

The Glacial Cause of Changing Climates

where along the 49th parallel of latitude (which denotes the boundary between British Columbia and United States) will be 49 sun + 49 moon diameters south of the zenith—and at the same time 60 sun + 60 moon diameters down the celestial meridian line for the points along the northern boundary of British Columbia.

The latitudinal difference between those northern and southern boundaries is 11° , whereas the climatological difference along the coast between Victoria (50°) and Skagway (35°), measured by the isothermal lines of "equal mean annual temperatures," is 15° . Therefore, if some world-tilting force could tilt the earth southwards 11° along the Prince Rupert (130°) meridian line, Victoria would have its climate changed to the warmer one of San Francisco, and correspondingly Skagway would (apart from the effects of the Pacific currents which may be considered later) gain the climate advantages now enjoyed by Victoria, so far as the major basis of differential climates mainly controlled by the divergent angles of the sun's rays is concerned.

At the same time reference to a geographical globe will make clear that such a tilt would divert Nova Zembla to the climate location of the North Pole, whilst Russia, Persia and Egypt would become correspondingly cooler, by being diverted northwards. On the other hand, South Africa would become much warmer, as it would be tilted closer to the Southern Tropic.

9. The earth's crust is now being very slowly tilted southwards by the weight of the continental ice on Greenland, consequently the glaciers of Europe and North America are collectively and steadily receding, because the slightly warmer climate every year melts both the glacier tongues and thickness away, as may be seen by comparing Plates IV and V, showing the photographs of the Yoho Glacier's tongue (near Field, B. C., on the C. P. R.) as it was in the years 1906 and 1907.

The contrast in the thickness of both the tongue and the upper part of the glacier, as evidenced by the gauges furnished by the mountain shoulder and pack behind, will convince the most sceptical, especially when he notes by Plate VI that the bulk of the glacier has moved forward 123 feet during the year—and yet the whole front has

receded about 20 feet, so that 143 feet have been melted.

Further, examination of Plate VII, showing a side view of the Yoho Glacier's tongue with the eroded side of the mountain beyond, proves to the experienced eye, by the bared striated natural rock-side 300 to 400 feet high, that the glacier was within comparatively recent years 300 to 400 feet thicker, as indicated below the tree-line.

10. As the Illecillewaet Glacier, close by Glacier Station on the C. P. R., is the most easily accessible, it has been most closely observed, as may be noticed upon the inspection of Plate VIII, which by its "top section" charts a cross-section through the glacier along the straight line permanently located by survey points on both side-rocks by Messrs. George and William S. Vaux, of New York, who yearly place copper plates secreted in the ice along that line, to test the progressive rate of flow by which the ice sags down that valley.

The bent lines, next below, record the located positions in July 1900, 1902 and 1903 of the plates they had put along the top line on July 31, 1900, proving that the ice had bodily moved forward about 700 feet in four years, or about 175 feet per year.

The lower hit-and-miss line locates the position of the ice-tongue in 1888, and the heavy solid line denotes the edge of the ice in 1906. The distance of about 800 feet between them demonstrates that during the eighteen intervening years the rate of recession averaged 44 feet per year. Between 1888 and 1898 the 500 feet of recession averaged 50 feet per year, because the ice was flatter spread out on the "ground moraine," as shown on Plate VIII. Those rates of recession are faster than the 20 feet flow of the Yoho, and are partly due to the steeper declivity down which the Illecillewaet Glacier slides and partly to the thinning over the bed-rock now being bared more rapidly.

11. One most exceptional feature of the Illecillawaet during the winter of 1908-1909 was the accessible condition of its beautiful "ice cave" (located to the right above the stream source of the Illecillewaet River) which enabled the writer to get underneath and watch the massive ice grinding the bed-rock to the "rock flour"