Annual Review of Neuroscience, 2022. Botond Roska and Huda Y. Zoghbi (eds). Annual Reviews, 1875 S. Grant Street, Suite 700, San Mateo, California 94402, USA. Vol. 45. x + 493 pages. Price: US$ 118.00.

The book *Annual Review of Neuroscience* has emerged nicely with excellent chapters ranging from genetic and molecular aspects of neural signalling to development, system levels of motor planning, vocalization, locomotion and pathophysiology of various neurological and psychiatric disorders. In addition to illustrating the basic concepts, most of the chapters of this review have provided the latest in the theoretical framework as well as the practical utility with possible future directions, thus providing the reader with all the necessary aspects of past, present and future of specific topics of neuroscience.

To review some of the basic and molecular level topics such as 'Signalling pathways in the neurovascular development', authors have explained the unique cellular and molecular properties in the course of development to establish the blood-brain barrier (BBB) which prevents the sensitive brain parenchyma from passive diffusion of toxic materials in the blood. The interplay of vascular endothelial growth factor and beta-catenin signalling in regulating this process in the development of neurovascular coupling has been well demonstrated in this chapter. Further, the utility of this concept in breach of BBB microvascular haemorrhages and brain tumours needs to be applied in these clinical scenarios to aid in managing these patients.

In the chapter describing the functional anatomy of the cerebellum, 'The cerebellar cortex', the complex circuitry of various types of cells (Granule, Golgi, Purkinje cells) and various fibres (Mossy and climbing) connections are illustrated. Further, the complex concepts of plasticity, including both long-term potentiation and depression, which are crucial of cerebellar learning and its defects, would lead to many disorders of ataxias.

The chapter 'Neural signaling in cancer' highlights the ever-increasing cause of morbidity and mortality in the modern medical era, especially its neuroscience perspective, such as electrical activities (depolarization, neurogenesis and transient calcium currents). Further altered neuronal signalling through Neuroligin, Neurotrophins, various paracrine factors and tumour-induced neuronal hyperexcitability are explained in great detail. In addition to understanding the neural regulation of development and plasticity, this chapter also tried to propose a few directions towards achieving new therapeutic strategies in the management of dreaded cancers of the brain.

The chapter 'Breathing rhythm and pattern and their influence on emotion' explains how the 'breathing central pattern generator (bCPG)' modulates the rhythmicity and pattern of breath to ensure adequate oxygenation of the blood during various environmental conditions, including emotions. The role of Developing Brain Homeobox Protein 1 (Dhx1) in the rhythmogenesis in these bCPG cells was nicely explained with elegant studies. Further, how the emotional state and cognition affect breathing, these intrinsic states can be altered by voluntary changes in breathing rate, which was exemplified in traditional control of breath control (pranayama) or controlled breathing with slow movements (*yoga* or *tai-chi*), which helps to achieve effective stress control.

The chapter 'Neural algorithms and circuits for motor planning' demonstrates how the planning-related neuronal activity and dynamics in the networks are turned into voluntary movements in various parts of the body such as eyes, limbs, head and tongue. These coordinated movements of various body parts require ultimate precision and synchrony of various neuronal networks, which have been postulated with the computation of neuronal dynamics. How the neuronal activity ramps up and down symmetrically in cortico-cortical, thalamo-cortical and basal ganglia-thalamo cortical loops in various phases of planning and execution of voluntary movements are well explained with illustrations. These concepts are of applied value in using various artificial intelligence modes to assist voluntary movements in patients with stroke, spinal cord injuries and other motor control/movement disorders.

The chapter 'Neuroimmune interactions in peripheral organs' summarizes recent studies that explored the interaction between nervous and immune systems utilizing technological advances of molecular meditators and receptor complex mediated orchestrated physiological processes involving various organs, including skin, intestine, lung and adipose tissues. Further, this chapter provides a few examples, such as dorsal root ganglion in skin immunity, vagal sensory neurons in the lung and gastrointestinal immunity. This advanced hot topic has many percussions in managing various psycho-neuro-immuno-endocrine axis, which is hypothesized to be the major cause of many medical disorders.

In the chapter 'Neuroscientific evidence for processing without awareness', how non-consciously perceived (NCP) stimulation on behaviours and neural circuitry has been explained with neurophysiological (evoked potentials) and imaging (fMRI) modalities. Such NCP phenomenon in various aspects of language, emotions, attention and memory has been explained with scientific studies. However, decoding such NCP information still needs large-scale studies with multiple levels and domains of processing and replicability of such behavioural experiments.

In the chapter 'Microglia and neurodevelopmental disorders', the role of microglia (resident immune cells of the brain) plays an important role through diverse arrays of neurodevelopmental processes in the brain maturation and function, thus claiming its possible involvement of various neurodevelopmental disorders (autism, attention deficit hyperactivity disorders, intellectual disability, Down syndrome, cerebral palsy, alcohol syndrome, etc.). Since microglia is involved in normal cell death and survival as well as synapse elimination and formation and its role in clearing debris during the process of neural development, its role is critical and also in circuit regulation in these disorders. Further, the role of microbes, especially the gut microbiota and role of the vagus (X cranial nerve and important division of parasympathetic nervous system), which carries 80% of afferent fibres and only 20% as efferent to the gut (secreto-motor in function), it is a hot topic to investigate the role of the gut-brain axis in the pathophysiology and later management of neurodevelopmental disorders.

The chapter 'Cross-modal plasticity in brains deprived of visual input before vision' explains the development of structural and functional plasticity, which develops when one mode of sensory loss leads to changes in the networks in a wide spectrum of sensory fibres. They have demonstrated these changes in visual, auditory and somatosensory systems and concluded that research in the field is still rudimentary emphasizing the need for more multifaceted research with multimodal investigations.

