

in print, the Chairmen's reviews give the reader, for the most part, a valuable means of orientating his way through the proceedings. Perhaps more importantly, they will enable many of those not directly involved in microiontophoresis to follow the spirit of the meeting readily. There are, inevitably, a few pages where the Chairmen appear to have been over-indulgent and to have ignored the information submitted. Here the unfortunate reader must fend for himself.

The wide variety of interests encompassed by this book comes as no surprise; topics covered in the 7 different sessions include: cellular actions of dopamine in the nigrostriatal system and elsewhere; actions of peptides on central neurones; intracellular iontophoresis; studies in tissue slices and cultures; presynaptic inhibition; nociceptive neurones and opioids; the evaluation of other catecholamines, amino acids, purines, prostaglandins and acetylcholine as putative central neurotransmitters. As a concise survey of many new developments in neurophysiology and neuropharmacology the present volume is, therefore, warmly recommended.

The Editors have included reviews of the discussions held in each session. After the energetic and productive dialogue that actually took place, these somewhat drab and impersonal accounts come as a disappointment. They are really only intelligible to those who attended the meeting and give little help to the absent colleague who wishes to know the undercurrents in this particular field.

If all else fails the reader can always resort to Professor Krnjević's Overview, a masterly 7 page appraisal of the information crammed into this Symposium.

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**Stochastic models for spike trains of single neurons**  
(In: *Lecture Notes in Biomathematics*, Vol. 16, S. Levin (Ed.).—G. Sampath and S.K. Srinivasan (Springer, Berlin, 1977, 188 p., D.M. 18.-)

This book contains a literature review on stochastic models of spontaneous activity in single neurons. The authors discuss a variety of models in a number of chapters: superposition, deletion, diffusion, counter, discrete state and continuous state models. These chapters are preceded by a brief introduction to the relevant neurophysiology and followed by a concluding chapter describing the applicability and effectiveness of the different models. The mathematical aspects of the models are stated as a series of lemmas

and theorems. In the discussion paragraphs the physiological relevance of the models are discussed.

To my opinion this book contains a relevant summary of the literature in this field which, as the authors already state, is vast and scattered. It will be of value to everyone interested in the field although I doubt whether it will be readable for scientists without a thorough mathematical background.

The analysis of impulse sequences is treated extensively. It should be stressed that a theoretical treatment of 'impulse sequences' need not be synonymous with that of 'spike trains'. As the authors say, the models are often based on rather global and even unrealistic physiological assumptions whereas in most cases the modelling results cannot be verified experimentally. In the discussions at the end of the different chapters the authors state among other things: 'The superposition model is unsatisfactory'; the diffusion model although a 'useful description of a firing process' has 'severe limitations'; 'counter models are not really neuron models by themselves, they are only the application of studies in counters to other types of models'. That the reviewed models are unpractical in most cases can also be concluded from the fact that only a few articles are reviewed which are concerned with physiological problems (i.e. Bishop et al. and Saba et al.). In reading the book one gets the impression that models are adopted which have some neuron-like properties, such as counter models with dead times comparable to refractory periods, or superposition or deletion models which have properties usually found also in pre-synaptic inhibition, and that with a sort of naive attitude other neuronal properties are also expected to be present. However, when the models become more realistic they cannot be handled any longer due to 'computational difficulties'.

Once again this book illustrates the enormous gap between experimenting neurophysiologists and theoretizing mathematicians. The former often refrain from modelling and produce more and more experimental data whereas the latter only consider trivial physiological facts and spend their time in building very complex mathematical models based on too elementary physiological assumptions.

Although mathematical elegance is very often observed many models of the kind described in the book not fulfil one very important condition to be of any practical value, namely that a model should generate a testable hypothesis.

Fortunately in the last years very advanced research has been done in which both disciplines, physiology and mathematics, have been fruitfully cooperating and remarkable results have been published. In my opinion research based on careful experimentation and thoughtful modelling can lead to a better understanding of the nervous system.

Resuming, it can be stated that the book of Sampath and Srinivasan is of importance for the group, however limited, of mathematically trained scientists interested in the field of analysis of impulse sequence. Seen through the eyes of a mathematician it is a good book; however, seen through the eyes of a biophysicist interested in *biological* problems it is of little value for the above mentioned reasons.

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**Mechanisms in transmission of signals for conscious behaviour.** — T. Desiraju (Ed.) (Elsevier, Amsterdam, 1976, 376 p., ill., Dfl. 120.-)

This book presents 15 comprehensive and authoritative papers, together with discussions, from a Satellite Symposium of the XXVI International Congress of Physiological Sciences, 1974, in New Delhi. The following topics are represented: motor control, mechanisms of the generation of movement patterns, mechanisms of sleep and wakefulness and synaptic function.

(1) *Motor control.* Ito describes the cerebellar control of vestibulo-ocular mechanisms, especially the inhibitory action of flocculus Purkinje cells upon the vestibulo-ocular pathways. Gilman recorded alpha-motor and fusimotor neurone responses to natural stimuli in adult cats and found different response patterns before and after decerebellation. Ohye et al. stimulated the caudatum and putamen in adult monkeys and recorded inhibitory effects on the spike activity in the subthalamic area and substantia nigra.

(2) *Generation of movement patterns.* Based on records of prefrontal unit discharge rates, Kubota discusses a prefrontal programming of lever pressing reactions in adult monkeys. Asratyan's contribution about the physiological mechanisms of goal-directed movements summarizes data and hypotheses, mainly of Russian and Soviet investigators.

(3) *Sleep and wakefulness.* Six papers are more or less concerned with problems of the control of sleep and wakefulness. Chase describes changes in the masseteric reflex in the sleeping and waking adult cat induced by reticular and cortical stimulation. Steriade

recorded EEG and extracellular cortical spike activities in adult unanaesthetized rhesus monkeys; he postulated a depression of recurrent inhibition and inhibitory control of interneurons during sleep. Desiraju correlates EEG and extracellular recorded cortical unit activity of the same animal and observes vigilance-dependent discharge patterns correlated with characteristic EEG phenomena. In adult cats Horn observes changes in evoked potential parameters dependent on attention and arousal. Pribram, contrary to a simple input-output understanding of frontal brain function, presents evidence 'that the frontal eugranular cortex ordinarily serves to inhibit the distracting effects of novel inputs by processing the input (via habituation) in terms of an established context which controls what is attended and intended' (p. 316). Bechtereva correlates electrophysiological with psychological methods in the human and sees different EEG and single cell excitation patterns in connection with the semantic structure of words.

(4) *Synaptic functions.* Highstein et al. study the morphological and physiological properties of the Mauthner fibre-giant fibre synapse of hatchetfish and discuss a possible mechanism for the subsequent events during chemical synaptic transmission and recovery. Bennett investigates electrophysiologically synapses of electroreceptors in electric fishes and compares these data with vestibular and retinal receptor synapse data from other species. According to Oomura's and Takigawa's microphysiological findings areas 6 and 10 of the frontal cortex are connected with lateral hypothalamic nuclei via complex excitatory and inhibitory reverberatory circuits. Purpura's intracellular study of the functional development of intrathalamic and reticulo-thalamic pathways comes to the conclusion that inhibitory neurones start functioning earlier in thalamic than in hippocampal and neocortical structures.

Summing up, the excellently printed book is a valuable contribution to neurobiology; everybody working in Neurophysiology, Neurology, Animal Behaviour and Psychological Physiology will use it with profit.

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