

Book reviews

Recent Progress in Antarctic Earth Science Proceedings of the Sixth International Symposium on Antarctic Earth Sciences, held at National Women's Education Centre, Ranzan, Saitama, Japan, September 9–13, 1991.

Edited by Y. Yoshida, K. Kaminuma & K. Shiraishi
Terra Scientific Publishing Company, Tokyo (1992).
796 pages. \$299.00 ISBN 4 88704 109 8.

This volume consists of one hundred papers from the two hundred and sixty-four presentations given at the Sixth International Symposium on Earth Sciences held in Japan in September 1991. The papers selected cover a wide range of topics covering all parts of Antarctica including subantarctic islands. They are grouped by general subject area into seven sections as follows: 1. Crustal evolution: East Antarctic shield (23 papers); 2. Crustal evolution: Transantarctic Mountains and West Antarctica (13 papers); 3. Syn- and post-breakup of Gondwana (13 papers); 4. Recent tectonics of Antarctic Peninsula and subantarctic Regions (9 papers); 5. Terrestrial geophysics (7 papers); 6. Marine geology and geophysics (7 papers) and 7. Cenozoic geology and geomorphology (18 papers). The volume concludes with an adequate index.

The first of these sections has papers covering various aspects of crustal evolution with six of them being concerned with the Sor Rondane Mountains. The 13 papers in Section 2 range from the stratigraphy and sedimentology of vertebrate-bearing Triassic beds to metamorphic facies of the Ross Orogeny in northern Victoria Land. Topics covered in Section 3 range from late Cretaceous and Eocene palynofloras from the Fildes Peninsula, King George Island (South Shetland Islands) to apatite fission track evidence for contrasting thermal and uplift histories of metamorphic basement rocks in Western Dronning Maud Land. Section 4 is dominated by papers relating to areas around Deception Island and King George Island with one paper relating to long-range sidescan sonar of the Antarctic Peninsula Pacific margin. Seismics, gravity studies and magnetics all get coverage in Section 5 on terrestrial geophysics. Section 6 is relatively short and includes papers on the Ross Sea, Wedell Sea and one on the ANTOSTRAT Project involved in Cenozoic history, glaciation and sea-level change in Antarctica. The final section of 18 papers covers a wide range of topics including the modelling of the bathymetry of the Antarctic continental shelf and the satellite data processing of Victoria Land.

Volumes of this nature have a reputation of often taking a long time to appear and of being little more than a collection of unrelated papers set between a single set of covers. In this

case the editors are congratulated for getting the volume into print remarkably quickly and, as far as is possible, of having edited the papers so that there is some coherence to the volume. Though in places the English is a little unusual, there are no places that the reviewer has found where its meaning is obscure, and there are remarkably few typographical errors - no mean feat bearing in mind that the editorial team, the printers and the publishers are all non-native English speakers. The average length of the contributions is a little over seven and a half pages and it has to be said that none is set to become a classic. One suspects that all of the more significant papers presented at the meeting have already been published in scientific journals where they will undoubtedly get better exposure to the scientific world. The volume does, however, provide a vehicle for the documentation of new information and interpretation of data relating to Antarctica and as such will be useful and should be held in libraries of all major centres of earth science research.

C.P. HUGHES

Shallow Subduction Zones: Seismicity, Mechanics and Seismic Potential

Edited by R. Dmowska & G. Ekström
Birkhauser Publishing Ltd, Basel (1994).
240 pages. £17.00. ISBN 3 7643 2963 7.

This book is a companion volume to Part I published in 1993. Both volumes consist of 15 articles, reprinted from issues of *Pure and Applied Geophysics* (PAGEOPH) which appeared in 1993 and 1994. The articles consist mainly of studies of large shallow earthquakes in the circum-Pacific earthquake belt.

