Making Space for Fossils:
Power and Paleontology in Yoho National Park (1907 – 1988)

By

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Abstract

Yoho National Park protects the Burgess Shale: a chain of fossil beds in British Columbia bearing what paleontologist and science writer Stephen Jay Gould once called "the world's most important animal fossils."[1] They are an extraordinary record of underwater soft-bodied organisms from just after the Cambrian Explosion, around half a billion years ago. Paleontologists and geologists have shaped public understanding of the fossils through their fieldwork and research activities. They have also shaped *all* actors' use of the Burgess Shale fossil beds in Yoho through the arguments and tactics that they used to access, collect, and recognize the heritage value of the fossils.

In this thesis, I present three case studies of moments in the twentieth century when paleontologists helped shift the access regime around the Burgess Shale. I begin with the first systematic scientific studies of the Burgess Shale, from 1907 – 1925. I examine how Smithsonian Institution Secretary Charles Doolittle Walcott, family members like his wife Mary Vaux Walcott, and the rest of the Smithsonian team negotiated access to the Burgess Shale. They did so by claiming space for Parks Canada and the Canadian Pacific Railway through species naming, by trading favours, and by participating in recreational activities that helped promote the mountain tourism industry. Next, I focus on two permit requests that the Royal Ontario Museum made in the 1970s: one that was denied, and one that Parks Canada found impossible to refuse. I examine how curator and paleontologist Desmond Collins tapped into the discourse of nationalism and an endorsement from the Geological Survey of Canada to make his case for

[1] Stephen Jay Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W.W. Norton, 1990), 23.

access. Finally, I examine the Burgess Shale's nomination to the World Heritage list in 1979, and the consequences for park management up to 1988. Here, the authorized heritage discourse and expanding tourist pressure met a parks agency increasingly concerned with wilderness preservation.

Through their research in the Burgess Shale, these generations of paleontologists expanded collective understanding of the evolution of life on Earth. At the same time, they helped Parks Canada and the Canadian Pacific Railway Company claim territory in the Rocky Mountains, increased Parks Canada's perception of the fossils' heritage value, and ultimately helped make the sites so popular with tourists that park managers saw strict access restrictions as the only way to protect the fossils.

Preface

This thesis is an original work by Chris Chang-Yen Phillips. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “History of UNESCO Designation in the Burgess Shale”, No. Pro00118284, March 7, 2022. At the time of defense, no part of this thesis has been previously published.

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Thank you to my supervisor, Dr. Liza Piper, who has introduced me to an extraordinary range of methods, ideas, sources, and even their own parents when I had the opportunity to visit fossil sites in Nova Scotia. This project would not have been possible without their guidance, support, and timely references. This thesis has also benefited from the feedback of many faculty and classmates, including Dr. Heather Coleman, Dr. Shannon Stunden Bower, Dr. Keith Mouré, Dr. Sarah Nickel, Dylan Hall, Riley Penny, Tulika Singh, and Connor Thompson.

I appreciate the time and candour shared by my interviewees: John Acorn, Jean-Bernard Caron, Randle Robertson, Hal Eidsvik, and Todd Keith. I also appreciate the hospitality of folks in Field, Banff, Cranbrook, and Winnipeg. There is no substitute for visiting fossil sites in person, and I had excellent guides through the Burgess Shale, the Joggins Fossil Cliffs, and Dinosaur Provincial Park, and the geography of the Bay of Fundy, including Georgia Pe-Piper and David Piper. Many people at the University of Alberta helped me contextualize, see, and display fossils mentioned here, including Clive Coy, Howard Gibbins, Cathy Blaker, and Lisa Budney.

This project was funded by the Social Sciences and Humanities Research Council of Canada (SSHRC), the Eleanor Luxton Foundation, and the Department of History, Classics, and Religion at the University of Alberta. My path back into academia after a decade away was made possible by Dr. Stephen Bocking, Dr. Stephen Hill, Kathryn Ivany, and Dr. Russell Cobb.

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the Alberta Legislature Library, the Smithsonian Institution Archives, and the Golden Museum and Archives, as well as Meg Stanley, Alessandro Balsamo, and Christina Cameron.

Infinite thanks to the family and friends who inspired and pushed this project forward, including my Grammy and Grampa Phillips, my mom, my dad, and my stepmom. I am cosmically grateful to my husband Finn for his patience, support, curiosity, encouragement to go farther, and for being my hiking buddy.

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Abbreviations

AMNH	American Museum of Natural History
CPR	Canadian Pacific Railway
DPP	Dinosaur Provincial Park
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for Conservation of Nature
GSC	Geological Survey of Canada
ROM	Royal Ontario Museum
U of A	University of Alberta
U of T	University of Toronto
UNESCO	United Nations Educational, Scientific and Cultural Organization
USGS	United States Geological Survey
WRO	Parks Canada's Western Region Office

Introduction

Figure 1: Modern day hikers climbing up to the Mount Stephen Trilobite Beds. Illustrated by the author.

On a sunny day in late July of 2016, I am walking gingerly over chunks of shale high up on the slopes of Mount Stephen with my husband Finn, our friend, and our tour group. It feels sacred and profane every time I hear my hiking boots make a hollow crunch on the rocks, like stepping over stained glass windows in a 505-million-year-old cathedral. Most of these rocks contain dark and shiny fossils of trilobites – some of the extraordinary organisms that lived underwater here just after the Cambrian Explosion, half a billion years ago. They are part of the Burgess Shale: a chain of fossil beds in British Columbia (BC) that paleontologist and science writer Stephen Jay Gould once called "the world's most important animal fossils." [1] Here in

[1] Stephen Jay Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W.W. Norton, 1990), 23.

Yoho National Park, we are guests in Ktunaxa, Stoney, and Secwépemc traditional territory. We have made this secular pilgrimage with a tour guide from the Burgess Shale Geoscience Foundation. He has led us from a parking lot in the tiny town of Field, up through dense trees and lichens and bleeding tooth fungi, to this open scree slope overlooking the Kicking Horse River and the Canadian Pacific Railway (CPR) tracks in the valley. Here, we hope to see and touch the remains of soft-bodied marine species millions of years older than dinosaurs. And we have paid $90 a person for the privilege.

We learn that the Mount Stephen Trilobite Beds and the Walcott Quarry, just across the Kicking Horse Pass on a ridge between Wapta Mountain and Mount Field, were added to the UNESCO World Heritage list in 1980, and are now the nucleus of the vast Canadian Rocky Mountain Parks World Heritage Site. Both fossil beds are in restricted zones now, closed to the general public and marked with Parks Canada signage. This zoning limits the presence of both recreational groups and scientists in the area. Our time here is short, we have been under surveillance along the trail, and we are not to take anything away except pictures. I am totally in awe as we crouch down to pick up these small and powerful totems of the deep past,[2] and I wonder how it became so difficult and expensive to know nature in this place.

Paleontologists and geologists played a major role in shaping scientific and public understanding of the Burgess Shale and park management of these spaces. The term "Burgess Shale" is used today to group together the Mount Stephen Trilobite Beds, the Walcott Quarry, a site near Stanley Glacier in Kootenay National Park, and other fossil beds in Yoho and Kootenay

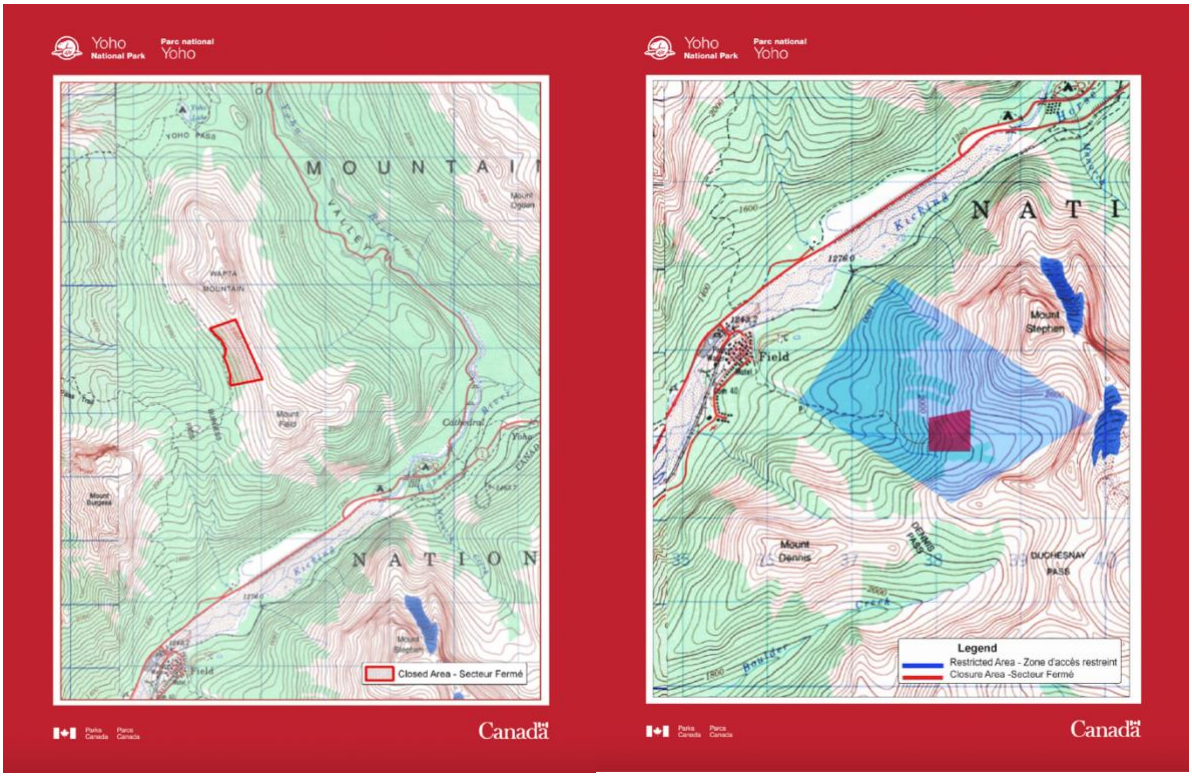
[2] Paleontologists estimate the age of the fossil beds through biostratigraphy. The Mount Stephen Trilobite Beds are estimated to be between 510 and 506.5 million years old, but the age of the other sites varies slightly. Dave Rudkin, "The Mount Stephen Trilobite Beds," in *A Burgess Shale Primer: History, Geology, and Research Highlights. Field Trip Companion Volume, ICCE 2009.*, ed. Jean-Bernard Caron and Dave Rudkin (Toronto: The Burgess Shale Consortium, 2009), 93.

with similar fossil remains. These fossils are small, strange, and difficult for members of the public to interpret, so paleontologists have been essential in creating their public image.[3] The stories of scientists' work in Yoho are a major theme in interpretive talks, museum displays, and park management documents about the Burgess Shale. These stories usually highlight geologists and surveyors who identified trilobites while building the railway through the Kicking Horse Pass in the 1880s. They also celebrate the 1909 "discovery" of the most famous Burgess Shale site by American geologist and Smithsonian Institution Secretary Charles Doolittle Walcott, and his later studies of the fossils there. Paleontologists are under-studied historical actors in the development of Canadian national parks. My analysis will focus on these scientists' role in guiding decisions about who can access the Burgess Shale and what activities are allowed there.

My curiosity is partly driven by my own family's history in the mountains of BC, especially on my dad's side. My grandmother and her family immigrated from Denmark to BC, where her dad made wooden cabins and signs for Mount Revelstoke National Park. Revelstoke is also where she met my grandfather, whose family came from Scotland and Galicia, and who worked with the CPR. We shared a fascination with the railway's Spiral Tunnels through Yoho. As an adult member of the Jurassic Park generation, I have loved travelling with them to places like Stanley Glacier, holding fossilized specimens of *Metaspriggina* and *Tuzoia* in our hands. I remember talking to my grandparents about how hard it was to book a spot on one of these hikes. I want to understand the context behind these awestruck, soul-filling experiences we shared. It

[3] The unique iconography of the Burgess Shale that paleontologists have articulated has sparked a huge subgenre of paleoart reconstructing life in the Cambrian, from Marianne Collins' scientific illustrations to a 2016 riff on the nyan cat meme starring an *Anomalocaris*. Estrella Vega [@EstrellaVega1], "My Kickstarter Has Ended! 168% Funded! Here's a Gif to Celebrate, Inspired from Nyan-Cat Meme: Nyan-Anomalocaris! https://T.Co/9VzPCyKDJo," Tweet, *Twitter*, September 15, 2016, https://twitter.com/EstrellaVega1/status/776430992101900288. For those unfamiliar with the original gif of a cat/Pop Tart hybrid flying through space, see: "Nyan Cat," Know Your Meme, April 16, 2011, https://knowyourmeme.com/memes/nyan-cat.

strikes me that we live in a culture that alienates humans from the rest of nature, and visiting ancient marine relatives in these fossil beds can connect us to the family of life.



Figures 2 & 3: Parks Canada maps of restricted areas around the Walcott Quarry (left) and Mount Stephen Trilobite Beds (right). From: Parks Canada, "Bulletins - Area Restriction: Walcott Quarry," Government of Canada, February 6, 2019, https://parks.canada.ca/pn-np/bc/yoho/bulletins/8E486B04-BBB9-4ADB-BD14-3AA3A881630D; Parks Canada, "Bulletins - Area Restriction: Mount Stephen Zone 1," Government of Canada, November 6, 2018, https://parks.canada.ca/voyage-travel/securite-safety/bulletins/FB96C7E1-CABD-4745-8FC1-FFCA4262AB5E.

Three authors have provided major inspiration for this study: Ramachandra Guha, Harriet Ritvo, and Laurajane Smith. When considering the relative "pull" of paleontologists, I was drawn toward parallels with conservation biologists in parks. In 1997, Indian environmental historian Ramachandra Guha denounced the influence of "the authoritarian biologist" in wildlife conservation in what he called the Third World. India's Nagarhole National Park, for example – in the state of Karnataka – was home to both tigers and tribal people. When the Karnataka Forest Department pushed for the locals' eviction, "claiming they destroy the forest and kill wild

game," tribal villagers pushed back that their impact on tigers was very modest, especially compared to an incoming hotel chain and potential poaching by coffee planters on the edge of the forest.[4] As Guha tells it, Dr. John G. Robinson of New York's Wildlife Conservation Society whisked through Nagarhole in 1995 and held a last-minute press conference on the issue. "Throwing the tribal people out of the park, he said, was the only means to save the wilderness," blaming them for "compulsively hunt[ing] for food" and starving out the tiger population.[5]

Guha points to many examples of conservation biologists exerting heavy influence on conservation policies through Africa, Asia, and Latin America to the detriment of local people. Tropical ecologist Daniel Janzen, he says, leaned on "an ecologically-updated version of the White Man's Burden" to justify helping create a national park that ultimately dispossessed Costa Rican forest farmers of their land, where (as Guha puts it) "the biologist knows that it is in the natives' true interest to abandon their homes and hearths and leave the fields and forest clear for the new rulers of their domain."[6] In Janzen's own assessment justifying the situation, he wrote, "We have the seed and the biological expertise: we lack control of the terrain."[7]

Admittedly, Guha presents a very cynical view of the "anti-human environmentalism"[8] of wildlife conservation in the Global South, framing it as an industry that essentially only serves rich foreign tourists. Yet there are parallels in how scientists' work has supported imperialism in Canada's parks. Yoho was founded as the Mt. Stephen Dominion Reserve in 1886, amidst a reserve-creation process in BC that intentionally excluded Indigenous people from traditional territory in the area. The CPR had just completed the transcontinental railway, fulfilling a

[4] Ramachandra Guha, "The Authoritarian Biologist," Seminar, no. 466 (June 1998), 17.
[5] Guha, "The Authoritarian Biologist," 17.
[6] Guha, "The Authoritarian Biologist," 16.
[7] Guha, "The Authoritarian Biologist," 16.
[8] Guha, "The Authoritarian Biologist," 19.

promise that brought BC into Confederation. Then the company convinced the Canadian government to build parks like Yoho, Rocky Mountain (now Banff) and Glacier along the railway line as a way of "capitalizing the scenery" through tourism.[9] The first settlers to notice the Mount Stephen trilobites were surveyors and geologists building that railway, and the fossils were among the park's advertised tourist attractions by the early 1900s. Regulating scientists' labour then helped legitimize the Dominion Parks Branch's stewardship in an era when both the BC and Alberta governments were contesting its authority to regulate hunting, as discussed later in this thesis.[10]

Filling maps of the Rockies with settler names for mountains, rivers, and species was an important method of asserting settler-colonial power there. Harriet Ritvo has argued that European powers' imperial expansion in the seventeenth through nineteenth centuries was similarly accomplished with the aid of "knowledge workers" like cartographers, geologists, and naturalists sailing all over the globe to categorize and name the plants and animals they encountered.[11] They often made these trips, she points out, on the deck of imperial naval ships. "Naming constituted a strong, if metaphoric, claim to possession," Ritvo argues, "not only of the newly christened species, but by implication of its native territory; conversely, territorial claims were easier to question in scientific journals than on the battlefield."[12]

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[9] E. J. Hart, *The Selling of Canada: The CPR and the Beginnings of Canadian Tourism* (Banff, Alberta: Altitude Publishing, 1983), 7.
[10] Now known as Parks Canada. In general, I refer to dominion parks, the dominion government, and the Dominion Parks Branch throughout chapter 1, and national parks, the federal government, and Parks Canada in chapters 2 and 3. For more on English-speaking Canada's increasing distance from the British identity and the idea of being a "Dominion" after the 1960s, see: José E. Igartua, *The Other Quiet Revolution: National Identities in English Canada, 1945-71* (Vancouver: UBC Press, 2006).
[11] Harriet Ritvo, "Zoological Nomenclature and the Empire of Victorian Science," in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 334-336.
[12] Ritvo, "Zoological Nomenclature," 342.

When naturalists like Charles Darwin and Thomas Henry Huxley named the species they encountered on their voyages, they were partly expressing an assumed right to classify whatever lay within the borders of these colonial empires. In part, they were also making charged political arguments through their linguistic choices. Most British naturalists of the time favoured the Latin-based Linnaean classification system for its potential to rise above systems linked to any one nation. To their frustration, this universal system was not universally beloved. Thomas Stamford Raffles, for example, fired two French colleagues who had been helping him collect and identify specimens in Southeast Asia out of a fear that "all the result of all my endeavours … be carried to a foreign country" – i.e. that the specimens they collected would be integrated into a French scientific literature and naming system.[13] Ritvo notes that "long after their nation had become independent, American naturalists resisted outside efforts to name and describe, and so claim, species indigenous to their country".[14] In this light, the nationalities and naming practices of paleontologists are important for understanding their ability to get into Yoho and keep coming back. They provide evidence of how park authorities perceived the risks and benefits of allowing scientists to enter and to embed the fossils in a scientific system of knowledge.

