an elementary notion of differential equations". It is my experience that in the United Kingdom such knowledge implies that the candidate shall have studied mathematics at A-level. In practice only a very small percentage of those entering our universities to read degree courses in the biological sciences have this background; moreover, in a great many cases they have not made up this background by the time that they have completed their degrees.

It may be that this is not a fair basis for assessment of this book—the author is a professor in the Department of Molecular Biophysics and Biochemistry at Yale, and in this position may well be confronted by more able students, or at least students with a stronger mathematical grounding than is common in my experience. Making due allowances for this, however, one must still press the question of whether the book really succeeds in getting through the barrier of formal language and mathematics. For me, it does not. Many biologists will find it slow going and reference to two examples will illustrate the problems. In chapter 2, dealing with energy, the author explains: "The amount of work done in moving an object from point x_1 to point x_2 is then given by

$$W_{12} = \int_{x_1}^{x_2} F \cdot dx$$

For purely mechanical systems with no friction W_{12} depends just on the end points x_1 and x_2 and is independent of the detailed way of getting from x_1 to x_2 (empirical generalization). Such systems are called conservative systems and they constitute the subject material of pure mechanics". Turning then to the conservation of energy the author continues:

"The empirical generalization just stated imposes strong mathematical limitations on the function F and in fact requires the first equality in the following equation:

$$F = \frac{dW}{dx} = \frac{dV}{dx}$$

For mathematical convenience we often do not use the function W , but use the negative of W , which we designate as V . V is called the potential, and forces which conform to equation (2-3) are said to be derivable from a potential (definition). All of the usual forces of mechanics and electrostatics are derivable from a potential (empirical generalization)". All sound enough and in a sense straightforward, but trying it out on a tutorial group, I found that the response was a hesitant stumbling towards a grasp of what was being said. As a second example of the difficulty of expression, opening the discussion of activity: "The molar chemi-

cal potential μ is often a difficult quantity to determine, and a related quantity, the activity, is frequently used. The activity of the i th substance a_i is defined by the following relation:

$$a_i = e^{(\mu_i - \mu_{i0})/RT} \text{ (definition)}$$

μ_{i0} is the chemical potential of the i th substance in the standard state and the activity concept does not adapt itself to any simple intuitive interpretation".

Nothing wrong with this but not to my mind the style of wrapping which is going to get through to the average biologist.

It is not my intention, by these subjective criticisms, to condemn this book. The material is well thought out and nicely organized and some chapters appear to reach across to the groping biologists more than others.

One particular alteration in my opinion would greatly enhance its accessibility to biologists; this would be to bring forward chapter 14, "Measurement in Thermal Physics", to be chapter 1. To biologists involved in a phenomenological subject this practical gambit would surely have had a more direct appeal.

H. W. WOOLHOUSE

Brain Hormones

Hypophysiotropic Hormones of the Hypothalamus: Assay and Chemistry. (Proceedings of a Workshop Conference, Tucson, Arizona, January 8-11, 1969.) Editor-in-Chief: Joseph Meites. Pp. ix + 338. (Williams and Wilkins: Baltimore. Distributed in UK by Livingstone: Edinburgh, 1970.) 200s.

THIS book, which is the result of a workshop conference held in the USA, represents the second National Institute of Health sponsored symposium on neuroendocrinology. The book gives a critical evaluation of the present status of the bioassay and chemistry of the hypophysiotropic hormones.

Because it was Professor G. W. Harris and his collaborators who have provided the most convincing anatomical and physiological evidence for the postal vessel chemotransmitter hypothesis, it seems more than fitting that Harris should write the introduction to this book. This introduction provides an excellent review of the current status of the chemotransmitter hypothesis, and discusses the possible future practical application to man of using luteinizing hormone releasing factor for infertility studies.

After the introduction the book is divided into three chief headings. First, there are eleven chapters on the bioassay of the hypophysiotropic hormones followed by four chapters on the chemistry of those hormones and finally there are three chapters on new

directions in hypophysiotropic research. Both *in vitro* and *in vivo* bioassay systems are discussed in the earlier chapters, and then bioassay systems are reviewed for all known six releasing factors. It is very apparent that only the most rigorous bioassay methods are acceptable for releasing factor assay. They must be statistically sound, specific and responsible. It is very unfortunate that most hypophysiotropic hormones have to be assayed by bioassay because this introduces a large double error and the problem of non-specific effects in the assay system. In certain instances, in growth hormone, luteinizing hormone and thyrotropin releasing factors, assays have been performed by radioimmunological assessment of their respective pituitary hormone release. Even here, however, we have a bounden duty to show that the radioimmunoassay and bioassay are measuring the same hormone, and that the immune response really reflects the biological response. This book certainly presents the problems in a forthright manner and is to be recommended for this. (Each chapter is followed by a discussion which is interesting.) When purified releasing factors become available in the future, it should be possible to develop the necessary antisera and hence use direct radioimmunoassay procedures.

The chapters on the chemistry of the hypophysiotropic hormones present a brilliant outline of some of the problems involved in the analysis and synthesis of small molecular weight proteins and polypeptides. It is not surprising that numerous difficulties have arisen in the hypophysiotropic field where very little material is available, even when vast quantities of hypothalami are processed. The last chapters discuss new directions in this field, such as direct measurements of releasing factors in postal vein blood, the changes in releasing factor activity in relation to changes in physiological function in animals, and the impact of the molecular biologist on the field of mechanism of action of these hormones on the pituitary.

Since the writing of this book, two important events have occurred in the field of neuroendocrinology. First, the synthesis of ovine thyrotropin releasing factor, and second, the synthesis of growth hormone. These remarkable achievements will spur on the elucidation of the chemistry and physiology of the hypophysiotropic hormones.

This book is a must for all neuroendocrinologists, and other endocrinologists of all types; it would interest anatomists and physiologists. Neuroendocrinology is still in its infancy, and I for one am very pleased to have a copy of this book on my shelf.

DONALD EXLEY