Probable Change in Drainage of the Black and Gaspereau Rivers, Kings Co., N. S.—By F. C. Churchill, Wolfville, N. S.

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Although I fully realize the difficulty, also the rashness, on my part in attempting a question of this nature, nevertheless I feel that a beginning should be made to decipher many of these problems in our local geology; and unless one begins I am afraid very little will ever be accomplished.

I have spent much time in examining the region in Kings Co. drained by these rivers, and also have speculated much concerning their probable history; but I wish the reader to understand that very much of this is speculation on my part, and it will have to be in the future that one may know the full history of these changes.

The Deep Hollow is intimately connected with the history of these rivers and demands a description. It lies to the north of the Black and Gaspereau Rivers, and is nearly opposite where the Black River joins the Gaspereau, lying nearly 150 feet above.

This whole region slopes in a northerly direction and may be considered part of the South Mountain; the Deep Hollow and Black River running nearly at right angles to the Gaspereau and flowing northward. The small brook now occupying the Hollow is fed by springs, and is entirely too small to have cut a gorge of this size; and the question is, From whence came the sources of this river?

The road that runs through the valley from Whiterock, north to New Minas, follows the ancient channel of the river; and as one passes over it, he is impressed that it once must have been a river, as it winds to and fro like a river over its flood-plain. The valley shows many signs of being stream-cut, having overlapping rock spurs, the height of which reaches 75 feet or more cut into the hard slate and quartzite.

I am indebted to Mr. E. R. Faribault of Ottawa for an excellent map of this region, which has enabled me to understand its complicated geological structure. The slates and quartzites underlying this section are folded into a series of parallel anticlines and synclines having their axes in a north-east and south-west direction, and are disturbed by numerous faults.

In viewing this region I have considered it as the inner margin of an elevated ancient coastal plain, the outer or seaward margin being near the Bay of Fundy where the underlying rocks dip north-westerly towards the shore. If my supposition be well founded the earliest lines of drainage to be established on this surface, would follow the surface of the ground and run as a consequent stream, taking the shortest course to the sea, across the strike of the strata parallel to the dip. This is the law of coastal plain drainage, and I think there is reason to believe that the Black River took this course through the Deep Hollow.

I have located a large meandering gorge in the North Mountain nearly opposite the Deep Hollow, and this may be its old outlet into the Bay of Fundy. Be this as it may, the fact is well established that when anticlines and synclines are eroded their remaining portions form a series of ridges like the cuestas of a coastal plain, and that the earliest drainage over those eroded structures is parallel to the dip, and the later rivers and tributaries develop by running at right angles to these, that is, parallel to the strike.

Judging from the structure and position, I have assumed that the Deep Hollow was once the northerly extension of the Black River. This river shows many signs of great age. By this expression I mean stage of development. Its meanderings are well incised into the hard slates and quartzites, its only signs of youth being its falls which are situated near its junction with the Gaspereau. I think however these falls do not necessarily show youth, but are the result of the uplift in this region which brought near the surface the dyke of hard diorite that crosses this stream. But the river has cut deeply into this dyke, thus showing this uplift to be greatly remote in time.

The Gaspereau River on the other hand has no incised meanderings and its appearance is far more youthful.

The probable history of these rivers may be stated as follows: When the Black River began its flow the whole region was well elevated above sea level, and as time elapsed it cut its valley and its drainage area to a very low grade. In this stage of development it meandered lazily over its flood plain, thus outlining the present Deep Hollow. Then a period of uplift began, giving the river a high grade and enabling it to cut its course into the bed rock below. Probably the Gaspereau was just be-

ginning its journey to the sea during this uplift, having begun its flow a short distance east of the Deep Hollow.

Probably during this process the Gaspereau was steadily working its way headward until it finally tapped the Black River at the Deep Hollow, and diverted its waters eastward, although that part of the Gaspereau which now lies west of the Deep Hollow may have been a tributary to the Black River.

My reasons for supposing that the Gaspereau began its flow to the east of the Deep Hollow are based upon the law of coastal plain drainage, that the later rivers grow chiefly by headwater erosion; that is, they cut their valley headward, and the Gaspereau appears to have followed this rule. A short distance east of the Deep Hollow, near the present Electric Power dam, the river flows into a syncline of quartzite and slate. This structure, in my mind, helps one to understand the drainage of this region. If the Gaspereau cut headward into this syncline it took it a long time to cut such a deep gorge, and during the time this gorge was being cut, the Black River had ample time to engrave its meanderings into the hard rocks of the Deep Hollow before it was tapped by the Gaspereau.

The Gaspereau has still the appearance of a youthful river where it crosses the mentioned syncline. Here the valley is steep and gorge like and time has not yet elapsed for it to obey the law of stream development, that rivers seek the lines of least resistance and forsake synclines and move over on the adjacent anticline which is the weaker structure.

Moreover, before the Black River was tapped by the Gaspereau it was a weak sluggish stream with a course of about 12 miles to the sea from Whiterock. On the other hand the Gaspereau, a young and vigorous stream with a short course of about 6 or 7 miles to the sea from Whiterock, had the advantage over the Black River and captured its drainage area.

What has happened to this drainage area during the Glacial Period I would not care to venture more than a guess. We can safely say, however, that portions of these rivers were dammed by the ice, its debris producing the lakes in this district; and when the country finally was submerged, the marine waters were admitted well up into the valley. Evidence of this may be seen in the gravel deposits that now stand about 200 feet above sea level.

After re-elevation of the country, owing to the increased grade of the rivers, vast quantities of glacial material must have been swept into the sea, thus helping to build up our modern marine marshes.

The topography of this region, I believe, is all pre-glacial, the small mounds of gravel and the gentle slopes of the hills to the north, have been more or less shaped by the ice sheet that has now vanished.