Reviews and Notices of Books.

Muscular Contraction and the Reflex Control of Movement. By J. F. FULTON, B.Sc., M.A., Ph.D. London: Baillière Tindale and Cox, 1926. Pp. 644. Price 45s. net.

DURING the last two decades noteworthy advances have been made in our knowledge of muscle, both as a machine for converting energy into work and as a means of motion. Dr. Fulton's book deals mainly with the second aspect of the problem. He has gathered together in this monograph a host of observations which have been culled from a literature which is both scattered and extensive, as is well shewn by the bibliography of 1066 titles. The book is well printed and fully illustrated. It should prove of great value as a work of reference to physiologists and neurologists alike, though the latter will find that much of the experimental material dealt with is of a highly technical character.

Some of the outstanding features of the book will be briefly summarized. The first half of the book deals with the nature of the contractile response of individual skeletal muscle fibres. There is an admirable historical introduction which deals first with the work of Galen, Croone, Steno and Willis. Then the studies of Haller on irritability, the observations of Galvani and du Bois-Reymond on the electrical changes in muscle, and of Helmholtz on heat production are considered. Modern work is then reviewed, leading up to the proof by Pratt and Eisenberg by direct observation with the microscope that the 'all-or-none' law applies to individual muscle fibres. The properties of isolated muscle are systematically considered. The theory of 'chronaxie' is discussed, and it is concluded that 'chronaxie' of irritable tissues runs parallel with the magnitude of the latent period and the rate of conduction in the tissue. Such old problems as tetanus, superposition, and the features of the isometric twitch are considered, and the results detailed are largely based on personal observations by the author. It is shewn that if the circulation is intact, fatigue to exhaustion of one group of fibres in a muscle does not lead to fatigue of adjacent fibres which are protected from the action of metabolites which are accumulating in neighbouring tissue. The relative unfatiguability of postures is due to rotational activity of the individual constituents of the muscle. Though an equal number of fibres are always performing in an 'all-or-none' manner, it is not the same fibres which are functioning all the time. The vexed problem of the innervation of the individual fibre is discussed; plurisegmentally innervated fibres are not uncommon in the hedgehog, but it is uncertain whether this is a widespread phenomenon. There is a short account of the nature of the contractile process, based largely on work which has been carried out in Hill's laboratory. The curious observation of Fenn is considered—that when

a muscle shortens the total amount of heat liberated is the same as that obtained during isometric contraction, and that there is also an additional liberation of energy which is proportional to the amount of work done.

The second half of the book deals with the reflex control of movement, and is based mainly on recent contributions from the Oxford laboratory by Sir Charles Sherrington and his pupils. This section will be of greater interest to the clinical neurologist. The knee-jerks of the spinal and decerebrate animals are compared. The spinal jerk is a short tetanus resulting from four to eight volleys of impulses at 200 per second. It has three times the duration of the decerebrate knee-jerk, has a longer latent period, and shews a smooth curve of relaxation. In the decerebrate animal the knee jerk usually has the duration of a single twitch and the phase of relaxation is interrupted by a "hump" at half-relaxation, called the "myotatic appendage," which is probably equivalent to the shortening reaction of tonic muscle. It is perhaps unfortunate that no attempt is made to correlate these observations with clinical studies of the knee-jerk.

Two theories are considered to account for reciprocal innervation ; (1) the older 'interference' theory, which is based on the well-known Wedensky phenomenon in peripheral nerve, and which has been elaborated in recent years by Lucas, Adrian and Forbes ; and (2) the newer chemical view, which postulates the liberation about the nerve-cells of a specific inhibitory substance which can antagonize a specific excitatory substance which is liberated in the same region. The response of muscle to stretch is dealt with in detail after the work of Liddell and Sherrington.

