The chapter on Malaysia highlights just how the leadership role for the Third World at the United Nations has been abandoned for a more pragmatic role as a potential Consultative Party. Malaysia set a record in ambivalence towards signing the Treaty, spending a remarkable period as an observer at the ATCM whilst its scientists were hosted by other Parties. Its original intransigent role beginning in 1982 was engineered by the then Prime Minister Mahathir who used it to criticize all of the ATCM activities as "exclusive" and suggest that the UN should take over responsibility for resource management. In the long term, this was an untenable foreign policy and Hamzah describes very well how Malaysia took quite a while to find an acceptable exit strategy which would not cause it to lose too much credibility. Whilst it has made plenty of statements, including one suggesting it will establish the first Islamic station, the rhetoric has yet to be matched by serious investment in the science and more convincing evidence of legal and political commitment.

The author of the chapter on the USA, Chris Joyner, sadly died before publication but his chapter lays out the key tenets of US policy which date back to 1958. It serves US interests best to maintain the Treaty as it is and that remains its long-term objective. Whilst he notes that climate change is a growing problem he fails to record how the Treaty struggled with this whilst George W. Bush was president and insisted that it should not be discussed. Equally he refers to the fact that the USA is not a signatory to either the Law of the Sea and the Convention on Biodiversity but fails to explain just what a problem this is when all the other countries are signatories and want to progress.

In discussing Russia, Irina Gan also includes the former Soviet states with polar pretensions. Whilst Russian activities only just survived the breakup of the Soviet Union there is evidence of recent funding increases to allow an improvement in the quality of science, which not long ago was judged to be poor in many fields. Belarus has been using Russian expeditions to train its scientists, whilst Ukraine took over an old British station and developed its own capacities. Apparently Azerbaijan, Tajikistan and Kazakhstan also cherish Antarctic ambitions but are a long way from realising any of them. Brady's account of New Zealand interests is more detailed and nuanced than Gan's and demonstrates just how far Antarctic policies have penetrated into New Zealand governance and its society. The present system, with its support from the USA, provides almost the ideal cost/benefit for New Zealand and has made it perhaps the most cost effective of all Antarctic counties in cash spend terms. Sulikowski provides a potted history of French involvement in and around the continent, asserting that France has made major contributions to the ATCM and to international science on the continent. She makes some interesting guesses as to why France refused to ratify CRAMRA and describes the joint station with Italy at Dome C but says little about the difficulties of managing it nor anything about how having TAAF in Reunion and IPEV in Brest is a sensible scheme for co-ordinating French activities.

The final three chapters cover some well-worn ground. Elzinga writing about research covers his contention again that research stations are proxies for colonization and that science is diplomacy by another name! His account of why Sweden was not amongst the original Treaty Parties is interesting and I had not made the connection before between the Swedish view that the United Nations was the right forum for international management rather than a new treaty. The question of station sharing is also examined in some detail as is the need to maintain relevant programmes in one location over long periods. Verbitsky outlines the history of tourism in the Antarctic and puts the case for a tourism convention, something the Parties have refused to consider, whilst also suggesting that decision-making for some activities could be delegated to SCAR, a responsibility that SCAR is never likely to embrace. Finally, Jabour looks again at biological prospecting, and concludes that it has no more need of special regulation than fisheries in the Southern Ocean. Rewards go to those who invest and she sees little prospect of that changing to a more equitable system or that the developing countries will ever get a share of the rights. Why would the Parties undermine their own industries, which have now registered almost 100 patents on krill alone, in order to give rights to countries not even active on or around the continent? Life and politics are not like that!

An interesting volume with much that is new or so disseminated that few will have seen it. A useful research tool and reference for several key Antarctic countries.

D.W.H. WALTON

Antarctic Science, **27** (2015)
doi:10.1017/S0954102015000103

Secrets of the Ice

Veronika Meduna
Yale University Press, New Haven, 2012.
ISBN-13: 978-0300187007, 232 pp. £29.95.

Antarctica has long held the intrigue of humankind. Its vastness and crystal clear air renders measurement of scale difficult at best. Its bounty of wildlife, mostly marine, is legendary, and its heroic era has been the fodder of many a

classic tale. Are the many nations invested in Antarctica there simply for geopolitical reasons? Or on the other hand, does Antarctica hold insights, even answers, to fundamental scientific questions with global implications?

