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Young men

Essays on the Nervous System. By R. Bellairs and E. G. Gray. Pp. viii + 511. (Clarendon: Oxford; Oxford University Press: London, 1974.) £11.50.

THIS admirable book consists of nearly 20 essays by former pupils and colleagues of J. Z. Young—essays well chosen and substantial. They cover most of Young's fields of interest—endocrine activity in the nervous system, by the late Sir Francis Knowles; learning in the octopus, by M. J. Wells; synaptology, by E. G. Gray; the vertebrate retina, by B. B. Boycott—as well as the hard core of the organisation of the central nervous system represented by Zeki on the visual cortex, Webster on vision in the pigeon, Nadel and O'Keefe on the hippocampus, and Ralston on the spinal cord. The peripheral nervous system includes the muscle spindle described by David Barker—a pupil of Young at Oxford before his University College days—growth of nerve fibres in tissue culture by D. W. James; and Hall-Craggs on mammalian skeletal muscle. P. K. Thomas on nerve injury reminds us of Young's war time interests from which grew new lines of immense importance.

It is an enormous range of interests, in which he has touched little without making it flower. Sometimes the flowers take unexpected shapes. In Zeki's work sharp and detailed localisation appears as the ground plan of the various visual re-representations in the prestriate cortex. In the paper on the hippocampus a new and fascinating model is put forward to account for the detailed and regular structure of that puzzling formation.

This is, in fact, the thread that joins up this variety of contributions—the need for detailed and exact knowledge of structure on which to base any account of function in the nervous system. There was a time when random spread and connection of nerve fibres was believed to occur even in the visual cortex. Since then we have learned of the precise limits of eye dominance and orientation columns in the cortex, the sharply defined decussation of fibre tracts in the octopus, and the orderly growth and regrowth of fibres in the optic tracts and tectum. It is arguable that although there have been great advances in knowledge of synaptology from electron microscopic studies of the retina described here by Boycott and more generally by Colonnier, we still need more information at the optical microscopic level. Golgi stains give us a small sample of the cells present but only as individuals isolated from each other. Perhaps what we need more is something which does not

yet exist—Golgi-like pictures limited to small groups of cells which are immediately linked to one another, instead of being picked out by the vagaries of staining.

This thread runs through Graziadei's account of the curious regeneration to be found in olfactory nerves, in Guillery's account of experimental production of structural changes in visual pathways, and in Webster's valuable account of the present state of knowledge of visual pathways in birds. Rather oddly, it is not obvious in Wall's essay on cognition and perception as a preliminary to relevant behaviour. What better title could one have for Well's account of the octopus than 'A location for learning'?

This book is a worthy tribute to the work and inspiration of one who has moulded twentieth century studies of the nervous system. **D. Whitteridge**

Applied estimation

Applied Optimal Estimation. Edited by A. Gelb. Pp. 374. (MIT Press: Cambridge, Massachusetts and London; 1974.) \$6.95.

THE title of this eclectic compendium is a conventional solecism. 'Applied' means applicable as in 'applied mathematics'. Examples of the use of optimal estimation are included to elucidate the techniques rather than to discuss the application.

A high proportion of computer time in current use is expended on optimally fitting data to models which are ill founded in theory and erroneous in application. Examples abound in every field, from particle physics to town-planning. A mathematically written textbook which sets out conditions under which models can be built up is needed; it may have the same title as this book but this book is not it. The fact that this volume will increase the number of persons technically equipped to estimate model parameters optimally may well turn out to be a misfortune.

But in spite of reservations about what this book is not, it is an excellent handbook of practical, ably described and heuristically presented techniques. It assumes a degree of mathematical sophistication and knowledge which could be reasonably expected in a graduate (the first chapter summarising this information is too breathless to be didactic), treats linear optimisation fairly exhaustively, and makes extensive inroads into non-linear theory. Space is also found for sensitivity analysis and the last chapter on "Additional Topics" includes stochastic estimation and real-time parameter identification.

P. E. Roe