

which could well have wider application. Other papers touch on the historical aspects of the subject, stereotactic surgery for intractable pain and some clinical anomalies of pain sensation. The humanitarian interests of the sponsors are represented by two papers on the avoidance of unnecessary pain in laboratory experiments.

A printing error on p. 241 has resulted in part of the text being omitted and leaves one Table unexplained. This seems to merit an erratum slip in future copies sold.

A. M. HALLIDAY.

Macromolecular Specificity and Biological Memory. Edited by F. O. SCHMITT. The Massachusetts Institute of Technology Press. 1963. Pp. 119. Price \$23.

The somewhat forbidding title of this book conceals an account of a very remarkable symposium held at Massachusetts Institute of Technology in the spring of 1961. Its purpose was to probe informally into the possible mechanisms for the coding, storage and recall of memory traces in neural tissue. The outcome is as exciting and stimulating as the list of the distinguished participants would suggest. This includes R. D. Adams, M. P. Barnett, Fernández-Morán, Galambos, D. Gitlin, H. Hydén, V. M. Ingram, Kliver, Lorente de Nó, Morrell, Polay, F. O. Schmitt and O. H. Schmitt, Sperry, Tallant and others. Each contributed to the speculations, but brought also a summary of solid, original and often startlingly new work bearing upon the subject. It is not uncommon nowadays to read reviewers criticizing the growing custom of publishing proceedings of symposia and conferences. There may well be some truth in such criticism, but how else is one to record material as valuable as this together with the relevant bibliography, all in the space of 117 pages?

Some of the first contributions in this volume deal with the cybernetic aspects of the problem, and these are followed by a discussion of the genetic problems posed by protein specificity and its possible modifiability by nerve impulses. The distinctive property of nerve cells, besides conduction of impulses, is their large content of cytoplasmic RNA and the ability to produce correspondingly large quantities of protein. The amount of RNA increases up to a point with the age of the individual, and this suggests that this substance and the proteins produced by it play a leading part in the storage of memory traces. An analogous process is perhaps the production of antibodies in certain somatic cells. It is not surprising therefore that much of the discussion was concerned with the dynamic aspects of RNA composition in

nerve and glial cells. Electronmicroscopical studies of neurons and glial cells coupled with biochemical investigations of the various parts of these cells obtained by ultracentrifugation have shown the untenability of some of the classical concepts in the neuron theory. In particular, the old "class structure" of the cellular population in neural tissue, with the subservience of glial cells to the more aristocratic neurones is coming under a long-overdue attack. New data show that the glial cells fill almost entirely the space between capillaries and neurones, except at synapses. But they are not only the active substrate of the blood-brain barrier, but seem themselves able to propagate impulses, which are, however, different and, perhaps, complementary to those of neurones. Glial cells are probably also coupled reciprocally with neurones in the dynamic changes occurring in the RNA bases during activity. Furthermore, the hierarchical concept of glial structure is undermined still further by the demonstration of a lack of clear-cut distinction between the various kinds of glial cells. Other contributions deal with the neurophysiological aspects of learning and the psychological implications of this problem, and, finally, there are also a few brief clinical reports on the amnesic syndrome.

It would be impossible to claim that all the contributions could be understood by many readers. Some are too specialized. In fact, if there are still clinicians harbouring illusions about their ability to keep abreast with the basic sciences, let them try this book as a kind of do-it-yourself psychometry. Yet no one can possibly finish reading it without learning much that is fresh and challenging.

L. CROME.

The So-called Extrapyramidal System. Edited by SIGVALD REFSUM, HANS M. LOSSIUS and PER DIETRICHSON. Copenhagen, Stockholm, Göteborg: Universitetsforlaget. 1963. Pp. 363. Price 50s.

This volume (also published as supplement 4, Vol. 39, 1963, to *Acta Neurologica Scandinavica*) consists largely of the report of a Symposium at the 16th Congress of Scandinavian Neurologists at Oslo in 1962, dealing with the extrapyramidal system; there are a further 100 pages on free subjects (including an interesting investigation on vessel-plaque relationships in disseminated sclerosis). One outstanding paper from the Symposium is a consideration of the anatomy by Brodal, who emphasizes that it is not possible to separate anatomically the pyramidal and extrapyramidal systems. Broman reports on the figures for Parkinson's disease obtained from a survey of the frequency of various neurological disorders in