The third author whose work has greatly inspired my analysis is Australian heritage and culture scholar Laurajane Smith. Parks Canada's management plans for Yoho frequently reference the Burgess Shale's designation as a natural heritage site to justify access restrictions there.[15] In her book *Uses of Heritage*, Smith argues that heritage is not a "thing" which old buildings and sites and artifacts have, but a cultural practice. It is most useful, she says, to

[13] Ritvo, "Zoological Nomenclature," 342.
[14] Ritvo, "Zoological Nomenclature," 343.
[15] For example: *Yoho National Park: Management Plan* (Environment Canada, Canadian Parks Service, Western Region, 1988), 19-20.

understand heritage as a hegemonic discourse which "naturalizes the practice of rounding up the usual suspects to consume and 'pass on' to future generations, and in doing so promotes a certain set of Western elite cultural values as being universally applicable."[16] She describes this "authorized heritage discourse" as privileging qualities like monumentality and grand scale, age, the judgement of scientific and cultural experts, and nation-building value.

Smith argues that this discourse is embodied in heritage documents and institutions like UNESCO and in norms that only certain "experts" are qualified to speak about heritage. It shapes how scientists' voices and labour are perceived in fossil sites, whether sites are considered for international recognition, and what activities are invited into those spaces afterward. Smith examines the fossil-rich Riversleigh landscape in Australia as an example. Paleontologists identified fascinating Miocene mammal fossils there over the twentieth century, including marsupial lions and carnivorous kangaroos, which made it a candidate as a natural heritage site on the World Heritage List. Yet its categorization as "natural" not only made the cultural work of these scientists invisible, it fed into an Australian "bushman" pioneer mythology seeing colonizing activities not as destructive, but as completing a landscape which Aboriginal people "failed to shape and improve."[17] Moreover, Smith argues that the authorized heritage discourse rendered the local Waanyi Indigenous community's valuation of this landscape as uniquely "political" (and thus incompatible), including requests for scientists to return fossils to the land after studying them, to keep their holistic meaning as part of the landscape.[18]

Canadian civil servants have been keenly aware of international institutions' tendency to privilege certain forms of heritage over others. In the 1980s and 90s, for example, Canadian

[16] Laurajane Smith, *Uses of Heritage* (New York, NY: Routledge, 2006), 11.
[17] Smith, *Uses of Heritage*, 170.
[18] Smith, Uses of Heritage, 175.

heritage officials and politicians worried about the perception of wooden structures within ICOMOS, the non-governmental organization that evaluated cultural sites nominated to the World Heritage List. One reason was that iconic Canadian buildings like farm houses and grain elevators were seen as lower status than monumental stone architecture. Canadian architect Herb Stovel collaborated with experts from Norway and Japan to push ICOMOS to recognize wooden architecture as equally "authentic" and worthy of recognition.[19] Another example of this self-consciousness emerged when Sgang Gwaay/Anthony Island was being considered for the World Heritage list. The BC government hesitated before supporting the nomination because it worried the decay of the site's wooden totem poles would immediately put it on the list of heritage in danger.[20]

Anxieties about the perceived heritage value of "cultural" sites in Canada led civil servants to prioritize the nomination of "natural" sites in parks, like the Burgess Shale. Where the authorized heritage discourse intersects with the Canadian "wilderness" discourse in parks, it tends to push human presence out of landscapes. It privileges non-consumptive ways of interacting with nature (pictures and pencil rubbings over pocketing), and it unlocks funding and possibilities for education and interpretation by actors who share these views of nature, like the Burgess Shale Geoscience Foundation. Ironically, this discourse has justified park zoning which restricts scientists' presence in the fossil beds, and what they are allowed to do there.

I have structured this paper around three case studies, inspired by the arrangement of Paige Raibmon's *Authentic Indians*. Each chapter focuses on one period in the twentieth century

[19] Aurélie Élisa Gfeller, "The Authenticity of Heritage: Global Norm-Making at the Crossroads of Cultures," *The American Historical Review* 122, no. 3 (June 1, 2017), 770. https://doi.org/10.1093/ahr/122.3.758.
[20] Peter H. Bennett: Memo to file, September 28, 1981. RG 84 – Parks Canada, Folder 1165-36 / U88 & ENV, Box 38, Library and Archives Canada (LAC), Winnipeg.

when scientists helped shift the access regime around the Burgess Shale. I chose this approach because power is often revealed in moments of conflict and change, when historical records show who was arguing, what language they were using, and who they turned to for advice. Although Canada's first national park regulations gave authorities the power to regulate fossils, there is a difference between power as written and as exerted on the ground. Even today this is true: people have approached me in writing this project to tell me about relatives that took fossils from the Burgess Shale, and hikers are regularly caught taking fossils from Yoho and Kootenay National Parks without permission.

What these case studies demonstrate is that paleontologists shaped *all* actors' use of the Burgess Shale fossil beds in Yoho through the arguments and tactics that they used to access, collect, and recognize the heritage value of the fossils. **Chapter 1** focuses on the first systematic scientific studies of the Burgess Shale, from 1907 – 1925. The chapter examines how Charles Doolittle Walcott, family members like his third wife Mary Vaux Walcott,[21] and the rest of the Smithsonian team negotiated access to the Burgess Shale. It focuses on themes of claiming space through naming, through trading favours with the parks branch and the CPR, and through recreational activities like camping and horseback riding. **Chapter 2** focuses on two permit requests that the Royal Ontario Museum (ROM) made in the 1970s: one that was denied, and one that Parks Canada found impossible to refuse. I examine how curator and paleontologist Desmond Collins tapped into the discourse of nationalism and an endorsement from the Geological Survey of Canada (GSC) to make his case for access. **Chapter 3** examines the

[21] Walcott met his first wife, Lura Ann Rust, while living with her family on their farm in Trenton Falls, New York. She died sixteen months after they were married. His second wife, Helena Burrows Walcott, is a significant character in Chapter 1 of this thesis. Ellis L. Yochelson, *Charles Doolittle Walcott 1850 - 1927: A Biographical Memoir* (Washington, DC: National Academy of Sciences, 1967), 473.

Burgess Shale's nomination to the World Heritage list in 1979, and the consequences for park management up to 1988. Here, the authorized heritage discourse and expanding tourist pressure met a parks agency increasingly concerned with wilderness preservation.

Although this thesis expands scholarship on fossil sites in national parks and on the World Heritage List, it naturally builds on existing studies. Yoho's origin as a dominion park reserve in 1886 is reasonably well-documented in works like William F. Lothian's *A History of Canada's National Parks*, though less studied than the nearby parks of Banff and Jasper. The history of the expanded World Heritage designation for the Canadian Rocky Mountain Parks in 1984 has been documented by Robert Sandford in his book *Ecology & Wonder*.[22] Kanyen'kehá:ka history professor Cody Groat and Metis professor Kim Anderson have pointed to the 1984 designation as an example of public commemorations in Canada that misinterpret or exclude Indigenous histories.[23] Sterling Evans has written a conservation and social history of Alberta's Dinosaur Provincial Park which provides an interesting comparison, since that fossil-centric park was added to the World Heritage List at nearly the same time as the Burgess Shale.[24]

This is not a scientific study of the fossils themselves, but paleontologists are my main historiographical sources for understanding the expeditions in the Burgess Shale. There is a sturdy subgenre of books by paleontologists about the history of collecting in the Burgess Shale, most famously Gould's *Wonderful Life* and Simon Conway Morris' *The Crucible of Creation*. The best sources about Walcott's work are his own diaries as well as paleontologist and science

[22] Robert William Sandford. *Ecology & Wonder in the Canadian Rocky Mountain Parks World Heritage Site*. Edmonton: Athabasca University Press, 2010. http://archive.org/details/EcologyAndWonder
[23] Cody Groat and Kim Anderson, "Holding Place: Resistance, Reframing, and Relationality in the Representation of Indigenous History," *The Canadian Historical Review* 102, no. 3 (2021): 465–84.
[24] Sterling Evans, "Badlands and Bones: Towards a Conservation and Social History of Dinosaur Provincial Park, Alberta," in *Place and Replace: Essays on Western Canada*, ed. Adele Perry, Esyllt W. Jones, and Leah Morton (Winnipeg: University of Manitoba Press, 2014), 250–70, https://archive.org/details/placereplaceessa0000perr.

writer Ellis Yochelson's biographies about him, and Vaux's letters and articles offer insight into her motivations. Collins passed away in 2023, but he wrote about his work in popular and scientific publications, and I have had the opportunity to learn about his work by interviewing the current Richard M. Ivey Curator of Invertebrate Palaeontology at the ROM, Jean-Bernard Caron.[25] Another major source is a collection of correspondence in the Parks Canada archives between their staff, the ROM, and the GSC in the 1970s. Not every link in the chain of correspondence is preserved. Some of it reveals what park wardens and scientists were thinking, but this collection should not be treated as a comprehensive source on every conversation amongst these actors.

Many paleontologists I cite were still working in Cambrian paleontology and the Burgess Shale sites while they were writing, and it is worth considering that they had a vested interest in maintaining access to national parks. They may have been less likely to publicly question power structures that gave their predecessors access because it could undermine their own presence there, and because many of them grew up revering the mythology of Walcott. This is not to say these scientists are unaware of their complex motivations for accessing the fossils and the effect their actions had on park management. Conway Morris himself wrote that although the Walcott Quarry outcrop "is rather drab and unremarkable […] any palaeontologist would want to work there for two reasons." One: the outstanding preservation of the fossils themselves. The other: the mountains, glaciers, "turquoise-coloured lakes, and forests set in wilderness. If one has to collect fossils, one might as well collect them here."[26]

[25] In this paper, I use the spelling "paleontology" except when citing institutions or quotations where "palaeontology" is used.
[26] Conway Morris, *The Crucible of Creation*, 2.

This study is limited by the lack of contemporary voices from Indigenous communities with close ties to the Yoho area and the Kicking Horse Pass, which may have offered wider windows into resistance against colonial claims to ownership over the Burgess Shale. Histories about Indigenous groups' presence and dispossession in the Rocky Mountains have been written by Marianne Ignace and Ronald Eric Ignace, John Snow, and Gabriel Lacombe, but they do not specifically discuss the Burgess Shale.[27] In the course of my research, I reached out to Ktunaxa, Stoney, and Secwépemc knowledge keepers. During the blip of better access to online learning during the Covid-19 pandemic, I enrolled in a Ktunaxa course at the College of the Rockies, but it was cancelled before classes began. I travelled to Cranbrook, BC and the ʔaq̓am community, where I had the opportunity to visit the Ktunaxa Interpretive Centre at the former St. Eugene Residential School (now a resort and casino) and to speak with staff working in education and research with the Ktunaxa Nation Council. Unfortunately, they did not express interest in this study. I have turned to fragmentary records of Ktunaxa voices from the 1910s and 20s, in testimony recorded during the McKenna-McBride Commission and in newspaper articles and bulletins about trail riding in Yoho. These are colonial sources, and we must assume some errors, omissions, and gaps in translation either by the speakers or their translators.

To round out my research, I also interviewed several past and present parks employees, hiked up to the three Burgess Shale sites where guided tours are available, and visited the ROM

[27] Marianne Ignace and Ronald Eric Ignace, *Secwépemc People, Land, and Laws*, McGill-Queen's Native and Northern Series: 90 (Montreal: McGill-Queen's University Press, 2017), 16; Ktunaxa Nation, "Who We Are: Ktunaxa Nation," accessed April 3, 2022, https://www.ktunaxa.org/who-we-are/.; John Snow, *These Mountains Are Our Sacred Places: The Story of the Stoney People* (Calgary: Fifth House, 2005); Gabriel Lacombe, "Treaty Negotiations Related to Kootenay National Park, an Opportunity for Reconciling the Interests of the Ktunaxa/Kinbasket Tribal Council and Parks Canada?" (master's thesis, Simon Fraser University, 1998), National Library of Canada/ Bibliothèque nationale du Canada https://www.collectionscanada.ca/obj/s4/f2/dsk2/tape15/PQDD_0023/MQ37568.pdf

gallery where their Burgess Shale fossils are displayed. I have also looked at primary sources such as letters and publications by scientists who worked in the Burgess Shale, oral history interviews of locals in Field and an official at the IUCN who evaluated the Burgess Shale's nomination to the World Heritage list. On top of these, I have reviewed Parks Canada promotional materials about Yoho, consultations and management plans, and permits and regulations concerning fossils and biological specimens in the mountain parks.

Historians of science like Bruno Latour, Martin Rudwick, and Stephen Bocking have wrestled with the merits of internalist and externalist historiography.[28] Should the evolution of scientific thought be explained on the basis of rational ideas building on another within their field, or seen through the society and values influencing the work? This thesis does not focus heavily on paleontologists' shifting interpretations of the fossils at the Burgess Shale, because the Burgess Shale's stunning window into the evolution of animal diversity has been well-documented by paleontologists themselves. Nevertheless, where I do explore the scientific conclusions that scientists like Walcott drew from the fossils, I find the evidence more compelling that they have done their best to be guided by the fossils with the tools and knowledge of their own time, rather than rigid ideology. When it comes to explaining their motivations to collect fossils in the Rocky Mountains though, I believe they were at least partly motivated by the pleasure of being in the field and taking a piece of the past back home. Whether any paleontologist needs each of the thousands of shale slabs they might collect in a season is a

[28] Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, NJ: Princeton University Press, 1986); M. J. S. Rudwick, *The Great Devonian Controversy: The Shaping of Scientific Knowledge among Gentlemanly Specialists*, Science and Its Conceptual Foundations (Chicago: University of Chicago Press, 1985); Stephen Bocking, *Nature's Experts: Science, Politics, and the Environment* (New Brunswick, NJ: Rutgers University Press, 2004).

judgement call though, and one that sometimes only bears fruit when they are split open back at the lab.

These fossil beds might look like tiny dots on a map of the Rocky Mountains, but this is more than a micro-history. The Walcott Quarry, the Mount Stephen Trilobite Beds, and the other Burgess Shale sites are transcendently beautiful spaces, and knowing nature through visiting and contacting the fossils there can profoundly change our understanding of time and our relationship with our planet. The negotiations over accessing and protecting them were part of larger debates over scientists' place in parks and wilderness in the twentieth century. Since it is possible to point to specific moments and conversations where power over the Burgess Shale was expressed and tested, this thesis can inform wider studies of scientists as actors in parks. To the extent that fossils can be seen as "resources" for education, research, tourism, and heritage, Bocking has identified important consequences of restricted participation in decision-making over resource management: basic assumptions don't get questioned, and "wider discussion of the practices and objectives of resource policy simply does not occur."[29] Gently poking the stories that get repeated about the Burgess Shale in heritage spaces and park interpretation matters, because these stories help give legitimacy to paleontologists' continuing work in parks and the systems used to protect the fossil beds.

Since the federal government has generally claimed sole jurisdiction over national parks, they have served as unique protected spaces for fossils in provinces without specific rules about their collection. BC had no legislation governing fossils until 2018,[30] and paleontologists themselves thought about the way fossils were treated differently inside and outside of national

[29] Bocking, *Nature's Experts*, 88.
[30] Larry Pynn. "B.C. Launches First Ever Rules to Regulate Fossils." The Narwhal, November 21, 2018. https://thenarwhal.ca/b-c-launches-first-ever-rules-to-regulate-fossils/.

parks because of that. In the 1970s, a team from the Provincial Museum of Alberta spent four summers racing to saw out fossilized dinosaur tracks in the Peace River canyon. A BC Hydro dam planned for the valley would soon submerge them. “Shame to have to take out these fine footprints,” museum curator David Spalding lamented at the time. “This area should have been a park, with the whole bed exposed and protected.” He later reflected that “by the 1980s, such a resource would have been seen as having major tourist potential.”[31] Looking at the history of the Burgess Shale, we can see what actually happened when parks were in charge of fossils.

[31] David Spalding, *Into the Dinosaurs’ Graveyard: Canadian Digs and Discoveries* (Toronto: Doubleday Canada, 1999), 132.

Chapter 1: Controlling The Terrain (1907 - 1925)

Figure 4: Two epochs in the Walcott Quarry. Left to right: Charles Doolittle Walcott, Sidney Stevens Walcott, and Benjamin Stuart Walcott sit together with a much-enlarged living specimen of Sidneyia inexpectans. *Illustrated by the author.*

I am on another mountainside, making another pilgrimage to Yoho. It is August 2022, and my tour group is standing on a trail high above the impossibly beautiful Emerald Lake, waiting to walk up to the Walcott Quarry. We woke up before dawn to meet our Parks Canada guide in the parking lot below Takkakaw Falls. I could not believe how chilly it was, even with a pair of poutine print pyjamas on under my pants. The hike up this morning was intense, from the steep climb through the forest to Yoho Lake, to the intense heat at noon, flies, and loose scree on the exposed slope at the top. Now, here on the ridge of the Burgess Pass between Wapta Mountain and Mount Field, we just have one final switchback to go, and we're already surrounded by chunks of shale from the quarry above.

"We're following a guy called Charles Walcott," our guide explains. She passes around a piece of shale, and tells us to tilt it in the sun. It's a *Marrella* fossil, an arthropod no bigger than a thumbnail: the kind of evidence that Walcott found here of real soft body fossilization. "He found *Marrella* in this area, and then he made his way up to what's called now Walcott Quarry. We're right underneath it." We zigzag up the last stretch into the restricted area, strap on blue helmets, and suddenly I am completely overwhelmed. I cannot believe I actually get to pick up flattened purple *Vauxia* sponges with my own hands, feel the cool breeze off the ice in the quarry, and see the holes in the cliff face where paleontologists chipped away to find these fossils. We have an hour and a half to walk around, and to see the treasures the guide pulls out of a lockbox: the notochord and muscle tissue of the *Metaspriggina* ("our grandma," she says) and the black banana-looking *Ottoia* worms. It is not enough time. I will never get enough of the hollow music of the shale clinking when we walk, or the view of the mountains around us, or the joy of finding an *Anomalocaris* claw all on my own, from an animal that died 505 million years ago. It seems unbelievable that it lived so long ago, right after the Cambrian Explosion, "the advent (at least into direct evidence) of virtually all major groups of animals—and all within the minuscule span, geologically speaking, or a few million years," as Stephen Jay Gould writes.[1]

In this chapter, I will introduce the physical and discursive space of Yoho National Park from 1907 – 1925, when American geologist Charles Doolittle Walcott conducted the first systematic study of the Burgess Shale fossils in the park.[2] I will discuss the dominant perspectives on what activities were to be permitted in the new mountain parks, other actors who

[1] Stephen Jay Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W.W. Norton, 1990), 24.
[2] Ellis L. Yochelson, "Discovery, Collection, and Description of the Middle Cambrian Burgess Shale Biota by Charles Doolittle Walcott," *Proceedings of the American Philosophical Society* 140, no. 4 (December 1, 1996): 469–545.

made claims on this space, and Walcott's relationships with these actors. We will meet family members and colleagues of Walcott's – like Mary Vaux Walcott – who worked with him over this period at the Burgess Shale, and discuss their social status in the park. I will discuss the railway lines that allowed them to come to Yoho to find these fossils, and to send tens of thousands of slabs to the Smithsonian Institution in Washington, DC.

