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The Location and Construction of the Canadian Northern Pacific Railway in British Columbia.

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The route followed by the Pacific Section of the Canadian Northern Railway System in reaching tide water from the interior, is of remarkable interest, not only because it follows the best natural highway through the Pacific mountain system of North America, but because there appears to be no other instance where a great mountain region is traversed by a railway with such easy gradients and with such comparative economy of construction. To understand this situation it is necessary to consider briefly the main physical features of British Columbia.

TOPOGRAPHY.—In broad outline the Canadian Cordillera may be divided into four provinces: (1) The Rocky Mountain system; (2) The Middle or Interior Range, including the Purcell, Selkirk, Columbia, Cariboo and Cassiar Mountains; (3) The belt of interior plateaus; (4 The Coastal System, including the Coast, the Cascade, and the Vancouver-Queen Charlotte Ranges. The first, third and fourth of these provinces extend, with but minor interruptions, through Yukon Territory and Alaska to the Behring Sea. The middle ranges are specially broad in southern British Columbia, but practically disappear about latitude 54 degrees, and reappear again between latitudes 56 and 62 as the Cassiar Range. Thus, briefly, we have two main mountain systems, one composed of the Rocky Mountain and Middle Range systems, the other the Coast Range, and between the two lies the belt of the interior plateaus. The striking feature of the first group of mountains which form the first and principal obstacles met with in approaching tide water from the prairies, is that they are subdivided by a number of great depressions running approximately northwest, and making a small angle with the main axis of the mountain ranges. The greatest of these depressions extends from Flathead Lake, in Montana, to the Yukon boundary, 990 miles. It is a relatively narrow but imposing trough, successively drained by the headwaters of most of the great rivers of the Canadian Cordillera. The larger streams flowing in the depression are:—The Kootenay, the Columbia, the Canoe, the Fraser, the Parsnip and Finlay (of the Peace River system), and the Kachika (of the Liard River system). Many of these leave the trough by transverse gorges cut in the adjacent mountains. All the mountains in Canada and in Montana lying to the northeastward of the trench have long been segregated as the Rocky Mountain system, and the trough has been named the Rocky Mountain trench. A second trench, about 220 miles long, cleaves the southeastern wall of the first, near Beavermouth, and runs southward. It is successively drained by the Beaver, Duncan and Kootenay Rivers, and for 74 miles is occupied by the Kootenay Lake. This trough rigorously separates the Purcell Mountain Range on the east, from the Selkirk Range on the west, and is called the Purcell trench. The Purcell Range is thus bounded on the east and west by the two trenches, and on the south by the loop of the Kootenay River in Montana and Idaho. A third depression extends from near latitude 52 degrees, where the Columbia River leaves the Rocky Mountain trench and flows south in a wide valley 310 miles long to the Columbia lava fields of Washington State, passing through the Arrow Lakes on its way. This depression is sometimes referred to as the Selkirk Valley. East of the Selkirk Valley, and west of the two master trenches, is the Selkirk Mountain system, which, like the Rocky Mountain and Purcell systems, extends into the United States. The rugged mountains to the west of the Selkirk Valley have been grouped under the name of the Columbia Mountain system. Between the 54th and 56th parallels the western wall of the main Rocky Mountain trench is much less prominent than it is either to the south or the north, where it is formed by the Cassiar Mountain Range, so much so that between these two parallels the interior plateaus might be said to extend right up to the trench. The various ranges to the west of the Rocky Mountain trench and south of the 52nd parallel concentrate into one north of the Selkirk Valley. The single range has its narrowest width and lowest pass at Albreda Lake, almost opposite the Yellowhead Pass.

In so far as this generation is concerned we may consider latitude 56 degrees as the northernmost limit of the territory across which a transcontinental railway would be constructed. Between this latitude and the International Boundary there are seven main passes through the Rocky Mountain chain, as follows:—The Crows Nest, at an elevation of 4,449 ft.; the Kicking Horse, at an elevation of 5,200 ft.; the Howse, at an elevation of 4,500 ft.; the Athabasca, at an elevation of 5,710 ft.; the Yellowhead, at an elevation of 3,718 ft.; the Smoky River, at an elevation of 5,400 ft.; the Pine, at an elevation of 2,850 ft.

The Crows Nest and the Kicking Horse passes have been taken by the C.P.R. They cross the Rocky Mountain and Selkirk groups of mountains at its widest and lead to routes which inevitably cut square across the great trenches enumerated above, and pass over intervening summits of magnitude. There is only one suitable route open to them across the Cascade and Coast Ranges, viz., the Fraser River Valley, to enter which involves, not only a circuitous route, but heavy gradients. The Howse offers no suitable approach from the east, and leads to the same difficulties as the Kicking Horse. The Athabasca and the Smoky are too high, and the approach to them from the west and the east is too rapid for easy grades. The Pine is good, but the geographical situation places it at a disadvantage as compared with the Yellowhead, which alone complies with the necessary requirements of:—Easy approach from the west and the east, access to an easy pass through the Cascades, and to a first class deep water harbor.

This leads to the consideration of the approach to the Pacific through the Cascades. The main alternatives are by the way of:—The Fraser River to Burrard Inlet; Nomathco to Bute Inlet; the Bella Coola to the North Bentinck Arm; the Salmon River to Dean Inlet; the Kemano River to Gardner Inlet; the Skeena River to Prince Rupert. Of these only the first and last are routes that pass through major breaches in the Cascade Range, and the only ones that do not offer gradients somewhere in their course which would be a serious obstacle to transcontinental traffic. The Coast Range is less mountainous towards the north than it is in the south, hence, although the Skeena in reality is not as great a river as the Fraser, yet it is so relatively to the country through which it passes, and provides almost an equally suitable approach to the Pacific. The second condition of the problem, viz., the satisfactory connection between the Rocky Mountain pass and these breaks in the Cascades, is wonderfully fulfilled by both routes. Instead of the great trenches being obstacles, as is the case in the southern routes, they now form part of the connecting link. The northern route through the Skeena follows the Rocky Mountain trench until the western wall of the latter comes to an end, whence there is an easy way across the great interior plateau by the Nechako and Buckley Rivers. For the southern route there is the providential opening through the Columbia Mountain system at the Albreda summit, from which flows a branch of the Thompson, the main tributary to the Fraser. Here is another illustration of how railways must, as far as possible, follow nature's highways, the rivers. Seldom, however, does nature put her great waterways in as suitable a position for the use of railway locators as she has done in this case. Of these two routes the northern is followed by the Grand Trunk Pacific, and the southern by the Canadian Northern Pacific.

THE GEOLOGICAL HISTORY of the Canadian Cordilleras is yet largely a matter of mystery. The formation is chiefly sedimentary, and there is little evidence of volcanic action. There appear to have been several sedimentary periods alternating with periods of upheaval; and the evidence tends to show that the sediment was from detritus from mountains to the northeast. Probably the Rocky Mountain Range is younger than the Selkirks. There is no doubt that the region of interior plateaus was covered during the Pleistocene period by the cordilleran ice cap. With the waning of this ice cap it gradually gave place to alpine, cirque and valley glaciers, which slowly retreated until the time of maximum extension of the Keewatin ice sheet on the east, when the second period of valley glaciation took place. These glacial conditions, followed by eons of disintegration and slow (and probably discontinuous) land upheaval, appear to have modified the original form of the Cordilleras to their present condition. By what exact process the wonderful rift was made, which is followed by the C.N.P.R. through these mountains, can only be determined, if ever, by very much more geological study