accomplishments. The first of these occurred in March 1908, when, immediately after setting up their base, a party of six Antarctic novices left to make the first ascent of the active volcano Mount Erebus (with five actually reaching the summit). The next October – after the long, dark winter – a pair of small parties set out on two of the most remarkable journeys in Antarctic history, either of which would have established the expedition as one of the most successful exploratory efforts ever in the far south.

The Northern Party – consisting of the famous Australian geologist T.W. Edgeworth David, his protégé Douglas Mawson, and the Scottish surgeon Alistair Mackay – man-hauled more than 1250 miles (counting relaying) along the coastal ice of Victoria Land, across the Nordenskjöld and Drygalski Ice Barriers, up a heavily crevassed series of glaciers to the Antarctic Plateau, and then across that barren plain, to become the first men to reach the vicinity of the South Magnetic Pole. Meanwhile, the Southern Party of Shackleton, second-in-command Jameson Adams, surgeon Eric Marshall, and Frank Wild – accompanied initially by four Manchurian ponies – headed towards the southernmost place on Earth. They crossed the Great Ice Barrier, discovered and ascended the Beardmore Glacier, and continued across the heart of the Antarctic Plateau until, running out of food, they had to turn back when only 97 geographical miles from the South Pole. Like the Northern Party, they somehow overcame all the obstacles that promised disaster on the way back, and managed – pushed by the indomitable will of Shackleton – to arrive back just in time to catch *Nimrod* before she abandoned them and sailed north.

This reviewer's own work, *Nimrod* (Riffenburgh 2004), was the first book in almost a century (since Shackleton's *The heart of the Antarctic* in 1909) to tell the full tale of the BAE, from its haphazard organisation to its incredible feats of endurance. But Wilson's new book brings a whole new dimension to the story by compiling a stunning set of photographs detailing every aspect of the expedition, from when *Nimrod* first sailed up the Thames for an overhaul that would make her sea- and ice-worthy, until, suddenly world-famous, she returned to England to serve as a floating exhibition highlighting one of the greatest adventures of the era. In between, accompanied by a succinct but thorough text, is a feast of photography and artwork that adds immeasurably to the understanding of many aspects of the expedition: the voyage to the south, the establishment of the base, the ascent of Erebus, the confined winter, and the struggles and triumphs of the sledging parties.

Some readers will be familiar with a number of the photographs – a large selection coming, of course, from the picture library of the Scott Polar Research Institute. But many of the images have never been published before, Wilson having painstakingly tracked down numerous photos, sketches, paintings, and maps from different archives or from the descendents of the members of the expedition. Not the least significant of these are a series of full-colour paintings by George Marston, the expedition artist, showing, amongst other things, *Nimrod* exploring in the ice, scenes from Cape Royds, and the beauty and mystery of the Antarctic winter. Wilson also spent many laborious hours identifying photos and illustrations that either had no information supplied with them or, when there was more than one copy, had conflicting information; this was a scholarly contribution that is much appreciated.

Both Wilson and his long-time publisher, Nick Reardon, should be congratulated on such an informative, well-produced book. It is a valuable and greatly enjoyable addition to the literature about the exploration of the Antarctic, and should find a place on the bookshelf of every polar enthusiast. (Beau Riffenburgh, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

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GEODYNAMIC EVOLUTION OF EAST ANTARCTICA: A KEY TO EAST-WEST GONDWANA CONNECTION. M. Satish-Kumar, Y. Motoyoshi, Y. Osanai, Y. Hiroi, and K. Shiraishi (Editors). 2008. London: Geological Society (Geological Society special publication 308), 464 p, illustrated, hardcover. ISBN 978-1-86239-268-7 £100.
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The book has 22 chapters by independent contributors. It has a seven page index and a preface. Publication of this book is a part of the Japanese contribution to International Polar Year 2007–2008. The main geographical area of interest of the book is the Neoproterozoic and Palaeozoic geology of the area of east Antarctica from 0° to 60° E extending along the coast from the Napier Complex of Enderby Land in the east, to west and central Dronning Maud land in the west, broadly centred on the Japanese Syowa station.

