Antarctic Science 13 (2): 221–223 (2001)

Book Reviews

The Ozone Layer

Maureen Christie
Cambridge University Press (2001).
227 pages. £40. ISBN 0 521 65072 0 (hardback) ISBN 0 521 65908 6 (paperback)

This book is one which all proponents and opponents in the current 'Greenhouse Warming' debate in particular and scientists in general should read. The subject of the book revolves around the discovery of the Antarctic ozone hole, however the lessons from the story apply to many other areas of science and it is worth taking a step back from the detail of one's own work and looking at its philosophical aspects. Maureen Christie does just this in her book.

In the case of the ozone hole Christie argues that it was not the discovery of the ozone hole that proved that mankind had changed the atmosphere of our planet by the addition of seemingly inert chemicals. Rather it was the follow up research led by NASA in the Airborne Antarctic Ozone Experiment, which on one particular flight demonstrated a beautiful inverse correlation between chlorine monoxide and ozone. This was not a direct prediction of any of the theories in existence at the time, even those involving chlorine chemistry. Christie argues that the observation was more a falsification of the antithesis of the chemical theory, i.e. 'Chlorine chemistry is not responsible for ozone destruction'. Because there clearly was a link between ozone destruction and chlorine monoxide it became almost universally accepted that chlorine from CFCs was responsible for the ozone destruction.

There is much more to the book than this. It provides a dispassionate account of the scientific history of the ozone layer from the discovery of ozone in the nineteenth century to the close of the twentieth century. It then looks at how proof of scientific theory works in practice, using the ozone hole as an example and even covers some of the emotional rhetoric of those who were not swayed by the scientific argument. Today there are still a few people who argue that CFCs are not the cause of the Antarctic ozone hole, and there are many who argue that releases of "greenhouse gases" by mankind will not produce global warming. Christie's book gives some insight into how the arguments could be marshalled in order to provide a convincing resolution to the debate.

As with most books, there are one or two errors, but these are mostly small and the typesetting is generally good. Two errors stood out to me: Weather circulation does not mix gases in the troposphere (page 32) and Dobson did not visit Antarctica in 1956/1957 (page 46). One or two figures are rather poorly presented. For those not familiar with the philosophy of science there are points in the book where the going becomes rather heavy, but the effort is worth it. There is also a certain amount of repetition, almost as if the book was required to be a certain length.

Taken as a whole the book is a valuable addition to the literature. For the general student there is a simple description of the scientific background to ozone layer theory, for the historian the discovery of the ozone hole is put into perspective and for all scientists there are some thought provoking ideas on the mechanism of scientific debate.

JONATHAN SHANKLIN

The West Antarctic Ice Sheet: behavior and environment

Edited by Richard B. Alley & Robert A. Bindschadler
Antarctic Research Series volume 77, American Geophysical Union, Washington (2001).
294 pages. Price ($65 AGU members $45.50). ISBN 0 87590957 4.

For much of the last two decades, the West Antarctic Ice Sheet has been seen as a something of a Sword of Damocles - a bucket of ice propped atop the door of the world, which might, with a relatively minor push, spill up to six meters of sea level rise into the world's oceans. If the base were to warm slightly, if the ice shelves braking it were to become a bit smaller, we thought, then a catastrophic acceleration might begin, outpacing all other contributors to sea level. The time scale for this runaway behaviour might be as short as two centuries, instantaneous by geologic standards. Of course, even at the start, opposing, stabilist views countered the cataclysm. But the debate centred on this simple, profound scenario.

With this book, comprised of 16 papers whose authorship spans nearly all researchers involved in the subject, the Antarctic scientific community acknowledges a maturing of this perception. It depicts an ice sheet that, while capable of very dynamic behaviour on a large scale, is better imagined as a complex of several independent glacial basins, often acting not in concert but in competition. The papers outline a growth in understanding of all the components of the problem: glacial and climate history, fast flow onset areas, the physics of ice shear margins and the basal zone, geologic controls, modelling, and the current patterns of change in the ice sheet. Ice Stream B is now slowing, but may recently have been moving much faster; Ice Stream C may have been stopped a century and a half ago by some effect of B's existence or growth. Taken as a whole, the glaciers draining the Ross side of the ice sheet are nearly in balance, and drawdown on this side of the ice sheet

appears to have slowed considerably or stopped in the last few millennia.

