

of the Southern Ocean. Stark provides a very nice summary of the developing science of cosmology from Antarctica showing how study of the cosmic microwave background from there has demonstrated that we live in a “flat” universe. Finally, Solomon & Chanin describe the formation of the ozone hole, contrast it with stratospheric behaviour in the Arctic and show how the science informed policymaking. The ozone story is nicely rounded off by Sarma & Anderson in their contribution on the way science and diplomacy worked in synergy in creating and maintaining the vitality of the Montreal Protocol.

A particular highlight is the paper on the origins and development of the Committee for Environmental Protection by Orhiem, Press & Gilbert (the former chairs of the CEP). They show both the power of the CEP and the threats posed to its effectiveness by overload and the limitations of the AT, themselves having their roots ultimately in Article IV. Similarly, the recently retired Executive Secretary of CCAMLR (Miller) provides an excellent summary of its work. Huber, former Executive Secretary of the ATS, gives a thoughtful resume of the weaknesses of the ATS, particularly in regard to bringing agreed Measures into operation in a timely fashion and in actually meeting commitments on exchange of information. Again these limitations can be traced in some measure to the restrictions imposed by Article IV.

The final paper in the volume by three of the editors is simply entitled “Conclusions”. Readers might reasonably expect to find the various threads of the conference and the preceding papers drawn together here. They would be disappointed. Whilst the paper is interesting and thought provoking it appears to be summarizing what the authors hoped the meeting would be about, rather than the actuality. It is a pity that it was not given a more appropriate title!

This is a curiously flawed volume from an editorial viewpoint, but individually most of the contributions are worthy and will provide a very valuable family of reference material for scholars.

J.R. DUDENEY

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An empire of ice - Scott, Shackleton and the heroic age of Antarctic science

E.J. Larson
Yale University Press, New Haven, NJ, 2011
ISBN 978-0-300-15408-5. 320 pp. £18.99

The centenary celebrations for the “Heroic Age” of Antarctic exploration have already been going for nearly 15 years but are almost at their apogee with the Scott Terra Nova Expedition and Amundsen’s South Pole Expedition.

In 1912 the race for the Pole was both won and lost after which interest began to fall away quite rapidly. There are already many metres of bookshelves devoted to these expeditions and there will be even more by the end of 2012. Are they all really necessary or did the trees die in vain?

Edward Larson has approached his book through an analysis of the contribution that these expeditions made to science. He is certainly not the first to take this focus but it has proved a much less travelled road than the one on the gallantry and endurance of our Antarctic explorers. The history of Antarctic science by Tony Fogg (1992) was an account written by a scientist for scientists. It tried to be all-encompassing and is replete with technical terms. This book is very different – restricted to just the three British expeditions of Scott and Shackleton and written by an historian for a much wider public.

I must first take exception to his statement on the first page of the Preface that “in the era before World War I, when Antarctic exploration was largely a British project...” which simply appears to ignore Nordenskjöld’s Swedish Expedition, two French expeditions lead by Charcot, De Gerlache’s Belgian expedition and the first German expedition headed by Erich von Drygalski. How was this largely a British project? Leaving that aside how has he treated the British material?

To try and avoid going over the same ground several times he has opted to address the activities by science subject rather than by expedition, so we have chapters on magnetism, oceanography, zoology, geology and glaciology. In most cases he interweaves comments on the science with a retelling of the activities of the expedition. A great deal of this will be very familiar to Antarctic aficionados as it comes from the published accounts; indeed his use of original manuscript material is very limited although he does use quite a few contemporary newspapers to provide a different view of events.

Larson describes very clearly how the tensions between the Royal Society and the Royal Geographical Society over the remit and leadership of the Discovery Expedition were exploited by Markham to ensure that Scott was put in charge. Since JW Gregory then withdrew the expedition lost its scientific leadership and a great deal of expertise that Scott did not manage to fully replace. The original programme by the Royal Society was focussed on magnetism but also took account of the geology and meteorology about which there were major questions. In the event the meteorological data collected by Lt. Royds proved much less satisfactory than expected as he had no formal training in this, although the Antarctic Manual prepared for this expedition by the Royal Society gave meticulous details on how various aspects of polar science had previously been approached. Despite the discovery of the Dry Valleys by Scott and the collections of rocks and marine specimens so much more could probably have been achieved with an experienced professional scientist