The first part of this volume opens with a paper by Gu *et al.* demonstrating systematic differences between some selected subduction zones as to how the plate motion is partitioned between displacements along the thrust plate interface and the forearc and backarc regions. From a study of outer rise earthquakes, Liu & McNally find that the mean tangential load over a 125–200 km region ranges between 166–671 bars for the Tonga, the New Hebrides, the Kuriles and the Kamchatka subduction zones, which is compatible with that estimated from thermal-mechanical models. Seismicity of subduction zones from local and regional networks is studied by Kisslinger, with spatial and temporal configurations of earthquakes and their physical interpretation being discussed. Unfortunately, the data from the regional networks, which is not easily available to scientists all over the world, is not included in table form in the paper. A detailed study of the aftershocks of the $M_s = 6.9$ April 25, 1989 San Marcos, Guerrero, Mexico using data from a portable network deployed

after the event, is presented. The occurrence of this event in a mature seismic gap, together with the previous history of large earthquakes in the region, suggests the possibility of occurrence of a large earthquake covering both this gap and the adjacent Guerrero gap. Using a time-predictable model, Papadimitriou estimates the probabilities of earthquakes of $M_s > 7.5$ along the Central and South American subduction zones in the period 1992–2002 and shows that large events are very probable in the Oaxaca and Chiapas regions of Mexico and in southern Peru. By studying the spatial and temporal changes in seismicity in the southern Peru and the northern Chile seismic gaps, Comte & Suarez attempt to estimate the maturity of these gaps but demonstrate that currently observed differences in the distribution of stresses and seismicity are not sufficient to come to any conclusions on this. From an analysis of P and SH body waves and relocated aftershocks of the October 20, 1986 Kermadec earthquake ($M_w = 7.7$), Houston *et al.* suggest that this event occurred due to the process of segmentation of the subducting Pacific plate at the Kermadec/Tonga trench near its intersection with the Louisville Ridge. Xu & Schwartz study large earthquake pairs in the Northern Solomon subduction zone.

The second part commences with a study by Johnson *et al.* of great March 9, 1947 Aleutian earthquake, the third largest earthquake this century and with the longest aftershock zone of 1200 km ever recorded. This is the most comprehensive study of this event to date and gives the main source parameters such as seismic moment, fault area, etc. for this earthquake. This is followed by two papers on the great 1964 Prince William Sound, Alaska event, known also as the Good Friday earthquake. Christensen & Beck present a seismological study and Sauber & Holdahl a geodetic inversion for this devastating earthquake. The theme of Alaska-Aleutian events is continued in the next paper by Bufe *et al.* where the seismicity trends and potential for large earthquakes are analysed. Ruff & Miller study the rupture process of great earthquakes along the Mexican subduction zone. McCaffrey discusses the deviations of slip vector azimuths from expected plate convergence directions for thrust events for major trenches and shows that for the great subduction zone earthquakes, this deviation is small. Finally, Barrientos investigates the casual relation between the May 22, 1960 Chilean earthquake of $M_w = 9.5$ and the occurrence of a volcanic eruption 48 hours after the earthquake, the volcano being situated above the rupture zone of the earthquake.

The book is useful for scientists interested in recent studies of large shallow subduction zone earthquakes and who do not have access to PAGEOPH. The only problem I had was that I found that the list of references was rather incomplete in many papers, this being particularly true for some papers dealing with broad discussions of many subduction zones.

S. DAS

High Latitudes — A History of Swedish Polar Travels and Research

G H Liljequist

Swedish Polar Secretariat, Stockholm. (1993).

60 pages. £37.00. ISBN 91 7886 1020.

All the well known histories of polar exploration in English are written by either British or American authors. The background for these is nearly always the existing English language literature and there is usually little evidence of much original research into polar documents in languages other than English. This is a shame, but understandable, since considerable amounts especially of Arctic documentation, are in Russian or the Scandinavian languages. For this reason, many of the major Russian or Scandinavian expeditions are dealt with in a relatively scanty manner. This book very firmly redresses the balance at least for Swedish polar activities.

This is truly a *magnum opus* of over 600 pages printed on high quality paper and very well illustrated with half tones and drawings. It is not a book to read from cover to cover, but one to dip into and discover, in much more detail than was previously possible, the complete story of many of these expeditions. In fifty chapters the author takes us from 1729 through to 1990. He deals not only with the well known expeditions to Spitzbergen, Greenland and the voyages through the North-East passage but also with the less well known explorations in the Canadian Arctic archipelago, Siberia, and the Barents Sea. In each case he gives both a detailed account of the planning and activities and describes the science achieved. The reference list of eleven pages in small type gives access to a very large number of papers and books in Swedish that have never been translated.

