



## Book Review

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### A Journey in Antarctica: Exploring the Future of the White Continent

Sergio Rossi

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Antarctica has been considered for centuries a rather isolated place with vast regions of extraordinarily thick snow cover, ice sheets and mountains, including the Transantarctic Mountains (see Fig. 1), which divide the terrestrial part of the continent into western and eastern regions. This fifth largest continent (in terms of total area) is surrounded by the Southern Ocean, several tributary seas (e.g. the Amundsen, Ross and Weddell seas) as well as islands (e.g. the South Orkney, South Shetland and Balleny islands), which lie below an area south of latitude 60° S. Following the enactment of the Antarctic Treaty in 1961 and the Madrid Protocol (on the protection of the Antarctic environment) in 1998, this area has been designated a 'natural reserve', only for use for peaceful and scientific purposes (Hughes *et al.* 2021, Rogers 2023). Antarctica is by far the coldest continent on Earth, with temperatures dropping below -70°F (-60°C) in winter and -4°F (-20°C) in summer. The combination of extreme low temperature, high wind chill and a dry climate, as well as living and working in a remote, confined and extreme environment, make Antarctic expeditions challenging, necessitating the unique personal physical and psychological qualities as well as unique teamwork skills of an extraordinary group of expeditioners to work there (Nash 2022).

Like other regions on Earth, Antarctica is affected by dramatic changes due to anthropogenic activities. These include accelerated climate change in recent decades with associated global warming, decreasing ice-cover and ice-shelf break-up and ocean acidification. Moreover, marine pollution, noise and the incursion of invasive species that affect native fauna, flora and microorganisms and, in turn, native biodiversity and ecosystems are changing the Antarctic environment. Commercial activities that include fishing, tourism and research expeditions are expected to affect this continent further (McCarthy *et al.* 2019, Rogers *et al.* 2020). Considering all of these alterations to the environment

and the continuing national rivalries and territorial claims, one needs to ask: what might the future of this previously isolated, undisturbed and pristine continent hold?

The book *A Journey in Antarctica: Exploring the Future of the White Continent* by Sergio Rossi is part of the 'Springer Praxis Books' series, with entries from active researchers, scholars and/or industry professionals. Rossi is a university professor, scientific journalist and writer who participated in several oceanographic cruises, including an expedition to Antarctica on the *Polarstern* research vessel. He divided the book into a Foreword, 23 chapters and an Epilogue.

Rossi writes in the Foreword: 'I hope that by the end of this book the reader will have a slightly different view of the white continent, a better concept of what happens there and how it can affect us all, even though so far from home' (p. xi). He continues in the first chapter with a description of the remote location and extreme environment of Antarctica. He also describes the animals and plants that can withstand this cold climate. In Chapter 2, Rossi gives an overview of previous Antarctic expeditions, including those by Fabian Gottlieb von Bellingshausen, Robert Scott, Roald Amundsen, Georg von Neumayer and Ernest Shackleton.

The following four chapters cover topics related to climatology (Chapter 3), survival lessons (Chapter 4), glaciology (Chapter 5) and ice-floe dynamics (Chapter 6). More specifically, Rossi reviews in the third chapter palaeoclimatic studies of the Antarctic continent, which explain the changes in ocean currents and their heat transport that have occurred throughout the Earth's history. He discusses in Chapter 4 organisms that can survive the hostile Antarctic environment and emphasizes the importance of avoiding external contamination when studying organisms on this continent. Glaciers and icebergs are the focus of Chapter 5. Here, Rossi emphasizes that ice 'is an important component of our planet's global energy balance and its thermal equilibrium' (p. 27). He explains in the following chapter the influence of ice floes on phenomena such as El Niño and La Niña climate patterns.

Chapters 7–11 are devoted to Antarctic wildlife. Rossi starts out by describing microbial life in Antarctica (Chapter 7), then focuses on algae and krill (Chapter 8) and on lifeforms under the ice (Chapter 9), before turning his attention to birds and mammals on and around the Antarctic continent (Chapters 10 and 11, respectively). He mentions the importance of krill that feed on algae and 'transform and transport essential nutrients and leave them dissolved throughout the water



**Figure 1.** A segment of the Transantarctic Mountains. Credit: Michael Van Woert (National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS), Office of Research and Applications (ORA)); photographer: Giuseppe Zibordi (NOAA Photo Library: public domain).

column' (p. 52). Rossi describes many Antarctic organisms, including sponges, gorgonians, bryozoans, sea lilies, holothurians, small crustaceans and (ice)fish, as well as penguins, petrels, albatrosses, whales and seals. The role of krill in biogeochemical cycles and in Antarctic food chains has been a topic of great interest in recent years (e.g. Cavan *et al.* 2019, Rowlands *et al.* 2021).

