figured. But nearly every page contains matter which would be of interest to readers of *Science*, and unfortunately we cannot yet print numbers in twelve hundred pages quarto. We are obliged to reserve our concluding paragraphs for the geological aspects of the voyage.

## GLACIERS, AND THEIR RÔLE IN NATURE.

PROFESSOR RATZEL'S 'Bibliothek geographischer handbücher' reaches its fourth volume in Heim's comprehensive review of what may be called 'glaciology,' — a general discussion of glaciers, and the part they play on the earth's surface. It is fully up to the high standard attained by the earlier numbers of the series. Ratzel's 'Anthropogeographie' was the first issued; and, although somewhat venturesome in regard to the control that geography has exercised on history, it is a

very suggestive book. I 'Klimatologie' has already

been reviewed here: it has everywhere received high praise, and at once takes its place as a standard work. The

'Ozeanographie,' begun by von Boguslawski, was unhappily left incomplete on his death: one

part was issued a year ago, containing an exhaustive description of the oceans, but not reaching the discussion of their physical conditions. Drude, von Fritsch, Penck, Vetter, and Zöppritz are still to follow with volumes on special subjects.

These books have no equivalents in English. It is becoming very monotonous to record, time after time, that German writers are so far in advance of us; but the fact is very plain. If such works cannot be originated here, we wish that they might at least be translated and republished, so as to come within reach of our teachers and students.

Professor Heim has hitherto been known rather as a worker on mountain structure than on glaciers. His studies in the direction of the latter subject, so far as they are published, have been concerned chiefly with the share that ice has had in mountain sculpture; but the book now before us shows deliberate and careful work on all topics connected with glaciers

Handbuch der gletscherkunde. Von Albert Heim. Stuttgart, Engelhorn, 1885. 16+560 p., map. 8°.

of the present time. The reference made to their former extension is sufficient for a volume that professedly does not discuss that part of the question. As in the earlier numbers of the series, illustrations and references to authorities are practically wanting. An index is also absent in this volume; but its place partly taken by a well-arranged table of contents and page-headings. Our many students of the difficult problem of North-American glaciation will find much of value in the summaries of recent Swiss studies on the structure of glacial ice, of observations in Greenland on the motion of the great glaciers there, and of the many suggestions to account for glacial motion, as well as in the accounts of existing glaciers and their oscillations.

The remarkable recession of the Swiss glaciers during recent decades, which travellers



finely illustrated in the figure of the glacier of the Rhone, of which a part is copied here. The measurements carried on of late years, under the direction of the Swiss alpine club, give precise data on this matter, and, if continued long enough, will undoubtedly in the end lead to the discovery of the cause of glacial oscillations in the peculiarly dry or wet, warm or cold, weather of some antecedent series of years; the effect leisurely following the cause, as the excess or deficiency of upper snow supply arrives at the lower end of the ice-stream. A view of the Rhone glacier, as it was at its recent maximum extension about 1820, is given in de Charpentier's 'Essai sur les glaciers,' and offers a striking contrast to the little remnant of ice at the foot of the steep slope, as seen by travellers of last summer.

The anatomy of the greatest glacial system of Switzerland, that which forms the Aletsch glacier, is excellently shown in a folded map. The scale is 1:50,000; contour lines are drawn in blue on the ice and snow every thirty metres; the moraines are marked in detail; and the peculiar zigzag bands in the ice, like the grain of wood, so conspicuous in the wonderful view from the Eggischhorn, are carefully represented. This map may therefore be ranked even above the interesting one of the 'Mer de glace' system (scale, 1:40,000) on Viollet-le-Duc's sheet of the 'Massif du Mont Blanc,' published about ten years ago.

The question of glacial erosion has always been fruitful of opposite views since it was first given importance by Ramsay; and we have to regret that the summary of the matter presented by Heim does not go further in reconciling the apparently contradictory facts quoted by the advocates of the contrasted theories. Heim writes, 'Glaciation is a period of rest in valley-making.' Professor Newberry concludes<sup>1</sup> that a great glacial sheet, shod with stones and gravel, "would not only be capable of sweeping away any ordinary barriers that opposed its progress, but would grind down the underlying rock with a resistless and comparatively rapid action."

Neither of these authors gives sufficient indication of the more judicious middle ground taken by James Geikie and some others, to the effect that glacial action may be destructive in one district, and constructive in another; that glaciers, like rivers, erode chiefly in their upper streams, and deposit the detritus quietly on the flood-plains and deltas of drift near their termination. The great amount of glacial drift undoubtedly affords the strongest argument that can be made in favor of the marked changes effected by glaciers, just as the vast volume of stratified fragmental rocks testifies to the successful persistence of water-action; and for North America, at least, we cannot accept Heim's conclusion, that pre-glacial weathering afforded the chief part of the drift, while direct glacial erosion gave rise only to fine sand and mud. The occurrence of angular, unweathered, and unworn bowlders, and of drift rich in limestone, forbids such a conclusion, and has been successfully quoted against it. On the other hand, the evidence of the protective, or at least the very moderately destructive, action of the old glaciers near their

<sup>1</sup> School of mines quarterly, vi. 1885, 152.

termination, and the not excessive erosion in any part, is ably stated; and, to our mind, this leads much nearer to the truth than does the path followed by those who see an argument for glacial erosion in nearly every lake of northern countries and every fiord of west ern coasts.

## HOUSEHOLD SANITATION.

IF the author succeeds in winning the audience she desires, she may justly claim pioneership in one direction of the higher education of women. The path indicated is not well beaten. Sanitary science is of late origin; so late, indeed, that the men who formulated it are still young. Its proposition to prevent disease by removing the conditions that provoke disease, merits the popular approval, and legislation has been quick to help sanitarians put their science to the test. With plenty of money, and in fair localities, it is not difficult to satisfy all the demands of the sanitarians. It will, however, hardly be contended that the sanitarians have formulated insurance against the outbreak of the zymotic diseases for the ordinary householder in any locality where necessity has placed him. And yet this is the very problem which sanitary science is to solve. Much can be done in one home to make it healthful; but the influences that affect one home are so intermixed with the influences that affect large areas, that state and national interference is demanded by sanitary science. The author has stated the sanitary conditions of healthful homes with accuracy, and with sufficient fulness to make these conditions readily comprehended. She appeals to the women of the land to familiarize themselves with the results of sanitary science, that they may be able to critically examine their own homes, and influence opinion, so that healthful conditions may be made compulsory under the law. This is good work, and the more of it the better. There is an immense chasm between crazy-quilts and sewer-pipes, sonatas and bad drainage; but it can be bridged by informing the women, and teaching the girls. If rosy children and long-lived husbands are worth the while, this education in what constitutes a healthy home is worth a place in the school curriculum for girls.

Sanitary science is so new, that ' consulting sanitary engineers,' without warrant of author-

Women, plumbers, and doctors; or, Household sanitation. By H. M. PLUNKETT. New York, Appleton, 1885. 248 p., illustr. 8°.