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CRACKING THE CRETACEOUS CODE

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Exploring the Geology of Caves in the Rocky Mountains and Adjacent Ranges

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ABSTRACT

Caves in the Rockies and adjacent ranges occur in a NW-SE belt over 1200km long and 200km across. Many of the cave areas are remote and involve non-trivial approaches by foot, vehicle, air or combinations thereof. Starting in the mid 1960's, intensive exploration discovered and recorded hundreds of caves across this vast area. While the caves occur in many different physiographic and stratigraphic settings, some generalities can be observed.

In the Rocky Mountains, alpine karst frequently develops in hanging valleys that are floored by limestone pavements. Many of these karst areas are currently being exposed by retreating glaciers. Fractures and joint networks play an important role in the catchment of aggressive glacial meltwater. Resurgence springs occur lower down on valley walls, often near the base of the soluble limestone units.

Caves in the Front Ranges tend to be found in steeply dipping Upper Paleozoic limestones, particularly in the Palliser and Livingstone formations. In these steeper dipping intervals, many significant caves are developed as dip tubes along duplex faults. In these areas, the steep dips, faults and networks of joints play a large role in directing the development of cave passages.

In the Main Ranges, many caves are hosted in relatively low-angle dipping limestones, particularly the Cambrian-aged Mural and Cathedral formations. The Cathedral Formation contains Castleguard, formerly Canada's longest cave, which is plugged by glacial ice from the overlying Columbia Icefields over 10km from its entrance. Where stratigraphic dips are low-angle, bedding units and sparse joint networks control many cave passages.

In Western Ranges, like the Selkirks, Purcell and Monashees, significant caves occur in marble units within metasedimentary packages including those on the flanks of metamorphic core complexes. This so-called "marble-stripe karst" develops in soluble carbonate that is bounded by relatively insoluble lithologies like schist.

While the pace of exploration today has slowed, new discoveries are still being made and several systems continue to be pushed with optimism for potential connections to other nearby caves. Given the vastness of the area, new caves are sure to be found, particularly as exploration pushes into more remote and difficult areas.