In the chapter 'Functional ultrasound neuroimaging', the new mode of imaging using ultrasound captures cerebral blood

flow through which neuronal activity is indirectly measured with high spatiotemporal resolution. Thus, by adopting the principles of neurovascular coupling, linking the relationship between neuronal activity and hemodynamic changes. These studies have been validated in animals (rodents and primates), but in humans' skull offers much resistance to these ultrasonic signals. This procedure could only be performed in infants (with opened skull sutures) and during neurosurgical procedures. However, the role of focused ultrasound as therapy in a few subcortical structures (basal ganglia/thalamus for essential tremor and Parkinson's disease) needs further validation and replication with long-term changes and lesser side effects.

Finally, the chapter 'Synaptic mechanisms regulating mood state transitions in depression' describes the transient state of neuronal activity in the stress-sensitive circuits responsible for the mood fluctuation transition modulated by plasticity in these circuits following different modes of antidepressant therapies. The interactions between various synaptic dysfunctions involving chronic stress models involving the hippocampus, medial prefrontal cortex, amygdala nucleus accumbens, ventral tegmental area and lateral habenula are nicely illustrated and compared with human studies involving imaging after various antidepressant therapies. Several newer molecular therapeutic techniques target the synaptic function-related genes involved in causing this dysfunctional plasticity in these networks.

Thus, this annual review of Neuroscience is a collector's edition with a wide range of topics and in-depth discussion reviewing all the latest in neuroscience research with future directions, providing thrust and hot areas of investigation in the years to come. All the authors, as well as the editors have done exceptional work, making this book an absolute masterpiece for any science enthusiast and a guide for researchers working in this exciting field of Neuroscience.

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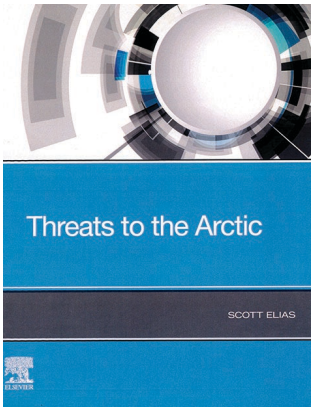

Threats to the Arctic. Scott Elias. Elsevier, Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands. 2021. xxi + 581 ages. Price: not mentioned.

The book *Threats to the Arctic* by Scott Elias is a timely publication when the world is keenly looking at the changing Arctic. The Arctic is currently the mainstay of climate, and the world is concerned about the declining summer sea ice which is one of the key modulators of climate. Many papers being published on the Arctic domain show contemporary interest in this domain. India has recently come out with the Arctic Policy. The changing climate is a big threat to the Arctic, and the book under review is an excellent resource for anyone interested in scientific pursuits of the polar regions. This book is for decision-makers and policymakers, teachers and researchers interested in the different domains of the Arctic.

The book is devoid of a Preface and biography of the author. It commences with a lucid Introduction chapter explaining why the Arctic is important to climate change, including its fragile environment. This chapter defines the scope of succeeding chapters in the book and gives a brief outline of the content of those chapters (without the contents page!). This chapter introduces the reader to the Arctic region and includes components of Arctic history, early explorers, and Arctic fragility in terms of climate change. I would have been happy to see a separate chapter on the brief history of exploration of the Arctic. There is a section, however, later in the book on the Arctic people in Chapter 16 titled 'Changing political landscape of the Arctic'. More information is needed on the history and knowledge of the settlement of the indigenous population that is a key element in the Arctic history.

The contents of the book are given after the Introduction chapter. The book is divided into four sections: I – Arctic seas (eight chapters); II – Arctic ice (one chapter); III – Arctic lands (three chapters) and IV – Arctic people (three chapters).

The section on Arctic seas opens with the limelight chapter 'Loss of sea ice', which is a matter of huge concern and apprehension not only for the Arctic but the whole world. Numerous recent publications and scientific dailies have been reporting this predicament regularly. Loss of sea ice is of immense interest and a lot of research has been carried out in the last decade (pp. 3–15). There is a section on the predicted loss of sea ice with global warming (p. 10) based on studies utilizing numerical modelling. It would have been more interesting if the chapter had covered possible teleconnections and the causative factors, both oceanic and atmospheric, which account for the sea-ice changes. Further, considering the effects of recent extreme events and global warming, this will be a highly debated topic in the decades to come.

The rising sea-surface temperature (SST) is one of the key factors for the loss of summer sea ice in the Arctic. This chapter, from pp. 17–25, discusses SST observations since the early 19th century. A sector-wise table of SST from NOAA indicates the average SST from August 1995 to 2012 and compared with the August 2019 SSTs. However, it is also important to understand depth-wise warming of the Arctic Ocean in the different sectors along with the ocean heat changes, which is a topic of much research. The role of the Beaufort Gyre has been discussed in detail, on pages 22–23.

The changes in ocean circulation patterns (chapter 3) are now getting more attention with recent reports on the freshening of the Arctic Ocean. The chapter briefly covers the Arctic oscillation and informs the reader of the basics of Ekman transport, the role of eddies and sea ice. An interesting observation that is highlighted is the 'Warm Arctic-cold continents pattern', and the latest scientific papers have highlighted the possible causative relationship. The topics on North Atlantic circulation and the Atlantic Meridional Overturning Circulation (AMOC) as tipping points and their reference in the IPCC report have been well addressed. The chapter highlights many other points, including the Pacific water input and its effect on possible cooling during the Younger Dryas interval (p. 41).

The sea level changes and climate are intrinsically interrelated in the Polar regions. The chapter on sea level changes (pp. 45–65) defines the changes in the Greenland