The book opens with a broad introduction by Satish-Kumar and others that sets the scene for the contributed chapters, although there does not appear to be any particular way that these are laid out. The opening chapter is largely organised geographically and it would have been useful if the rest of the book had been structured along similar lines. The main scientific focus is the late Neoproterozoic to early Palaeozoic history of east Antarctica and how it reflects the events that led to the final amalgamation of east and west Gondwana, but also looking at the older Archaean and Palaeo-Mesoproterozoic rocks that were affected. Of particular importance is the relatively recent discovery of the Lutzow-Holm Bay early Cambrian mobile belt. This preserves considerable detail from the time of final Gondwana amalgamation and marks a move away from stabilist, cratonic interpretations of east Antarctic evolution in the post-Mesoproterozoic. As the authors point out, Antarctica is in a unique position globally in that it has very little subducting margin and has been tectonically isolated largely since the Mesozoic. This has kept much detail of earlier orogenic events in, as they describe it, a kind of tectonic 'cold storage' without subsequent overprint.

Geophysical insights into the sub-ice crustal structure of east Antarctica have in some cases presented structural possibilities at odds with the geological interpretation from surface rocks and this is summarised by Satish-Kumar and others in the opening chapter. Detrital mineral studies are also providing new information from beneath the ice and it is anticipated that sub-ice sampling may be possible in the future using ice drilling technology. Satish-Kumar and others identified several areas in east Antarctica that are important scientifically not just from the point of view of understanding the interaction between the former parts of Gondwana during amalgamation, but also, to name but a few, from the point of view of understanding the driving mechanisms and effects of ultra-high-temperature metamorphism and deep crustal processes in the Archaean and Proterozoic. New microprobe techniques are discussed that have the potential to provide significant new insights into high grade terranes in the future, with the potential for sub mineral scale studies of composition, geochronology, geothermometry and isotopes.

East Antarctica formed as a collage of three distinct Mesoproterozoic provinces: the Wilkes (1330–1130 Ma), the Maud (1090–1030 Ma) and the Rayner (990–900 Ma). This book deals specifically with the western Rayner province, including the Archaean Napier Complex, and the eastern Maud province. The three early chapters by Shiraishi and others, Jacobs and others, and Grantham and others provide a broad overview of the geochronological control, magmatism and tectonic events in Dronning Maud Land, Africa and Sri Lanka associated with this amalgamation and are essential reading for workers interested in these topics. The extent of Neoproterozoic orogens extending from Dronning Maud Land to western Australia is comparable to the Alpine-Himalayan chain, although low T-high P rocks are absent.

A considerable portion of the book is devoted to the Archaean Napier complex in Enderby Land. This is unique in Antarctica in being entirely composed of high-temperature granulites. The 3850 Ma tonalitic granulites are some of the oldest rocks in the world. The various Japanese Antarctic Research Expedition visits to the Napier Complex are reviewed in this book in the chapter by Ishizuka. Knowledge of the Napier and Rayner complex regional structure comes mainly from the Russian Soviet Antarctic Expedition and extensive geological mapping by the Australian National Antarctic Research Expedition in the 1970's. The chapter by Toyoshima and others builds on this early work to generate a regional form line map of the regional macroscopic structure. The elastic and seismic properties of lower crustal rocks in Enderby Land and Dronning Maud Land are reviewed and summarised by Ishikawa and others. in the only geophysical chapter in the book. It is notable that the Napier Complex has experienced ultra-high temperature (UHT), metamorphism in Neoarchean and Panafrican times, with temperatures up to 1150° C over a large area, and Hokada and others argue that this is on a scale not seen anywhere else in the world. Kawasaki and Osanai have developed a titanium-in-quartz geothermometer and tested it on UHT metamorphic rocks from Enderby Land. The chapter by Sato and others shows the value of Fe-Mg partitioning between orthopyroxene and spinel in UHT granulites for determining closure temperature of the system post-peak metamorphism. Understanding the behaviour of fluids is of key importance in UHT metamorphism, particularly where melting does not occur. The chapter by Tsunogae and others indicates that in Enderby Land CO_2 bearing fluids transported heat and inhibited melting reactions. Swarms of dykes have been emplaced at multiple times in Enderby Land, as summarised in the chapter by Susuki and others most notably mantle-wedge-derived dykes in the Palaeoproterozoic and ocean island basalt affinity dykes in the Mesoproterozoic (this second episode coinciding with Umkondo LIP emplacement in Dronning Maud Land). Early Palaeozoic pegmatites and associated metasomatism are also abundant and Carson and Ague argue that the ultimate source is underplating of sedimentary rocks during convergence between the Rayner and Napier complexes.

