

## Review

PÁLSSON, S. 2004. *Icelandic ice mountains*, translated into English, annotated and illustrated by R.S. Williams, Jr and O. Sigurðsson. Reykjavik, Icelandic Literary Society in association with Icelandic Glaciological Society and the International Glaciological Society, 183 pp. ISBN 9979-66-146-1, hardback, US\$56.

Between 1792 and 1794 Sveinn Pálsson, who had trained as a medical doctor at the University of Copenhagen and was working as a circuit physician in southern Iceland, undertook a series of journeys 'to the most prominent Icelandic ice mountains'. He had undertaken some courses in natural history at Copenhagen which had given him the inspiration for his studies and had enabled him to gain a significant field research grant from the Danish Natural History Society.

His resulting manuscript, 'a physical, geographical and historical description of Icelandic ice mountains ... with four maps and eight perspective drawings', was never published by the Natural History Society. Had it been, it would have undoubtedly constituted the first significant glaciological treatise, predating by several decades the contributions of Louis Agassiz (1840), James Forbes (1843) and John Tyndall (1860). His writing was contemporary with James Hutton (1788), one of the founders of modern geology, and more penetrating by far than Horace-Bénédict de Saussure's study of glaciers in the Alps (de Saussure, 1786). Parts II and III of Pálsson's work, written in Danish, were published in that language in 1882 and 1884, but the whole, translated into Icelandic, did not appear until 1945.

We have to thank Ritchie Williams and Oddur Sigurðsson for their meticulous work in translating the text. Their informative introduction provides a biographical sketch of Sveinn Pálsson, natural history information and maps available to him at the time, and an interpretive glossary of glaciological terms in which they have taken Pálsson's classification of glaciers in Iceland and relate these to modern glaciological terminology. Furthermore they have produced a thoroughly researched compendium of endnotes (415 in total, occupying 33 pages of text) in which they reference source materials, discuss and resolve confusion over place names (supported by a comprehensive index) and importantly refer to Pálsson's glaciological insights. Pálsson's maps are reproduced with reference to modern cartography, and facsimile perspectives are accompanied by annotated modern panoramas.

If this were all the volume had to offer it would be a significant addition to the literature on the earliest studies of glaciers, but the book is profusely illustrated with stunning high-quality colour photography and satellite imagery of the ice caps, glaciers and other geological features referred to in the text. This makes the book not only immediately accessible but a most useful additional source of glaciological photographs of Iceland.

Part I is about 'ice mountains in general'. Pálsson writes a section on classification which distinguishes ice caps from outlet glaciers and defines 17 terms for types of ice masses. There are sections on moraines and glacial rivers, and frequent reference to jökulhlaups and the formation of features such as sandur and kettle-holes. Part II (in 12 sections) is a description of particular ice masses and includes maps of Vatnajökull, Eyjafjallajökull (with Myrdalsjökull), Langjökull

and Hofsjökull. Part III is 'on the eruptions and devastations by the ice mountains' and concentrates on volcanic-related activities including further comments on jökulhlaups.

Some of the glaciological concepts which Pálsson enumerates include: a rather primitive notion of mass balance; water percolation into snow and glacier ice; the counting of layers to determine glacier age and deductions about subglacial streams including the notion of R-channels ('I consider it more reasonable to assume that the above-mentioned streams have thus formed small conduits more easily through the ice than through the underlying firm and compact ground' (p. 59)). There is reference to the idea that glaciers may exhibit hard and soft beds; observations on proglacial rivers and their sediments; a discussion on whether geothermal heat is able to melt ice at depth; and a crude inference regarding pressure melting. Pálsson recognizes a role in glacier flow of water at the bed ('the water that is denied escape is dammed up inside and underneath the glacier and undeniably raises the rear part of this glacier aloft, which promotes its advance' (p.28)) and describes graphically the outburst floods from glaciers during jökulhlaups. He details a situation where volcanic heat melts the ice base, resulting in the formation of subglacial lakes. One very interesting section gives the earliest accurate description of ice rheology by analogy with pitch: brittle at high imposed stresses but plastic at low stresses ('Should one not, I thought, assume similar liquid quality [to that of pitch] as far as glacier ice is concerned?' (p. 60)).

Besides these remarkable early insights, there are some enjoyable asides in Pálsson's descriptions; one quote will suffice to give a flavour: 'above a wind-eroded area called Emstrur ... mention is made of a valley that is presumed to be inhabited by robbers and to still have a pretty forest, but probably this is nothing but nonsense' (p. 80)!

This is a scholarly yet delightful book and should be essential reading for all who venture to study glaciology in Iceland. Above all, it has accomplished a major service in celebrating the considerable achievements of Sveinn Pálsson, thus pushing back our historical understanding of the roots of glaciology.

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