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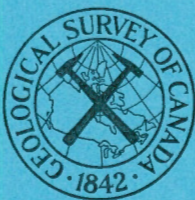
CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA
TOPICAL REPORT NO. 30

GEOLOGY OF NAKIMU CAVES
GLACIER
BRITISH COLUMBIA

BY
J. O. WHEELER



OTTAWA
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Recd 15 Dec 60

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The Nakimu caves occur entirely within limestone of late Precambrian age (i.e. more than 500 millions of years old). The most extensive outcrops of this limestone are on either side of the lower part of Cougar Creek Valley. There, the limestone has been folded and thrust westward up onto younger quartzites and slates that form the main part of Cougar Mountain, all of Mount Bagheera, and the western slopes of Catamount Peak. Consequently, in the region of the caves the limestone beds have been considerably fractured and have been tilted so that they trend northwesterly and slope moderately steeply downwards to the east.

The caves, in general, have an elongate or roughly tabular shape developed more or less parallel to the stratification in the limestone. The caves were formed partly by the solution of the limestone in which zones of weakness such as fractures and planes of stratification guided dissolving waters, and partly by erosion by underground streams that followed and enlarged pre-existing openings originally created by solution.

Limestone is very susceptible to solution by water carrying carbon dioxide, as rain-water and water derived from the melting of snow and ice. That the limestone in the region of the caves has been partly dissolved is suggested by the following features. Underground streams and channels are restricted to the limestone and are absent in the adjoining quartzites and slates. Depressions at the surface in the limestone above and to the west of the caves on the south side of Cougar Creek Valley are typical of those in regions where cave-ins at the surface have been caused by solution of the limestone underground. The cavern walls are commonly dimpled; a feature attributed to solution.

Erosion by underground streams carrying highly abrasive gravel, sand and silt is suggested by deposits of such material in abandoned underground stream

channels, by numerous pot-holes, and by marks of scouring and abrasion along the walls and floors of such channels. Although the major process of formation of the caves appears to have been solution of the limestone, it is probable that underground erosion by streams contributed to the enlargement of the caves.

The outlines of the caves have been controlled in large measure by the layering in the limestone. This is suggested by the way in which the rudely tabular shape of the caves conforms to the layering in the limestone. In addition, the shape of the caverns has been governed by vertical fractures in the limestone that trend both northwest and east-northeast. The roof of the caves has been influenced both by the stratification in the limestone and by fractures that slope gently to the west.

As the caves were widened and deepened parts of the roof and walls were left unsupported and consequently blocks broke away. These blocks fell to lower levels and jammed where the caverns were narrower producing such places as Fat Man's Misery and the passageway south of the Bridge of Sighs. Elsewhere, loose blocks fell onto sloping shelves of limestone where they are potentially dangerous to visitors walking beneath them.

In many places the cavern walls have a coating of redeposited calcium carbonate called "dripstone". This has formed where water, which dissolved limestone elsewhere, trickled down the cavern wall. On evaporation some of the dissolved material in the trickle was redeposited as a coating on the wall. Where the trickle of water was restricted so that it fell from a projection on the roof the redeposited material accumulated in roughly the same place to form a rock "icicle" or stalactite. Drops that fell from the roof continued to evaporate and upon hitting the floor deposited more calcium carbonate to build rock pillars or stalagmites. Stalactites and stalagmites, however, are extremely rare in the

Nakimu Caves. Buddha is an example of the latter form and apparently has grown or changed little in 50 years.

Incrustations of powdery calcium carbonate cover the upper parts of many of the caverns, particularly in the lower parts of the caves such as in the Sphinx and the Cathedral. Their origin is not as yet understood.

The Nakimu Caves are thus an example of caves formed principally by solution of limestone but locally enlarged and deepened by erosion from powerful, debris-laden underground streams.

Ayers, W. S. and Wheeler, A. O. (1914) The Nakimu Caves,
Glacier Dominion Park, B.C. : Dominion
Parks Branch, Dept. of the Interior, Ottawa,
29 pages.

APPENDIX : SAFETY MEASURES.

Considerable effort will be required to make the upper or northern part of the caves safe for visitors. From the Terror southeast there is little evidence of fresh rock-fall and hence it is inferred that the loose blocks lying on sloping shelves are fairly stable. It would be wise, however, to test poised blocks in order that dangerous ones may be removed before construction starts within the caves.

From the Ballroom to the opening at the upper end of the caves the roof is loose and dangerous. Numerous relatively recent rock falls have occurred within this stretch of the caves. It is possible that the upper end of the caves, being exposed to the cold air from the surface in winter and having a considerable moisture present in the air because of the nearby rushing stream and waterfalls, may be subject to more freeze and thaw cycles than in the lower reaches of the caves where it is warmer and drier. Cold air penetrates at least as far down as the Ballroom judging from the presence of ice on the floor of the caves in that region. Consequently frost action would pry blocks apart in the upper reaches of the caves more readily than below. It will be necessary to consult with experts in the field of mine timbering and support in order to make the region between the Ballroom and the upper end of the caves safe for visitors.