Did the stabilists win the debate? In fact, the nature of the debate has changed. Now we seek to resolve each outlet glacier in detail, recognizing each one as complex in its own right. As if on cue, a paper published just after this book became available identifies one basin, the Pine Island Glacier catchment, as rapidly thinning, and possibly starting down the runaway path once envisioned for the whole ice sheet.

Two advances in particular, acknowledged directly or indirectly by several of the authors, wrought these changes in perception. One is the development of more sophisticated numerical models; the other is the advance in remote sensing. Numerical modelling now has the ability to tackle any aspect of ice sheet physics or climatology. We no longer go from observation to interpretation without insisting that numerical modelling be there to validate the ideas explored. Of course, this change, while remarkable, is a natural outgrowth of better, more spatially continuous, observations; here is where remote sensing has made an astounding improvement. Grids of data undreamed of just 15 years ago now plaster the map of the continent, telling us speed, topography, bed elevation, internal layering, firn properties and more, to high precision.

This volume is a vital one. Its completeness in treating all aspects of the subject, and the quality of the individual papers, marks it as an important summation. But it is also a turning point in Antarctic glaciology. It will be an important reference for all further study.

TED SCAMBOS

The Liverwort Flora of Antarctica

H. Bednarek-Ochyra, J. Váňa, R. Ochyra & R.I. Lewis Smith
Polish Academy of Sciences, Institute of Botany, Cracow (2000).
xvi + 236 pages, 96 figures including 20 colour photographs. Price US $35. ISBN 83-85444-74-2.

To those interested in Antarctic bryophytes, the appearance of the *Liverwort Flora of Antarctica* is an exciting event. Liverworts are widespread in coastal regions of the Antarctic and, unlike mosses and lichens, their occurrence is principally determined by the moisture regime of the substrate. Therefore, they are among the best indicator organisms of humidity conditions in the region. Knowledge of the liverworts of the Antarctic has long been extremely poor, however, and much confusion has existed about the status of the species. Identification of liverworts usually requires the presence of reproductive organs and since the majority of the species occur in the region in the barren state, their identification has long remained very difficult.

A team of European specialists has now elucidated the taxonomy and distribution of the liverwort species of Antarctica, the region spanning all land south of 60°S latitude. Based on a critical revision of the complete herbarium materials from the region, 27 species in 12 families are recognized. All of them occur in the relatively mild, maritime zone, including South Sandwich, South Orkney and South Shetland Islands, and the west coast of the Antarctic peninsula and its offshore islands. Only one liverwort, the common and highly variable *Cephaloziella varians* (synonyms *C. antarctica*, *C. arctica*) has been recorded from the harsh continent of Antarctica.

For each species keys, morphological description, notes on taxonomic and nomenclatural status, habitat, and local and world distribution are provided. A complete listing of specimens examined and previous literature reports are also given. The descriptions are comprehensive but the lack of information on oil bodies is missed here, especially in the generic descriptions. The text is accompanied by beautiful, full-page plates drawn by the first author, and by maps showing the local and world distribution of the species. The authors took considerable pains to make the work as useful and comprehensive as possible. Nomenclatural citations are provided in full, including valuable information about type specimens and their locations. The use of exclamation marks and "*non vidi*" for specimens seen or not seen is unnecessary, however, and exclamation marks could have been omitted. The correct author citation for *Hygrolembidium andinum* (p. 55) is "(Herzog) R.M. Schust.," not "Herzog". Taxonomic concepts usually follow the most recent taxonomic opinions but the genera *Lophocolea* and *Clasmatocolea* are kept in their traditional sense (in my opinion rightly so) and are not reduced under *Chiloscyphus* as proposed by some recent workers. All the species and genera are treated in alphabetical order and are numbered, also in the keys, and this facilitates quick access to the names.

The treatment begins with 40 pages of introductory materials, including aspects of the geography, climate and geology of Antarctica, a history of hepaticological exploration in the region, as well as ecology and phytogeography of the Antarctic liverworts. These chapters are very informative and are a good introduction to the region for those less familiar with the Antarctic. In the short list of important recent workers on austral hepatics (p. 34) the name of G.G. Hässel de Menendez should have been included.

