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# Book reviews

## Antarctic Cenozoic History from the CIROS-1 drillhole, McMurdo Sound

*Edited by P.J. Barrett*

DSIR, Wellington (1989) 254 pages. $(US)29.95. ISBN 0477 02564 1

The chronology of the pre-Quaternary Cenozoic glacial history of the earth is relatively poorly understood. This bulletin from the Department of Scientific and Industrial Research, Wellington, New Zealand, provides an in-depth analysis of the CIROS-1 drillhole of McMurdo Sound, cored during the austral summer of 1986.

The primary aim of the project was "to attempt to date the onset of Antarctic Cenozoic glaciation and document its early history"; the very successful core percentage recovered (98%) provides an excellent section from which such an investigation can be attempted. The 702 m deep CIROS-1 drillhole is situated on the margin of an intercontinental rift basin off the Victoria Land coast, and is interpreted to reflect earliest Oligocene - early Miocene sedimentation (36-34.5 Ma and 30.5-22 Ma).

The bulletin is divided into 10 major sections with a total of twenty-eight papers, although most of the emphasis is given to papers on the stratigraphy, sedimentology and palaeontology of the cored strata. The first three papers comprise a short introduction by the bulletin editor, Peter Barrett, followed by scene-setting papers on data attained from downhole logging (White) and seismic reflection surveys (Davy and Alder); the latter suggests that the cored strata form part of a deltaic complex that was deposited near the centre of a broad submarine extension of Ferrar Valley.

This is followed by a comprehensive paper on the stratigraphy and proposed facies model of the cored strata (Hambrey *et al.*). The early Oligocene sequence is dominated by relatively deep-water sediments, and is consequently not very sensitive to variations in the position of the glacier margin or sea-level. However, the late Oligocene-early Miocene sediments are strongly glacially influenced and record seven major advances over the site, marked by lodgement and waterlain tills, that compare well with global sea-level changes. The authors use the proposed model for the Transantarctic Mountain front behaving as a free edge, such that the isostatic effect on the growth and collapse of ice sheets at the drillsite would be at least partially alleviated.

The papers on sediment texture (Barrett), grain fabric (Hambrey) and clast shape (Hall) are primarily aimed at constraining the facies model in terms of variation in water depth and depositional setting of diamictite beds. Constraining the basal glacial character of the sediment is important because during the early Cenozoic there was a temperate, not polar, ice sheet. It is interesting to note that the authors point out the common problem that detailed textural studies show the core to be muddier than the original core descriptions indicate.

Perhaps the most acute problem with research on the Cenozoic glacial deposits of Antarctica is the question of the age of glaciation. Far and away the largest section of this bulletin (almost one half) is committed to answering this problem. There is a fairly exhaustive attempt to constrain the age of the core and to provide climatic information from the analysis of siliceous microfossils (Hurwood), benthic foraminifera (Webb), terrestrial (Mildehall) and marine palynomorphs (Wilson), molluscs (Beu & Dell), a single *Nothofagus* leaf (Hill) and calcareous nannofossils (Edwards & Waghorn).

The occurrence of *in situ* palynomorphs and *Nothofagus* suggest that cool temperate forests grew on the foothills of the Transantarctic Mountains and persisted through several glacial cycles.

Absolute age dates from strontium isotopes derived from aragonitic shell material (Barrera) near the base of the core indicates an age between 34 and 36 Ma, consistent with biostratigraphical estimates. A palaeomagnetic stratigraphy has been proposed (Rieck) which enhances the detail of age control in the upper half of the core. However, a polarity log is not presently available for the lower interval due to a strong diagenetic overprint.

This section is followed by a group of papers on the petrology and geochemistry of the drilled strata. Sediment provenance is based on sandstone petrography (George), conglomerate clast compositions (Grapes *et al.*) and whole rock geochemistry (Roser & Pyne), which indicate a source area composed of Ferrar dolerite, basement rocks and Beacon Supergroup sedimentary rocks.

Analysis of the diagenetic features (Bridle & Robinson) suggest that there has been little alteration of detrital clay since deposition. Mudstone velocities and vitrinite reflectance on carbon particles (Lowery) both indicate that the sequence has been buried more deeply, by the order of a kilometre. Oxygen isotope studies (Wada & Oliada) suggest that the carbonate cement was precipitated from ground water derived from isotopically light glacial meltwater. The clay mineralogy (Claridge & Campbell) indicates soil development under forest or scrubland in a cool or temperate environment.

Hydrocarbons were encountered in trace quantities in the form of methane (Wada & Sano) and a residue in a sand unit. (Coole & Woolhouse). These are reported to be "the first non-gaseous hydrocarbons to be recovered from the Antarctic". But, before all the environmental pressure groups get hot under the collar and re-broadcast scenarios involving *Exxon Valdez*-style disasters, the analysis of source potential and

maturation of the core shows prospectivity of the Victoria Land Basin "must be regarded as low" (Collen *et al.*).