What of the Antarctic component? He deals in detail with the preparations for Otto Nordenskjöld's expedition in 1901–1903 and adds significantly to what I knew about it by utilizing material from the untranslated accounts by Andersson and Duse. In setting the scene for this he reveals that it was originally to be led not by O Nordenskjöld but by A E Nordenskjöld's son, Gustaf. It was only the untimely death of Gustaf that allowed the appointment of Otto. He also provides interesting information about the proposed Anglo-Swedish Antarctic Expedition planned for around 1914 which failed because of the First World War. His account of the Norwegian/British/Swedish Antarctic Expedition 1949–1952 does not add a great deal to what is already available in English but it does set this particular expedition in the continuing context of Swedish interest in polar research. The book ends with the establishment of Sweden back in Antarctic research as a member of the Antarctic Treaty and a member of SCAR.

I have nothing but praise for this volume and the efforts of the Swedish author. There are very few grammatical errors or spelling mistakes in the volume, the text reads extremely

well and the detailed documentation shows just how dedicated the author's researchs have been. Such a volume, I am sure, could be produced for Norwegian activities in polar research but to the best of my knowledge has not yet been. This firmly indicates both the importance of the polar regions to Sweden and its continuing contribution to exploration and scientific investigation both North and South.

D W H WALTON

The Biology of the Southern Ocean

George A. Knox

Cambridge University Press, UK (1994).

444 pages. £90.00 ISBN 0 521 32211 1.

Reviewing a book of this size is not accomplished over a few week-ends and I admit with some guilt that it took me much longer to read than I had anticipated and intimated to the editor of this journal. While ploughing my way through this mine of information, I was constantly impressed by the magnitude of the task undertaken by the author. Not only is my own field of interest (plankton) very well covered but I gained the impression that this comprehensive coverage extends to all the other aspects of Southern Ocean biology as well. Indeed, I was unable to guess the author's field of specialization from the contents of this work. This is a compliment and George Knox is to be highly commended for the service he has rendered all biologists working, or intending to work, in the Southern Ocean.

The bulk of this book consists of a review of almost all of the papers published on Southern Ocean biology up to 1991/92, including translations, reports and "grey literature". About 2000 publications have been cited, and as far as I could judge, the various messages have been distilled and presented in an easy-going writing style. When dealing with conflicting opinions, the author has avoided taking sides; controversial issues – such as the great "iron debate" – have barely been highlighted as such. The book is intended to "provide an invaluable and comprehensive reference covering all aspects of this important ecosystem". This aim has been met although the frequent literature references – sometimes 20 or more in a row – do tend to interrupt the flow of thought.

There are 18 chapters in the book, all of them exhaustively referenced and chock-full of information. The first chapter introduces the physical setting and is followed by 10 chapters devoted to the major ecosystem components ranging from phytoplankton and primary production, through sea-ice communities, zooplankton, krill, nekton, fish, seals, whales, birds and, finally, to benthic communities. For each of these ecological and systematic groups, species composition, distribution and salient features of organism biology are described with particular reference to specific adaptations to life in the Southern Ocean.

The descriptive chapters provide the basis for the next four which address processes and their interactions in various regional and seasonal settings. The first two deal with fast ice and ice shelves and with ice-edge processes and are both up-to-date syntheses of what is known to occur in these regions. The third chapter is concerned with the recent "paradigm shift" that has occurred in pelagic ecology, viz. our new understanding of decomposition and the roles of bacteria and protozoa. These organisms are missing from the introductory chapters and have been dealt with here, presumably because the author has had to draw on studies conducted far afield from Antarctica in order to paint a picture of what is probably going on in the Southern Ocean. The final chapter of this section is on ecosystem dynamics and represents a brave attempt to compile the contents of previous chapters into a coherent whole. The author uses the circuit diagrams of Odum – so popular in the seventies – to construct conceptual frameworks of interactions between organisms and their environment. Having myself become disenchanted with the usefulness of Odum circuitry in conveying structure and dynamics of ecosystems in an adequate manner, I was not very impressed with the outcome. However, one can skip the diagrams as there is plenty of other valuable information compiled here. Surprisingly, benthic ecology is not included in this chapter and I can well imagine that at least some benthologists will feel they and their respective fields have not been adequately represented.