Finally, we will examine moments of tension over this space, and use Guha and Ritvo's analyses of scientists in parks and at the edges of empire to help us understand Walcott's work in Yoho. We will see that the relationship between taxonomy and territorial claims helps explain why scientists from the United States were welcomed to practice paleontology in the Rocky Mountains of Canada in the early twentieth century. Conversely, paleontologists and geologists in turn gained access to the Burgess Shale in this period because their work helped the dominion government and Canadian Pacific Railway claim space in Yoho.

Encountering the Fossils

It was the railway that first put the trilobites in the path of parks and scientists. The Canadian government and the Canadian Pacific Railway (CPR) company considered many routes through the Rockies before deciding on the Kicking Horse Pass.[3] The pass is quite steep: train engines initially struggled to slow down coming in, and struggled to go back up the hill. CPR built the Mount Stephen House restaurant and hotel at the bottom of this hill in 1884, beside the new railway town of Field, partly because of the difficulty of pulling heavy dining cars up and down the valley.[4] CPR officials lobbied the Canadian government to found parks in scenic

[3] W.F. Lothian, *A History of Canada's National Parks*, vol. 1, 4 vols. (Ottawa: Parks Canada, 1976), 17.
[4] Lothian, *A History* vol. 1, 42.

spots like this along the railway, inspired by Yellowstone National Park in the United States. The core of Rocky Mountains Park (now Banff) was created in 1885, and the Mt. Stephen Dominion Reserve (today's Yoho) was created shortly afterward in 1886. A 1901 Order in Council renamed it the Yoho Park Reserve, and expanded it to a vast 828 square miles, drawing in the Yoho Valley, Takakkaw Falls, Emerald Lake, and Lake O'Hara.[5] These first dominion parks and reserves (later renamed national parks) were established to draw tourists to the mountains along the CPR route.[6]

Parks Canada historian William F. Lothian has written that these first park reserves were created haphazardly, with no unifying branch or policies for decades, and "[o]nly the interest and expenditures of the Canadian Pacific Railway Company kept them in the public eye."[7] Mabel Williams, who performed several communication roles for the early Dominion Parks branch, said that in the early days this meant the park managers had a fair amount of autonomy: "the Government straightway forgot about them, and for years the reserves were left to look after themselves."[8] Early park managers welcomed development of CPR attractions like the Emerald Lake Chalet in Yoho, and invited mining and logging. This aligned with the Canadian government's view that parks should develop natural resources and foster the national economy, both through resource extraction and tourism.[9] Early residents of Field worked in railway and timber operations and for the Monarch Mine, extracting lead and zinc on Mount Stephen. [10] Just

[5] Lothian, *A History* vol. 1, 30, 39.
[6] Alan MacEachern, "M.B. Williams and the Early Years of Parks Canada," in *A Century of Parks Canada, 1911-2011*, ed. Claire Elizabeth Campbell, Canadian History and Environment Series 1 (Calgary: University of Calgary Press, 2011), 31.
[7] Lothian, *A History* vol. 1, 31.
[8] MacEachern, "M.B. Williams," 27.
[9] Kevin McNamee, "From Wild Places to Endangered Spaces: A History of Canada's National Parks," in *Parks and Protected Areas in Canada: Planning and Management*, ed. Philip Dearden and Rick Rollins (Toronto: Oxford University Press, 1993), 20-21.
[10] Lothian, *A History* vol. 1, 31.

across the Kicking Horse River, mining was later conducted at the Kicking Horse Mine on Mount Field. These two mines' ore deposits are very close to the two Burgess Shale fossil beds discussed in this chapter, though there is no evidence that mining companies sought to operate directly underneath the fossil beds.[11]

Ktunaxa, Stoney, and Secwépemc traditional territory extends through Yoho, and oral histories place the Kicking Horse Pass itself within traditional territory for Ktunaxa and Stoney peoples.[12] Archaeological evidence confirms Ktunaxa inhabitation in the Kicking Horse Valley before contact, and in 1792 and 1802.[13] In his account of Stoney traditions and oral history, Stoney Chief John Snow states that they were always present in this part of the continent, "roaming along the foothills and out onto the prairies to the east and deep into the Rocky Mountain country to the west," beyond the present-day BC border.[14] Thus it seems likely members of these groups observed some of the Burgess Shale fossils long before settler surveyors and labourers arrived in the area. The first settlers to notice Cambrian fossils in what is now known as the Burgess Shale were in the Kicking Horse Pass to help develop Field and the CPR line.

In late nineteenth-century Western Canada there was significant overlap between geology, paleontology, and geography – both in who was doing the work, and what they paid attention to. The British North American Boundary Survey of the 1870s was intended to map out

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[11] Paul A. Johnston, Christopher J. Collom, and Patricio Desjardins, "Lower to Middle Cambrian of the Southern Canadian Rockies," in *Geologic Field Trips of the Canadian Rockies: 2017 Meeting of the GSA Rocky Mountain Section*, vol. 048 (Geological Society of America, 2017), 91, https://doi.org/10.1130/2017.0048(03).
[12] Marianne Ignace and Ronald Eric Ignace, *Secwépemc People, Land, and Laws*, McGill-Queen's Native and Northern Series: 90 (Montreal: McGill-Queen's University Press, 2017), 16; "Who We Are: Ktunaxa Nation." Accessed April 3, 2022. https://www.ktunaxa.org/who-we-are/; Sandford, *Ecology & Wonder*, 31.
[13] Thomas H. Loy, "Archaeological Survey of Yoho National Park: 1971," Parks Canada Manuscript Report No. 111 (Ottawa: National Historic Parks and Sites Branch, 1972), 68.
[14] John Snow, *These Mountains Are Our Sacred Places: The Story of the Stoney People* (Calgary: Fifth House, 2005), 3-4.

western stretches of the border between Canada and the United States, but geographer and naturalist George Mercer Dawson reported finding dinosaur fossils while they worked in present-day Saskatchewan and Alberta.[15] Joseph Burr Tyrrell was studying coal seams in the Alberta badlands in 1884 with the Geological Survey of Canada (GSC) when he found the fossilized skull of a dinosaur now known as *Albertosaurus sarcophagus*.[16]

A surveyor working for the CPR in 1884 may have been the first non-Indigenous person to notice fossils on Mount Stephen,[17] and GSC geologists found more fossils along the railway's path in the area. Labourers in Field tipped off GSC geologist Richard G. McConnell about "stone bugs" (a charming, if misleading description of trilobites) on a specific slope of the mountain, and on September 13, 1886, he collected some of these fossils from the site.[18] There is some ambiguity over whether Otto Klotz was actually the first scientist to document these fossils. Klotz was a Department of the Interior astronomer who was measuring longitudinal coordinates through the Kicking Horse Pass in 1886 for the railway when his cook apparently gave him a collection of fossils from the Mount Stephen Trilobite Beds.[19] McConnell and Klotz both published descriptions of the trilobites in 1887.

The GSC's main purpose in the pass was to support railroad construction and settlement. The Survey was initially an arms-length agency, but over the nineteenth century became more tightly integrated into the dominion government. Its mandate was to determine what resources

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[15] Sterling Evans, "Badlands and Bones: Towards a Conservation and Social History of Dinosaur Provincial Park, Alberta," in *Place and Replace: Essays on Western Canada*, ed. Adele Perry, Esyllt W. Jones, and Leah Morton (Winnipeg: University of Manitoba Press, 2014), 257, https://archive.org/details/placereplaceessa0000perr.
[16] The Royal Tyrrell Museum of Paleontology is named in his honour. Evans, "Badlands and Bones," 257-8.
[17] Simon Conway Morris, *The Crucible of Creation: The Burgess Shale and the Rise of Animals* (Oxford, New York: Oxford University Press, 1999), 38.
[18] Royal Ontario Museum, "Discoveries," *The Burgess Shale*, accessed December 13, 2022, https://burgess-shale.rom.on.ca/history/discoveries/.
[19] Royal Ontario Museum, "Discoveries."

might be available for creating mining industries in the Province of Canada.[20] "[N]o group in Canada was so well qualified as the officers of the Survey to judge the mineral potential of the North-West," argues historian Morris Zaslow, "or to appraise the whole complex of natural resources of the [allegedly] undeveloped regions."[21] So the government instructed the GSC to start surveying BC, and to take note of a wide range of data, from soil and timber quality to coal availability for railway resupply stations.[22] Historian Suzanne Zeller writes that cataloguing resources like these was part of a Victorian tradition of scientific inventory that many in British North America saw as useful "not merely to locate sources of material wealth, but also to construct an ordered society."[23] Science helped make landscapes useful for building a transcontinental nation.

At the time of the Survey's founding, fossils were attracting great interest from geologists. The idea that present-day natural processes could explain the creation of geological formations (the theory of uniformitarianism) was becoming more widely accepted. So was the idea that "guide fossils" or "trace fossils" characteristic of one strata of rock could be used to correlate formations in different areas, and that differences in fossils could be used to distinguish between layers, which were lined up on top of each other in a consistent order (called geological succession).[24] "[B]y the time of the inauguration of the geological survey in Canada in 1842

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[20] Which referred to southern parts of modern-day Ontario and Quebec. Christy Vodden, *No Stone Unturned: The First 150 Years of the Geological Survey of Canada* (Ottawa: Energy, Mines and Resources Canada, 1992), 1.
[21] Morris Zaslow, *Reading the Rocks: The Story of the Geological Survey of Canada, 1842-1972* (Published by the Macmillan Co. of Canada in association with the Dept. of Energy, Mines and Resources, and Information Canada, 1975), 107. The book is a frank but largely apolitical and internalist history of the GSC. It was commissioned by the organization for its 130th anniversary.
[22] Zaslow, *Reading the Rocks*, 155.
[23] Suzanne Elizabeth Zeller, *Inventing Canada: Early Victorian Science and the Idea of a Transcontinental Nation*, Carleton Library Series: 214 (McGill-Queen's University Press, 2009), 6.
[24] Zaslow, *Reading the Rocks*, 24.

[paleontology] was a well-established guide for comparative dating of rocks,"[25] says Zaslow. Thus, fossils were considered useful for determining whether, say, a geological formation was a potentially coal-rich band of Cretaceous rock. The GSC initially leaned on foreign scientists like the New York State Geological Survey's James Hall to identify fossils, but hired Elkanah Billings as its first in-house paleontologist in 1856.[26]

American geologist Charles Doolittle Walcott (1850 – 1927) was working for the United States Geological Survey (USGS) at the time and had a deep interest in trilobites. He obtained specimens from the McConnell and Klotz collections, likely read papers on the trilobites they collected, and helped the GSC interpret Yoho stratigraphy and identify fossils.[27] Walcott understandably felt compelled to visit the place these trilobites were from. He became head of the USGS though – a time-consuming position – and had to wait decades for an opportunity to see the Canadian Rocky Mountains in person. Finally in July of 1907 he made his first visit to Yoho, to collect trilobite samples and better understand their context.

By 1907, Walcott had just accepted a new role as Secretary of the Smithsonian Institution. It was a prestigious job, but one that biographer Ellis Yochelson thinks Walcott accepted more because he hoped the institution's smaller size might give him more time for fieldwork.[28] Walcott is well-known today for his work identifying the fossils at the Burgess Shale, but it is impossible to separate his geological and paleontological interests. This he shared with earlier geologists like John William Dawson and Charles Lyell, who studied both the coal

[25] Zaslow, *Reading the Rocks*, 26.
[26] Vodden, *No Stone Unturned*, 5.
[27] Collins, "Chapter 1: A Brief History," 16; Royal Ontario Museum, "Discoveries."
[28] Ellis Leon Yochelson, *Smithsonian Institution Secretary, Charles Doolittle Walcott* (Kent, Ohio and London: Kent State University Press, 2001),12-13.

beds at Nova Scotia's Joggins cliffs and the fossils embedded there.[29] Even a manuscript of Walcott's with a straightforward title like "Cambrian Trilobites" was as much about using trilobite deposits to correlate geological formations as it was about the organisms themselves.[30] Yochelson has concluded that Walcott's main objective was to use the fossil fauna to understand the sequence of Cambrian rocks in western Canada.[31]

In July 1907, Walcott rode the train north from Washington, DC together with his wife Helena and two of their four children (Helen and Stuart). They transferred in Toronto onto a CPR line winding west towards the Rocky Mountains. The train traced the treacherous "Big Hill" down the Kicking Horse Pass towards Field, where the rest of their team was waiting to begin a summer of geological work.[32] Their party was large, and everybody participated in the work as they set up camp on Mount Stephen. The fossil-bearing rocks on this mountain are commonly known today as the Mount Stephen Trilobite Beds, but Walcott called this spot the *Ogygopsis* shale after a very abundant type of trilobite: *Ogygopsis klotzi*.[33] Stuart turned 11 that summer, and hiked up the shaley slopes with his father to help look for the source of the trilobites that had brought them to the park. Helen, just two years older, was out collecting too, as was their mother Helena, research assistant Lancaster Burling, and his wife.[34] One anomaly was the absence of Arthur Brown. As Walcott's long-time field cook and camp manager, Walcott generally relied on Brown to prepare the tents and the hot cakes, act as an occasional

[29] Zeller, *Inventing Canada*, 225.
[30] Yochelson, *Smithsonian Institution Secretary*, 188.
[31] Yochelson, "Discovery, Collection, and Description," 517.
[32] Yochelson, *Smithsonian Institution Secretary,* 20. Not long afterward, the Spiral Tunnels in the Kicking Horse Pass reduced the dangerously steep angle of this route.
[33] Named by Carl Rominger in honour of Otto Klotz. Conway Morris, *The Crucible of Creation*, 38.
[34] Yochelson, *Smithsonian Institution Secretary*, 21-24.

nurse and guardian to the children, and sometimes accompany the kids back to Washington.[35] On subsequent trips to the Canadian Rockies, Brown would travel ahead to Banff to prepare the camp before Walcott's arrival.

It was a successful season, though exhausting and drizzly. The group moved a few miles up the railway line to a spot where GSC geologists had found *Olenellus* trilobites in the 1880s, and Helena found trilobite specimens on Mount Bosworth from a species that Walcott later named *Albertella helena* in recognition of her efforts. He gave another genus the name *Burlingia* in honour of his assistant.[36] They stayed in CPR's posh Mount Stephen House railway hotel in Field. On their journey home, the Walcotts had dinner at Lake Louise with CPR Vice President William Whyte. "No doubt one subject was the virtue of railroad cuttings, artificial rock exposures," speculates Yochelson, "and the kindness of the track-building crews in helping to push back the frontiers of geologic knowledge."[37]

In 1908, Walcott wrote a short paper about his findings in the *Canadian Alpine Journal*, which the Alpine Club of Canada had just started publishing the year before. His contribution, "Mount Stephen Rocks and Fossils," was sandwiched between strata of scientific papers on glaciers, a tale of men trying to "conquer" Pinnacle Mountain,[38] and botanical notes from the Rocky and Selkirk Mountains. Whether they are writing about hadrosaur femurs or *Arthropleura* trackways, paleontologists usually explain where they found their fossils, to help other researchers locate related specimens and to give geological context. Today, there is a tension around being too precise, because of the fear of theft or damage to the fossils. Walcott, though,

[35] Yochelson, *Smithsonian Institution Secretary*, 521.
[36] Yochelson, *Smithsonian Institution Secretary*, 24.
[37] Yochelson, *Smithsonian Institution Secretary*, 25.
[38] P. D. McTavish, "Three Attempts on Pinnacle," *Canadian Alpine Journal* 1, no. 2 (1908), 197.

wrote quite specifically about where to find the best trilobite specimens on Mount Stephen. “The frost, rain and snow have gradually broken up the great layers of shale and scattered them down the slopes,” he wrote. “Nature has done all that she could to open up and make accessible the great storehouse of fossils contained in the shales.”[39] He included a photograph with letters pointing to the best collecting and camping spots on the mountain (Figure 5), and gave readers advice on how to plan out a field day:

> The best way to make a collection from the “fossil bed” is to ride up the trail on a pony to about 2000 feet above the railroad, collect specimens, securely wrap them in paper, place them in a bag, tie the bag to the saddle, and lead the pony down the mountain. A fine lot can be secured in a long day’s trip, 6 a.m. to 6 p.m.[40]

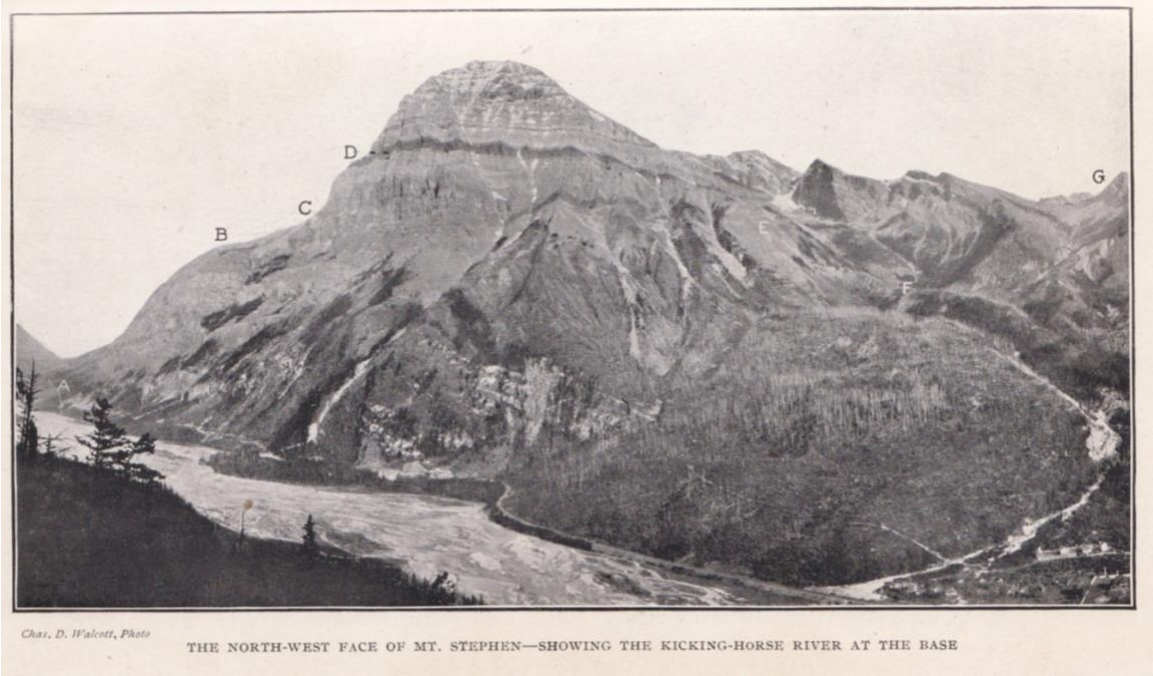

Figure 5: A photo from Walcott's 1908 paper. The letters mark locations useful for the reader: "A--The railroad tunnel. B--The great north shoulder. C--The lower bluish-black limestone belt. D—The upper bluish limestone belt. E—The celebrated “fossil bed.” F—Best locality to camp in working “fossil bed.” G—East slope of Mount Dennis. From: Charles D. Walcott, “Mount Stephen Rocks and Fossils,” Canadian Alpine Journal 1, no. 2 (1908): 232–48.

