Mixed material

John A. Campbell

Biocomputers: The Next Generation from Japan. Edited by Tsuguchika Kaminuma and Gen Matsumoto. *Chapman & Hall: 1991. Pp.206. £25.95, $49.95.*

THE first problem for anyone interested in the idea of biocomputing is to discover exactly what biocomputing is. The evidence is likely to be confusing. Neural networks, biosensors, molecular computing and loose descriptions of Japanese 'post-fifth-generation' programmes are only a sample of the ingredients in the mixture. Although it is easy to track down articles about each of them, it has been much more difficult to find material that gives an overall perspective.

This book fills this gap very creditably. Each of the relevant subjects gets proper attention, confirming that biocomputing is indeed still very much of a mixture of topics and ideas waiting for a helping hand towards coherence. Some degree of coherence will certainly be needed if devices that can reasonably be called biocomputers are to emerge from the present variety of theoretical and experimental work. The prospects are promising for the medium term, but commercial payoffs will not happen tomorrow, or even the day after tomorrow. The book's contents show why this is so, although the title oversells the prospects. The usual explanation for such mismatches in books on advanced technologies is overeagerness on the part of a publisher.

At present, biocomputing is a convenient name to cover activities in all the areas that involve research on chemical or biological phenomena, or idealized models of the phenomena, with a bias towards applications in computing. One reason for the diversity of areas is that there is no obvious single or most rewarding target: computing can mean many different things, from limited specialized processing of data by molecular or biological sensors to large-scale imitations of intelligent behaviour in drawing analogies and making complex inferences. A common requirement for progress in all areas, however, is that each type of participant should understand the general shape and the essential results of other participants' fields. In particular, computing specialists need to appreciate the achievements and problems of the participating biological scientists, and vice versa. The book does a good job of setting up an educational agenda and signposts for further reading for computer scientists, although it is rather less effective in explaining the results and preoccupations of advanced computer science to others. Even so, it is the best all-round educational source for biocomputing that exists at the moment.

Some of its information is helpful in making sense of the news of Japanese research and development programmes that are announced from time to time. For example, the 'sixth generation' label is associated with planned work with organic molecules rather than silicon-based technology. A further Japanese initiative, identified in the book as being about "technological creation of a system which processes information in ways resembling human intelligence", has the dubious distinction of receiving the 'seventh generation' label from Western journalists. These programmes are described accurately, along with several others, in a manner that is more sober than in much Japanese writing on related subjects. The authors appreciate and state the difficulties matter-of-factly; there are only small traces of the purple prose (not unusual in the early days of the 'fifth generation') that fits some of the demands of higher Japanese literary style and is calculated to inspire the scientific troops. The general picture is of a set of overlapping but diffuse scientific objectives — exactly following the actual situation for biocomputing itself, in fact.

Because the subject is even more ripe than 'fifth generation' computing for precompetitive research — a favourite phrase at the beginning of the rival European Strategic Programme for Research and Development in Information Technology — it needs more direct collaboration between industry and universities, and between representatives of different disciplines, than has occurred in Japan in the past. The editors raise this issue a little ambiguously: they mention collaborations that are already being encouraged, yet also argue for collaboration with almost missionary fervour. To encourage it in some Japanese university and commercial environments requires the combined skills of a missionary and a *samurai*, so the fervour is understandable. The European record on this front is better, but not so much better that we can be pleased about it, especially given the present tendency towards pressing for shorter-term results from programmes in advanced technologies in Europe and decreasing the amount of university participation.

After the serious questions are disposed of, *Biocomputers* is also good for some innocent enjoyment. Apart from a few startling but harmless mistakes in the history of science, the main source of novelties (such as the misappropriation of K. Blodgett's credit with I. Langmuir for their molecular-film deposition method by a mystery physicist called Brogette) is Japanese phonetics. Fortunately, the main messages of the book are trustworthy; disinformation is confined to the decorations around the edges. □

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Distant vision

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Remote Sensing in Hydrology. By E. T. Engelman and R. J. Gurney. *Chapman & Hall: 1990. Pp.225. £35.*

REMOTE sensing is often seen as being primarily a series of techniques looking for a problem to solve. The high-tech nature of the business, the endless acronyms and unintelligible technical jargon have created a subworld (or superworld) of specialists who can speak eloquently to each other but who have trouble communicating with outsiders (that is, those scientists who might actually want to use the technique).

It was a great pleasure, therefore, to read this book, which assumes little knowledge of remote sensing, explains the technology in a clear and concise manner and demonstrates a wide range of applications in one field, that of hydrology. Both authors are experienced hydrologists who have adapted remote sensing to meet their particular needs. The book is perfectly readable to the nonhydrologist, who is briefed in the first chapter on the basics of the hydrological cycle and then later in chapters on precipitation, snow, evapotranspiration, runoff, soil moisture, groundwater and water quality. The distributed nature of hydrological problems such as flooding patterns across regions or estimating snow cover over an inaccessible mountainous area ensures that remote sensing can play an important role. But real operational applications have so far been restricted by practical necessities such as the need for clear weather to ensure a cloud-free image. New technologies based on active radar which can 'see' through cloud systems will enhance the general applicability of remote sensing.

As the authors point out, remote sensing is not yet an operational tool. But the necessary research has been undertaken in many fields within hydrology to demonstrate the potential for operational management. To some extent, this is already happening in the area of flood forecasting, where spatial information on rainfall obtained by ground-based weather radar systems is being routinely used to update flood forecasting models.

Remote sensing is at last offering a reliable series of techniques that can provide hydrologists with new insights, new datasets, regional and global information. There is now a major challenge for hydrologists to use this information to assist in answering questions on the global water balance, soil moisture, vegetation processes, calibration of models and to match the level of large-scale or macro-modelling achieved by atmospheric and ocean modellers. This is perhaps where remote sensing has a key role to play in future years. □

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