

## ' BARRIER ' versus ' SHELF '

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THE rival merits of these two words whether alone or modified, *e.g.* ice barrier, shelf ice, etc., have been a matter of discussion for some forty years, but it is only now that we appear to have reached the stage at which definite decisions can be suggested. We are dealing with the great ice features, consisting in essential of successive horizontal layers of *névé* or firn-ice, of which the most widely known both in detail and in extent is the Ross Barrier discovered and named by Sir James Clark Ross and widely explored by Captain Scott. As will appear below, the problem is not merely a choice of one or more words but concerns the order in which the words should be used; we have to consider "ice barrier" and "barrier ice," as well as "shelf ice" and "ice shelf."

The problem divides itself into three: (a) the nature of the ice itself as a substance; (b) its areal extent, and the geographical term or terms considered most suitable to describe its occurrence in nature, and in turn to form the appropriate place-name; and (c) subsidiary terms and derivative names such as the edge of the ice feature.

In the case of a mountain glacier, it is customary and correct to speak of the above three as (a) glacier ice, (b) glacier and (c) (say) glacier snout. A similar distinctive terminology is necessary for the *névé* or firn-ice feature which we are now considering. Its cliff face has a characteristic appearance (see photograph p. 419). It is probably the commonest ice form round the Antarctic coast; but it should be noted in passing that it is a formation which occurs in the Arctic as well, as shown by the coloured illustration of a "floeberg" in Moss: *Shores of the Arctic Sea*, Pl. XII.

*Historical*

The term "ice barrier" originated with Sir James Clark Ross in 1841 when he found the southward advance of the *Erebus* and *Terror* blocked by high ice cliffs at the head of the Ross Sea. Ross himself had little opportunity of seeing across his "great icy barrier," but in the account of his 1841 voyage he refers to its cliffs, its mass, its outer edge, the face of the barrier, the upper surface, the breaking off of large portions and the ice-blink over it. Further, his description of the eastern portion, visited the next year, in 1842, confirms his application of the name "barrier" not to the edge only but to the whole mass of ice between him and his supposed land (Ross: *Voyage to the Southern Seas*, Vol. II, p. 202), a usage which was taken up and made evident in the Instructions issued to Captain Scott many years later.

The next explorer to make use of the same nomenclature (and presumably for the same type of feature) was Captain C. A. Larsen in December 1893. Larsen in the *Jason* cruised along the ice edge off the east coast of Graham Land from lat. 66° S. as far as lat. 68° S. He in turn also undoubtedly used the term "ice barrier" for the whole body of the ice between him and the mountains. He speaks of the barrier stretching from the mountains to the sea, and also (in German) of very long fjords which reach through it ("Fjorde, die sich durch die Eisbarriere erstrecken").

When Captain Scott looked down from above Cape Crozier on to what he called the "Great Ice Barrier," and a few days later when he landed at Balloon Inlet, in January 1902, his use of the name "barrier" for the immense plain of ice stretching southwards from his landing-place as far as he could see was in keeping with his Instructions, and was no more than what Ross and others had already done. Following Scott, "barrier" became the natural geographical term for this ice feature, and since his time it has lent itself to a multitude of derivative uses, such as result from an appropriate name.

It is important to make clear therefore that the word "barrier" has always had an areal significance and has never at any time been limited to the ice edge alone.

(a) *The ice itself*

The first consideration is the choice of word which most suitably describes the nature of the ice itself as a substance—a word analogous, say, to glacier ice. "Barrier ice" was first in the field in 1902. It is interesting to notice that Scott in using the name had no difficulty in appreciating the difference between "ice barrier" and "barrier ice." "Shelf ice" was put forward by Otto Norden-skjöld in 1909 to describe the type of ice which he had discovered off Graham Land, but he made no attempt to exclude "barrier ice" as a term. It can be fairly said that since then "shelf ice" has found considerable favour among academic geographers, mostly in America and also in this country, but that there have been exceptions. Hobbs, who did so much to popularize Otto Norden-skjöld's suggestion of "shelf ice" writes in *Characteristics of Existing Glaciers* of "the shelf ice such as is found in the Ross Barrier." In this country Wright and Priestley on the one hand, in their glaciological memoir of the British (Terra Nova) Antarctic Expedition 1910–1913 speak of the shelf ice of the Ross Barrier. Debenham of the same expedition, on the other, prefers "barrier ice" as the ice name as well as Ross Barrier as the place-name. It will be noticed that none of the authorities quoted make use of "shelf ice" as a place-name.