The Lutzow-Holm Complex is a relatively newly identified late Neoproterozoic orogenic belt significant for understanding of the final collision between the blocks that came to form Gondwana and receives detailed treatment in the book. The complex contains rocks of oceanic and potentially ophiolitic origin which are treated in the chapters by Suda and others and Kawakami and others. The complex was affected by UHT metamorphism in latest Neoproterozoic times, as described in the chapters by Yoshimura and others and Goto and Ikeda, and the chronology of events post-peak metamorphism is reviewed in the chapter by Miyamoto and others. In the second Satish-Kumar and others chapter of the book, the authors use a combination of geochemistry and isotope techniques to determine the likely age of deposition of high grade marble units in the Lutzow-Holm complex, which they estimate was between 830–730 Ma, probably in the Mozambique Ocean. Cape Hinode on the Prince Olav Coast is unusual in that it preserves Grenvillian ages only. The chapter by Hiroi and others presents evidence that this may represent an allochthonous block emplaced during the waning stages of the amalgamation of Gondwana. The major zircon age populations in the Cape Hinode block are more comparable to the Maud province to the west rather than the nearby Rayner complex.

The Sør Rondane Mountains are divided into a NE and SW terrane by a major ductile shear zone. The implications of new geochronological results for the evolution of the Sør Rondane Mountains are treated in some detail in the chapter by Shiraishi and others who suggest that following crustal formation in the Mesoproterozoic the northeast and southwest terranes were juxtaposed around 570 million years ago under amphibolite facies conditions. Considerable further work remains to be done on this terrane.

Central Dronning Maud land has a clear Grenvillian tectonothermal history overprinted by Panafrican and post-Panafrican tectonothermal events between 560 and 490 million years ago, which was associated with voluminous granitic magmatism described in the chapter by Jacobs and others. The Grenvillian tectonothermal event has been linked with emplacement of a Mesoproterozoic large igneous province. A two-stage collision model involving an initial arc-continent collision followed by a continent-continent collision has been proposed for Central Dronning Maud Land. In the current volume Baba and others use metamorphic data to identify coastal parts of Central Dronning Maud Land with histories that can be linked to south-east Africa, that is in west Gondwana, whereas inner mountain regions have affinities that link them to east Gondwana. Owada and others also present geochemical data from post-tectonic mafic dikes which they also interpret as indicating the location of a suture zone separating east and west Gondwana between Central Dronning Maud Land and the Sør Rondane mountains.

There are some minor weaknesses of this volume. The terms 'east' and 'west' Gondwana, are subdivisions that resulted from break-up of the supercontinent. There is a growing body of

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evidence to suggest that Gondwana may have amalgamated from three, rather than two multi-craton blocks in the late Precambrian and early Cambrian, with several more minor additions. The focus on interactions between east and west Gondwana is, in a sense, slightly outmoded. Secondly, there is little mention of globally expressed Late Mesoproterozoic large igneous province magmatism (c 1100 Ma), locally expressed as in Dronning Maud Land and southern Africa as the Umkondo LIP, which is recognised as a major contributor of heat to western Dronning Maud Land. Finally, there is a lack of chapters on key tectonic blocks, in particular the Rayner complex and Yamato-Belgica complex. On the other hand, the regional focus of the book is transcended by the potential significance for understanding of crustal evolution of the large areas of UHT metamorphism and the evidence for carbonic fluid fluxing and heat transport. Overall this volume is a treasure trove of new data and the many reviews that make up its chapters make it an essential reference work for those interested in the evolution of east Antarctica, processes of crustal formation and evolution, and also the early stages of the formation of Gondwana. (Alan P.M. Vaughan, Geological Sciences, British Antarctic Survey, High Cross, Madingley Rd., Cambridge CB3 0ET.)

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