

## CORRESPONDENCE

The Editor,  
*The Journal of Glaciology*

SIR,

*Ice Pressure against Dams*

The American Society of Civil Engineers has recently reconstituted a research sub-committee to investigate the pressure exerted by ice against dams. The problem is an involved one, but of great economic importance in view of the allowances which have to be made in dam design for anticipated ice pressures. Very few actual observations of the pressures so exerted appear to have been made, but it is hoped to initiate a research programme of this character. Since the matter is not unrelated to glacial problems, it may be that some readers of this *Journal* can contribute information which will be of use to those responsible for this new investigation. If so, will they please communicate with me.

National Research Council,  
Ottawa, Canada.  
25 May 1948.

ROBERT LEGGET, Director,  
Division of Building Research.

SIR,

*Formation of Norwegian Fjords*

Monsieur Koechlin's explanation of the formation of Norwegian fjords (*Journal of Glaciology*, Vol. I, No. 2, 1947, p. 66) is contradictory on the subject of ice erosion: "Erosion," he writes, "is slight in the accumulation areas, but increases greatly at lower levels . . ." "Erosion takes place uniformly throughout the bed of the ice stream, so that the glacier gradually sinks into the ground parallel to the surface." These statements contradict each other and seem at variance with cirque-cutting, as well as ignoring the known fact that deposition of ground moraine often checks erosion altogether.

Perhaps the author's theory is valid for Norway, but it will not harmonize with formation of fjord-like valleys in the Coast Range of British Columbia. Glaciers had their inception in the heads of valleys of a mature landscape; they lengthened, eroding the valleys on their way to the sea (a stage not touched on by the author). Another stage for which he did not provide was ice inundation, which often proceeded until valleys contained as much as 4000 ft. (1220 m.) of ice at their mouths.

In passing it may be pointed out that rock thresholds, where they exist in British Columbia inlets, are as easily explained by the ice being able to spread near valley mouths. Its erosive power is thus reduced and this seems at least as good an explanation as one which requires the presence of the sea. Moreover, many lakes have rock thresholds. Rock structure also must always be considered in relation to erosion.

Both statements which I have quoted imply that erosion is not related to the thickness of the ice. One hesitates to believe the author really meant this. I find no mention of the known fact that glaciation must be more prolonged in the upper reaches of any glacier. That is where the greatest supply of angular material to provide erosive tools must be found.

So far as the Coast Range of British Columbia is concerned it is believed the ice age ended rather abruptly. A few hundred feet below present-day alpine glaciers I have found well preserved horizontal striations of valley glaciers which were 4500 ft. (1370 m.) thick. There was also clear evidence that ice from the inland ice cap, not from the Coast Range, was the last to occupy the valley.

373 *Tempe Crescent*,  
North Vancouver, B.C.  
2 March 1948.

W. A. DON MUNDAY