[39] Charles D. Walcott, “Mount Stephen Rocks and Fossils,” *Canadian Alpine Journal* 1, no. 2 (1908), 232–33.
[40] Walcott, “Mount Stephen Rocks,” 234.

Walcott's thorough description is probably better read as a "methods" section of scientific paper than as a tourist brochure. Readers of the *Canadian Alpine Journal*, like other mountain park visitors, broadly belonged to the new middle class – what CPR president Van Horne called "the class that travels."[41] The British, Canadian, and American tourists who made up the bulk of CPR passengers, however, mainly experienced their journey on the train itself or on short ventures at stops along the way. E.J. Hart writes that the CPR intentionally marketed its passenger service to the "Imperial tourist market:" one that expected comfortable accommodations, deferential staff, and English newspapers at breakfast.[42] *Canadian Alpine Journal* readers, meanwhile, belonged to an overlapping but smaller community seeking independent opportunities to pursue science and adventure in the mountains. Zac Robinson writes that the young journal reflected a view of mountaineering as a force for constructing masculinity and empire through athletic conquests and scientific cataloguing. The Alpine Club of Canada thus took the journal seriously as a platform for scientific study.[43]

Walcott returned to Yoho in 1909, and it was this trip that earned him the reputation as the man who discovered the Burgess Shale. That season, instead of starting their work on Mount Stephen, Walcott's team rode north to search for related formations on the other side of the Kicking Horse Pass. They took the horses from the train station in Field through the Yoho Valley and up to the base of Takakkaw Falls, then on to the Burgess Pass – a ridge between Mount Field and Wapta Mountain overlooking Emerald Lake. This is where they made a world-changing

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[41] Zac Robinson and Stephen Slemon, "Deception in High Places: The Making and Unmaking of Mounts Brown and Hooker," in *Sustaining the West: Cultural Responses to Canadian Environments*, ed. Liza Piper and Lisa Szabo-Jones (Waterloo, Ontario: Wilfrid Laurier University Press, 2015), 147.
[42] Hart, *The Selling of Canada*, 41.
[43] Zac Robinson, "Storming the Heights: Canadian Frontier Nationalism and the Making of Manhood in the Conquest of Mount Robson, 1906–13," *International Journal of the History of Sport* 22, no. 3 (May 2005) https://doi.org/10.1080/09523360500048662, 420.

encounter with the remains of soft-bodied organisms that, at the time, were known nowhere else on Earth. Walcott named this site the "Phyllopod bed" – "an old name for a group of marine crustaceans bearing leaflike rows of gills on one branch of their legs," writes Gould.[44] The intention was to honour a common arthropod found there named *Marrella splendens*, once thought to be a phyllopod. This site is generally known as the Walcott Quarry, and as part of Fossil Ridge.[45]

To appreciate why paleontologists describe the Burgess Shale as one of the planet's precious *Lagerstätten* (extraordinarily rich fossil sites, or literally "lode places"), it's worth considering the hurdles between any organism's death and finding it comprehensibly preserved in a fossil. Remains of the organism have to be buried quickly, in a watery environment. Bones and teeth are relatively likely to survive death, dismemberment, and decay, but most animals do not have such hard parts, nor do organisms like fungi with their delicate gills and hyphae. Even the ones that do are only partly intelligible through their bones: a molar might provide clues about what an ancient animal ate, but has less to say about whether it had feathers, or a bright red wattle, or how it cared for its young.

A trilobite's body fell somewhere in the middle of the scale of preservation challenges: as marine arthropods, they did not have bones, but they did have a relatively hard outer shell. "[S]ubjected to maceration and disintegration by the action of water," Walcott noted in a study of their biology, "and also to the attacks of the small scavengers of the time," the remains of a trilobite then had to be buried quickly in mud to begin the long process of mineralization, during

[44] Gould, *Wonderful Life*, 69.
[45] Parks Canada, "Walcott Quarry Guided Fossil Hike in Yoho National Park - Walcott Quarry: Classic Expedition," March 2, 2020, https://parks.canada.ca/pn-np/bc/yoho/activ/burgess/walcott.

which fine details like organs and legs could easily be lost.[46] Add in the chances of splitting a fossil-bearing rock with a hammer on just the right angle, and "that one specimen in twenty gave an instructive section is not at all surprising."[47] This is part of why the rich Mount Stephen Trilobite Beds are remarkable, though other deposits with abundant trilobite fossils were known by the late 1800s, such as the Silurian limestone deposits that Walcott studied in Trenton Falls, New York.

Figure 6: Excerpted figure from a series showing elemental mapping of the gut of Ottoia prolifica *from Burgess Shale. From: Jean Vannier, "Gut Contents as Direct Indicators for Trophic Relationships in the Cambrian Marine Ecosystem," PloS One 2012, no. E52200 (December 26, 2012): 1–20, https://doi.org/10.1371/journal.pone.0052200. Licensed under Creative Commons Attribution License.*

By contrast, the Walcott Quarry is full of marine organisms with completely soft parts. Most of these have been preserved as "compressed carbonaceous films,"[48] but some of their remains are shown in three dimensions so fine-grained in that it almost defies hyperbole. There are specimens of *Ottoia prolifica* – a priapulid, or "penis worm" – preserved in the Burgess Shale with stomach contents detailed enough to show fragments of small trilobites and brachiopods.[49] A specimen of *Marrella*

[46] Charles D. Walcott, "The Trilobite: New and Old Evidence Relating to Its Organization.," *Bulletin of the Museum of Comparative Zoology at Harvard College* 8, no. 10 (1881): 191–230.
[47] Walcott, "The Trilobite," 192.
[48] Collins, "Chapter 1: A Brief History," 20.
[49] Jean Vannier, "Gut Contents as Direct Indicators for Trophic Relationships in the Cambrian Marine Ecosystem," PloS One 2012, no. E52200 (December 26, 2012): 1–20, https://doi.org/10.1371/journal.pone.0052200.

splendens that Walcott collected at the Burgess Shale in 1912 captures the tiny arthropod in the midst of moulting, squeezing halfway out of the front of its old exoskeleton.[50] Crucially, these fossils date back to between 505 and 510 million years ago, not long after the Cambrian Explosion, when multicellular life set out on bold experiments with body shapes and motion. The identification of this fossil bed vastly expanded the number of multicellular species known from the Middle Cambrian. Conway Morris has stated that "although the really special accumulations of Burgess Shale-like fossils are uncommon, this type of exceptional preservation is really quite widespread in the Lower and Middle Cambrian. Why it should be so is not very clear, although the Canadian paleontologist Nick Butterfield believes that special properties of the sediments, notably the clays, may have acted to inhibit bacterial decay."[51]

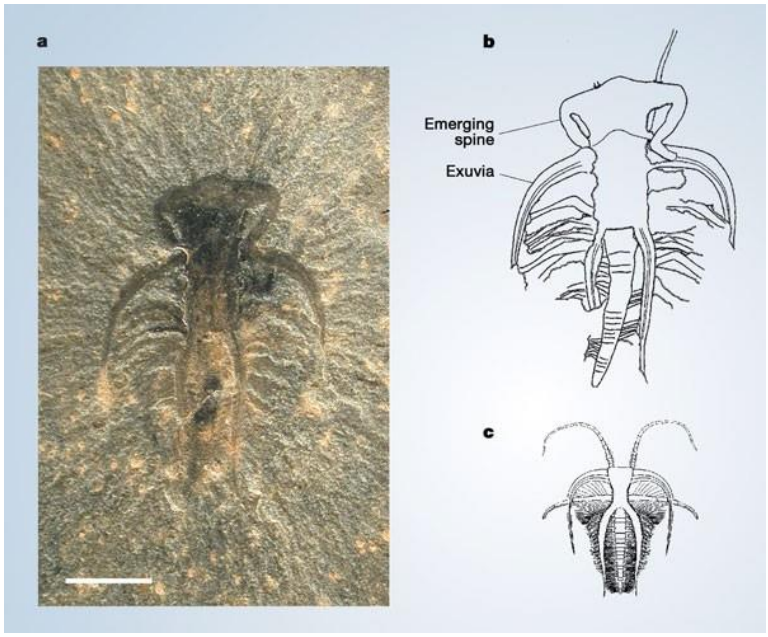

Figure 7: The oldest known fossil of an arthropod in the act of moulting: Marrella splendens*, from the Middle Cambrian Burgess Shale of British Columbia, Canada. a, Specimen of M. splendens (ROM 56781) emerging and pulling out the flexible lateral spines from the old exoskeleton (exuvia). b, Camera lucida drawing of the same specimen. Scale bar for a and b, 5 mm. c, Reconstruction of Marrella. From: Diego C. García-Bellido and Desmond H. Collins, "Moulting Arthropod Caught in the Act," Nature 429, no. 6987 (May 2004) https://doi.org/10.1038/429040a, 40. Reproduced with permission from Springer Nature.*

Walcott's encounter with the fossils on the Burgess Pass has developed its own mythology, with recurring themes of surprise. Popular histories often tell a story about how

[50] Diego C. García-Bellido and Desmond H. Collins, "Moulting Arthropod Caught in the Act," *Nature* 429, no. 6987 (May 2004): 40, https://doi.org/10.1038/429040a.
[51] Conway Morris, *The Crucible of Creation*, 45.

Walcott's party "literally stumbled upon them during a visit to the Rockies in 1909."[52] A sub-genre involving Helena can be traced back as early as Walcott's obituary in a 1927 issue of *Science* by his friend and fellow invertebrate paleontologist, Charles Schuchert:

> One of the most striking of Walcott's faunal discoveries came at the end of the field season of 1909. As his party was coming down Mount Wapta, Mrs. Walcott's horse slipped and in so doing turned up a slab that at once attracted her husband's attention. Here was great treasure – wholly strange crustaceans of Middle Cambrian time – but where on the mountain had it come from? Snow was falling and the search for the original layer had to be left to another season. Next year Walcott was back again on the southwest slope of Wapta and eventually the layer from which the slab of the previous year had come was discovered-a bed of black shale, later known as the Burgess shale, 3,000 feet above Field, British Columbia, and 8,000 feet above the sea.[53]

While this version of the story has action and danger, it seems apocryphal. Stephen Jay Gould has pointed to the less dramatic story told in Walcott's own diary. On August 30, 1909, Walcott wrote that he was out collecting in the area all day, and "[f]ound many interesting fossils on the west slope of the ridge between Mounts Field and Wapta. Helena, Helen, Arthur and Stuart came up with remainder of outfit at 4 P.M." He may have found their source the next day, since he wrote that he was "out with Helena + Stuart collecting fossils from the Stephen Formation" and "found a remarkable group of Phyllopod crustaceans," with accompanying drawings of some of the most common species in the Walcott Quarry.[54] Collins has further deflated the story by noting that Walcott was probably guided by a tip, rather than random chance. In June of 1909, Walcott was in the UK to receive an honorary doctorate at the University of Cambridge, and stopped at the British Museum in London. "The keeper of geology

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[52] Sandford, *Ecology & Wonder*, 22.
[53] Charles Schuchert, "Charles Doolittle Walcott: Paleontologist--1850-1927," *Science* 65, no. 1689 (1927): 455–58. This version of the story has persisted for decades, even popping up a century later in a book review published in *Science*: Jill S. Scheiderman, "Against All Odds: A Geologist Revels in the Unlikely Reality of Life on Earth," *Science* 354, no. 6312 (November 4, 2016): 559.
[54] Gould, *Wonderful Life*, 71-75.

there, Henry Woodward, had observed in a 1902 paper that Mount Field is part of the same massif as Mount Stephen and 'will no doubt yield the same Cambrian fossils'. Presumably Woodward repeated this observation during Walcott's visit, because, on Walcott's return to the Rockies nine weeks later, he made straight for Mount Field."[55]

While the narrative of Walcott's surprise encounter may be apocryphal, it continues to perform important work claiming land on behalf of settler scientists and parks authorities. Simon Conway Morris and Harry Whittington referenced this story of "accidental" discovery in the introduction to a 1985 report about the Burgess Shale fossils, for example, before describing their own work in the fossil beds.[56] It reinforces a narrative of a land that was without people until their arrival, where all features of interest in the Rockies were first "discovered" by fur traders, mountaineers, geologists, and railway workers.

Walcott was entranced by what he found, and continued to return to the Canadian Rockies many times over the next decade and a half. Over the years, he sent over 60,000 specimens back to the Smithsonian.[57] He began publishing his findings in the *Smithsonian Miscellaneous Collections* as well as popular magazines. Many of his scientific papers on the Burgess Shale findings were "preliminary" efforts to describe and name the species – field work was just part of Walcott's busy life as the Smithsonian Institution Secretary and he was always short on time to write.[58] In 1911, Walcott told *National Geographic* readers that some of

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[55] Collins, "Misadventures," 952.
[56] Simon Conway Morris and Harry B. Whittington, "Fossils of the Burgess Shale: A National Treasure in Yoho National Park, British Columbia," Miscellaneous Report 43 (Ottawa: Geological Survey of Canada, 1985), 1.
[57] This collection is held and displayed by the Smithsonian's National Museum of Natural History. H. B. Whittington, *The Burgess Shale* (New Haven, CT: Published in association with the Geological Survey of Canada by Yale University Press, 1985), 12.
[58] The bulk of Stephen Jay Gould's book *Wonderful Life* is a critique and re-examination of Walcott's choice to group most of these species into currently-living families. Simon Conway Morris' book *The Crucible of Creation* is in turn largely a rebuttal to Gould's conclusions.

"Nature's […] most attractive treasures"[59] could be found throughout the mountain passes of the Canadian Pacific Railway, including the Cambrian fossils along the Burgess Pass. His article, "A Geologist's Paradise," was published together with a large fold-out panoramic view from the Burgess Pass, which he photographed himself.

Family members continued to join Walcott on these trips and help unwrap fossils back in Washington. Sidney found a small fossilized predator with a shield-shaped head and a fan tail, which Walcott named *Sidneyia inexpectans* (since they were surprised to find such a creature in a rock layer older than the Ordovician).[60] He named the abundant *Marrella splendens* after a friend and fellow paleontologist at Cambridge, Dr. John Edmund Marr,[61] and a cone-like genus of sponge *Hazelia* after Hazel Peak – now known as Mount Aberdeen – near Lake Louise.[62] Walcott worked hard to spread the word that these well-preserved soft-bodied organisms revealed an ecosystem of complex, active marine life much richer than scientists had previously imagined. And it was, of course, Walcott who proposed the name "Burgess shale of the Stephen formation" for the band of shale that stretched across both the Ogygopsis shale on Mount Stephen and the Phyllopod Bed on the Burgess Pass.[63]

The Walcott family went through great upheaval over the next few years. In July 1911, Helena was killed in a horrific train accident in Connecticut. While she was sleeping in a passenger car en route to visit family, an open switch on a track sent her car plummeting down

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[59] Charles D. Walcott, "A Geologist's Paradise," *National Geographic Magazine*, June 1911, National Geographic Virtual Library, 509.
[60] Royal Ontario Museum, "Sidneyia Inexpectans," *The Burgess Shale*, accessed March 8, 2023, https://burgess-shale.rom.on.ca/fossils/sidneyia-inexpectans/.
[61] Royal Ontario Museum, "Marrella Splendens," *The Burgess Shale*, accessed March 8, 2023, https://burgess-shale.rom.on.ca/fossils/marrella-splendens/.
[62] Royal Ontario Museum, "Hazelia Palmata," *The Burgess Shale*, accessed March 8, 2023, https://burgess-shale.rom.on.ca/fossils/hazelia-palmata/.
[63] Charles D. Walcott, "Middle Cambrian Holothurians and Medusæ," *Smithsonian Miscellaneous Collections*, Cambrian Geology and Paleontology II, No. 3, 57, no. 2 (1911), 51.

from a viaduct. The grief and loneliness were immense for Walcott and the children. Perhaps seeking comfort in the mountains, the team was once again out quarrying in Yoho that August.[64] Then in 1913, their oldest son Charlie died of tuberculosis.[65] The remaining three children were all by Walcott's side that summer, collecting in Yoho together one last time.[66]

In 1914, he married a long-time acquaintance and fellow lover of the mountains from Philadelphia: Mary Morris Vaux, afterward known as Mary Vaux Walcott (1860 – 1940). She was a respected photographer, botanical illustrator, and amateur glaciologist in her own right. Vaux had first visited the Rocky Mountains in Canada in 1887, on a trip along the CPR route with her father and brothers. They stopped at Glacier House and photographed the Illecillewaet Glacier. A return trip a few years later revealed the glacier had retreated a surprising amount, and they began a long-term mapping and photographic study of the glacier's movement.[67] Their family were Quakers, and while Mary did not have the same opportunity as her brothers to get a formal education, she was mentored in wildflower observation and sketching, and became skilled at platinum print photography and developing dry glass plates. "Among Quakers for whom scientific study and the natural world were held in esteem," writes historian Colleen Skidmore, "collecting and identifying botanical specimens under the Linnaean system of classification was a widespread and serious activity for both professionals and amateurs, women and men."[68]

Walcott and Vaux first met in the early 1900s, and became fond correspondents after Helena Walcott's death. Theirs was most definitely a scientific romance. Walcott and Vaux

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[64] Yochelson, *Smithsonian Institution Secretary*, 86-89.
[65] Yochelson, "Discovery, Collection, and Description," 514.
[66] Their son Stuart served as a pilot during the First World War, and was killed in action in France in 1917.
[67] Colleen Skidmore, ed., *This Wild Spirit: Women in the Rocky Mountains of Canada*, Mountain Cairns (Edmonton: University of Alberta Press, 2006), 165.
[68] Skidmore, *This Wild Spirit*, 168-169.

married in June 1914, and the first stop on their honeymoon was the Redpath Museum at McGill University in Montreal, which Walcott had visited with Helena on their own honeymoon years before. Then they took the train west to Glacier National Park in BC, where Walcott assisted Vaux with photographs and measurements of the Illecillewaet Glacier.[69] Their marriage was a driving and energizing force in Walcott's continuing presence in western Canada. Just one year earlier, he told an audience at Yale that he was ready to move on from his work in BC.[70] By the time of their engagement he had changed his mind, writing to ask his quarryman in Field to leave their equipment at the Burgess Shale camp for future seasons.[71] Vaux worked by his side in Yoho when he returned in 1917, 1919, 1921, and 1924.

