CASTELLO, J.D. and S.O. ROGERS, *eds.* 2005. *Life in ancient ice*. Princeton, Princeton University Press. 336 pp. ISBN 0-691-07475-5, hardback. €45.

The edited volume *Life in ancient ice* brings together contributions from key exponents in the field of glacial microbiology, including a range of Russian research that has not previously been easily accessible. The papers result from a US National Science Foundation-funded meeting held in Oregon in 2001 (organized by the editors, J. Castello and S. Rogers) which brought together disparate researchers in this area, including some of the Russian pioneers. Consequently, the volume is a valuable compilation of research results to date, providing an overview of the range of differing approaches and analyses that have been utilized.

Eighteen chapters cover studies of the microbial content of both modern and ancient ice, primarily from Antarctica, Greenland and permafrost areas and involving microscopic, morphological and genetic analyses. Extraterrestrial locations are also included, with a discussion of how similar methods could potentially be applied to Martian permafrost deposits. The diversity and density of detected organisms is often remarkable, ranging from viruses and bacteria to fungi and diatoms. Key areas of interest include the taxonomic and population diversity within samples of accretion ice, ice cores and permafrost samples of differing ages and comparisons of analogous modern and ancient material. A critical issue is whether microbes detected in samples hundreds of thousands of years old (or more) are viable, or even living. This is taken to extremes with a discussion of the risks of human pathogens re-emerging from frozen deposits and starting new epidemics, which seems a reasonable premise for a science fiction plot and should certainly be withheld from health and safety administrators. Dubious extrapolations are also used to predict DNA survival in ice (and salt, amber and even mummified specimens) for hundreds of millions of years. However, more serious concerns are raised by the variable standards and approaches used to decontaminate the exterior of frozen samples from ubiquitous modern microbes. Rogers and others show that the only effective means to remove external contamination is to soak core sections in concentrated bleach before use, with other common methods (e.g. water, ethanol or mechanical ablation, ultraviolet treatment) proving inadequate. This important finding potentially undermines the reliability of much of the other data presented, and indeed several recent papers have questioned such studies in the absence of appropriate controls (e.g. independent replication, monitoring of indicator species and quantitation of DNA). These issues were partly anticipated at the meeting and are discussed in the editors' summary chapter, which calls for the establishment of standardized methods and controls, multidisciplinary engagement before sampling commences and the establishment of a formal group and regular meetings. In the latter regard, they have been very successful as the Second International Conference on Alpine and Polar Microbiology has just been held in Innsbruck, Austria. The call for improved and standardized approaches is also timely, given the impending sampling (and potential contamination) of unique resources such as Vostok Subglacial Lake, and the Mars mission.

Overall, the editors are to be commended for drawing together a clear and comprehensive account of the research to date in this esoteric but important research field, and for recognizing that such unique samples deserve the most rigorous possible research approaches.

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