The bulletin concludes with a discussion of the core's biostratigraphy and chronology (Harwood *et al.*), reflecting its importance as an almost continuous record of Oligocene to early Miocene high latitude sedimentation. The authors point out the problems regarding this biostratigraphic-based chronology and the need for new biostratigraphical reference sections with some measure of absolute age control from the ODP legs around Antarctica and with future drillholes in the Ross Sea. The overall synthesis of the cored strata (Barrett *et al.*) provides tentative correlations to similar high latitude sequences and suggestions for future research: "The CIROS-1 glacial record, when considered with the Oligocene glacial strata of Prydz Bay and the South Shetland Islands, substantiates the view that continent-wide glaciation of ice sheet proportions was a major feature of the Oligocene in Antarctica and were probably similar in size and longevity to those of the Northern Hemisphere in the Quaternary". I would, however, add a note of caution to this statement. Within a temperate setting there is the problem of local surging glaciers, which might obscure the proposed major shifts in ice volume during the Oligocene and early Miocene. The reviewer's own re-examination of Oligocene glacial sediments on the South Shetland Islands suggests that those sediments reflect glacimarine deposits derived from local ice caps, an interpretation which is somewhat different to the presently accepted pan-Antarctic style glaciation attributed to such Oligiocene-age sediments. This really only goes to highlight the relative lack of knowledge and confusion surrounding the early history of Cenozoic glaciation.

It would be useful to have a more comprehensive index, but the layout is such that, although it is composed of individual papers the overall effect of the bulletin is not disjointed, and there is a great deal of cross-reference between papers. Overall, I feel the best attribute of this bulletin is the amount of raw data that are presented in clear, concise tables, logged sections and core and microfossil photography. These range from an exhaustive presentation of all the diatom data throughout the core to all the whole rock geochemical analyses. The data provides a very useful reference section for future studies on the early history of the Antarctic ice sheet, and if, for example, age refinements are required, then this will be relatively easy to accommodate. Peter Barrett is to be congratulated on assembling a comprehensive set of papers on this crucial section in such a convenient volume which can be recommended to geologists and also glaciologists with an interest in Cenozoic palaeoclimates.

P.J.BUTTERWORTH

## Rotifer Symposium V. Proceedings of the Fifth Rotifer Symposium, held in Gargano, Italy, September 11–18 1988.

*Editors: C. Ricci, T.W. Snell & C.E. King*

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Preliminaries to the volume include photographs of symposium participants, a memoriam to the late Dr Josef Donner and a preface consisting of biographical reminiscences by W.T. Edmondson. The scientific presentations are divided into five sections, Ecology, Taxonomy & Morphology, Physiology, Genetics and Aquaculture. The first section, Ecology, is by far the largest, accounting for 254 of the 433 pages and 30 of the 51 papers. It is divided into four subsections: Food (6 papers), Competition (3), Autoecology (10) and Communities (11). The scope within these disciplines ranged from communities to ultrastructure. All papers are published in English and it is a tribute to the editors, and to those authors whose first language is not English, that the stilted phrases and grammatical errors so often characteristic of international symposia, are so few in this volume. Typographic errors are minimal. Many symposium proceedings stint on presentation of illustrative material. Such is not the case in the present volume; adequate space is allotted to graphic and tabular materials and to electron micrographs. In general, the scientific quality and level of presentation are both high.

One normally expects symposia to present integrated reviews. However, the rotifer symposium consists mainly of primary research reports that could have been published just as suitably in technical journals. Although many of these review pertinent literature at least briefly in either the introduction or discussion sections, there are few comprehensive reviews. Notable exceptions are papers by May on epizoic and parasitic rotifers, Miracle & Serra on salinity and temperature influences in rotifer life histories, Clement & Amsellem on rotifer muscles, Koste & Shiel on taxonomy and Snell on reproductive isolation. This is not a book to be sought out to ground oneself in broad areas of rotifer biology. It is for specialists, and is extremely good in that context. It assembles in one place literature on a diversity of topics on rotifers that allows one to see major trends and recent developments in selected fields without searching widely. It provides an entry into the specialised literature for those who want to pursue particular topics in depth. It reports on new techniques (e.g. Pauli on methods of estimating dry weights) and application to rotifers of techniques developed in other fields (e.g. Carmona, Serra & Miracle on use of protein patterns to study aging).

The coverage in the ecology section reflects current emphasis on planktonic rotifers. Less attention is paid to benthic forms and there is only one paper devoted to the rotifers of marshes (paper by Nogrady) and one to those in mosses (paper by Ricci, Pagani & Bolzern).

A minor, but consistent error mars the otherwise high quality of several of the papers in the Communities section. A biotic community consists of all the taxa that live together and interact. That part of the community composed of a particular taxon, such as Rotifera, is an assemblage. Consequently, it is incorrect to refer to 'rotifer communities' as several authors do repeatedly. The correct term is 'rotifer assemblages'. The fact that this is a rather common error does not make it any less distracting to the knowledgeable reader. The paper by Nogrady on rotifers in Canadian wetlands stood out by using appropriate terminology.

The section on Aquaculture provides information on various practical aspects of rearing rotifers as food for larval fish of commercial importance.

This section demonstrates the great extent to which practical applications have stimulated research into basic life history, nutrition and bioenergetics of rotifers, especially of *Brachionus plicatilis*, one of the most important commercial rotifers.

The geographic coverage is wide, with reports by 84 authors from 19 countries. However, there is rather a strong emphasis on Northern Hemisphere studies that reflects the greater volume of work carried out there. It will disappoint readers of *Antarctic Science* that there are no papers dealing with Antarctic rotifers and only one (Holloway & Hussey on Andean *Nothoica*) even makes reference to Antarctic or Subantarctic rotifers in passing. Several papers on Arctic rotifers, however, would hold especial interest for persons interested in polar biology.

In summary, Rotifer Symposium V is a specialised book of high quality. It covers a wide range of topics and geographic areas, but emphasizes planktonic rotifers in the Northern Hemisphere. There is nothing on Antarctic rotifers, but much to interest anyone working on Antarctic rotifers.

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