In her highly readable *Secrets of the Ice,* Veronika Meduna lays to rest any lingering concerns that the science of Antarctica is superfluous and not worthy of our support. Her book, with its decidedly New Zealand perspective and generally Ross Sea focus, is divided into four major sections: 1) *Uncovering the Past*, 2) *Life on Ice*, 3) *True Antarcticans*, and 4) *Oasis in a Frozen Desert*. In an accompanying short introduction Meduna dangles the allure of discovering life in the waters of Lake Vanda buried deep within the icy polar plateau, while in a similarly brief Coda she discusses the exploitation of Antarctica as a means of peering beyond our galaxy. These elements provide nice bookends to the four major sections. Complementing the prose throughout the book are numerous outstanding colour photographs, each with highly informative captions.

In *Uncovering the Past* the author explores the Gondwanian origins of Antarctica, introducing the reader, as she does so effectively throughout her book, to the heart and soul of individual scientists, and in this case to several at the forefront of studying Antarctica's geological past. Highlighting the ontogeny of drilling projects carried out over the past fifty years in the deep Southern Ocean, at Cape Roberts in McMurdo Sound, and in the McMurdo Dry Valleys, Meduna weaves a compelling story of how these largely international projects have provided insights into how our earth's climate has changed over the course of millions of years. The author then summarizes two relatively recent, key ice-sheet drilling projects, the first carried out at Vostok Station, the second 600 km distant, that have provided an immensely important 800 000 year chronology of our earth's atmospheric temperatures and levels of carbon dioxide. This information, unlocked from air trapped in ice cores, has provided incontrovertible evidence of humankind's role in the production of greenhouse gases that are driving rapid global warming. A brief description follows on the circulation of the Southern Ocean (e.g. the Antarctic Circumpolar Current; the world's largest), known to influence global patterns of oceanic circulation and thus climate. The author wraps up this section with an overview of those individuals involved in the discovery, elucidation and, via the Montreal Protocol, potential mitigation of the anthropogenically induced thinning of the ozone layer (ozone hole) over Antarctica.

In *Life on Ice* the author selects a suite of Antarctic wildlife and through the eyes of leading scientists describes aspects of their ecology, life history, and unique behavioural, morphological, physiological and molecular adaptations to low temperature. Included are the emperor and especially the Adélie penguins, a variety of species of fish, and the seafloor invertebrates that comprise rich communities structured primarily by biotic factors and ice scour. The author reminds us that a remarkably diverse marine biota has been further brought to light by recent scientific collaborative programmes such as the International Census of Antarctic Marine Life (CAML).

True Antarcticans introduces readers to a collection of terrestrial organisms that have somehow managed to make Antarctica home. Nematodes, minute cylindrical worms whose biodiversity is as far reaching as their biogeography, lead the way. Once again by introducing us to key scientists, Meduna describes the nematodes of Antarctic soils and their subcellular adaptations to survive extremes of desiccation and cold. Equally fascinating is Antarctica's one and only insect, the springtail, whose small size complements its blink-of-an-eye life cycle. While I would politely argue that Antarctica's true forests are comprised of the rich forests of towering macroalgae that populate the coastal seafloor of the western Antarctic Peninsula, beyond Antarctica's two tiny flowering plants, the author's stated choice of Antarctic forests are two-dimensional. Here, the rich diversity and biology of lichens, mosses and liverworts on the western Antarctica Peninsula are presented, and the fungi discussed in the context of their troublesome decomposition of huts constructed during the heroic era. A brief description of studies of the extremophile bacteria occupying hot seeps at the 3794 m summit of Mount Erebus rounds out this section of the book.

In the book's final major section, *Oasis in a Frozen Desert*, Meduna turns her focus to the McMurdo Dry Valleys. She first describes dry valley geology and then the discovery of a rich microbial diversity in a presumptive lifeless environment. Every potential habitat is exploited; even the soil beneath mummified seal carcasses harbours bacterial ecosystems while cyanobacteria thrive in aqueous environments of ice covered lakes. Fittingly, in the end, the author tells the compelling story of scientists and technicians drilling almost four kilometres below the ice cap to sample the waters of Lake Vostok, its potential for life fraught with extra-terrestrial implications. Despite Meduna finishing this tantalizing book before the Vostok samples were analysed, I suspect her prose would have celebrated their biodiversity.

Overall this is a superb book that will nicely complement several others written without a New Zealand focus; yet similarly address the importance of Antarctic science through the eyes of its scientists. Meduna is well versed in science and professional writing and it shows. This is one of those rare books that can be enthusiastically recommended to both scientist and layperson alike.

JAMES MCCLINTOCK

https://doi.org/10.1017/S0954102015000103 Published online by Cambridge University Press