THE SEARCH FOR THE OLDEST FOSSILS IN THE CORDILLERA

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ABSTRACT

In the late 19th century, discoveries of Cambrian fossils in the Cordillera were coincidental consequences of the activities of the Geological Survey of Canada in the service of the Canadian Pacific Railway. These activities centred on exploration of possible routes through the mountain barriers and on the search for coal. One serendipitous result was George Dawson's discovery of the Lower Cambrian trilobite Olenellus gilberti along the Canadian Pacific Railway main line at Kicking Horse Pass.

Cornelius Van Horne, the General Manager of the Canadian Pacific Railway, attempted to reduce the company's massive debt by exploiting the budding Victorian interest in mountain scenery. This initiation of tourism in the Canadian west also had important implications for Cambrian paleontology. In 1886, workmen building the CPR tourist hotel at Field discovered abundant trilobites in shales on Mount Stephen. A collection from the trilobite beds was sent to Carl Rominger at University of Michigan who published a quickie paper on these fossils. This paper, inept as it was, piqued the interest of Charles Walcott, the Cambrian paleontologist at the United States Geological Survey, who recognized that these fossils were of Middle Cambrian age. But Walcott had to wait twenty years before his curiosity about these fossils and their stratigraphic setting could be satisfied. He left the federal service in 1907 to become Secretary of the Smithsonian Institution, and in July of that year we find him on Mount Stephen collecting fossils from the trilobite beds. Until his death in 1927, most of Walcott's research was devoted to Lower Paleozoic stratigraphy and paleontology of the Canadian Cordillera, including description of the Burgess shale fossils which he discovered in 1909.

INTRODUCTION

In the two decades following British Columbia's entry into Confederation, most geological exploration in the Rocky Mountains was carried out as part of a loose collaboration between the Canadian Pacific Railway (CPR) and the Geological Survey of Canada. Two objectives were emphasized: exploration of possible routes for the transcontinental railroad through the mountain barriers and documentation of the distribution of critical deposits of coal (Zaslow, 1975, p. 108). The initial focus was on a northern route. Alfred Selwyn, the second Director of the Survey, ascended the Thompson River as far as the Yellowhead Pass and later explored a possible route along the Peace River. George M. Dawson, who later succeeded Selwyn as Director, travelled through Pine Pass and also explored the upper Columbia River. In the early 1880s, when the CPR decided to build the railroad along a southern route, Dawson and George McConnell were sent by Selwyn to explore geologically the country along the Bow River and into the passes to the west (Dawson, 1886).

No Cambrian fossils were collected during these geological reconnaissances even though
extensive fossiliferous strata of this age occur in the areas explored. But in 1885 Dawson
discovered the trilobite *Olenellus gilberti Meek* in limestones exposed near the Kicking Horse
Pass, immediately east of Field, British Columbia. This trilobite documented, for the first time,
the presence of the Lower Cambrian *Olenellus* Zone in the Canadian Cordillera.

Later discoveries of Cambrian fossils from the area around Field were closely linked to the CPR’s
attempts to establish a lucrative tourist industry in the Canadian Rocky Mountains.

**The CANADIAN PACIFIC RAILWAY, tourism and carpenters**

Tourism and vacations are fairly recent social phenomena which date from the late 19th century
when the middle and upper classes began to seek out seaside and mountain resorts to escape
the heat and pollution of the industrialized cities. Travel for pleasure had become a new and
original vacation option for affluent and adventurous tourists in the 1870s. Jules Verne’s book
*Around the World in 80 Days* had just been published, Thomas Cook began to offer round-the-
world excursions, and Yellowstone National Park had recently been established. The late
Victorian era was also the time of beginning awareness of the significance of wilderness through
the writings of John Ruskin in Britain and Henry David Thoreau and John Muir in America.
Mountains assumed almost mystical significance in their writings – *mountains are the beginning
and the end of natural landscape* according to Ruskin (Hart, 1983).

Cornelius Van Horne, the astute General Manager of the CPR, identified a way to reduce the
massive debt load of the company. He decided to exploit the public’s fascination with wilderness
experiences and mountain scenery. *If we can’t export the scenery, we’ll import the tourists.* To
service this anticipated rush of tourists, Van Horne ordered the construction of a series of hotel
dining stations along the main line through the mountains: Fraser Canyon House at North Bend,
Glacier House at Rogers Pass and Mount Stephen House in Field. These were not to be hotels,
like those in Banff and Lake Louise; rather they were to be restaurants which eliminated the
need for the locomotives to pull heavy dining cars up the steep grades.

Mount Stephen House was finished in 1886 at a cost of $20 000. Its interior was executed in
high Victorian style with gas lights, heavy brocades, pump organ and caged canaries. The food
was less distinguished. Van Horne, who investigated every minutiae of his railroad, noted, *The
hotel at Field, in addition to being excessively expensive, is very badly managed. I have never
yet seen a decent meal in the house, and complaints are numerous* (Hart, 1983).

Some of the workmen who were building Mount Stephen House during the summer of 1886
spent their Sundays scrambling across the steep slopes of the surrounding mountains. One day,
a group of now-forgotten carpenters discovered abundant and well preserved *stone bugs* high
on Mount Stephen above Field (Figure 37) in what was later to be known simply as the Trilobite
Beds (Collins, 1986). This discovery was to have profound implications for Canadian Cambrian
paleontology.
The workmen told McConnell of the Geological Survey of Canada of their discovery. He had been sent out to investigate the stratigraphy and structure along the CPR main line. In September, he made a larger collection from the Trilobite Beds and he was able to place these fossiliferous shales some 600 metres upsection from the *Olenellus*-bearing limestones that G.M. Dawson had discovered the previous year.