The following five chapters (Chapters 12–16) cover the effects of climate change, the ozone layer and pollution in Antarctica. Rossi considers the Antarctic Peninsula as 'The Most Accelerated Zone' (p. 95) for climate change and explains the asymmetries between the warming of the Arctic and Antarctic. He points out that changes in land and water snow and ice on and around Antarctica (i.e. accelerated melting and losses in snow and ice cover, creation of inland lakes in the glaciers, ice cracking, fragmentation and break-up of icebergs, as well as warmer ocean water and changes in global ocean currents) affect the entire Antarctic ecosystem. The increases in ultraviolet radiation and pollution pose additional threats to life in this region. Although Antarctica is considered the least polluted place on Earth, the discovery of broken glass from beer bottles, mercury in krill, microplastics and other debris contaminants nevertheless demonstrates that pollution is impacting Antarctic fauna and flora. Rossi points out that all of these changes lead to a mixture of native and pioneer-type organisms in Antarctica, where 'two worlds [are] meeting and one [is] disappearing' (p. 105).

The following three chapters are about commercial activities in Antarctica. More specifically, Rossi discusses in Chapter 17 the prospect of mining for minerals and drilling for oil and gas. He writes: 'Fortunately, the white continent does not make it easy for us to exploit it. First, less than 2% of the surface is free from large glaciers. The rest has a layer of ice that ranges between 1000 and 4000 m thick' (p. 134). A problem for the extraction of natural resources is not only the ice itself but the fact that the ice is moving. Thus, mining in Antarctica is economically not feasible. Furthermore, the Antarctic Treaty System currently provides protection from exploitation. However, the Treaty will be renewed in 2048, and discussions about future mining activities are already underway (see Talalay & Zhang 2022).

Chapter 18 deals with industrial fishing, especially for krill. These small creatures play an important role in the Antarctic ecosystem by providing food for marine animals, but they are also considered a good source of protein for humans. Rossi describes the history of exploiting krill from Antarctic waters and discusses recent measures to protect krill stocks (i.e. finding a balance between fishing and conservation). He also describes the problem with illegal and unregulated fishing, such as the catch of Antarctic hake.

Chapter 19 is about tourism and the introduction of invasive species. Rossi discusses here the increase in the number of people visiting Antarctica to see 'one of the last truly pristine places on the planet' (p. 148). He points out that although cruise ships and research vessels


are built to be safe and environmentally friendly and visitors are instructed not to leave anything behind, sewage discharge into the sea, contamination of the soil, disturbance of native species and harvesting of endangered species for economic profit, as well as the introduction of invasive species to this continent, are all negatively impacting Antarctica (see Tejedo *et al.* 2022).

The role of the Antarctic Treaty is another topic explored in this book (Chapter 20). Rossi reviews the history of this agreement and discusses its benefits and shortcomings. He regards the Antarctic Treaty as 'one of the few truly decent documents to have been created during the past century by multiple countries with highly diverse interests and policies' (p. 153). The following two chapters concern the lives of expeditioners on Antarctic bases (e.g. on the Neumayer research station; Chapter 21) as well as onboard the ocean-going icebreaker *Polarstern* (Chapter 22). The final chapter (Chapter 23) is titled 'The Last Bastion of an Unspoiled Planet'. Rossi states: 'When you have studied it [Antarctica] and realized that we know only superficial things about its constitution, functioning and role within our planet, you appreciate that it is impossible to explain everything through the scientific prism alone. The white continent is the clearest example that, separately, the various branches of science will never reach their goal of understanding. Only a holistic view, of the whole, can allow us to make even a superficial approach to its complexity' (p. 179). In the Epilogue, Rossi expresses the hope that his book will make readers aware of the many issues that affect this southern region.

The book *A Journey in Antarctica* provides a detailed description of the many facets of this continent as viewed through the eyes of a scientist. It is written as a 'popular-style narrative', containing substantial scientific information that is easy to follow and understand. The text is detail-orientated, illuminating, captivating, inspiring and thought-provoking. Rossi's personal experiences during the Antarctic expedition on the *Polarstern* greatly enrich the content of this book. The text is complemented by numerous images that depict, for example, icebergs, ice shelves and ice floes, the research vessel *Polarstern* and its equipment, the Neumayer research station and selected Antarctic lifeforms. Unfortunately, all images are presented only in black and white. Although these photographs are overall quite impressive, I expected that at least the blue and green icebergs would be shown in colour. Rossi provides a 16 page bibliography to help readers explore individual topics about the Antarctic in more detail.

Overall, Rossi has written a book that is educational and entertaining. I consider it a significant contribution to the literature on the Antarctic region. I believe *A Journey in Antarctica: Exploring the Future of the White*

*Continent* could attract young and seasoned scientists, faculty and students in schools and universities and lay readers who want to learn about this faraway place on Earth. My hope is that this book will also be read by industry representatives, cruise line owners and politicians because it contains information about the many challenges Antarctica faces regarding increasing anthropogenic activities and the need for stronger environmental protection. I have no hesitation in recommending this book.

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### Author contribution

I am the sole author of this manuscript.

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