cognitive systems in the left hemisphere. Studies of this kind, as with the work on aphasia reported by Zurif, do put constraints on psychological models of normal functioning but this is only cross-disciplinary research in the loosest sense. That we happen to be dealing with the two hemispheres is really incidental; these are psychological studies carried out inside a theoretical framework which is also psychological.

The same is also true for the work on brain potentials reviewed by Kutas and Hillyard. The existence or not of certain components of these waves in particular tasks can be used to decide between competing psychological theories. However, what it is that is being tapped can only be expressed in terms of the psychological theory that the experimenter adopts. Furthermore it does not actually matter what neural events these electrical components correspond to. The technique is no more physiological than a key press is anatomical.

In general the book is stimulating reading, with chapters ranging through pedagogy in chimps (Premack) and the psychology of reasoning (Johnson-Laird), to a discussion of the mind–brain relationship (MacKay) and an attack on the computer metaphor for mind (Carello and others). It provides a good opportunity to catch up on work and thinking in a variety of areas; but do not expect to find a grand synthesis. □

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Winning at physics

Roy Porter

The History of Physics.
By Isaac Asimov.
Walker, New York: 1984. Pp.762.
$29.95.

TWENTY years ago you might have given your lucky teenage nephew three volumes of Isaac Asimov's *History of Physics* for his birthday. Today you can give it to *his* son (and nowadays his daughter too) all in one single volume.

Asimov has updated his classic text somewhat to digest recent advances in the subatomic departments, but all the old qualities of the dean of popularization still shine through, bright as a new pin. Above all, Asimov has the great knack of communicating the thrill of science's inexhaustible intellectual energies. He will convince the reader how, once Newton had pondered long and hard about an apple falling from a tree, his mind would thence be "never at rest", till the law of universal gravitation had been hammered out. Story after story unfolds this way of how, pressurized both by logic and by brute experience, the domains of mechanics, light, heat, sound, electricity, and the micro-world of the particles, successively took shape.

Asimov calls his book a history. It is only fitfully that, except in the sense that it shows how certain concepts followed consequentially from others. For Asimov actually takes no interest in the lives of scientists, in the psychology of discovery and creativity, or in the chronology of progress, let alone in the finer points of historical interpretation. Why was it during the Renaissance that Copernicus advanced the heliocentric hypothesis? — you will look in vain for "Renaissance" here.

In some ways, Asimov's rather Pickwickian notion of history is a missed opportunity. Your grand-nephew or niece won't gather from him what it was that made extraordinary figures such as Kepler and Galileo tick (give them Koestler instead!). And they will get a lopsided view of how science works, one which assumes the only sages worth mentioning are the giants who ended up on the winning side. Boyle, Hooke, Newton etc. all pop up, because of their laws, but even towering intellects such as Francis Bacon, Descartes and Leibniz, who figured no less in the making of scientific thinking and method, are wholly omitted or just mentioned in passing. Asimov is exhilarated by ideas, but they have a curiously disembodied feel to them.

Asimov says he is attracted to the historical approach because, while science changes and grows obsolete, history always stays the same. Well might the chagrined historian riposte: *Eppur si muove*. Yet neither can there be any doubt about Asimov's own mind being in constant motion. For his powers of unfolding the structures of physical thought in a style vivid and familiar, he still has few peers. □

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