Otto Klotz, a Dominion surveyor who was in Field to determine the latitude and longitude of points along the CPR, was also told of the discovery. Like McConnell, he made a fossil collection from Mount Stephen which he sent to Carl Rominger, professor of geology at the University of Michigan in Ann Arbor. Even though he had no prior experience with fossils of this age, Rominger (1887) published a hastily assembled paper in which he described mostly new species of trilobites. This was clearly a paper written by a non-specialist. Rominger did not refer to a single published paper on trilobites. Correlations to other successions in North America were not attempted and he used the even-then antiquated term *Primordial* to indicate the age of these beds.

**Piquing Walcott's interest**

Rominger’s paper is important, not for its scientific content, but because it alerted Charles Walcott of the United States Geological Survey to the quality of Cambrian fossils preserved in long stratigraphic sections in the Canadian Cordillera, particularly in the area around Field. During the 1880s and 1890s Walcott had achieved unchallenged mastery of the fields of Cambrian and Precambrian paleontology and stratigraphy. In response to Rominger’s paper, Walcott (1888) published a note in the American Journal of Science, but this was much more than a simple critique. In order to properly identify these trilobites (Figure 38), he borrowed both Klotz’ and McConnell’s collections from the Trilobite Beds. As one very familiar with Cambrian fossils of western North America, he was able to show that the Mount Stephen fossils are of late Middle Cambrian age.

Figure 37. Mount Stephen House at Field, British Columbia as photographed by Otto Klotz in 1886. Workmen discovered "stone bugs" in what was later to be known as the Trilobite Beds on the flank of Mount Stephen (shown by white arrow).
The pace of Walcott’s research was hardly interrupted when he succeeded John Wesley Powell as Director of the United States Geological Survey in 1894. Walcott was the first paleontologist in North America to systematically study the limited biota of the Late Precambrian, mainly stromatolites and possibly a few metazoans (Walcott, 1899; Yochelson, 1979) and particularly the fossils of the Belt Series. *Beltina danai* Walcott, reputed to be a merostome crustacean more advanced than a trilobite, was considered a very important discovery because it was tangible evidence of the gradual diversification of the arthropods which must have started well below the Cambrian according to Walcott's evolutionary thinking. These fossils came from Belt strata a few thousand metres below Cambrian rocks in Montana and British Columbia. Despite intense collection efforts, no other arthropod or other metazoan fossil was discovered in the Belt, and Walcott was becoming increasingly troubled by the morphologic discrepancy between the extreme simplicity of the organic structures such as stromatolites in the Belt and the great complexity of the diverse shelly fossils in the Lower Cambrian. To explain why these unmetamorphosed sequences of strata did not contain the fossils which document this slow development, Walcott was forced to reinterpret most of the Belt strata as nonmarine in origin, and, therefore, well removed from the locus of metazoan diversification which took place in late Precambrian marine settings. This late Precambrian period of marine sedimentation and early metazoan diversification was assigned to the Lipalian Era. According to Walcott (1910), the fossil record documenting this gradual diversification had been lost because the marine rocks were eroded prior to the Early Cambrian transgression.

Walcott’s interpretations of *Beltina* and Lipalian did not survive long into the 20th century. Although clearly organic, *Beltina* is not a metazoan; the specimens probably comprise broken sheets of algae (Yochelson, 1979). Walcott’s concept of the Lipalian foundered with the realization that most of the Belt strata were marine after all, and that they lacked shelly fossils for the simple reason that metazoans had not yet developed. Shelled metazoans did not appear until much later, close to the base of the Cambrian.

**Walcott’s Canadian phase**

In 1907 Walcott left the United States Geological Survey to become Secretary of the Smithsonian Institution and now, no longer a federal employee, he was free to do fieldwork and
to pursue research interests beyond the borders of the United States. Remembering the collections of Klotz and McConnell that were described by Rominger 20 years before, he headed straight for Field, British Columbia, and in July of that year he was on Mount Stephen collecting fossils at the Trilobite Beds. Walcott treated these fossils and their stratigraphic setting in the first volume of the Canadian Alpine Journal in 1908. This was the first of many papers based on Walcott’s extensive fieldwork in the southern Canadian Rocky Mountains. Walcott’s final contributions were two posthumous publications (1927, 1928) which dealt with Cambrian, Ozarkian, Ordovician and Silurian sedimentation and stratigraphy of the southern Canadian Rocky Mountains. In all, over 200 pages of text amply illustrated by metre-long fold out panoramic photographs of mountain scenery showing formational boundaries.

Returning to Field across Burgess Pass in August, 1909 Walcott discovered the celebrated Burgess shale fauna (Gould, 1989), the description of which occupied most of his research time until his death in 1927.

REFERENCES


Researchers have found fossils of Ordovician conodonts dating to between 446 and 444 million years ago for the first time in the western Mediterranean. The discovery of these very primitive marine vertebrates has helped scientists to reconstruct the palaeogeography of the Cordillera Bética mountain range. Their study shows that the mountain system in the south of the Iberian Peninsula was located alongside the Alps at that time. Share: FULL STORY. The fossils found by the research team are not only the oldest in the Cordillera Bética, but are also the first remains of Ordovician conodonts found in the entire western Mediterranean, from Gibraltar to the south of Italy.