The observation of de Kleijn is noted that if nystagmus is produced by irrigation of the labyrinth and the tensions of the external and internal recti are recorded, it is found that as one contracts the other relaxes. The reversal of reciprocal inhibition by means of strychnine is now denied ; the results which were previously obtained are attributed to strychnine causing augmentation of excitatory reflexes. If a homogeneous group of inhibitors is stimulated the inhibitory effect is still obtained after the administration of strychnine. There is a useful review of tonus along the lines of Cobb and Adrian. The work of Hunter is critically examined, and stress is rightly placed on the work of Orbeli on the sympathetic control of skeletal muscle. This author stimulated the motor nerves to a muscle till fatigue ensued. It was then found that stimulation of the sympathetic fibres caused an increase in the size of the twitch, and accelerated the process of recovery. It is surprising to find that the physiology of the labyrinth is not dealt with, and that no adequate account is given of the work of the Utrecht School on postural reactions.

The observation of Bremer and of Miller and Banting is emphasized that stimulation of the vermis of the cerebellum causes inhibition of decerebrate rigidity. Recent experimental work on the cerebellum is considered, and here again little attention is paid to the clinical observations of Holmes and others.

The appendix contains a detailed description of the torsion wire myograph of Sherrington. There is a full author and subject index.

This monograph can be cordially recommended to a wide circle of readers as a comprehensive and lucid survey of an important aspect of modern physiology.

An Introduction to the Theory of Perception. By Sir JOHN H. PARSONS, F.R.C.S., F.R.S., Ophthalmic Surgeon, University College Hospital, etc. Cambridge University Press. 1927. Pp. 254. Price 18s. net.

A BOOK of this kind must make an appeal to neurologist and psychologist alike, for it represents an attempt to deal with the afferent system, as it may be called, from lowest to highest levels, not only in a physiological, but also in a biological sense. That is to say, the author examines the mechanisms of perception (or what stands for perception) from the lowest animal species to man, interpreting the reactions of the former by what is known introspectively of the latter. Nor does he confine himself to common sensation; he develops his theory by special reference to a sense-avenue with which he is completely familiar, viz., the visual.

The general view is adopted that there is evidence of the existence of a dual mechanism in the sensory system, and it is of interest that the author's conception of this differs materially from that both of Head and of Foerster. He distinguishes a primitive or dyscritic stage, one of little discrimination and little differentiation, from an epicritic stage, with a high degree of both of the latter processes, though he admits that "between the two are many gradations of each which are difficult to unravel." While this general thesis is supported by a wealth of evidence from human and comparative anatomy and physiology, certain arguments are advanced in favour of it which are open to some criticism. For example, Parsons follows Head in denying cortical projection of painful impulses, although clinical data militating against this view have been recorded by Piéron, Foerster, and many more. He believes that the optic thalamus is "the seat of painful sensations," though Graham Brown has shown that the cases on which reliance is placed for the belief are capable of another interpretation. Whatever conclusion may eventually be reached as the result of further inquiries, in all probability the general statement mentioned above holds good; at present the details have not received anything like universal acceptance.

The greater part of the volume is taken up with an examination of the evidence for the existence of a dual system in respect of visual processes. This part is highly technical and of more interest for the ophthalmologist than for other specialists. But it forms a valuable contribution to an immensely difficult subject.

Sir John Parsons' erudition has furnished the reader with a mine of information of a varied kind in respect of the sensory systems and of sensation and

perception as a whole, which his selective ability has as it were combed out and made to run the gauntlet of his own criticism. One or two statements, however, ought, we think, to be revised. As an instance, on page 24 the author says that the Reissner fibre links the olfactory and visual receptors with the spinal motor common paths to the skeletal muscles; according to the researches of the late Sir Victor Horsley it is extremely doubtful whether the fibre has a nervous structure at all; both in its normal structure and in its not reacting to injury it differs materially from any known nerve fibre or tract.

L'Herpès et le Zona : Ectodermoses Neurotropes : Étude Étiologique et Pathogénique. By C. LEVADITI. Paris: Masson et Cie. 1926. Pp. 388.