Running a field camp was an expensive operation: tents, food, pack horses, and saddle horses for the family and the field assistants added up quickly. The Smithsonian Institution did not cover all of the costs of Walcott's field work or the fossil preparation back in Washington, but he helped bridge the gap by securing about $5000 in grants from organizations like the National Academy of Science, and potentially paying out of his own pocket. "How much of Walcott's own money went into the annual treks to Canada is not clear, but the SI did not cover all the expenses," writes Yochelson. "The money situation was grim." [72] Consequently he put considerable effort into fundraising for the Smithsonian's endowment in the mid-1920s, even as his own health declined. He planned to raise money by publishing scientific books through the Smithsonian, and by asking for private donations. He even (unsuccessfully) tried to pressure Secretary of Commerce Herbert Hoover to join the endowment drive.[73] Walcott died in 1927.

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[69] Yochelson, *Smithsonian Institution Secretary,* 146.
[70] Yochelson, *Smithsonian Institution Secretary*, 130-131.
[71] Yochelson, *Smithsonian Institution Secretary*, 144.
[72] Yochelson, *Smithsonian Institution Secretary*, 486.
[73] Yochelson, *Smithsonian Institution Secretary*, 467.

*Figure 8: Mountain Ladyslipper (*Cypripedium montanum *Douglas), as depicted by Mary Vaux Walcott. Encountered on a horseback ride near Radium Hot Springs, BC. "A beautiful plant about eighteen inches tall, with a delicate perfume quite its own—no wander that we quickly dismounted to pay homage to this queen of the forest," she writes. Mary Vaux Walcott, North American Wild Flowers, vol. 1, 5 vols. (Washington, DC: Smithsonian Institution, 1925), 102.*

Vaux put her own botanical and artistic skills to use to support the Smithsonian's fundraising. In 1923, she started working on an illustrated guide to North American wild flowers, to be published by the Smithsonian with an unprecedented number and quality of colour plates. In the foreword to Volume I, Vaux explained that the book grew out of friends and colleagues' appreciation of her watercolour sketches of rare and interesting plants throughout her travels. "A survey of wild flower publications," she said, "led to the decision that there was a need for a finely illustrated work that would be of service pictorially to all professional and amateur botanists and designers, and to the larger group of lovers of wild flowers and the great out-of-doors."[74] Printing the various volumes and editions cost an enormous $750,000, but in the end the book turned a profit for the Smithsonian.[75] Unfortunately, the first edition came out in 1925 – too late to be of help funding their Burgess Shale expeditions. The Mary Vaux Walcott fund was established in the Smithsonian's department of botany in appreciation of her efforts, and she also willed a significant amount of money to the institution upon her death in 1940.

[74] Mary Vaux Walcott, *North American Wild Flowers*, vol. 1, 5 vols. (Washington, DC: Smithsonian Institution, 1925), http://archive.org/details/NorthAmericanwiIWalc, 9.
[75] Yochelson, *Smithsonian Institution Secretary*, 519.

Given these funding challenges, Yochelson argues that Charles Doolittle Walcott was only able to continue collecting fossils in the Burgess Shale because his family members worked for free, and CPR provided free transportation. "Without those subsidies, the cost of collecting might have ended quarrying after 1911."[76] Evidently these were only occasional subsidies, because in some years he paid significantly out of pocket for these expenses. In 1913, just a few months after his son Charlie's death, Walcott made the trip out west on his own to work on Mount Robson before meeting the rest of his family and assistants in Field.[77] Just booking sleeper cars for himself on the train, a spot on a steamer, meals, and transferring 18 pieces of luggage added up to $99.70 USD, worth about $3,078.52 USD in 2023 ($4,184.78 CAD).[78] That year alone, he also paid for the transportation and field assistant services of his three surviving children, a quarryman, field transportation by the Brewster company, camp food, and various other hotel and supply fees. Any favours from the railway would have considerably relieved the financial pressures of the field season.

Subsidizing his trips was not an act of charity on CPR's part, but an appreciation of the marketing accomplished by Walcott and Vaux's pictures of their travels. In 1907, CPR arranged free passage west for Helena, Helen, and Stuart, for which Walcott sent CPR President Thomas G. Shaughnessy thanks in the form of landscape photographs.[79] In 1916, Walcott and Vaux negotiated free tickets to BC for themselves by sending Shaughnessy a *National Geographic* issue with photographs that Vaux and her brother George Vaux Jr. had taken along the CPR

[76] Yochelson, "Discovery, Collection, and Description," 516.
[77] Yochelson, "Discovery, Collection, and Description," 513.
[78] "Expenses, C. D. Walcott: Washington, D.C. to various points in Alberta and British Columbia, and return;" "Memorandum Account: C. D. W. – Trip West – 1913;" "Expenses of Helen B. Walcott during field season of 1913 refunded by C. D. Walcott." 07-004 Box 09 Folder 05, Smithsonian Institution Archives (SIA), Washington.
[79] Charles D. Walcott to Thomas G. Shaughnessy, May 25, 1907. 07-040 Box 01 Folder 138, SIA.

route.[80] In the next section, we will consider more ways that Walcott's presence in the Rocky Mountains benefited the railway, the parks service, and other actors he needed favours from.

The Privileges of the Permit

Charles Doolittle Walcott's work in the Burgess Shale bridged a time of major change in how Canada's national parks were managed, the international tensions around the first Great Canadian Dinosaur Rush, and the First World War. Despite this, Walcott does not seem to have encountered difficulties continuing to access the Burgess Shale fossils and sending them to the United States. Here we will consider why that might have been. The explanation may be a mix of ambiguous authority over fossil management and shared interests between Walcott, CPR, the GSC, and the Dominion Parks Branch.

To bring fossils back to Washington, Walcott would need implicit or written permission to collect them in Yoho and export them to the United States. Any collection request would likely have crossed the desk of Howard Douglas or Orville De Witte (OD) Hoar. Douglas was Superintendent of the Rocky Mountains Park (Banff), but was also directly managing Yoho[81]

[80] Mary V. Walcott to Thomas G. Shaughnessy, May 13, 1916. 07-040 Box 01 Folder 138, SIA and Canadian Pacific Archives RG2.A.A.107060. Walcott and Vaux received their passes in 1916, and negotiated passes for National Geographic Director and Editor Gilbert H. Grosvenor and four of his guests in 1915 by name-dropping Walcott's article "A Geologist's Paradise" and its accompanying 9-foot panorama of the Burgess Pass. Charles D. Walcott to Thomas G. Shaughnessy, June 10, 1915. 07-040 Box 01 Folder 138, SIA.

[81] Douglas worked as a CPR supplies officer and later ran a cartage and coal business in Calgary before being appointed as Superintendent of the Rocky Mountains, Yoho, and Glacier parks in 1897. According to Robert Sandford, Douglas had been exposed to Romantic transcendental writers like John Muir and had discussions with well-educated tourist-mountaineers in the Rockies. He saw that these tourists lamented the demise of wildlife, and that in practice hunting was going on in the park reserves even though it had been prohibited since 1890. See: Lothian, *A History* vol. 1, 29; Robert W. Sandford, *Yoho: A History and Celebration of Yoho National Park* (Canmore, Alberta: Altitude Publishing, 1993), 81.

until Hoar became his assistant and Superintendent of Yoho Park on July 10th, 1907.[82] Before 1911 legislation brought Canada's national parks under one branch, superintendents' roles and jurisdiction were somewhat hazy. Alberta, for example, printed up regulations prohibiting shooting or carrying firearms in Rocky Mountains Park, but Douglas had already hired a game guardian for the same purpose. He argued that the park had "always been entirely controlled by the Federal Government."[83] In this case, the Alberta government backed down. Douglas was given some areas of clear authority, such as building a road to Emerald Lake and laying out a coal mining town near Banff, but had to defer to the Department of the Interior on determining royalties on that coal.[84]

1911 was a turning point for all of Canada's national parks. The Dominion Forest Reserves and Parks Act was passed, grouping the parks under one act of legislation and under the new Dominion Parks Branch of the Department of the Interior. The act also turned the Yoho Park Reserve into Yoho Dominion Park, which was drastically reduced in size. Similar boundary changes happened at Rocky Mountains and Waterton Lakes Parks. The excluded areas were now incorporated into forest reserves.[85] Minister of the Interior Frank Oliver said in this new "parks within reserves" system, the reserves were supposed to be buffers protecting parks from

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[82] Hoar previously helped edit the Golden Star newspaper, and later filed prospecting claims near Prince Rupert. See: Editors Gather for Work in Organizing an Association," *The Daily Herald*, January 26, 1905; Government of British Columbia, *Government Gazette British Columbia (July 07, 1910)* (British Columbia, 1910), http://archive.org/details/governmentgazett50nogove_d8w8, 6911; "Orville de Witte Hoar designated as Supt [Superintendent] of the Yoho Park - Min. Int. [Minister of the Interior], 1907/06/20," 1907/06/22-1907/07/10, Archives/Orders-in-Council, RG2, Privy Council Office, Series A-1-a., item number 135541, Library and Archives Canada.

[83] Robert J. Burns and Michael J. Schintz, *Guardians of the Wild: A History of the Warden Service of Canada's National Parks*, Parks and Heritage Series: 2 (University of Calgary Press, 2000), 4.

[84] Howard Douglas to Department of Interior Secretary, May 27, 1904, in *Banff National Park: Office of the Superintendent, 1893-1910*. Parks Canada (RG 84, Vol 567 & 569), Canadiana, Banff National Park, Canada. Accessed November 28, 2021. https://heritage.canadiana.ca/view/oocihm.lac_mikan_181058

[85] Lothian, *A History* vol. 1, 40.

development and exploitation, but this simultaneously put pressure on parks to increase development for tourists.[86] Howard Douglas unsuccessfully tried to persuade the dominion government to preserve the old boundaries, but succeeded in getting it to ban hunting from the forest reserves.[87]

If Walcott asked Douglas for permission to dig in Yoho, the request and response did not make it into Douglas' superintendent records. In June 1907, Walcott wrote in his meticulously-kept diary that he was about to "leave for the west"[88] but did not seem to leave any other clues about the planning that went into the trip. The intense competition for dinosaur fossils in Canada a few years later hints that Yoho's managers may not have been able to stop him anyway. In 1910, American Museum of Natural History (AMNH) paleontologist Barnum Brown followed a tip about dinosaur bones in Alberta, and travelled out to collect fossils along the Red Deer River. His team excavated extraordinarily complete skeletons, and shipped them back for preparation and display at the AMNH in New York City. As paleontologist and science historian David Spalding has pointed out, this perceived new form of scientific colonialism from abroad presented an agonizing dilemma for the Canadian government, and it looked to the GSC to respond. Although much of this area is now part of Alberta's Dinosaur Provincial Park, there were no parks there at the time. "Although living animals could be protected," says Spalding, "the Geological Survey perhaps could not see an obvious mechanism to protect fossils. Besides, national parks were the responsibility of the new Parks Branch of the Ministry of the Interior, created in 1911, whereas dinosaurs [and other fossils] were clearly the responsibility of the

[86] MacEachern, "M.B. Williams," 28.
[87] Burns and Schintz, *Guardians of the Wild*, 14.
[88] Yochelson, *Smithsonian Institution Secretary*, 21.

Geological Survey, in the Department of Mines, created in 1907."[89] The issue was further complicated by the fact that the GSC was not collecting any of the dinosaur fossils itself, it benefited from the data that British and American research agencies published, and it did not want to start a diplomatic dispute with the United States. In 1913, the GSC decided to respond by hiring its own rival team of American paleontologists to collect dinosaurs in Alberta for the GSC museum, led by Charles Hazelius Sternberg.[90]

Thus, Walcott may not have had anyone ask for a collecting permit when he made his way to the Rockies. He may, however, have written the Department of Mines for a customs permit to export what he found. He asked for one in 1925, calling it his "usual request."[91] Walcott was a well-known consulting paleontologist for the GSC in 1907. He became an official GSC "collaborator" in 1911, describing rock layers he had measured including the "Phyllopod bed,"[92] and his 1908 paper on "Cambrian Sections of the Cordilleran Area" was informing geological literature about the Monarch and Kicking Horse Mines' ore bodies as late as 1954.[93]

For an influential scientist attached to a major institution like the Smithsonian, an exchange of favours could also build goodwill with parks managers. E.J. Hart writes, for example, about Walcott's role in helping send elk up from the US to the Rocky Mountains Park when Canadian officials grew concerned about dwindling local populations. In 1916, Walcott informed wildlife manager Howard Sibbald "that the Smithsonian's zoological park had recently

[89] David Spalding, Into the Dinosaurs' Graveyard: Canadian Digs and Discoveries (Toronto: Doubleday Canada, 1999), 52-53.
[90] Spalding, *Into the Dinosaurs' Graveyard*, 53.
[91] Charles D. Walcott to Charles Camsell, April 20, 1925, cited in Yochelson, *Smithsonian Institution Secretary*, 433.
[92] Yochelson, "Discovery, Collection, and Description," 500.
[93] Charles S. Ney, "Monarch and Kicking Horse Mines, Field, British Columbia," *CSPG Guide Book Fourth Annual Field Conference Banff-Golden-Radium*, 1954, 119–36.

acquired some elk from Yellowstone Park and that, in fact, the U.S. Department of the Interior was distributing elk widely in an effort to decrease pressure on its overgrazed Yellowstone range."[94] Walcott asked for a formal letter from Dominion Parks Commissioner James B. Harkin expressing an interest in the elk, in exchange for some sheep and goats for the Smithsonian's National Zoological Park. [95] Walcott was successful in convincing the superintendent of the US National Parks Service to sell the Canadians two train cars' worth of elk from Yellowstone for $5 per head.[96] For the most part the animals seemed to survive well, and Harkin was apparently so impressed by their reintroduction that he asked Walcott to help him procure another 200 elk for Jasper in 1919.[97] This was typical of the wildlife exchanges that the Dominion Parks Branch agreed to for over a half a century. Letting zoos, museums, government agencies, and scientists take animals symbolic of Canada's parks helped the branch build cultural power and forge alliances, writes Alan MacEachern.[98]

There have been limits to the parks agency's in-house financial resources and scientific expertise throughout its history, and mountains of bureaucracy to climb over to do work themselves. Early park managers sought out the expertise of geologists and archaeologists to assess the resources they managed, but in both cases relied on GSC staff, for instance.[99] 1980 was the first time that Parks Canada placed full-time archaeological staff out west, at Calgary's

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[94] E. J. Hart, *J.B. Harkin: Father of Canada's National Parks*, Mountain Cairns (Edmonton: University of Alberta Press, 2010), 171
[95] Yochelson, *Smithsonian Institution Secretary*, 208.
[96] Hart, *J.B. Harkin*, 172
[97] Hart, *J.B. Harkin*, 175
[98] Alan MacEachern, "Lost in Shipping: Canadian National Parks and the International Donation of Wildlife," in *Method and Meaning in Canadian Environmental History*, ed. Alan MacEachern and William J. Turkel (Toronto: Nelson, 2009), 198–213.
[99] Barnett Richling, "Archaeology, Ethnology and Canada's Public Purse 1910-1921," in *Bringing Back the Past: Historical Perspectives on Canadian Archaeology*, ed. Pamela Jane Smith and Donald Mitchell, Mercury Series 158 (Hull, Quebec: Canadian Museum of Civilization, Archaeological Survey of Canada, 1998), 104.

Western Regional Office.[100] This lack of local capacity and resources has created incentives for swapping favours. In the next chapter, we will see that Parks Canada allowed a team from the Royal Ontario Museum permission to collect fossils from the Burgess Shale in the 1970s partly in exchange for another favour: creating an exhibit for Yoho and collecting specimens for other Canadian universities and museums. It seems reasonable to conclude that Walcott's ability to facilitate exchanges of wildlife would be a factor in convincing park managers to allow him to conduct his paleontological research.

The Canadian Department of the Interior also granted Walcott permission to collect biological specimens (i.e. wildlife) for the United States National Museum from dominion parks like Jasper. Walcott was given such a permit in 1913 with the note that although Jasper park regulations forbade hunting or removing wild animals from the park, the minister was willing to waive them since "the collection is purely for scientific purposes and it is guaranteed that the privileges of the permit will not be abused."[101]

There is a fascinating parallel to expeditions to the eastern Canadian Arctic in 1926 and 1927, which severely tested the Canadian government's ability to exert sovereignty over space and define the boundaries of scientific fieldwork. Historian Tina Adcock has written that in the 1920s, Canadian officials grew concerned that non-British explorers (particularly Americans) would literally eat all the game and fish in the Northwest Territories on their annual expeditions, and cart away its physical heritage, without even asking permission to enter. In response, Canada

[100] E. Gwyn Langemann, "Archaeology in the Rocky Mountain National Parks: Uncovering an 11,000-Year-Long Story," in *A Century of Parks Canada, 1911-2011*, ed. Claire Elizabeth Campbell (Calgary: University of Calgary Press, 2011), 303–31.
[101] "Permission Dr. Charles Walcott, Smithsonian Institute to take biological Specimens in the Jasper Park - Min. Int. [Minister of the Interior] 1913/03/27," 1913/04/03-1913/04/05, Archives / Orders-in-Council, RG2, Privy Council Office, Series A-1-a, Order in Council number 1913-0750, Library and Archives Canada (LAC).

passed the 1925 Scientists and Explorers Ordinance, "stipulat[ing] that all such fieldworkers had to obtain permission before carrying out investigations in the Northwest Territories."[102] A team with the American Museum of Natural History was given licenses and permits to collect Arctic animal specimens in 1926 and 1927, including some protected by the Migratory Birds Convention Act.[103] When a Canadian migratory bird officer later found out that the group killed – and ate – many more birds than they reported, both American and Canadian officials denounced the expedition leader. Adcock argues that "officials in Washington may have wanted to openly affirm American as well as Canadian legal presence in the eastern Arctic Archipelago, further debunking the myth of the open Arctic."[104] Even when they found it difficult to regulate scientific activities, invoking such laws strengthened both states' legal claims in the region. Counterintuitively, this suggests that the presence of Walcott's American team in the Rocky Mountains helped the Canadian government to reinforce its authority over this space. By requesting permits to collect biological specimens and export fossils, Walcott reified the Canadian government's assertion that it had the final word on what was allowed in parks.

Park managers' interest in driving tourism may also have been a factor in welcoming Walcott's team. Both CPR and the parks service intermittently promoted the Burgess Shale as one of the tourist assets of the mountain parks during the years Walcott was quarrying at the site. One early reference to the fossils appears in a 1909 pamphlet the Department of the Interior published about the mountain parks. Under the "Yo! Ho! For the Yoho!" section, a suggested week-long itinerary started with a climb up to the trilobite beds:

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[102] Tina Adcock, "Scientist Tourist Sportsman Spy: Boundary-Work and the Putnam Eastern Arctic Expeditions," in *Made Modern: Science and Technology in Canadian History* (Vancouver: UBC Press, 2018), 60.
[103] Adcock, "Scientist Tourist Sportsman Spy," 66.
[104] Adcock, "Scientist Tourist Sportsman Spy," 76.

