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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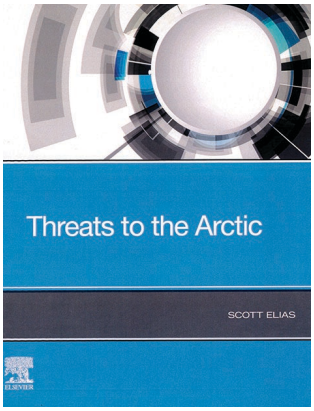


Threats to the Arctic. Scott Elias. Elsevier, Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands. 2021. xxi + 581 ages. Price: not mentioned.

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

ice sheet and mass balance in the chapter entitled 'Sea Level Changes'. The author has tried to compare the last interglacial with the available ice core records from the NEEM (North Greenland Eemian Ice Drilling) project. Papers citing the pivotal points have also been included. Further, it is interesting to concisely read about the fjord dynamics restricted to Greenland, as part of this book. Besides, a useful addition is the impact of sea-level rise on the coastal population, although references to the work are missing from this section.

Colder ocean waters are repositories of dissolved atmospheric gases, thus facilitating the exchange of gases between air and oceanic water. Colder oceans are sinks for carbon dioxide. Higher carbon dioxide in oceanic water will result in the formation of weak carbonic acid. This could lead to ocean acidification. This has been dealt with separately in a chapter on Ocean acidification impacts (pp. 67–91). Acidity and its impacts have been discussed along with the carbonate ecosystem of the Arctic. There is a printing error in the spelling of Calcite in figure 5.9, p. 78. An interesting mention is the relationship between fish and pH, along with the various stresses and interactions between temperature and pH at p. 86.

The Earth is a watery planet. With the introduction of plastics, the 'Impacts of chemical pollution on marine ecosystems' has become a major concern. Plastics of varying sizes are classified from micro- to nano-plastics (pp. 93–107). A simple flowchart has been utilized to indicate the ingestion of plastics in the food web. It is also important to understand the toxic effects of Persistent Organic Pollutants (POP) in the Arctic, a subject which has been covered well. A discussion on POPs and Mercury in polar bears (*Ursus maritimus*) along with a table indicating PCB (polychlorinated biphenyls polychlorinated biphenyls) levels measured in Marine Wildlife from the Arctic and Sub-Arctic is very useful for the readers and is detailed in the chapter (pp. 112–117).

Overfishing in the Arctic finds a prominent space in the book, and with a mention of the invasive species, the current and future problems are briefly dealt with. It should be emphasized that overutilization of fish as a resource will lead to problems. Further, the change in oceanic conditions with changing temperatures would see a shift in fish regionalism. This is a must-read for those interested in fishery and climate-related sciences (pp. 123–150).

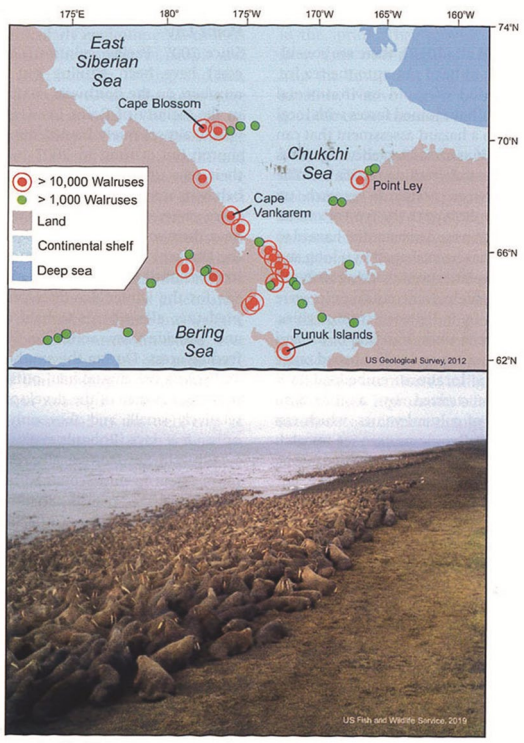
The impacts of global shipping in a changed Arctic Ocean have an interesting note on the Northwest passage in the Arctic, and the historical account of the expeditions is a welcome addition to the book (pp. 153–157). With changing patterns of sea ice, Arctic Ocean navigation will open a new story.

Good references have been cited to explain the shorter transit times for the shipping companies. The region will also witness a change in ship emissions, ocean pollution, discharges made by the ships, and the effects on the ecosystem. The sounds would also affect the whale community which has been brought out in this chapter (pp. 179–190).