The final four chapters deal with i) resource exploitation, ii) ecosystem changes resulting from resource exploitation, iii) management of the living resources and iv) current challenges in the form of an epilogue. Although treading an emotionally charged territory the author gives a dispassionate survey of the history of exploitation and summarises current thinking on the subject. The first three chapters provide an enlightening summary for "basic biologists" like myself who have a vague perception of the problems that organisations like CCAMLR are grappling with but who are not really aware of the details and the underlying rationale. These chapters highlight the unique status of the Southern Ocean where scientists conducting basic research are also involved, to at least some extent, in the formulation of resource management policy. Hopefully, this status will not only be maintained but will, in due course, set an example to management of living resources in other oceans. In Knox's words: "We cannot allow the world's first ecologically-based living resources management regime to fail." Come on CCAMLR, go for it!

The opening pages of the last chapter, titled "Epilogue" contrast with the style of the rest of this book as there are no references and the author voices his own opinions including the above quote. Progress made in our understanding of Southern Ocean biology in the course of the last three decades is listed and some of the many gaps still to be filled are pointed out. Knox sticks his neck out with his assertion that there is little, if any, scientific justification for the term

“fragile” which is often used to describe Southern Ocean ecosystems. I share his opinion that they “are actually rather robust”. He next deals with the role of the Southern Ocean in the current global change scenario and reviews work done so far on the impact of the ozone hole, although another challenge in the offing – the growing tourist trade – has only been mentioned in passing.

The final pages exhort the Southern Ocean scientific community to get their act together and continue integrated, international research ventures in the tradition of the successful BIOMASS programme. The SCAR/SCOR sponsored programme “Ecology of the sea-ice zone (EASIZ)” is identified as its logical successor. Although EASIZ can indeed be accused of foot-dragging, the good news is that another international programme, the Joint Global Ocean Flux Study (JGOFS), is already active in the Southern Ocean with several studies successfully accomplished since 1992 and with more to come. Furthermore, the Southern Ocean branch of the international programme “Global Ocean Ecosystems Dynamics”(SO GLOBEC) which focusses on zooplankton and their predators, has just drawn up its science implementation plan and will commence the first field studies within the next few years. Much as I would like to see a second edition of Knox’s book, I doubt whether, five years from now, a single author could continue to do justice to the wealth of information already in the pipeline and about to be harvested.

In a single-authored book of this size, errors will be inevitable but the number of spelling mistakes (typos in today’s jargon) is inexcusable. There are so many that I stopped correcting after a few pages. Some are howlers such as on the back cover: “...an ocean which supports a teaming array of life...” others are less funny but more conspicuous, such as “mist” instead of “most”.

Names suffer the worst treatment, sometimes consistently such as “Siebruth” instead of “Sieburth”. Even a name on the Editorial Board has been misspelled (Dewry instead of Drewry). Evidently, the final version was not proof-read. There are also some real errors and oversights: at the top of page 27 it is stated that “a positive correlation between phytoplankton production and levels of magnesium and molybdenum” were found. I could not check as the reference is from an inaccessible Russian translation but I assume that manganese and not magnesium was actually meant. The figures representing characteristic species of phytoplankton, protozoa and zooplankton have no size scales and *Prorocentrum*, (n) in Fig. 2.3, is called *Procentron*. On page 5 it is stated that “No ice is found north of the Ross Ice Shelf at this time” (during the summer minimum), yet on the next page, a figure redrawn from Knox (1984) depicts a sizeable area of ice in this locality in March. However, these are minor errors and I recommend this book to all those for whom the author toiled, viz. “those with a serious interest in Antarctic research, conservation and management”.

VICTOR SMETACEK