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of the hypothalamus and limbic system are involved in the emotional responses of aggression. But these same areas of brain have a high content of endogenous opioid transmitters, the endorphins. The endorphins in the brain stem are involved in the mediation of pain; their existence in forebrain may suggest a physiological axis of pain and anxiety. This is another area of research ripe for exploitation — the behavioural methods for studying responses to pain and aggressive responses are well developed; the chemical and anatomical axes of the spinal cord and brain are defined. It is now timely to ask what the functional relationships are between pain, anxiety and emotional behaviour.

In certain other areas there is less reason for optimism. If we consider the processes of learning and memory, it could be said that we are still struggling for the first rung of the ladder. Whilst it is recognized that there are methodological difficulties in studying memory — these can be overcome with appropriate controls (see Pilcher on state dependency) — there are more serious problems of interpretation: for example, in distinguishing deficits of retrieval from consolidation. We know that certain limbic areas are involved in the processing of information for memory storage, and we know that a wide range of endogenous and exogenous chemicals modify memory. But we still lack insight into the organization of

the normal processes involved.

Much of the information in this volume could be found in a comprehensive textbook of physiological psychology, but there the material would be classified by brain site. The hypothalamus chapter, for example, would include eating, drinking and aggression. The achievement of this volume is that it provides another way of classifying behaviour: on physiological-chemical axes. This is not as novel as it seems; the terms pituitary-gonadal axis and pituitary-adrenal axis, used by Brain in his chapter titles, are traditional concepts in research related to sex hormones and behaviour, and to the relationship between ACTH, steroids and stress. But the same concepts could be applied to all behaviour. The brain and the body are inseparable and each possesses an integrated hierarchy of control. The endogenous neurotransmitter systems of brain and body provide a major force for integration. It is hardly surprising that so many chemicals modify behaviour since neural signalling depends so heavily on chemical relays, and it is with these tools and a conception of the whole organism that we may one day come to understand normal and abnormal behaviour. □

Susan D. Iversen and Leslie L. Iversen are Assistant Director of Research, Department of Experimental Psychology, and Director of the MRC Neurochemical Pharmacology Unit, University of Cambridge.

Asteroid revolution

D.E. Brownlee

Asteroids. Edited by Tom Gehrels. Pp.1181. (University of Arizona Press: 1979.) \$19.95.

THE formation processes which created planets in the Solar System had at least one apparent failure. The failure occurred in the transition zone between the terrestrial and Jovian planets, and the surviving debris is known as the asteroid belt. Planetary formation was aborted at an early stage, presumably due to the proximity and rapid formation of Jupiter, the most massive planet in the Solar System. The majority of asteroids are believed to be composed of early Solar System materials which have been relatively well preserved for the age of the Solar System. They are the major source of meteorites and are a precious resource of information on the origin of the Solar System.

Ten years ago, measurable properties of asteroids were basically limited to orbits, broadband colours and brightness variations. Since then asteroid science has experienced a genuine revolution, with new observational techniques and new ideas producing a wealth of information relating

to the composition and physical nature of asteroids as primitive Solar System bodies. The revolution is documented in this remarkable book, produced and edited by T. Gehrels and M.S. Matthews, with contributions from a significant fraction of the scientists active in asteroid research. The book is the product of a conference held in Tucson, Arizona, but by no means is *Asteroids* an ordinary proceedings volume. Instead of a loosely organized compilation of each participant's research results of the previous six months, this is a carefully created volume composed of review articles which cumulatively provide comprehensive and coherent coverage of existing knowledge of asteroids.

The book contains very few omissions, little repetition but extensive cross-



The Moss Flora of Britain and Ireland by A. J. E. Smith, first published in hardback in 1978, has been issued as a paperback by Cambridge University Press. Fully illustrated with line drawings by Ruth Smith, and containing an artificial key and full descriptions of taxa, the paperback edition costs £12.50.