"Shelf ice" and "barrier ice" are regarded as freely interchangeable and both of them as suitable descriptive terms for this type of ice. In practice, authors in this country, the present writer included, have probably used shelf ice more often than barrier ice. The dilemma of which term to select is not unlike the problem of whether to speak of *névé* or of firn-ice. No one has the authority or the foresight to say which is best.

(b) *The geographical term and place-names*

So far there is little by way of problem or dispute. The real difficulty as between "barrier" and "shelf" concerns the choice of a geographical term for this type of ice feature as it occurs in nature—a term which in turn can be treated as suitable for use as the geographical or generic part in place-names. Glacier ice has its geographical and place-name counterpart in the word "glacier." Fresh water has its "lake," its "mere," its "tarn," and so on. What is to be the best geographical counterpart or counterparts for barrier ice or shelf ice?

An ice feature such as is under consideration is of very great extent, and has its own variations and peculiarities, and its own personality. Is it a "terrace," a "plateau," a "piedmont," and so on? Is it an "ice barrier" or an "ice shelf"?

A distinction has obviously to be made, as was done by Scott, between "barrier ice" and an "ice barrier," the words in that order, as also between "shelf ice" and an "ice shelf" (for we cannot, I think, speak of "a shelf ice"). "Shelf ice," so written, is a natural and suitable name for a particular type of ice. It cannot, however, with the words in that same order, ever be a convenient appropriate or usable geographical term for an ice feature. Looked at as an English word, "shelf ice" is not a substantive form; it cannot be used with the indefinite article; it has no plural; and is not in line with the usual geographical terms such as "plain," "plateau," "moraine," and so on. For a geographical term we want something more definite, a substantive word or noun, such as "beach," "cape," "headland" as applied to coastal land features, or "bay," "bight," or "cove" as applied to coastal sea features.

The Ross Barrier as a place-name formed itself naturally soon after its discovery in 1841, and its extremely wide use and its many derivatives are a proof of its appropriateness. Those who prefer "shelf" to "barrier," are faced with the unsuitability of "shelf ice" as a geographical term or as a place-name, but there is no reason why they should not follow Mawson who settled the matter in 1912 by naming the Shackleton Ice Shelf, the words in that order, in the Australian Antarctic territory. The term "ice shelf" seems to merit still wider usage, though when compared with "ice barrier" it is less original and less dramatic.

It should be pointed out however that what may be wanted to-day in ice terminology is not a single term but an increase in the number of suitable descriptive geographical names. No one single term, be it "barrier" or "shelf," seems to be sufficient. Many thousand miles of ice-cliff coast in the Antarctic have to be dealt with. The present seems to be the time to re-examine and clarify the terms so far in use, but it is still more opportune to debate the question of new geographical terms.

The term "barrier" is best known as applied to the two very large features, the Ross Barrier and the Filchner Barrier; and there is also Larsen's ice barrier on the eastern coast of Graham Land. Whether the word can be applied also to smaller areas is an open question, but, if not, other words should be considered—"ice shelf" probably; "ice fringe" or "fringing barrier" for the extended fringe south of lat. 68° S. on the east coast of Graham Land; "ice terraces" where more than one level occurs; "piedmont barrier" possibly on Coats Land; and so on.

The original introducers of "shelf ice" never intended to use the word in the further sense of a place-name, as has been advocated by some recent writers. As a place-name "barrier" not only has priority but is much the most suitable word. Ross Barrier certainly will always have a much wider currency than any rival name. For each single reader who finds the words "Ross shelf ice" in scientific literature there will be at least ten who will be familiar only with the place-name "Ross Barrier" in the official and other accounts of the Scott, Shackleton and Amundsen expeditions. More recently it occurs again and again in the many accounts of Admiral Byrd's expeditions, evidence of its popularity as a term among American Antarctic travellers. "Ross Barrier" is in fact probably the best known of all Antarctic place-names.

Two recent uses are to be noted. Debenham, one of the few in this country who can speak on this matter, deliberately prefers "barrier" to "shelf" in his glaciological paper published in the *Geographical Journal* for Oct.-Dec. 1948; a preference which was also noticeable among those who took part in the discussion which followed the delivery of the paper. The other is the choice of the name "Ross Barrier" for the appropriate article heading in the latest (1950) edition of *Chambers's Encyclopaedia*; in this case full weight had to be given to the fact that barrier as a geographical term and as a place-name has always been preferred by British glaciologists and other scientists qualified to deal with this particular example.