IN this book Levaditi has expanded considerably the chapter on herpes in his previous publication, *Ectodermoses neurotropes* (1922). This chapter was only twelve pages long, whereas the present volume is almost entirely concerned with the experimental study of this disease. To the neurologist the last three chapters, which deal with zoster and epidemic encephalitis, and their relationship to the virus of herpes, are of the greatest interest. They occupy only 74 pages, but it would be impossible to understand the author's argument in them, or to form any opinion on the justice of his conclusions, without a knowledge of the experimental work which is detailed in the first 300 pages.

The study of the herpes virus and of its transmission to rabbits possesses a great fascination for all who are interested in the pathogenesis of disease. It is a filter-passing virus, which possesses special affinity for the ectoderm and the nervous system, apparently leaving the other tissues of the body severely alone. Possibly in consequence of this peculiarity, it does not produce any humoral immunity: the serum of an immune animal has no protective power on a fresh animal, either when injected at the same time as the virus, or when previously mixed with the virus *in vitro*. Yet immunity which appears to be purely cellular in nature is easily produced, and, though it is most complete in the inoculated region, spreads to the other susceptible tissues of the body. The mechanism of this spread is far from clear. The immunity does not radiate out gradually from the inoculated area, but appears in every part of the body at the same time. Inoculation of the cornea, possibly owing to the poor vascularity of this region, usually fails to immunise the rest of the body, and only partially immunises the other cornea, although the inoculated cornea is completely immunised. Hence corneal inoculation has been chiefly used for crossed immunity experiments between various strains of virus, as the same animal can be used both as test and as control. This form of immunity relates the virus of herpes to that of vaccinia, and separates it from most of the others which have been studied experimentally. In man, immunity seems to be very capricious, and many people are subject to recurrent outcrops of herpes.

The thorough study of the herpes virus has made it possible to compare it with the strains of encephalitic virus isolated by Levaditi, Doerr, and others from cases of encephalitis lethargica. There appears to be no escape from the conclusion that these viruses are identical in nature, though not in virulence, with that of herpes. Crossed immunity experiments show that they are at least of the same family, and in experimental work they behave in an exactly similar manner. The only possible question then is, whether the patients who served as sources of the virus carried the virus of herpes as well as that of encephalitis lethargica. This still remains possible, although the recent work of Perdrau (which Levaditi does not mention) provides a strong argument against this theory. Levaditi states this objection fairly, and answers it frankly, if not quite convincingly. There are two main arguments in his favour; (1) the fact that of very many injections of cerebrospinal fluid or brain matter from cases other than encephalitic or herpetic, transmissible herpes virus has only been obtained once (by Flexner and Amoss from the cerebrospinal fluid of a case of neurosyphilis). Even the cerebrospinal fluid of patients suffering from herpes has only yielded transmissible virus to one pair of workers. (2) Encephalitic virus appears to have considerably greater tendency to affect the nervous system than herpetic virus. When inoculated on to the cornea it usually causes the death of the animal from encephalitis in seven to ten days, whereas with herpetic virus either no encephalitis occurs or it is less rapidly fatal.

Levaditi is less certain as to the experimental work on zoster, which has given very discordant results in different hands. The only fact which emerges from this confusion is that there is no demonstrable relationship between the virus of herpes and that of zoster. It seems indeed to be doubtful whether the virus of the latter disease exists in the vesicles at all.

The work of Goodpasture and Teague on the passage of the virus of herpes up the nerve trunks, probably via the axis cylinders, and its spread in the nervous system is reviewed and a short account of the morbid histology of the various lesions is given.

With the exception of the English work of 1925, to which reference has already been made, the book is fully documented and brings the subject fairly well up to date. In spite of the technical nature of the subject, the author has made it everywhere readable and in places extremely interesting.

J. G. GREENFIELD.

Mind and Personality. By WM. BROWN, M.D., D.Sc. London: University of London Press. 1927.

THIS book is a collection of more or less popular essays on a wide variety of psychological subjects. It is evidently not intended as the writer's ultimate contribution to the subject of the title, being didactic rather than philosophical in manner. Indeed the interest of the essays lies not so much in the discussion of personality (of which comparatively little is said) as in the ethical chapters,