> MONDAY we will explore the fossil-beds. These occur in the lower reaches of the route leading to the peak of Mt. Stephen, about two miles from Field. The trail over glacial moraines is good, and leads us to not the least interesting point in the whole range of the Rockies. A wide-extended deposit of trilobite fossils is here exposed nearly at timber-line on the flank of the mountain ; millions of specimens are ours for the taking. We can't help crushing hundreds of them as we walk, and, sitting down we gather them as one gathers blueberries in a blueberry swamp.[105]

A CPR promotional booklet from 1910 also mentioned the Mount Stephen trilobite beds. [106] A few years later, the newly-identified Walcott Quarry appeared in the 1914 "Guide to the Geology of the Canadian National Parks on the Canadian Pacific Railway between Calgary and Revelstoke" published by the Department of the Interior. The guide was clearly intended for visitors, given its stated aim of being readable "by one who has only an elementary knowledge of geology" and focus on geological attractions along the CPR route.[107] It contained a photograph of one of Walcott's field camps and mentioned: "The Middle Cambrian contains many remains of animal life especially in the Stephen formation. The famous 'Ogygopsis shale' on Mt. Stephen and the 'Burgess Shale' on Mt. Field on the opposite side of the valley have been found by Dr. Walcott to contain a great variety of Trilobites, Pteropods, Brachiopods, Annelids and sponges."[108] This promotion was inconsistent, though. Mabel William's 1927 guide "The Kicking Horse Trail" was a prime example of her work promoting the parks in rapturous detail with many photographs, but did not mention the Burgess Shale fossils, and Yoho brochures in the 1930s didn't mention it among the park's attractions either.

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[105] Agnes Deans Cameron, *The Prince of Playgrounds: Come Home by Canada and Revel in the Rockies; Beautiful Banff* (Canada Department of the Interior, 1909), 16.
[106] "A Burgeoning Tourism Industry," *The Burgess Shale*, accessed January 28, 2023, https://burgess-shale.rom.on.ca/history/historical-context/context/a-burgeoning-tourism-industry/.
[107] Charles Camsell, "Guide to the Geology of the Canadian National Parks on the Canadian Pacific Railway between Calgary and Revelstoke" (Ottawa: Department of the Interior, 1914), 5, http://webcache.googleusercontent.com/search?q=cache:SkTllQmXfN0J:parkscanadahistory.com/geology/geology-np-1914.pdf&cd=49&hl=en&ct=clnk&gl=ca.
[108] Camsell, "Guide to the Geology," 35.

Claiming Through Naming

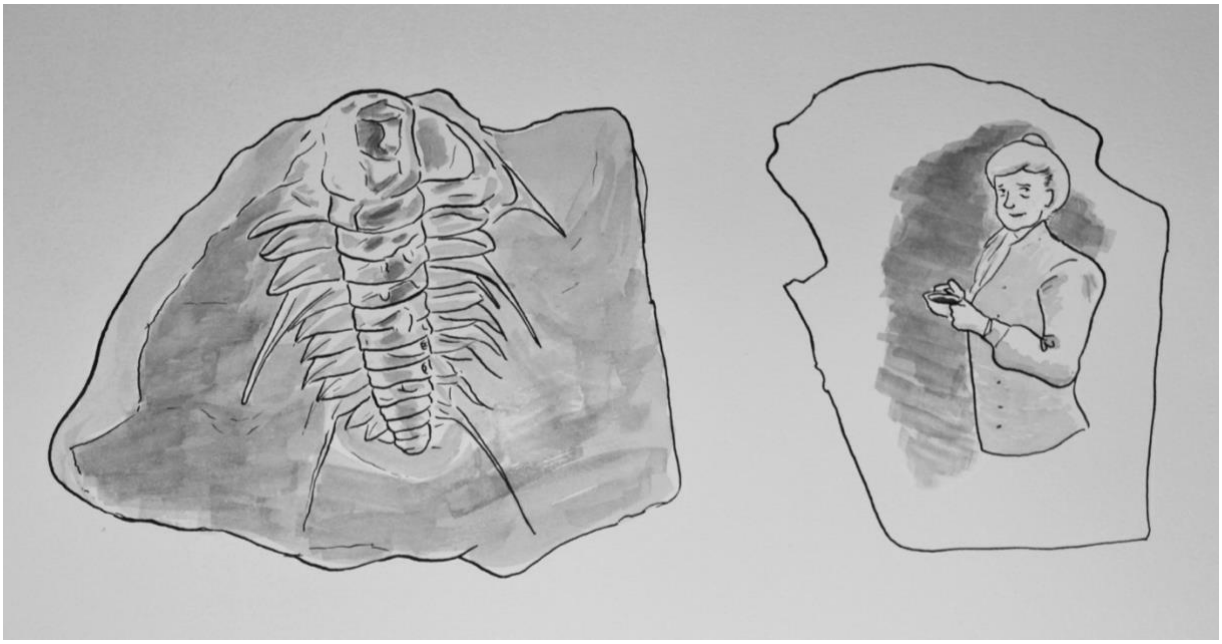

Figure 9: Left: Albertella helena. *Right: Helena Stevens Walcott. Charles Doolittle Walcott named this trilobite after her because she encountered this fossil on Mount Bosworth, and he wanted to give her credit for it. Illustrated by the author.*

Was Walcott also welcomed because the act of describing the Burgess Shale fossils helped reinforce the authority of the dominion government and its agencies in the mountain parks? Now that we have encountered some examples of how Walcott named the fossils, we can hold them up in the light of Harriet Ritvo's observation that within Victorian scientific practice, "Naming constituted a strong, if metaphoric, claim to possession, not only of the newly christened species, but by implication of its native territory."[109] Though Helena Walcott, Mary Vaux Walcott, and others participated in the fieldwork, most of the manuscript publishing and

[109] Harriet Ritvo, "Zoological Nomenclature and the Empire of Victorian Science," in *Victorian Science in Context*, ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), 342.

taxonomical work was done by Walcott back in the US between field seasons. What patterns can we observe in the names he chose, and what ends might those choices have served?

In the early twentieth century, British and North American naturalists were broadly following the system of scientific nomenclature that Carl Linnaeus set in motion in his *Systema Naturæ* in 1735: Latin-based binomial naming, organized into hierarchies of kingdoms, phyla, orders, and so on. This despite the fact that, as Ritvo notes, for practical and political reasons this system did not live up to its promise to filter out problems like the mountains of synonyms for the same species; "[n]etworks of transportation and communication were constantly improving, but not fast enough to guarantee that naturalists would be able to locate and examine all potentially relevant reports,"[110] for example. Biologist Stephen B. Heard has explained that the "rather legalistic Codes that govern the practice of naming"[111] demand that names be spelled in the modern Latin alphabet without special characters or accents, be at least two letters long and easy to pronounce, and be published somewhere. There is no legal force to these codes, but scientists generally follow them for mutual comprehensibility and to make sure that journals will publish their work. More informal conventions allow scientists to name organisms after habitats, mythological figures, onomatopoeia, relatives, colleagues, and collectors. Technically, naming species after yourself is not prohibited by the Botanical or Zoological Codes, notes Heard: "It just isn't something one does; and when someone—occasionally—does do it, eyes roll."[112]

Generally, Walcott followed these conventions, with some idiosyncrasies. As discussed above, he named some of the organisms after his family members and associates: *Sidneyia*

[110] Ritvo, "Zoological Nomenclature," 338.
[111] Stephen B. Heard, *Charles Darwin's Barnacle and David Bowie's Spider: How Scientific Names Celebrate Adventurers, Heroes, and Even a Few Scoundrels* (New Haven, CT: Yale University Press, 2020), 18.
[112] Heard, *Charles Darwin's Barnacle*, 85.

inexpectans for his son Sidney, *Albertella helena* after his wife Helena, *Burlingia* after his assistant Lancaster Burling, and *Marrella splendens* after his colleague John Edmund Marr. "The romance of the Burgess has had at least one permanent effect upon all future study of its fossils," notes Stephen Jay Gould: "the setting of their peculiar names."[113] Peculiar because rather than starting with Greek or Latin roots, Walcott based many genus names on colonial names for locations nearby, such as towns, waterfalls, and railway stops (Figure 10). Many of these were given by officials from the Canadian Pacific Railway in the thirty years before Walcott's arrival. *Leanchoilia*, for example, is a small arthropod with a shielded head and two frontal appendages that Walcott named in 1912. *Leanchoilia* is derived from Leanchoil, a small railway stop in Yoho. Further down the etymological rabbit hole, CPR's William Cornelius Van Horne named the stop in 1884 after the Scottish ancestral home of CPR co-founder Donald Alexander Smith's mother.[114] *Banffia* and *Laggania* have similar ties to the railway and to Scotland. Some genus names have echoes of Indigenous languages, but come from locations named by settlers. Walcott called a sponge *Takakkawia* in honour of nearby Takakkaw Falls, which Van Horne named after a Cree word for "magnificent" as recorded in Father Albert Lacombe's Cree-French Dictionary.[115] *Wiwaxia*, *Odaraia,* and *Yuknessia* echo Wiwaxy Peaks, Odaray Mountain, and Yukness Mountain, whose names were inspired by Stoney words but entered onto maps by 20-year old American mountaineer Samuel Evans Stokes Allen in the

[113] Gould, *Wonderful Life*, 68.
[114] Royal Ontario Museum, "Leanchoilia Superlata," *The Burgess Shale*, accessed March 12, 2023, https://burgess-shale.rom.on.ca/fossils/leanchoilia-superlata/; Donna McDonald, *Lord Strathcona: A Biography of Donald Alexander Smith* (Toronto; Tonawanda, NY: Dundurn Press, 2002), 363; Glen W. Boles, Roger W. Laurilla, and William L. Putnam, Canadian Mountain Place Names: The Rockies and Columbia Mountains (Calgary; Custer, WA: Rocky Mountain Books, 2006), http://archive.org/details/canadianmountain0000bole, 149.
[115] Royal Ontario Museum, "Discoveries;" "Takakkaw Falls," *BC Geographical Names*, "Takakkaw Falls,"accessed March 12, 2023, https://apps.gov.bc.ca/pub/bcgnws/names/17560.html; Albert Lacombe, *Dictionnaire de la langue des Cris* (Montréal: C.O. Beauchemin & Valois, 1874), http://archive.org/details/dictionnairedela01laco, 604

1890s (in the case of Wiwaxy Peaks, while travelling with Stoney packer Enoch Wildman, from Morley).[116]

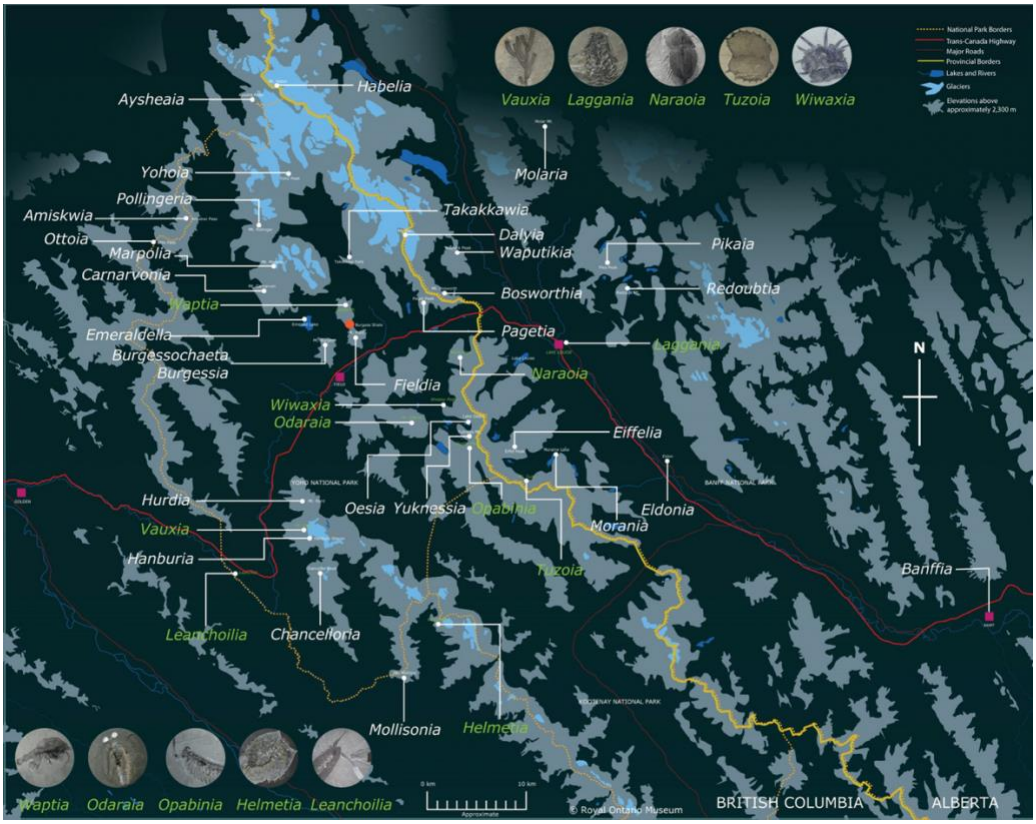

Figure 10: "Map showing the location of geographic features used by Walcott to name his species," reproduced from Royal Ontario Museum, "Discoveries," The Burgess Shale*, accessed December 13, 2022, https://burgess-shale.rom.on.ca/history/discoveries/. Courtesy of the Royal Ontario Museum, © ROM*

[116] Royal Ontario Museum, "Wiwaxia Corrugata," The Burgess Shale, accessed March 18, 2023, https://burgess-shale.rom.on.ca/fossils/wiwaxia-corrugata/; Royal Ontario Museum, "Odaraia Alata," The Burgess Shale, accessed March 18, 2023, https://burgess-shale.rom.on.ca/fossils/odaraia-alata/; BC Geographical Names, Royal Ontario Museum, "Yuknessia Simplex," The Burgess Shale, accessed March 18, 2023, https://burgess-shale.rom.on.ca/fossils/yuknessia-simplex/; "Yukness Mountain," accessed March 18, 2023, https://apps.gov.bc.ca/pub/bcgnws/names/25330.html; J. M. T. and American Alpine Club, "Samuel Evans Stokes Allen, 1874-1945," 1941, http://publications.americanalpineclub.org/articles/12194615500/Samuel-Evans-Stokes-Allen-1874-1945; Glen W. Boles, Roger W. Laurilla, and William L. Putnam, *Canadian Mountain Place Names: The Rockies and Columbia Mountains* (Calgary; Custer, WA: Rocky Mountain Books, 2006), http://archive.org/details/canadianmountain0000bole, 272; *BC Geographical Names*, "Odaray Mountain," accessed March 18, 2023, https://apps.gov.bc.ca/pub/bcgnws/names/17937.html. Samuel E.S. Allen, "Ascent of Mount Temple, Canadian Rockies," *Appalachia*, June 1895, HathiTrust, 282. Boles, Laurilla, and Putnam's book attributes "Odaray" to J. J. McArthur in 1887, but the BC Geographical Names database disputes this. Allen also named the Beehive, Moraine Lake, Butwell Peak, and many other locations near Lake Louise.

Though Walcott clearly intended to honour Rocky Mountain locations he cherished, these place-based names thus also reveal his deference to settler-colonial maps. Christina Gray and Daniel Rück note, in a Yellowhead Institute policy brief, that throughout the last several centuries in Canada, "huge swaths of Indigenous lands were remapped by colonial powers, usually by white men. More often than not, places were named according to the whims of surveyors, cartographers, and politicians of the day."[117] Far from being an extension of innocent curiosity or ignorance about places like the Rocky Mountains, they say that "renaming has been a critical part of settler colonialism generally, which is predicated on the erasure of Indigenous peoples, including their languages, cultures and social structures – and all evidence of Indigenous people's living presence."[118] In most parts of present-day Canada, settler-colonial maps point back to European places, people, and saints. They argue that despite the few Indigenous names that punctured through, "taken together, the settler colonial landscape is overwhelmingly named by and for settlers, using settler references and languages."[119] The power that Walcott reinforced through his taxonomical work is not revealed in the *etymology* of the place names he referenced, but in who he assumed had the authority to determine them.

Perhaps the most revealing name he gave is that of the fossil layer itself: the Burgess Shale. It is not directly named after a person; Walcott was referencing the Burgess Pass, a nearby route to the Walcott Quarry.[120] The Burgess Pass and Mount Burgess next to it, though, were named by Otto Klotz in 1886 after his superior officer, Deputy Minister of the Interior Alexander

[117] Christina Gray and Daniel Rück, "Reclaiming Indigenous Place Names," Yellowhead Institute, October 8, 2019, https://yellowheadinstitute.org/2019/10/08/reclaiming-indigenous-place-names/.
[118] Gray and Rück, "Reclaiming Indigenous Place Names."
[119] Gray and Rück, "Reclaiming Indigenous Place Names."
[120] Walcott, "Middle Cambrian Holothurians and Medusæ."

Burgess.[121] Klotz, remember, was the interior department astronomer who published a description of the Mount Stephen trilobites in 1887. Gray and Rück say Klotz's work presents a particularly egregious and narcissistic example of colonial re-naming:

> Klotz, like many of his contemporaries, believed that Indigenous peoples were subhuman and doomed to extinction. As such, he had no interest in existing place names. He named lakes in the Turtle Mountain area (in Southern Manitoba), for example, after his children, pets, and employees. He also named several mountains in British Columbia after himself, one of which is still known as Mt. Klotz.[122]

By deriving the names of taxa from these new place names, Walcott's work had the effect of reinforcing colonial authority over Rocky Mountain spaces.

One team member who Walcott did not seem to name any species after was Arthur Brown, who cooked and prepared camp for the Burgess Shale expeditions after 1907. He and Walcott met at the USGS, where Brown first worked as a watchmen and messenger before becoming a cook on Walcott's collecting expeditions in Utah and Montana. He even did the delicate work of unpacking the fossils they shipped to Washington, DC in 1912.[123] It is possible that Walcott did not name any species after Brown because he was not directly involved in collecting, but given that he was a Black man and the son of a slave, his steady presence in the field complicates Walcott's impact in constructing Yoho as a white space.[124]

Paleontologists can also make claims on space through interpretations of the fossils and their ecological context. One of the great debates about the Burgess Shale over the twentieth

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[121] Boles, Laurilla, and Putnam, "Canadian Mountain Place Names," 53.
[122] Gray and Rück, "Reclaiming Indigenous Place Names."
[123] Yochelson, "Discovery, Collection, and Description," 512.
[124] Brown was far from the only Black person travelling and working in the Rocky Mountains at this time, including as sleeping car porters for railways. See: Donald Avery, *Reluctant Host: Canada's Response to Immigrant Workers, 1896-1994* (Toronto: McClelland & Stewart, 1995); Karina Joan Vernon, "The Black Prairies: History, Subjectivity, Writing" (PhD diss., University of Victoria, 2008), http://dspace.library.uvic.ca:8080/bitstream/handle/1828/896/Vernon%20Thesis%5B1%5D.pdf.

century was whether its strange organisms belonged to families of life still around today, or whether they represented wild experiments trimmed from the tree of life by random circumstance over the eons. Stephen Jay Gould believed that later paleontologists such as Harry Whittington and Simon Conway Morris found evidence of the latter, and that Walcott missed this because as a devout Christian, he sincerely believed that his religious and moral principles would be reinforced by what he found in nature.[125] According to Gould, Walcott thought paleontology had the potential to reinforce moral lessons about God's benevolence and orderly work to prepare the Earth for man. "He longed to find moral answers directly in nature," says Gould, "—his kind of answers, to support his conservative view of life and society."[126]

Many nineteenth-century geologists shared the view that collecting rocks and fossils would provide evidence of God's design in nature, but not all agreed that Charles Darwin's theory of evolution had a place in that design.[127] Walcott lived through some bitter disputes in the United States over the relationship between morality and evolutionary theory, including attempts to ban teaching evolution in schools. In a way, argues Gould, Walcott was trying to fend off these fundamentalist Christian attacks on science by arguing that evolution was just the revelation of God's orderly plan, "culminating in man."[128] Walcott, says Gould, "considered himself a Darwinian, expressing by this stated allegiance his strong conviction that natural selection assured the survival of superior organisms and the progressive improvement of life on a predictable pathway to consciousness."[129] As evidence, he points to notes for a lecture called "Searching for the First Forms of Life" that Walcott delivered sometime between 1892 and 1894.