### (c) *The ice edge*

Of subsidiary terms, one of the most important is the most suitable word for describing the seaward edge of barrier ice or shelf ice formations. It is now known that much of the Antarctic coastline consists of high ice cliffs. The cliffs, however, are not invariably "barrier cliffs" and over considerable distances the only appropriate description is "glacier cliffs." The only exploration in any detail of an ice coast of this type was on the voyage of the *Endurance* south-west along Coats Land for a distance of about 300 miles in January 1915. Shackleton either spoke of the "barrier wall," the "barrier cliffs" or the "barrier edge," and the writer soon found it necessary to distinguish "barrier cliffs" from "glacier cliffs." The word "barrier" by itself was insufficient both for popular description and for scientific record. It would have been incorrect and inexact to have spoken of the edge as simply the "barrier" as has occasionally been advocated.

It is not possible therefore to speak of "barrier" unadorned for the ice-edge, even if it were free of inexactitude and if there were no changes of type of ice cliff. No one, however, can cavil at the more definite expression "barrier cliffs" or "shelf-ice cliffs." "Barrier edge," a term used by Ross, will to many no doubt seem the most appropriate wording, but an equally good term is "barrier cliff," also first used by Ross. The descriptive writer will distinguish between "barrier cliffs" or "shelf-ice cliffs" compared with "glacier cliffs," and also whether high or low, aground or afloat, and so on.

*Conclusion*

"The only permanently frozen seas in the Antarctic are comparatively narrow fringes of shelf ice permanently attached to the land masses. The best known example is the Ross Barrier in the New Zealand Dependency, but there is a small ice shelf on the east coast of Graham Land."

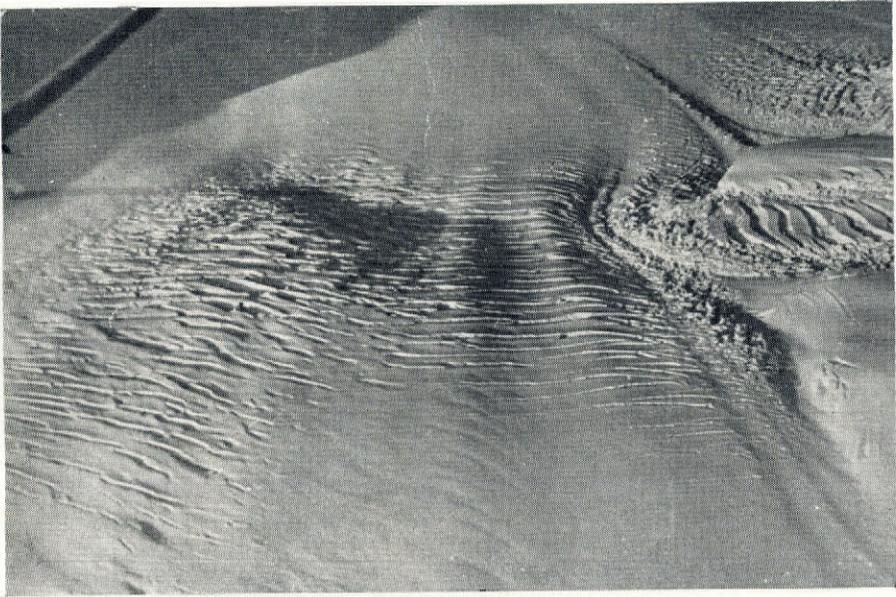
The quotation is from an article by C. H. M. Waldock, Chichele Professor of Public International Law at Oxford, on Disputed Sovereignty in the Falkland Islands Dependencies published in the *British Year Book of International Law* 1948, p. 318, and it will be seen that the writer makes the same natural use of terms as has been advocated in the present article, "shelf ice," as a descriptive term for ice, and "Ross Barrier" and "ice shelf" (in that order) respectively, as appropriate geographical terms for the ice feature in question.

I have, I hope, made it clear that the term "shelf ice" is welcomed as a technical term alternative to "barrier ice" for a particular type of ice. One must, however, oppose any attempt to try and introduce it, with the words in that same order, as a geographical term. "Barrier" or "ice barrier," whichever is preferred, is at present the only admissible place-name, and is a convincing term for ice features on a grand scale. The edge settles itself as "barrier cliffs" or "shelf-ice cliffs" or as "barrier edge." Many more terms, however, each with its particular shade of meaning, may be needed; and this is a matter for discussion among geologists and glaciologists.



*Barrier Cliffs, Coats Land*

*Photograph by F. Hurley taken from Shackleton's Endurance, January 1915*



*Extensive crevassing at junction of glacier and shelf ice, lat.  $68^{\circ} 15' S$ . Photograph taken from aircraft at about 7000 ft. looking down glacier about one mile from its end*



*Rift in shelf ice, lat.  $69^{\circ} 46' S$ ., about 6 miles from coast which runs approximately north and south*

*Photographs by D. Mason*