

BOOK REVIEWS

Neurosciences in India

Neurosciences in India: Retrospect and Prospect. Sunil K. Pandya, ed. Neurological Society of India and Council of Scientific and Industrial Research, New Delhi, 1989. 743 pp.

Practically all disciplines of neurosciences, basic or clinical, were initiated in the country only after independence. During the last 40 years, from humble beginnings there has been progressive development of these disciplines. This book gives a historical perspective of these developments. In addition it documents in one place the contributions made by Indian neuroscientists in various fields during these years. Each chapter is written by an authority on the subject; some of the authors were pioneers in their particular disciplines in the country.

The book covers all subspecialties of neurosciences, including developmental neurobiology, neuroanatomy, neurophysiology, basic and clinical neurochemistry, neuropathology, neuropharmacology, neuromicrobiology, neurology, neurosurgery, neuroradiology, neuroanaesthesiology, neuro-ophthalmology and neuroendocrinology. Besides accounts of these well-established disciplines, brief write-ups have also been provided on some newly emerging areas like neural transplant, and biochemistry and molecular biology of the ageing brain. Information was specially sought from all members of the Neurological Society of India and others well known in their fields. In spite of these efforts, it is possible that some contributions may have been overlooked. Nevertheless, the book provides an invaluable comprehensive source of Indian references. Not surprisingly, there are some repetitions, the same work being quoted in different chapters, there being no watertight boundaries between different disciplines covered by different authors.

Besides the scientific contributions, the book records the historical evolution of the Neurological Society, giving a summary of significant events yearwise.

This elegant volume should be compulsory reading for all postgraduates, research scientists and teachers of any discipline of neurosciences in India. In addition, it would be of great interest to neuroscientists anywhere in the world, as it provides the major Indian contributions and references. This is specially

true for those interested in subjects like geographical medicine, epidemiology of neurological disorders, and infections and infestations of the central nervous system.

P. N. TANDON

*Department of Neurosurgery
All India Institute of Medical Sciences
New Delhi 110 029*

Neuroscience frontiers in review

Annual Review of Neuroscience 1989. Vol. 12. W. Maxwell Cowan, ed. Annual Reviews, Palo Alto, USA, 1989. 550 pp.

The opening chapter of the volume is written by Viktor Hamburger. It has one of the most fascinating narrations of the journey of experimental neuroembryology during the last seven decades. Hamburger has also been a collaborator of Stanley Cohen and Rita Levi-Montalcini, Nobel laureates in physiology or medicine in 1986. His research indicated that neuronal death during neurogenesis 'in vertebrates is probabilistic and not programmed, as in some invertebrates'. He developed the 'basic conception of the control of the nerve centres by their targets via the nerve fibre route'.

There are 21 review papers in the volume, covering advances in some of the most interesting areas of neuroscience. R. S. Zucker reviews the progress of ideas on short-term synaptic plasticity, with special reference to alterations in neurotransmitter release and the role of Na^+ and Ca^{2+} . D. A. Robinson discusses the theme of 'integrating with neurons'. He has dealt not with the usual theme of integration but the theme of integration as is understood in calculus, e.g. 'y is the time integral of x', a mathematical operation that occurs in the central nervous system. He discusses the operation in the vestibulo-ocular reflex, and in some general aspects in motor control. C. L. Cepko discusses progress in achieving immortal neural cell lines by using retrovirus-mediated oncogene transduction. B. F. O'Dowd *et al.* review recent understanding of the structure of adrenergic receptors revealed by gene cloning and cDNA sequencing for the various adre-

