

*THE GLACIERS OF NORTH AMERICA.*

*Glaciers of North America: a Reading Lesson for Students of Geography and Geology.* By Israel C. Russell, Professor of Geology, University of Michigan. Pp. x + 210. (Boston, U.S.A., and London: Ginn and Co., 1897.)

A GOOD summary, in a convenient form, of what has been ascertained about North American glaciers, has been for some time a desideratum. Prof. I. C. Russell has supplied it in a volume of moderate size, well illustrated, and written in a cautious and critical spirit. As he points out in his opening words, North America, in reality, affords more favourable conditions for the study of existing glaciers and the records of ancient ice-sheets than any other continent. It affords excellent examples of the three types into which glaciers may be distinguished—namely, Alpine, Piedmont, and Continental. Of the first, specimens are abundant in the mountain system of the West, from “pocket editions” in the peaks of the High Sierra to the huge Seward glacier in Alaska. The latter region also supplies good instances of the Piedmont type, in which, as the name implies, the ice-streams of mountain valleys become confluent on a lowland; while Greenland is a grand case of the “Continental” ice-sheet. Of each of these types Prof. Russell gives careful and lucid descriptions, in the course of which he notices or discusses the more important phenomena of ice action. We must confine ourselves to mentioning only two or three, which bear more especially on general questions. We observe that he draws a distinction between osars and kames, applying the former term to continuous ridges, often many miles long; the latter to irregular hills with basins between. Both are mainly composed of water-worn materials, and are connected with ice-sheets; both exhibit stratification, more or less oblique and cross-bedded; on the surface of both large angular blocks have often been dropped, but the osar, he thinks, has been formed by streams flowing in sub-glacial channels; the kames, by deposition in cavities beneath the ice or in open channels on its margin. Prof. Russell also gives an excellent account of drumlins, those curious elongated mounds, mainly composed of “till,” which are among the ice-age puzzles. Of these he suggests as a “working hypothesis” the following explanation. Débris embedded in an ice-sheet tends to impede its movement. If, then, any portion of the latter, owing to local causes, contains an exceptional amount of adventitious material, it may behave in some respects as a large boulder (which, however, is gradually stretched out), the purer ice flowing past and around it. Then at last it may be stranded near the end of the sheet. The contained ice slowly melts, and leaves behind an elongated mound of “till.” The hypothesis explains several facts, but is not without its own difficulties, on which, however, we must not enlarge. It is certainly ingenious, and it deserves careful consideration. He gives an excellent description of the Malaspina Glacier, one of the Piedmont type, in Alaska. In its neighbourhood marine shells are found embedded in a boulder deposit, high above sea-level. Prof. Russell does not think it necessary to employ an ice-sheet to bring these shells inland from the bed of the Pacific, and remarks that they indicate

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very considerable upheaval in quite late geological times. We commend this part of the volume to those glacialists of Britain who repudiate almost with scorn the possibility of an important submergence at a date so recent as the glacial epoch. Perhaps in future we shall hear less of rampant ice-sheets at Gloppa and Moel Tryfan!

As regards Greenland, a good summary is given of the observations of Peary, Nansen, Chamberlin, and others, as well as some excellent and extremely suggestive remarks about buried masses of ice in Kotzebue Sund. We should not, however, be quite so ready to admit the possibility of the central ice in the former country being almost as thick as its surface is high above the sea. Surely it more probably conceals a country similar to, but on a larger scale than, Scandinavia, in which case the watershed would be towards the middle. There is a very clear summary of the diverse views on glacial physics. Prof. Russell concludes these by an “eclectic hypothesis,” in which a tinge of sarcasm, perhaps unconscious, seems perceptible. May not the difficulties of the subject be augmented by defective knowledge and an imperfect terminology? Fluid and solid are necessary distinctions in practice and in mathematics, but we cannot be so sure where the border-line lies, how far it depends on circumstances, or even if it has a real existence. But we must conclude. We may hesitate in accepting Prof. Russell's conclusions on one or two points, but not in heartily thanking him for this clearly-written volume, which ought to find a place on the bookshelves of every student of ice and its work.

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*OUR BOOK SHELF.*

*Hydraulic Machinery.* By R. G. Blaine. Pp. viii + 383. (London: E. and F. N. Spon, Ltd., 1897.)

THE term hydraulic machinery is generally confined to the machinery employed for storing up water under pressure, the arrangements for transmitting this power to a distance, and the various machines worked by means of the water pressure thus provided; and the utilisation of this form of power was mainly initiated by Lord Armstrong, whose portrait is given at the commencement of the book. This application of power has proved very serviceable for the intermittent operations required at docks, such as the working of dock gates, swing bridges, lifts, coal hoists, cranes, and capstans, and for raising passenger lifts, large canal lifts, and hydraulic graving docks. Moreover, hydraulic power has been very advantageously employed for various operations on board ship, namely, loading and discharging, steering, the working of big guns, and the movement of turrets; and it has furnished a very rapid and efficient means of riveting. Accordingly hydraulic machinery, as commonly understood, has a wide range; but the author has treated it merely as an important branch of a still wider subject, relating to the flow and measurement of the discharge of water, and the various machines in which water is an active or a passive agent. Only ten sections, out of the thirty-one into which the book is divided, comprising about 170 pages, are devoted to hydraulic machinery in its limited sense; and the rest of the book deals with the general principles of hydraulics, the hydraulic press, hydraulic jacks, the flow of water from orifices through pipes and in open channels, the methods of measuring discharge including water meters, jets, water wheels, turbines, pumps, and hydraulic rams and brakes. The book is illustrated by 272 clear figures and diagrams in the text, and is provided with a suitable