The quality of the print, the design, and the reproduction of the figures are excellent. The text is not free of typographical errors but most of these are minor ones. In summary, this is an excellent Flora that anyone dealing with liverworts or antarctic cryptogams should have on their book shelves and one that must be in all major libraries. The price for a work of this quality is very reasonable.

S. ROB GRADSTEIN

The Antarctic Dictionary : a complete guide to Antarctic English

Bernadette Hince
CSIRO Publishing & Museum Victoria (2000)
394 pages. Aus$39.95. ISBN 095774711X

As scientists we are used to reading jargon; indeed it seems to be a required component of most scientific papers. We use it in everyday speech and often find ourselves having to explain the meaning of many of the words to our nearest and dearest, never mind our colleagues. What is perhaps less obvious is how the Antarctic community continent-wide has developed its own version of English to suit the special requirements of living and working there. Bernadette Hince has wisely limited her Dictionary to English (who knows what special Spanish or Russian vocabularies have been developed?) and spent many years reading the literature to trawl up the various uses of the terms. It is a noble effort and the book provides a fascinating *pot pourri* of scientific terms, names and colloquialisms from British, American, New Zealand, Australian and South African expeditions.

This work of industrious scholarship has taken almost ten years to reach publication. It incorporates those special glossaries that BAS and ANARE have produced to make their staff newsletters intelligible to those outside Antarctica but it also provides details for most of the birds, whales, fish and seals as well as definitions of ice types (e.g. ice flower), topographic units (e.g. nunatak) and placenames (e.g. Southern Ocean).

Since this is an historical dictionary Hince provides dated quotations for the use and context of each term, basing this on 20 000 quotations taken from hundreds of sources (primarily books). Surprisingly, she has extended the scope of the dictionary to include the Falkland Islands and Tristan da Cuhna. I agree that both places do indeed have some interesting words in use but neither locality is really anything to do directly with the Antarctic. Whilst Tristan was originally included in the SCAR "Area of Interest" because of some of its biological associations the Falklands was never accorded that status. The Dictionary would have been considerably shorter and more focussed without the inclusion of this extraneous material.

I accept that the compiler did not wish the volume to be dominated by place names but since she has included some it is noteworthy that the selection is heavily geographically biassed. Whilst Australian Antarctic Territory is included there are no definitions for the Ross Dependency, Dronning Maud Land or British Antarctic Territory. Whilst all the New Zealand and Australian sub-Antarctic islands are included there is no mention of South Georgia, South Orkney Islands, South Shetland Islands, South Sandwich Islands, Bouvetoya etc. which seems a notable omission. Since the Antarctic Treaty is included why not SCAR and IGY?

This dictionary is a pioneering approach for Antarctica and it is of course, by definition, incomplete as language is constantly changing. Considering the complexity of the presentation there are almost no spelling errors - a remarkable achievement for the proof readers. As one who has spent too long delving into Antarctic literature I can see lots of things to suggest to the author for the next edition! I am certain there are earlier dates of usage than many she has found, there are many words missing - some logistic like 'primus stove', some scientific like 'ablation', some geographic like 'Gondwana'. I thought it would have been worth mentioning the reindeer herds on South Georgia and Kerguelen. Some definitions are wrong, for instance that for the Antarctic Treaty, or inadequate as that for Venesta (which suggests that the *South Polar Times* and not *Aurora Australis* was the first book printed and bound in Antarctica), whilst some quotations are inadequately defined, for example the extract from Snow describing seals as 'clap-match' refers specifically to elephant seals but is grouped with others referring only to fur seals. Worryingly for those who speak the Queen's English there is obviously a tendency for nouns to turn into verbs ('glaciologise') whilst some acronyms have apparently turned into nouns ('larc' and 'dukw') or verbs ('RTA') but this probably shows a lack of imagination on the part of this reviewer! The scientific terms chosen are a disparate collection and could be substantially improved on in the future without attempting to replace disciplinary dictionaries.

It would be invidious if I left the potential reader with the feeling that the dictionary was not a very worthwhile attempt to provide all of us with another useful tool. I will certainly be using it to find Latin names for animals or checking the variety of ways a descriptive term has been used. I cannot imagine any 'Antarcticist' not finding value and enlightenment in this volume and a recognition that they too have some useful terms and details of usage to contribute to any future editions. Now that we have the dictionary we have only ourselves to blame if we are unable to make ourselves understood by those not blessed with 'Antarcticitis'!

DAVID W.H. WALTON