Mammalian vestibular physiology

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Mammalian Vestibular Physiology. By V. J. Wilson and G. Melvill Jones. (Plenum: New York and London, 1979.) £20.48.

WHY do neurophysiologists choose to study one part of the brain rather than another? Amongst sensory systems, at least, it seems to be those which give us the greatest sensual enjoyment that attract the closest investigation: if we add to this the inevitable band-waggon effect, the result is a strikingly disproportionate amount of effort on vision and to some extent hearing, and rather little on anything else. The vestibular system has fared particularly badly from this: apart from the ambiguous delights of the roller-coaster and sky-diver, the system comes to most people's notice only at times of distinct misery — a bad Channel crossing, the acute effects of alcoholic overindulgence — and its contribution to the unending task of keeping us precariously balanced on two tiny supports goes largely unnoticed and unappreciated.

Of course, it has to be admitted that the vestibular system is somewhat redundant, in the sense that much of the information about head position and movement that it provides is also furnished (though more slowly) by the visual system and by proprioceptors in our joints. A man whose vestibular system has been destroyed by disease may not be aware that much is wrong until these alternative sources of information are also unusable — running over rough ground in the dark, or swimming underwater. But as Wilson and Melvill Jones make abundantly clear, these parallel visual and proprioceptive inputs seem largely to make use of the neural circuitry that was originally evolved to process vestibular information; and the study of central vestibular pathways has shed a good deal of light on how information from the eyes and other receptors is used for the same purpose.

One aspect of this cooperation that is particularly interesting, the importance of which has only recently been fully appreciated, is the way in which the matching of visual and vestibular signals is a function that must be *learned* by the brain: this calibration of one input in terms of the other seems to be going on all the time, ensuring that degenerative and other changes in the performance of the vestibular organs do not result in inappropriate responses. A dramatic way of demonstrating this is to get a subject to wear prisms that reverse his visual field: after only a matter of days it is

found that certain of his purely vestibular responses — ones that can be evoked in the dark — follow suit by reversing their direction as well. These changes are almost certainly the result of functional alterations in cerebellar circuitry, and offer the exciting possibility of studying motor learning by the cerebellum in a simple and quantifiable way.

Mammalian Vestibular Physiology provides a first-class account not only of these more recent areas of interest but also of the classical anatomy and physiology of the vestibular organs and their central connections, and fills much more than adequately what has long been an obvious gap in the literature. It is sufficiently wide

in its scope to be of interest to neurophysiologists in other areas as well as to specialists in vestibular and oculomotor physiology, who will certainly find both its intelligent and impartial reviews of difficult topics, and its notably comprehensive bibliography, of more than ephemeral value. Perhaps it may also help to lure neurophysiologists away from the rather obvious charms of visual physiology to a field which promises to begin to unveil the more challenging mysteries of the motor system. □

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Laser fusion

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The Physics of Laser Fusion. By H. Motz. Pp.290. (Academic: London and New York, 1979.) £17; \$37.

IT is a rather bold undertaking to write a textbook on the physics of laser fusion, for essentially two reasons. Firstly, laser fusion is a very rapidly developing field. The interpretation of the complex phenomena has only reached a quasi-steady state which has not yet been proven to be stable against new experimental results. Secondly, the physics of laser fusion comprises a large variety of quite different topics. Therefore, selection of the proper material for an introduction to this field is a major problem. The author has succeeded in this difficult task. He has chosen the essentials, concentrating on the basic phenomena, which are well established. The physics of the nuclear reactions and of high power laser systems

are only touched on briefly in the introductory chapters in order to acquaint the reader with the problems involved and the state of the art. The main part of the book deals with light plasma interaction processes, the excitation, propagation and interaction of waves in plasmas and their relevance to laser fusion. The complex phenomena connected with energy transport in the overdense region are touched on in a special chapter preceding the treatment of the hydrodynamics and its stability. Besides the analytical treatment of the phenomena, results from computer codes are also presented. Each chapter is followed by a list of references where more detailed information can be found on specific subjects. In conclusion, this book can be recommended as an introduction to the field of laser fusion for newcomers, but it is also a useful compilation of the basic physics of laser fusion for the specialist. □

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Models of r and d

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The Natural Selection of Populations and Communities. By D.S. Wilson. Pp.186. (Benjamin Cummings: Menlo Park, California, 1980.) \$12.95.

IN whose interest does an animal or plant behave? Evolutionary theorists believe that the workings of natural selection ensure that organisms act as if they were maximizing their reproduction (or more precisely, a weighted sum of their own and their relatives' reproduction). So although some kinds of behaviour might easily be explained as an individual acting in the interests of some larger unit such as its

group, species or community, the orthodox view is still that only in extreme and implausible conditions can this type of explanation be admitted. In *The Natural Selection of Populations and Communities*, D.S. Wilson attempts to give a theoretical justification for accepting these 'higher' levels of selection.

This book contains much to commend it to biologists interested in natural selection. Wilson's discussions, in the introduction and elsewhere, of the logic of his attempt are excellent. The idea of "trait groups" as the population subdivision within which frequency dependence operates,