

Connecting with the invertebrates

Adrian Horridge

Model Neural Networks and Behavior. Edited by Allen I. Selverston. Plenum:1985. Pp.548. \$69.50, £66.03.

THE scope of this book is less than the title suggests and limited largely to central nervous mechanisms in invertebrates. More than 20 of the contributors are from the US west coast and the same number work during summers at Wood's Hole. The dedication to Graham Hoyle is apt. In some sense it represents a panegyric of collective achievement as the topic has developed several important cutting edges, because, in Selverston's words, these invertebrate systems have "characteristics especially suitable for answering specific questions".

The qualitative analysis of real connections between actual neurones in favoured invertebrate preparations, and the origin of these patterns in development and inheritance dominate the scene. Fundamentally the book is an expression of the reductionist approach, in which analysis goes from detail to detail, down to actual mechanical causes by every available technique. The chase leads into topics such as the "activity-dependent enhancement of synaptic facilitation" as the mechanism at the point where learning actually occurs, to long-lasting effects of synaptic modulators, to cyclic AMP and calcium ions. In the growth studies, the editor has selected accounts of marking membranes with antibodies which reveal that neurone surfaces differ chemically, but the reductionism is non-quantitative, an interesting paradox.

With this type of analysis, an important feature is the commonality of the results. Almost every one of the 27 papers concentrates on a different preparation but the results seem to be comparable. We begin to understand that there are only a limited number of mechanisms, presumably based on a limited number of conserved DNA sequences, which generate channels, transmitters, receptors on membranes, hormones, and units in a construction set. After a century of effort, we understand many of these components; by contrast, we are just at the threshold of the chemical mechanisms that bring and hold the pattern of connections together. The final chapters on neurogenetics are excellent snippets of a fast-moving and fascinating topic.

As an exercise to demonstrate the importance of invertebrate preparations to our understanding of nervous systems, the volume is a great success. Identifiable neurones, large enough to be dissected

out singly and analysed for chemical content, have pushed our understanding much further than is possible with vertebrates.

That statement applies to much besides the contents of this book, notably to sense organs and sensory processing. For this volume has nothing on information flow, signal-to-noise ratios, or on the optimization of the neural networks. The software is all molluscan: the hardware chitinous. Those recording from anonymous mammalian neurones of medical interest get on-line computers whereas those slogging to elucidate the exactly identified invertebrate neural circuits pursue a task which one of them rightly recognizes as "a long and irksome process". But neural networks, surface-specific molecular interactions in growth, and polypeptide sequences are also topics where an enormous amount of tedious fact-finding must be done before elegant generalizations can be reached, simply because the human understanding has no ready-made models for ordering these new bodies of data.

There are seven chapters dealing with neural circuitry, nicely spread between leech, molluscs, locust flight motor and the lobster pyloric ganglion. Again this is essential foundation work, defining the components, that opens up studies of growth, learning, plasticity, transmitters and membrane biophysics. Later sections in the book deal with all these topics. Development studies, cellular chemistry and

membrane biophysics are again spread between insects, a mollusc and leech. Analysis of learning in circuits of identified neurones is restricted to molluscs, where work has consolidated over the past decade. Even neurogenetics now spans three phyla.

Unfortunately the presentation is often lack-lustre; lacking any introductory concessions, lacking spice, lacking a real philosophical backing, and certainly lacking a historical perspective or even a decent index. Essentially a result of lack of thought, it is today characteristic of much scientific writing done as an account of ongoing activity, out of date in five years. I suspect many of the circuits described are oversimplifications. Nowhere in the book is there a consideration of how to analyse neurone function. I am frustrated however that my own student, whom I have tried to interest in this problem, states that "this is the wrong type of question".

There are 60 contributors, among them most of the best specialists in the field, and there are many excellent contributions. The whole book is a splendid summary of ongoing activity at an expert level contributing to the understanding of many aspects of all nervous systems. The book should be read by all who try to make sense of how central nervous systems are really put together in the non-mathematical non-engineering sense. □

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Delayed responses

P. F. Baker

Calcium in Biological Systems. Edited by R.P. Rubin, G.B. Weiss and J.W. Putney. Plenum:1985. Pp.737. \$89.50, £85.03.

COMING to grips with the many roles of calcium is just another task the modern biologist must master. This volume is based on the proceedings of a "calcium theme" included in the 67th Annual FASEB meeting held in Chicago in April, 1983. It includes 80 contributions divided into three sections: metabolic and functional aspects, regulation of muscle contractility, and nutritional and pathophysiological aspects of calcium action.

In general, the choice of contributors and contributions — which range from calcium chemistry and biochemistry to clinical medicine — are excellent, although readers would have benefited from a few more overviews setting specific topics in perspective. A far more important criticism, however, is that the meeting was held in 1983 and the book only appeared in 1985, two whole years later.

For a field that is changing as fast as calcium such a delay is unacceptably long and, unfortunately, robs the book of much of its value. This is very sad as the book contains a great deal that would have been highly topical in 1983 or even 1984, but by now has largely reached the scientific community by other means. Nevertheless, it says much for the editors' choice that there is still material of considerable interest and the volume clearly delineates the ubiquitous and pivotal role of calcium in diverse physiological and pathological states. It is only a pity they did not convince their publishers that for those intending to purchase a book of this type, its value is inversely related to the delay between the meeting and its publication.

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• A recent volume in Humana's *Contemporary Biomedicine* series is *Calcium and Contractility: Smooth Muscle*, edited by A.K. Grover and E.E. Daniel. The book is a collection of reviews by well-known figures in the field and contains, says the publisher, "Incisive synthesizing summaries of the powerful outpouring of research on cell contractility today". Price is \$64.50 in the United States, \$74.50 elsewhere.