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[125] Gould, *Wonderful Life*, 260
[126] Gould, *Wonderful Life*, 261
[127] Zeller, *Inventing Canada*, 244-246.
[128] Gould, *Wonderful Life*, 262
[129] Gould, Wonderful Life, 258.

Gould notices that "Walcott told his audience that Darwin had provided the key to unraveling life's history as 'a certain order of progression'." Finding a complete and continuous fossil record of life on Earth would reveal "a perfect chain of life from the lowest organism to the highest."[130] This implicitly justified his research and methods, Gould argues. Quarrying and naming trilobites not only helped fill in the gaps, it provided proof of the "perfect chain" culminating in humans of a culture he happened to be part of. Walcott's lecture notes continue:

> In early times the Cephalopoda ruled, later on the Crustacea came to the fore, then probably fishes took the lead, but were speedily outpowered by the Saurians. These Land and Sea Reptiles then prevailed until Mammalia appeared upon the scene, since when it doubtless became a struggle for supremacy until Man was created. Then came the age of Invention; at first of flint and bone implements, of bows and arrows and fish-hooks; then of spears and shields, swords and guns, lucifer matches, railways, electric telegraphs."[131]

If cultural and technological change – especially violent tools and technologies – represent upward progression, one could argue that members of the society that had made the most "progress" had the best claim to contested spaces. Given the colonial context for the dominion parks, this could implicitly support territorial claims for both parks as guardians of space for science and railways as conveyors of scientists. Stephen Bocking says many environmental thinkers – such as Rachel Carson and J. Baird Callicott – have similarly drawn moral lessons from ecological science. [132] Bocking cautions that it can be overly simplistic to explain scientists' roles in environmental politics solely on the basis of their personal values though, and paleontologists and biographers have criticized Gould's framing here.

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[130] Gould, Wonderful Life, 258.
[131] Gould, *Wonderful Life*, 258-9
[132] Stephen Bocking, *Nature's Experts: Science, Politics, and the Environment* (New Brunswick, NJ: Rutgers University Press, 2004), 63.

Yochelson points out, for example, that in Walcott's diary we can see he did field work on many a Sunday, and that there is no discussion of religion in any of his publications.[133] Collins also calls Gould's criticism "nonsense." He argues, "[n]one of Walcott's contemporaries, nor indeed the scientists who followed him, questioned Walcott's assumption that the Burgess Shale animals belonged to living animal groups; not until Whittington. True, many of Walcott's zoological assignments were wrong, but this led others to attempt to correct his mistakes."[134] Indeed, Conway Morris himself has argued that Gould misinterpreted the data, and that many Burgess Shale species do indeed belong to still-living groups like arthropods. Thus, the evidence is weak that Walcott's religious values influenced his taxonomical work. In any case it does not appear Walcott explicitly defended parks and railways' authority over space on the basis of the fossil record of this "perfect chain." Perhaps the closest he came was when he wrote to the US Interstate Commerce Commission in 1926 to argue that it should help scientists get free passes from railway carriers. He said that they should be grouped with "persons exclusively engaged in charitable and eleemosynary work," since they were often travelling to do free research for the benefit of future generations.[135]

The aesthetic experience of being in the mountains sometimes inspired a feeling of ownership in those with a scientific relationship to Yoho. Scientific practice in the Rocky Mountain parks at this time was not just the action of measuring glacial flow, collecting fossils, or sketching wildflowers. A crucial part of the activity was the actual feeling of travelling to the mountains and adventuring there: a break from the demands of work and the social conventions

[133] Yochelson, "Discovery, Collection, and Description," 477.
[134] Collins, "Misadventures," 953.
[135] Joseph B. Eastman to Charles D. Walcott, June 3, 1926, Box 53, Folder 16, Record Unit 46, Smithsonian Institution - Office of the Secretary Records 1925-1949, SIA.

back home. For Mary Vaux Walcott, part of that aesthetic also seems to have been the idea of relative quiet, solitude, and of being the first white woman to visit places. A letter from Vaux to Walcott in 1912 suggested some feeling of ownership, however playful, springing from these experiences. Helena Walcott had recently died, and Vaux and Walcott were nominally only colleagues and fond correspondents. Vaux wrote about a mountain panorama she had sent him, and her thoughts on a report Walcott had written about a Burgess Shale fossil bed (presumably the Walcott Quarry). She shared newfound appreciation and interest in the "wonderful fossils," and a hope that "I may, some time, have an opportunity to see them."[136] Though she was a very experienced observer and traveller throughout the Canadian Rockies, she was humbled by Walcott's work detailing the paleontological record on the slopes she knew so well. "We have some very beautiful trilobites from Mt Stephen," she noted, "that we got before the location was so much patronized, but they are only the common ones. How much we pass by, owing to our lack of knowledge in recognizing the value of what we see."[137]

Evidently, she did not see herself as a tourist in these places. She went on to tell Walcott she would like to hear more from him about the Yoho Valley: "Thee knows I feel a sense of ownership in it, being the first white woman that visited it."[138] The valley was, she told Walcott, "the loveliest spot to be found, and always quickens my blood when I hear and speak of it, and I can imagine no greater delight than camping there away from the tourist, and the noise of the iron horse."[139] This sense of ownership seems mostly spiritual, or in light jest, and the letter suggests Vaux wanted to find quieter spots in the park, rather than keep these tourists and trains

[136] Mary M. Vaux to Charles D. Walcott, April 1, 1912, Box 5, Folder 2, Record Unit 7004, Charles D. Walcott Collection, SIA.
[137] M. M. Vaux to Walcott, April 1, 1912, Walcott Collection.
[138] M. M. Vaux to Walcott, April 1, 1912, Walcott Collection.
[139] M. M. Vaux to Walcott, April 1, 1912, Walcott Collection.

out. Her pride in being first, however, seems sincere and enduring. Almost two decades later, Catharine Robb Whyte described meeting Vaux in Yoho, "now about 70 but who came out here 30 years ago when all the mountains were first being climbed & was the first woman up Mt. Stephen & also was the first to discover various glaciers etc"[140] – feats she presumably heard about from Vaux herself.

It seems ironic that Vaux enjoyed these Yoho landscapes more before so many tourists frequented the park, given that her own presence added to the visitor population, and that she too advertised Yoho's charms to the *Canadian Alpine Journal*'s scientifically-engaged and mountaineering-oriented readers. She contributed an article about camping in the Canadian Rockies, offering enticing tips such as building in time to "sleep as long in the morning as you wish, get acquainted with the flowers and birds, and enjoy the delights of a quiet walk."[141] Assuming her readers would start from the Laggan train station, she wrote that "[f]or a four-days' trip, there is no place more delightful than Lake O'Hara – a lovely clear sheet of water, filtered through the rock slide at its head," with banks "carpeted with flowers" and so many mountains that "one is almost bewildered by the number and grandeur of them all."[142] Vaux made an effort to prepare fellow travellers for everything from the need to bring "rational clothes"[143] to the wild meat that could supplement whatever canned or dried foods one packed: "Trout and game are always a welcome addition to the larder."[144]

Walcott and Vaux shared a love of this aesthetic experience with contemporaries like Mary Schäffer. Schäffer was an artist, writer, and lover of the Rockies pulled all the way across

[140] Catharine Robb Whyte to Mother, August 11, 1930 in *This Wild Spirit*, chapter "Dearest Mother," p 259.
[141] Mary M. Vaux, "Camping in the Canadian Rockies," *Canadian Alpine Journal* 1, no. 1 (1907), 67.
[142] Vaux, "Camping in the Canadian Rockies," 67.
[143] Vaux, "Camping in the Canadian Rockies," 68.
[144] Vaux, "Camping in the Canadian Rockies," 69.

the continent on the CPR by the idea of delving "into the heart of an untouched land, to tread where no human foot had trod before, to turn the unthumbed pages of an unread book, and to learn daily those secrets which dear Mother Nature is so willing to tell those who seek."[145] Betty Spears notes that both Vaux and Schäffer's families were Quakers and "solid Philadelphians of some means." Though upper class, Spears says "[t]hey should not be confused with wealthy families who engaged in country club sports such as tennis, golf, and swimming."[146] Both of these women found purpose, comfort, and excitement in the niche that the Canadian Rockies offered: a place far away from the city where they could wear practical clothes, camp, ride horses, and participate in cultural and scientific activities.

Not everyone at this time, of course, could afford to take a few months in the summer to ride through the Rockies on horseback, with packs full of bacon and blankets and air mattresses, an outfitter, and a cook. Perhaps this is how space was inadvertently claimed for paleontology in the Rockies: it was part of an aesthetic experience sought by white, relatively wealthy visitors, and aligned with the type of wilderness experience that the Dominion Parks service, CPR, and recreational clubs sought to create.

Writing about travelling through the Bow Valley to the headwaters of the Saskatchewan River in 1907, Schäffer lingered both on the romance and escapism of being a woman travelling "in the country of which so little was known"[147] and on Nature's "evening hymn"[148] of night-hawks and moonlight. This sense of being a pioneer – one of the first white women to ride

[145] Mary Schäffer, *A Hunter of Peace: Mary T. S. Schäffer's Old Indian Trails of the Canadian Rockies*, ed. E. J. Hart (Banff, Alberta: Whyte Museum of the Canadian Rockies, 1980), 18.
[146] Betty Spears, "Mary, Mary, Quite Contrary Why Do Women Play?," *Canadian Journal of History of Sport* 18, no. 1 (May 1987): 72, https://doi.org/10.1123/cjhs.18.1.67.
[147] Schäffer, *A Hunter of Peace*, 17
[148] Schäffer, *A Hunter of Peace*, 25.

through these stretches of muskeg and rushing spring runoff – also sat side by side with acknowledgement and even admiration for Indigenous people who had walked the same trails. Beneath Mount Wilson, she described setting up tents near "old tepee-poles, bespeaking the sometime presence of the Indian hunter."[149] Yet these settlers who admired the Rockies must have known that Indigenous hunters were becoming a rarer "sometime presence" in the mountains, especially in the parks.

Mountain Parks as Spaces of Exclusion and Assimilation

The process of reserve-making was one tool for organizing Indigenous peoples' exclusion from the Rocky Mountains. Present-day Yoho encompasses passes that were important for the Ktunaxa to cross over for bison hunting. These were significant seasonal hunts, and provided communities with meat and hides for tipis, clothing, bedding, and leather goods.[150] According to Ktunaxa oral histories, these crossings were made several times a year – including in winter – even before the introduction of horses. When BC joined Confederation in 1871, the federal government agreed to give the province exclusive authority over assigning Indigenous peoples to reserves. Starting in 1884, BC Indian Reserve Commissioner Peter O'Reilly assigned Ktunaxa people reserves far to the south of present-day Yoho. Premier William Smithe gave O'Reilly orders to make sure the reserves were smaller than the ones on the east side of the

[149] Schäffer, *A Hunter of Peace*, 27.
[150] Robert Coleman, "Landscape of Power, Landscape of Identity: The Transforming Human Relationship with the Kootenai River Valley" (Tempe, AZ, Arizona State University, 2013), https://keep.lib.asu.edu/items/151743, 35; See also Chris Luke Sr., *The Yaqan Nukiy: Their History, Culture and Traditions* (Creston, BC: Chris Luke Sr., 2018).

Rockies, and to clear land for white settlers who might be attracted by the new railway.[151] Smithe's view was that "Native people should not be permitted to stand in the way, and should be assimilated as quickly as possible," writes geographer Cole Harris.[152] Ktunaxa leaders saw value in settler education, but residential schools like the St. Eugene Mission School served as a violent tool for assimilating Ktunaxa children.[153]

Bison and salmon populations crashed in the 1880s, and the issue of reserve size became even more important as livestock became a crucial source of food for Ktunaxa communities.[154] In 1912, Indigenous leaders in the Indian Rights Association of British Columbia petitioned the federal government to address the ongoing issues of unceded title and land rights. One member, Chief James Raitasket of Lillooet, told Prime Minister Robert Borden, "the whole country has been taken from us without treaty of agreement and without compensation of any kind, and the citiers have come later, and the railways later, and these things have been built on our lands."[155] In response, the BC and dominion governments jointly set up the Royal Commission on Indian Affairs for the Province of British Columbia (also known as the McKenna-McBride Commission). From 1913-16, the commission held hearings in reserve communities throughout interior BC. Chiefs presented concerns about access to doctors, education, and treatment by settler communities, but the commissioners were narrowly focused on the size of reserves.

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[151] Lacombe, "Treaty Negotiations"; W.M. Smithe to P. O'Reilly, June 13, 1884, in *RETURN To an Order of the House for a return of all lands set apart for Indians in this Province subsequent to the return made to this House on 13th January, 1873, with the names of the tribes and the number of Indians for whom each reserve has been made; and a return of the reserves which have been made to the Chief Commissioner of Lands and Works, but not assented to by him.*, (Victoria: British Columbia Legislative Assembly, 1885), v. https://open.library.ubc.ca/viewer/bcsessional/1.0060971#p24z-2r0f:

[152] Cole Harris, *Making Native Space: Colonialism, Resistance, and Reserves in British Columbia*, Brenda and David McLean Canadian Studies Series (Vancouver: UBC Press, 2002), 189.

[153] Sidney Anne Moran, "The Residential School 'Monster': Indigenous Self-Determination and Memory at Former Indian Residential School Sites" (Master's thesis, Ottawa, Carleton University, 2020).

[154] Harris, *Making Native Space*, 191.

[155] Ignace and Ignace, *Secwépemc People*, 468.

"[They] refused to address the overall question of unsurrendered Aboriginal title," write Marianne and Ronald E. Ignace, and threatened to imprison one chief when he questioned the commission's mandate.[156]

Ktunaxa leaders presented some of their most dismaying testimony in September of 1914, when the commissioners visited the Columbia-Kootenay Band, or ʔakisq̓nuk First Nation, on their reserve near Windermere. Ignatius Eaglehead spoke, along with Chief Arbel of the Lower Kootenay, or Yaqan Nukiy, Band. Eaglehead testified that he was hoping the commission would add land to his reserve for his people and their livestock. Some people were trying to grow potatoes and turnips and carrots, he said, but the soil was mostly too swampy or thin, leading to starvation. The most contentious issue was off-reserve hunting.

Indian agents had told them repeatedly that they were entitled to hunt all the way east to the Alberta border. When Robert Leslie Thomas Galbraith was their Indian agent, they were told the only restriction off-reserve was, "when the game season is closed for the white people you Indians at any time when you want meat you can go and hunt and kill one and don't sell it when it is out of the game season."[157] They approved of this law, said Eaglehead, but "the laws must be different in Ottawa,"[158] because they had since been severely punished for even possessing out-of-season meat. He told the commissioners about a time when he was travelling near the edge of the reserve and met someone on their way back, who offered him some venison. "[A] white man saw me with it and after that I heard I was going to be arrested,"[159] said Eaglehead. At

[156] Ignace and Ignace, *Secwépemc People*, 468.
[157] "Meeting with the Columbia-Kootenay Band," *Report of the Royal Commission on Indian Affairs for the Province of British Columbia [McKenna-McBride Report]*, 1916, https://gsdl.ubcic.bc.ca/cgi-bin/library.cgi?e=d-00000-00---off-0kootenay--00-2----0-10-0---0---0direct-10---4-------0-1l--10-en-50---20-about---00-3-1-00-0--4--0--0-0-01-10-0utfZz-8-00&cl=CL4.1&d=HASH012aade6d32920243ccd01de.6&gt=2, 61.
[158] Meeting with the Columbia-Kootenay Band, McKenna-McBride Report, 62.
[159] Meeting with the Columbia-Kootenay Band, McKenna-McBride Report, 62.

the courthouse, he was told he would either have to pay a fine or to go to jail. "I thought [to] myself I would not pay my fine because I know I will have my feed in there because I have nothing to eat in my house,"[160] he said. In the end, he was only released after he had spent a night or two in jail and his community had collected $49.50 to pay off his fine.

BC provincial governments took almost a decade to pass legislation accepting the commission's recommended reserve adjustments, and Harris writes that between land cut-offs and a new grazing common to be shared by Ktunaxa and Secwépemc farmers, "not much had changed" afterward – including off-reserve hunting rights.[161]

Hunting restrictions were used to exclude Indigenous peoples from Banff, setting a pattern for the other parks in the Rockies. Officials in Banff (then Rocky Mountains Park) began moving to prevent Indigenous groups like the Stoney from continuing to hunt in the park almost immediately after its founding in 1885. George Stewart, the inaugural superintendent of Rocky Mountains, Glacier, and Yoho Parks, wrote in his first annual report: "it is of great importance that if possible the Indians should be excluded from the Park. Their destruction of the game and depredations among the ornamental trees make their too frequent visits to the Park a matter of great concern."[162] In 1890, all hunting was prohibited in Banff.[163] In both BC and Alberta, the Forestry Branch and Dominion Parks Branch treated Indigenous groups as existential threats to game animals.

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[160] Meeting with the Columbia-Kootenay Band, McKenna-McBride Report, 62-63.
[161] Harris, *Making Native Space*, 254.
[162] Theodore (Ted) Binnema and Melanie Niemi, "'Let the Line Be Drawn Now': Wilderness, Conservation, and the Exclusion of Aboriginal People from Banff National Park in Canada," *Environmental History* 11, no. no 4 (October 1, 2006)
[163] Binnema and Niemi, "'Let the Line Be Drawn Now,'" 726.