as a leader. However, both Shackleton in his Nimrod Expedition and Scott in the Terra Nova Expedition learnt from the mistakes of the first expedition and made major scientific discoveries of lasting value. Both had better scientific staff and better equipment and even Shackleton, whose personal enthusiasm for science was not great, recognized that pursuing new knowledge was essential. The findings of the fossil *Glossopteris* leaves, the fossil fish at Granite Harbour, and the coal seams all proved that the Antarctic climate had been greatly different back to the Cambrian and that the continent had been connected at some point to the other southern continents. The collections of marine organisms, although often badly damaged, showed just how much life there was in the cold waters whilst the studies on the emperor penguins by Wilson provided new insights into the way animals had adapted to the extreme climate and killed the theory that penguin eggs would show the developmental aspects of the evolution of birds from reptiles. Bernacchi's gravity measurements allowed calculation of the exact shape of the southern end of the globe whilst the magnetic measurements allowed calculations of the movement of the magnetic pole. Debenham and Priestley made detailed studies on glaciers and the ice shelf whilst Taylor measured the air content of snow, its rate of compaction to ice and the way in which sea ice formed, effectively starting the science of glaciology in Antarctica. On the Nimrod Expedition James Murray's studies on freshwater lakes and pools provided unexpected biodiversity in such challenging habitats and Douglas Mawson began an illustrious career as an Antarctic geologist.

The building blocks in Antarctic geology, glaciology and zoology are all traceable to these early expeditions and Larson makes it clear that whilst achieving the Pole was a major objective of all three expeditions, science was equally important. What for me is missing here is a more detailed recognition of the importance of the science in the next 50 years before IGY started a new and more widespread interest in Antarctica. How did the *Glossopteris* find resonate with Wegener's continental drift theory? What did the discoveries on biodiversity mean for the biologists? How did the magnetic data influence thinking by the physicists? And what effect did the studies on ice have on the development of glaciology? None of these questions are answered, which I feel is a missed opportunity. In his Epilogue he very briefly comments on the later careers of many of the key players - again a chance was missed to show how Debenham's experience was put to use through the establishment and development of the Scott Polar Research Institute, little mention is made of how Taylor developed geography as a major discipline, how Wright became Director of Naval Research and Simpson became Director of the Meteorological Office, or indeed of Priestley's illustrious career in university administration. These Antarctic scientists were for the most part very talented young men who went on to major achievements. You would not conclude that from this book.

Larson writes at considerable length about the origins of the RGS, exploration in Africa and other more general features of the time to give an historical background. Whilst some will wonder at just how far away from Antarctica some of these digressions are I am sure many readers will find this helpful in understanding the questions of why the RGS was so obsessed with the Pole, why Scott opted for man hauling, and how the disasters in South Africa with the Boer War made heroic Antarctic achievements even more publically important. Yet I still feel the author has filled many pages with material that is already well known but has not provided the evidence for how the science data and specimens were used and interpreted. The book is certainly well written and although for me it contained little that was new for many readers the material in obscure reports and newspaper accounts will be novel as will the highlighting of the science undertaken.

DAVID WALTON

Reference

Fogg, G.E. 1992. *A history of Antarctic science*. Cambridge: Cambridge University Press, 483 pp.

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Globalizing polar science: reconsidering the International Polar and Geophysical years

R.D. Launius J.R. Fleming & D.H. DeVorkin
Palgrave Macmillan, New York, 2011
ISBN 978-0-230-10533-1. 400 pp. £19.99

This book is the outcome of an interdisciplinary conference at the Smithsonian in 2007 to mark the 50th anniversary of the IGY. Quite why it has taken four years to reach print is not clear but it has certainly been worth waiting for. The nineteen chapters are an attempt to address some broad and difficult questions as far as the Polar Years are concerned - how are science and technology related, what were the political and military consequences especially of IGY, what effect did these major international efforts have on the development of key science areas and what can we learn from them about the pursuit of scientific goals?

Organized into five sections the first is of four chapters on historiography. Putting the polar activities into a more general context of the history and development not only of science but of political structures is crucial in gaining perspective. For example, although Weyprecht is credited with developing the concept of the international polar year Rothenburg shows, in Chapter 2, that international