nergic and cholinergic muscarinic receptors. Masao Ito reviews research on long-term depression (LTD) of several minutes in synaptic transmission in the cerebellar cortex. LTD has been found to occur in Purkinje cells when two excitatory signals simultaneously arrive from parallel fibres of granule cells and climbing fibres of inferior olive neurons. He shows that calcium ions and quisqualate-specific glutamate receptors are involved in LTD that is a specific synaptic plasticity in the cerebellum. P. A. Walicke reviews recent knowledge about neurotrophic molecules that promote neuronal survival or stimulate neurite outgrowth. J. H. Pate Skene reviews progress in the field of proteins (e.g. gap 43, gap 24, tubulins, actin) that are involved in axonal growth and synaptic plasticity. C. G. Atkinson reviews comparative kinematics and dynamics of arm movement control, involving transformations from the perspective of motor learning in robot models and the human arm. P. A. Getting discusses progress in the elucidation of computational principles that govern the operations and modulations of real neural networks. The roles of the several synaptic transmitters in the retina have been reviewed by N. W. Daw *et al.* Use of fluorescent probes and fluorescence microscopy in the study of cell signalling has been reviewed by R. Y. Tsien. Dyes sensitive to membrane potentials and to various ions are being utilized to reveal dynamic cell functions. J. L. McGaugh reviews progress in research on regulation of memory storage by hormones and other chemical modulators. The role of cyclic GMP-activated conductance in photoreceptor physiology has been reviewed by K. W. Yau and D. A. Baylor. S. D. Roper discusses research on vertebrate taste receptors and their synapses. The neural basis of attention, song and recognition and other acoustic communications as understood from experiments on insects has been reviewed by R. R. Hoy. R. A. Andersen has discussed the visual and eye movement functions of posterior parietal cortex involved in transformations to coordinate perceptions and behaviour. The effects of spider toxins on excitatory amino acid neurotransmission and calcium channels have been reviewed by H. Jackson and T. N. Parks. Recent understanding of the properties and regulation of tyrosine

hydroxylase by phosphorylation has been reviewed by R. E. Zigmond *et al.* Recent research on altered brain proteins in Alzheimer's disease has been reviewed by D. J. Selkoe. J. R. Sanes discusses the role of extracellular matrix molecules in migration and differentiation of neurons. R. H. Miller *et al.* discuss recent understanding of cell lineages and functions of astrocytes and oligodendrocytes of rat optic nerve.

The 1989 *Annual Review of Neuroscience* is an outstanding collection of reviews in some of the most exciting frontiers of neuroscience. It will be of great use for reference and study to all neuroscientists.

T. DESIRAJU

*Department of Neurophysiology
National Institute of Mental Health
and Neuro Sciences
Bangalore 560 029*

Molecular physiology

Annual Review of Physiology 1989. Vol. 51. Joseph F. Hoffman, ed. Annual Reviews, Palo Alto, USA, 1989. 903 pp.

This volume has as its theme the molecular and cellular basis of physiological mechanisms and functions. It opens with the role of Na^+, K^+ -ATPase in transport. Its coverage of renal physiology includes cellular events lead-

ing to renal hypertrophy, autocrine and paracrine regulation of renal epithelial cell growth, and influence of epidermal growth factors and their characterization. The focus on gastrointestinal physiology relates to gastrointestinal transport regulation and covers recent developments in the understanding of the role of calcium in hepatocytes and pancreas, chloride transport, dietary regulation of sodium cotransport, and transport of bile acids by non-membrane-bound proteins in liver.

In the area of cardiovascular research the use of new cellular and molecular techniques in understanding the mechanism of cardiac growth and development, hormonal control of heart and vascular functions, and the linkages between hormonal and mechanical stimuli appear to be the main thrust. Physically, often electrically, coupled contractile cells of smooth muscle show extraordinary functional diversity. The unravelling of intracellular mechanisms governing contraction and smooth muscle energetics links their importance to the functioning of all organ systems. The diversity of channels, carriers and pumps reflected in the variety of integral membrane proteins that carry out these functions forms the basis of the section on cell and molecular physiology.

Optical measures are being increasingly used to monitor physiological events in the nervous system, ranging from fine neuronal processes to cortical imaging. In the section on comparative physiology, studies on the mechanism

underlying transport of nutrients from the environment to organisms and, following ingestion, within organisms reflect the tone of the renaissance in the field of nutrient uptake and the attempts to find unifying principles. Endocrine regulation of gene expression—molecular mechanisms that translate the interaction of a hormone with its target cell—is the present trend-setter of research progress in the field.

The sorting of molecules into specific organelles within the cell and the role of membranes in this process have attracted considerable attention, particularly in polarized tissues. The work that has examined polarity-determining signals has been directed towards understanding the sorting processes for cellular and membrane proteins, including endogenous and viral proteins.

The section on respiratory physiology addresses itself to the precise cellular and molecular mechanisms by which partial pressure of oxygen (pO_2) is sensed. Peripheral chemoreceptor function; control of mitochondrial respiration; erythropoietin-producing cells; heterogeneity of renal tissue pO_2 ; and oxygen transport in muscle, with particular reference to myoglobin in facilitating this flux, are the topics discussed in this context.

K. N. SHARMA

*University College of Medical Sciences
and Guru Teg Bahadur Hospital
Shahdara
Delhi 110 095*