

freezing of water in cracks and other spaces. Scheuchzer is thus the founder of the Theory of Dilatation, afterwards advocated by Charpentier and Agassiz. The pastor Altmann in 1750, and Gruner in 1760, wrote about glaciers without bringing forward anything essentially new. They referred the movement of Alpine glaciers to the sliding of the ice on a sloping base. Neither Scheuchzer nor the two last-named authors had given special attention to the moraines.

A short paper, published in 1787, by Kuhn in Höpfner's *Magazin für Helvetiens Naturkunde*, contained not only an excellent description of the Grindelwald glacier and its moraines, but the author also followed the old moraines, and concluded that the glacier had formerly been of far greater extent. De Saussure's famous *Book of Travels* (1796-1803) contained accurate descriptions of the glaciers in Wallis, the Bernese Oberland, and the Mont Blanc group. The form, arrangement, composition, and movement of the moraines were all carefully handled. Saussure also used the moraines as a means of determining the extent and the advance and retreat of the glaciers, without, however, drawing any general conclusions. Strange to say, he associated neither the smoothness of the glacier floor nor the "Roches moutonnées" with the movement of ice-masses.

Saussure had in F. G. Hugi a successor who accomplished much for the knowledge of Alpine glaciers. A fearless mountaineer, Hugi explored the upper reaches of the glaciers; in 1827 he even built a hut on the Finsteraar glacier for his convenience in carrying on researches. He observed many facts about the structure and constitution of the snow, firm, and ice at different heights, about the position of the firm line, about fissures and crevasses which had escaped previous investigators.

In the year 1821, at the Eighth Annual Congress of the Swiss Society of Scientists, the engineer Venetz read a paper on the variations of temperature in the Swiss Alps, which contained wholly new conceptions. This important paper was not published until 1833. Venetz called attention to the fact that there were not only moraines connected with the advances and retreats of the Alpine glaciers, but that in addition to those, morainic walls occurred at a greater distance from the present glaciers, and they gave evidence of glaciation on a scale of enormous magnitude in some former period. In 1829 Venetz