Section II of the book introduces the Arctic ice. The decline in the mountain glaciers (chapter 9) is a concern as they are losing mass due to climate change. The chapter gives the state of their health, citing recent references and includes a comparison of the major mountain glaciers of the world and the Arctic to highlight the wider effects of climate on glaciers. The Third Pole – the Himalaya is introduced, and we know its importance (p. 211), being one of the thrust areas for Indian researchers. This chapter is extensively covered in about 50 pages (pp. 211–258) and includes the rate of retreat of glaciers from the mountain regions in an apt tabular format. The book also includes glacial lake outburst floods, which are critical while developing tourism and building dams and reservoirs in the Himalaya.

The third section of the book is on Arctic lands. The first chapter in this section (chapter 10) underlines the Greenland Ice Sheet, one of the largest ice sheets besides Antarctica which is losing mass. The concept of Bipolar see-saw has been discussed. It would have been a valuable addition for the reader if the causative factors for this bipolar see-saw were discussed in detail. During August 2021, there were newspaper reports of unusual rain in Greenland (not snow, due to higher temperature); these are some signs of concern. The focus is on Greenland and its changes and is very relevant to the title of the book from pages 265–316.

Forty pages of chapter 11 on changes in terrestrial environments discuss major biomes in the Arctic region and define High and Low Arctic ecosystems. An interesting read is the phenology and the knowledge of the change of migratory birds with climate. The chapter on changes in terrestrial environments described Arctic amplification (AA). It would have been nice if the



Above: Pacific Walrus haul-out map from Oakley *et al.*, 2012. Walruses hauled out on a Chukchi Sea beach near Point Lay, Alaska, 2015. (Photo courtesy of USFWS, in public domain.)

author introduced AA with schematic diagrams rather than just utilizing modified, published diagrams of other authors. Polar bears and sea ice loss are some things that should be read and be aware of. Additionally, the carbon stored in the permafrost and its release due to erosion are brought out with some recent references in the book.

The impacts of climate change in the Arctic are getting amplified (read Chapter 12). The statement 'Global changes often do not occur as linear progressions but rather as nonlinear phenomena' (Steflen *et al.*, 2004) from this chapter is a thought-provoking line I deem every climate scientist should consider. The chapter describes different impacts, viz. terrestrial, persistent organic pollutants, lead, mercury contamination and radioactive contamination. It will also be interesting to read about the impacts of climate change on reindeer and polar bear populations and their survival strategies. The polar regions and invasive species are topics of discussion and have been deliberated briefly on p. 394. The term 'Greening of the Arctic' on p. 380, is a subject that the world is keen to understand as it would lead to ecosystem changes due to the warming of the Arctic region. A case study of a proposal on the introduction of earthworms to Arctic soils has been discussed, citing relevant references.

The Arctic is known for its resources, and this is one of the key reasons why this region is in the news, partly due to how the Arctic would appear as the climate change scenario continues to deteriorate. Oil and gas-rich offshore boundary disputes have been discussed briefly, citing a few references with a mention of the Russian government's developmental projects for oil and gas fields in undisputed shelf regions. The Arctic has been the main target despite environmental concerns such as oil spills. An interesting component of how marine microbes of the Arctic play a crucial role in oil spill remediation is covered through recently published work. A must-read component is the hazards to wildlife from petroleum operations and includes the vulnerability of sea birds followed by polar bears during the Arctic summer.

The Arctic is one of the largest repositories of permafrost, which is a key element undergoing change, as documented by the Arctic communities. This topic is covered under the Chapter entitled 'Impacts of permafrost degradation'. The impact of fires is an issue that will be much talked about in the foreseeable future and finds a prominent place in this section of the book. Additionally, the chapter discusses the consequences of permafrost changes and retreats, including its effects on Arctic infrastructure.

A key element of the Arctic is its native life, which is interlinked with its geography and culture. Some recently published works have covered the threats to their lifestyle, which include pollution, climate change, and related migration. The local native communities in different areas of the Arctic, viz. Alaska, Canada and Finland have shared their observations. The Inuit's role in the Arctic Council and the governance issues have been explicitly brought out. An interesting read on pp. 502–503 deals with the native Russian rights and autonomy.

An interesting chapter, 'Changing political landscape of the Arctic' (pp. 521–566), brings out science and geopolitics, which is interesting for people keen to work, know more, or write about the Arctic. It discusses who owns the Arctic and describes the Arctic Council and its role in geopolitics. The national strategies of the United States, China and Russia have been written in some detail. An interesting element is the post-Cold War geopolitics and shifts in the balance of power. In addition, natural gas and rare earth mining are areas of interest to the world, and this finds a place in this chapter.

This book gives us a lot of information. I strongly recommend this book to all those who have an interest in the Arctic. It would be good also to have a chapter on the experiences of the author of the book in the Arctic. I would have appreciated the inclusion of a list of figures and their sources before the Index of the book. An acknowledgement page for a book of this magnitude is desirable. In a nutshell, this is a book for essential reading, and I consider it fit for all libraries.

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