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Guest Editorial

Bunger Hills: the hidden Antarctic oasis

From Lt Cdr David E. Bunger's first view of a mysterious ice-free area from the window of a seaplane in 1947 during the United States Navy's Operation Highjump, to the wonders revealed in today's overflights and satellite imagery, Bunger Hills has remained a largely hidden place. Its location, surrounded by the ice sheet, heavily crevassed glaciers and Shackleton Ice Shelf, has ensured that sea- and land-based approaches are difficult and rarely attempted. Despite the challenge and cost of visits to the area, there has been a history of expeditions supported from a range of nations. A number of huts were constructed to support over-wintering parties by Soviet and Polish expeditions in the 1950s. Several dozen summering expeditions followed, with further huts being built by an Australian party in 1985. American, German and private expeditions followed, undertaking biological, geological, glaciological, lacustrine and logistical studies. Despite numerous examples of co-operation and collaboration, there has not yet been a systematic spatial mapping of many of the area's characteristics, which has hindered research efforts in Bunger Hills and, more generally, our understanding of all of the East Antarctic oases.

This volume consists of six related papers. The first paper describes the history of exploration and resultant human impacts, consisting mainly of *in situ* and wind-blown rubbish but also chemical contamination. This paper recommends maintenance or removal of huts and infrastructure before they create further environmental damage, and to conduct surveys for invasive species and existing and emerging contaminants. The second paper reviews 60 years of geoscientific research, emphasizing crustal correlations with Australia as part of the Rodinian supercontinent, and India and Australia as part of the Gondwanan supercontinent. The third paper describes the postglacial evolution of marine and lacustrine water bodies and their sediments over the last ~10 000 years of the Holocene epoch. Advance and retreat of bounding glaciers and ice shelf controlled the balance of fresh *vs* marine water input and the nature of the microfossils on lake and epishelf lake floors. The fourth paper demonstrates that strong winds have blown from the east–north-east for much of the postglacial period, and the fifth paper describes the effects of sea-spray dispersal from marine inlets and evaporation basins on sediments and landscape. The sixth paper describes the distribution of plants and flighted birds, and it suggests that the spatial occurrence of salt is a unifying driver for plant distribution.

The research in this volume has been conducted by small, agile field parties working in the summer months with minimal infrastructure support. We have shown that even small stations can create environmental impacts that last for decades. Future research undertaken in Bunger Hills, and similar ice-free areas, should be conducted through this small-scale agile approach, minimizing cost and environmental impacts.

What further research is required at Bunger Hills? Baseline studies of sediments, soils and biota would allow quantification of global and regional change and local impacts. A freely available high-resolution digital terrain model would allow accurate location and relocation of future sampling sites and datasets. A detailed relative sea-level curve constructed from isolation basins would help constrain regional former ice loadings. Resolving taxonomic uncertainties of bryophytes and lichens is vital for both here and other areas of Antarctica. Understanding whether or not seals and penguins presently travel between the marine inlets and the open ocean may identify unique populations trapped behind Shackleton Ice Shelf. A multi-omics approach would help with many of these research tasks. Once these baseline studies have been completed, we will have a better understanding of Bunger Hills, which has for so long remained the 'hidden' Antarctic oasis.

We dedicate this research to the memory of Professor David Walton, who championed this special issue. His support, mentorship and passion for Antarctic science were inspirational to many Antarctic researchers and expeditioners.

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