Sport hunters and park managers accused Indigenous groups of endangering wildlife populations despite not only centuries of traditional hunting on these lands, but a long history of treaty-making and territorial negotiation before the arrival of European settlers. Ignace and Ignace point to the Fish Lake Accord, for example: a peace agreement between Douglas Lake Okanagan area chief Pelkamulox III (or Pelk̓múlecw) and his sibling Kwolila of the Tk̓emlúps division Secwépemc.[164] Even after Confederation, Indigenous groups continued to negotiate land access between themselves, such as in the 1895 treaty between Secwépemc, Stoney, and Ktunaxa leaders to resolve hunting stresses in the Kinbasket area.[165]

Historian Ian MacLaren has argued that Indigenous people were excluded from the Canadian mountain national parks partly because the parks were inspired by Yellowstone, where the "Romantic notion of wilderness" led to regulations precluding all permanent human residence.[166] Binnema and Niemi dispute this, arguing that the driving forces were sportsmen hunters' desire for nearby areas to be replenished by park game reserves, parks managers' view that it was profitable to have deer and elk walking unafraid past tourists with cameras, and an agreement from Indian Agents that easy access to subsistence hunting in parks was preventing nearby Indigenous groups from fully assimilating.[167]

Indigenous hunting rights in dominion parks and forest reserves were also trimmed and extinguished as a by-product of resolving disputes between the BC and dominion governments. Lacombe notes that "the federal government wanted to administer Dominion parks as 'absolute

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[164] Ignace and Ignace, *Secwépemc People*, 289-290.
[165] Ignace and Ignace, *Secwépemc People*, 293.
[166] I. S. MacLaren, "Rejuvenating Wilderness: The Challenge of Reintegrating Aboriginal Peoples into the 'Playground' of Jasper National Park," in *A Century of Parks Canada, 1911-2011*, ed. Claire Elizabeth Campbell (Calgary: University of Calgary Press, 2011), 334.
[167] Binnema and Niemi, "'Let the Line Be Drawn Now.'"

game preserves'" with park-specific restrictions on hunting and fishing.[168] The BC government, on the other hand, wanted to have "a uniform set of hunting regulations applied consistently throughout the province."[169] Since the federal government "did not have title to the land base within the national park and forest reserves,"[170] the BC policy initially prevailed, and hunting licenses were recognized in Glacier, Yoho, and Mount Revelstoke. The resolution only came in 1919, when the two governments came to the table over the completion of the Banff-Windermere highway. BC could not afford to complete its portion of the highway through the Rockies on its own after the war, but was able to convince the dominion government to fund the construction in exchange for ceding a five mile (~eight kilometre) strip of land on either side of the road to Dominion Parks (land which became Kootenay National Park), and granting the dominion government "exclusive jurisdiction and title to all Dominion parks situated within British Columbia."[171] This had the effect of resolving inconsistent hunting and fishing regulations, but went much farther, as Lacombe writes:

> The effective result of the Banff-Windermere Highway- agreement was the broad scale application of federal legislation to national parks within British Columbia. With the stroke of a pen, existing Aboriginal rights or title to the land base within Yoho, Glacier, Revelstoke, and Kootenay National Parks were effectively nullified; and the ability of the Ktunaxa to hunt and fish in this part of their traditional territory was lost. Removing the ability of the Ktunaxa to hunt in what are now national parks effectively eliminated the raison d'etre for many other traditional activities which were practiced concurrently and were integral to the Ktunaxa culture [like] the gathering of foods and trade commodities as well as the pursuit of spiritual wellness.[172]

Ironically, a minor incident over illegal hunting arose in 1922 when a member of Walcott's team shot a sheep in Kootenay. James Morley Wardle, Canadian National Parks

[168] Lacombe, "Treaty negotiations," 53.
[169] Lacombe, "Treaty negotiations," 53-54.
[170] Lacombe, "Treaty negotiations," 54.
[171] Lacombe, "Treaty negotiations," 54. See also Leslie Bella, *Parks for Profit* (Montreal: Harvest House, 1987), 75.
[172] Lacombe, "Treaty negotiations," 55-56.

Engineering Service Chief Engineer, wrote to Kootenay's acting superintendent to complain that members of his road construction crew camped near Sinclair Pass reported someone in Walcott's party "shot and killed one of the Rocky Mountain Sheep that are now in the vicinity". Wardle was well aware that the park had recently become a game reserve and thought that this sheep herd's presence so close to the road "should be encouraged." "Under the circumstances I feel that Doctor Walcott's party used poor judgement in shooting one of this band,"[173] Wardle concluded. The Kootenay superintendent deferred the matter to Parks Commissioner Harkin, who replied "this matter has been noted. However, no action is contemplated at the present time."[174] Unlike Ignatius Eaglehead's venison incident, it seems no member of Walcott's party spent the night in jail or paid any fine over the sheep.

Yet Indigenous people continued to find ways to be present in the mountain parks throughout this period. In Jasper, members of the Moberly family that were evicted from the park in 1910 returned as outfitters in the 1920s.[175] Meanwhile, Stoney and Ktunaxa individuals seized opportunities to spend time in Yoho and Kootenay on horseback – at times crossing paths with Walcott and Vaux themselves in the mountains.

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[173] J. M. Wardle to R. S. Stronach, September 28, 1922. Department of Canadian Heritage, Canadian Parks Service: Park/subject classification system : T-12420, Image 1218 https://heritage.canadiana.ca/view/oocihm.lac_reel_t12420/1218

[174] J. B. Harkin to R. S. Stronach, December 12, 1922. Department of Canadian Heritage, Canadian Parks Service: Park/subject classification system : T-12420, Image 1214 https://heritage.canadiana.ca/view/oocihm.lac_reel_t12420/1214

[175] Peter J. Murphy, "Homesteading in the Athabasca Valley to 1910," in *Culturing Wilderness in Jasper National Park: Studies in Two Centuries of Human History in the Upper Athabasca River Watershed*, ed. I.S. MacLaren (Edmonton: University of Alberta Press, 2007), 139.

Assertions of Agency on the Trails

> One day upon the C.P.R.
> (Mark well what I do say!)
> Out on an observation car
> I met a moving picture Star
> And she said she went a-riding
> The livelong day
> A-riding, a-riding, a-riding where the Rockies are,
> She said she went a-riding the livelong day.
>
> - Excerpt from "A-Riding, A-Riding (Tune—A-Roving)," included in the songbook of *Trail Riders of the Canadian Rockies*, Bulletin No. 4, June 22, 1925, 3.

The Order of the Trail Riders of the Canadian Rockies is a horseback riding club whose history stretches from 1923 into the present day. The club was the brainchild of John Murray Gibbon, Chief Publicist for the CPR in the 1920s. According to Robert Sandford's history of the Trail Riders, the idea came to Gibbon on a backcountry ride with friends through Kootenay in 1923.[176] The Trail Riders' first bulletin paints a romantic picture of the group resting "one rainy day […] on a bed of white heather" after a long ride through the Wolverine Pass, which one rider declared "the most wonderful alpine trail he had ever ridden."[177] Someone in the group suggested creating a trail riding club, and Gibbon worked over the next year to marshal membership and resources to make it happen. Among other things, the club would aim to encourage horseback riding in the Rockies, conservation of wildlife and trails, and preservation of Canada's dominion parks. The first gathering was held in 1924: a ride across several days, capped by a "pow wow" at a camp in the Yoho Valley.

[176] The book was written for the club's 75th anniversary, and funded in part by CP Hotels. Robert W. Sandford, *Trail Riders of the Canadian Rockies: 75th Anniversary, 1923-1998* ([Banff]: [Robert W. Sandford], 1998), 5.
[177] Trail Riders of the Canadian Rockies, Bulletin No. 1, October 15, 1924, 1.

Gibbon published regular *Bulletins* of the club's activities with photographs and songsheets.[178] He described majestic and adventurous scenes from the annual rides and included a fastidiously updated list of members and the number of miles they had ridden in the Rockies. Early members of the Trail Riders' Council included CPR construction engineer and lodge designer Basil Gardom and Dominion Parks Commissioner Harkin, while former Banff superintendent Wardle became the first President-elect. The CPR also helped arrange accommodations for the Trail Riders at Takakkaw Falls in 1924, described by the BC *Grand Forks Sun and Kettle Valley Orchardist* as a "beautiful village of chalets a mile above the sea, […] reinforced with twenty Indian teepees and a huge Sun Dance Lodge which had been erected as camp headquarters by Stony Indians under the supervision of Chief Walking-in-the-road."[179] The tents were apparently painted by Stoney artists. We can speculate whether this was a superficial attempt to exotify the experience for settlers in attendance, but a Trail Riders bulletin the next January hints at organizers' continuing interest in the traditions that inspired the paintings. An article in that edition tells a story about the Vermilion Paint Pots, now a part of Kootenay National Park. The narrator describes Stoney peoples' use of the red clay from these natural springs: "Our people used to take their war paint at these springs, from the old generations."[180] Dreams, the narrator says, may have told people to paint "maybe the rainbow on the forehead, maybe a large eagle on the body," or "to paint a buffalo on their tents."[181]

Intriguingly, Walcott was the Trail Riders' first Honourary President, and he and Vaux were star members. They both attended the first gathering in 1924. According to the *Grand*

[178] Sandford, *Trail Riders*, 8.
[179] "Mounted Mountaineers Pow-Wow at Yoho," *The Grand Forks Sun and Kettle Valley Orchardist*, September 5, 1924, UBC Library Open Collections: BC Historical Newspapers, 3.
[180] "Where the Indians Got Their Paint," *Trail Riders of the Canadian Rockies*, January 15, 1925, 2.
[181] "Where the Indians Got Their Paint," *Trail Riders*, 2.

Forks Sun, Walcott saw this first attempt to unite horseback riders in the Rockies "as a step which will prove one of the great international attractions."[182] Reportedly, Walcott had one complaint about the event: "that bears stole the side of mutton which was hanging at the back of his chalet when he last saw it."[183]

PearlAnn Reichwein notes that Gibbon was also the CPR's liaison with the Alpine Club of Canada, which aimed to promote mountaineering and tourism to middle-class Canadians, "[i]nspired by a nationalistic dedication to share the Canadian 'mountain heritage.'"[184] Bella has argued that railway companies intentionally shaped Canada's national parks to filter out businesses targeting the working class; "[a]ccess to the mountains was provided instead to upper- and middle-income tourists willing to pay substantial sums for a sanitized view of the mountains."[185] Mountain parks like Yoho, she asserts, "were built […] to centralize control of that landscape in the hands of the railroads [to] reduce competition in the parks, and to restrict access to the mountains."[186] Recreational groups like the Trail Riders and the Alpine Club of Canada helped the railways build imagery of who the mountains were for, and Walcott and Vaux presented models of the ideal upper-class urbanite visitors.

The Trail Riders seemed to actively encourage both women and Indigenous people to participate. Several prominent Indigenous figures took the opportunity to be present on the land in Yoho and Kootenay. Stoney Chief Jonas Benjamin was an early Council member. Ktunaxa Chief Louis Arbel was too, and is listed among the very first members in 1924 as a holder of a

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[182] "Mounted Mountaineers," *The Grand Forks Sun*, 3.
[183] "Mounted Mountaineers," *The Grand Forks Sun*, 3. According to the Trail Riders Bulletin that year, the mutton was in his tent.
[184] PearlAnn Reichwein, *Climber's Paradise: Making Canada's Mountain Parks, 1906-1974*, Mountain Cairns (Edmonton: University of Alberta Press, 2016), 65.
[185] Leslie Bella, *Parks for Profit* (Montreal: Harvest House, 1987), 24.
[186] Bella, *Parks for Profit*, 24.

2,500-mile button,[187] though he apparently did not attend that first pow-wow in the Yoho Valley. As the Trail Riders prepared for their second gathering in 1925, they anticipated that "Arbel with six leading members of the Kootenay Indians [including his daughter Margaret would] join the cavalcade on the Wolverine Plateau, accompanied by Mr. Enas H. Small, Indian Agent at Cranbrook, B.C."[188] The plan was to have one group ride out from Marble Canyon (in Kootenay) on August 8 and meet up with Arbel's group at Wolverine Plateau.[189]

Coverage in the *Calgary Herald* said a "string of Trail Riders and pack horses a mile long, with riders ranging from eleven to seventy years of age, swung down the winding trail from O'Hara to Wapta" by August 10.[190] The *Herald* reporter said that they were following a trail cut the previous fall for their group by Windermere guide Walter Nixon, since "[b]efore the ride only straggling parties of hunters, trappers and Indians had attempted to get through the heavy timber."[191] Arbel seemed conscious of the significance of his group journeying through these mountains. "He will have travelled 400 miles to attend the ride and return home," noted the *Herald*. "Pointing to his own 2,500 mile badge, he told the riders that he was glad the first big party to travel through the land of his fathers should be members of his own organization. A

[187] Trail Riders of the Canadian Rockies, Bulletin No. 1, October 15, 1924, 6. I have tried to establish whether (and how) Chief Louis Arbel is related to the Chief Arbel who testified before the McKenna-McBride Commission. There is both an Arbell (born 1843 in the USA, married to Lury Arbell) and a Louis Arbell (born 1867 in British Columbia, married to Mary Arbell) listed in the 1901 census of Canada records for the Kootenay (East/Est), North Riding/Division Nord) Sub-District of Yale and Cariboo District 5 in British Columbia. A 1941 Lethbridge Herald obituary for Louis Arbell describes him as chief "of the Kootenay tribe of Indians at the reserve [near] Windermere" (the ʔakisq̓nuk First Nation) since 1916, and being about 74 years old at the time of his death. This would mean he assumed leadership two years after the Chief Arbel who is listed in the McKenna-McBride records testified in 1914.
[188] Trail Riders of the Canadian Rockies, Bulletin No. 4, June 22, 1925, 1-5.
[189] Trail Riders of the Canadian Rockies, Bulletin No. 5, October 15, 1925, 2.
[190] Trail Riders of the Canadian Rockies, Bulletin No. 5, October 15, 1925, 2.
[191] Trail Riders of the Canadian Rockies, Bulletin No. 5, October 15, 1925, 4.

great ovation of cheering greeted this pronouncement. The chief made himself at home and sang with the rest."[192]

Arbel's presence in the Trail Riders has parallels with Indigenous people's ambivalent roles in Banff Indian Days. From the 1890s to 1970s, Indigenous performers, mainly from the Morley reserve, came to Banff to join in annual parades, sporting competitions, and drumming and singing. Jon Clapperton writes that for settler organizers and parks officials, the event wrapped participants in roles that showcased them as part of the park's authentic natural heritage, but made sure they "posed a threat neither to the established colonial, social hierarchy nor to the park's environment."[193] Participants often resisted such colonial narratives though: Stoney chiefs threatened a boycott one year when park staff tried to limit how many of them could attend, and others took opportunities to transgress race, class, and gender boundaries during parades and pageants. Outfitting with the early mountain tourism industry similarly offered a way for other Indigenous people, like William Twin, to define their own presence in their homeland.[194]

1924 was the only year Walcott was able to attend a Trail Riders event, though he remained honourary president until his death. Vaux attended that year and several more times in the 1920s. I have not been able to find evidence that Vaux and Arbel met at the 1925 ride and pow-wow, but if they did, it would have been a fascinating conversation. Did they talk about the flowers and glaciers and feeling of wilderness she loved, the quiet and the vistas she kept coming back for, and the land they both cared about so much? Did they discuss the severe restrictions

[192] Trail Riders of the Canadian Rockies, Bulletin No. 5, October 15, 1925, 5.
[193] Jonathan Clapperton, "Naturalizing Race Relations: Conservation, Colonialism, and Spectacle at the Banff Indian Days," *Canadian Historical Review* 94, no. 3 (September 2013), https://doi.org/10.3138/chr.1188, 353.
[194] Tolly Bradford, "A Useful Institution: William Twin, 'Indianness,' and Banff National Park, c.1860-1940," *Native Studies Review* 16, no. 2 (December 2005): 77–98.

placed on Ktunaxa and Stoney people hunting in the Rockies, and the easy access that Vaux and Walcott had enjoyed to game and fish in the parks? Perhaps Walcott took a moment with Walking-in-the-road in 1924 to talk about the significance of their mutual presence in parks. I wonder if Vaux or Walcott reconsidered the easy way they rode into Yoho on railway lines, or spent some of their political capital trying to persuade parks officials to reconsider banning these men and their people from hunting in the parks.

* * *

As in Ritvo's analysis of Victorian taxonomists, naming was a form of claiming in the Burgess Shale, and it served the scientists who did the naming. Through his taxonomical work, Charles Doolittle Walcott embedded the Burgess Shale fossils in a Linnaean system of classification, and Vaux reinforced the same system in her wildflower illustrations. Though American, their work cataloguing fossils and glaciers served the imperialist mission shared by the Geological Survey of Canada and the Dominion Parks Branch: to build a scientific inventory of the nation. By requesting permits to collect biological specimens and export fossils, Walcott also helped reify Canadian authority over resources and territory in the Rockies. His job as Secretary of the Smithsonian Institution put him in a position to continue building goodwill by helping arrange for favours like a transfer of wildlife between US and Canadian park agencies. Though legal tools to limit fossil collecting were limited and vague, these are likely some of the reasons the Dominion Parks Branch allowed the Smithsonian team's expeditions.

Walcott was able to send home thousands of slabs with at least the tacit approval of the Yoho park managers and explicit endorsement from the Department of Mines. He and Vaux had unique positions that granted them leeway not only to dig in Yoho, but to ask for favours such as free passage on the CPR trains. In part, this is because Walcott and Vaux were not just scientists.

They were also relatively wealthy urbanites from the eastern United States who loved coming to the Canadian Rockies to take photographs, paint, climb mountains, and ride horses. They took panoramas of Yoho, they wrote about their travels along the railway, and they encouraged other tourists to visit too. The railway companies and Dominion Parks Branch helped claim space in Yoho for visitors like them who saw the Rockies as a place for respite, recreation, and adventure. In turn, their recreational activities helped reinforce the parks service and the CPR's authority over land in Yoho.

Unlike the conservation biologists that Guha criticized in India's Nagarhole National Park, it does not seem as though Walcott and Vaux pushed to make parks more restrictive spaces for visitors, Indigenous groups, or prospective fossil collectors. Still, their presence defended the space for colonial authorities, and they were able to fish and hunt in the Rockies while Indigenous people were fined and arrested for doing the same. This case study shows that, to some extent, scientists from the United States were welcomed to practice paleontology in Yoho in the early twentieth century because they could exchange powerful favours, and because their taxonomical work and recreational activities reinforced territorial claims by the federal government and the CPR over the Rocky Mountains.

Can we generalize throughout the twentieth century to say scientists continued to have outsized influence in Yoho? The picture is more complicated if we look closely at attempts by Royal Ontario Museum scientists to remove fossils from the park in the 1970s. By then, access was much more constrained for amateur and professional Burgess Shale enthusiasts. In the next chapter, I will show how Parks Canada messaging and regulations made it more difficult for scientists and tourists to remove fossils from Yoho.

Chapter 2: The National Interest (1972 - 1975)

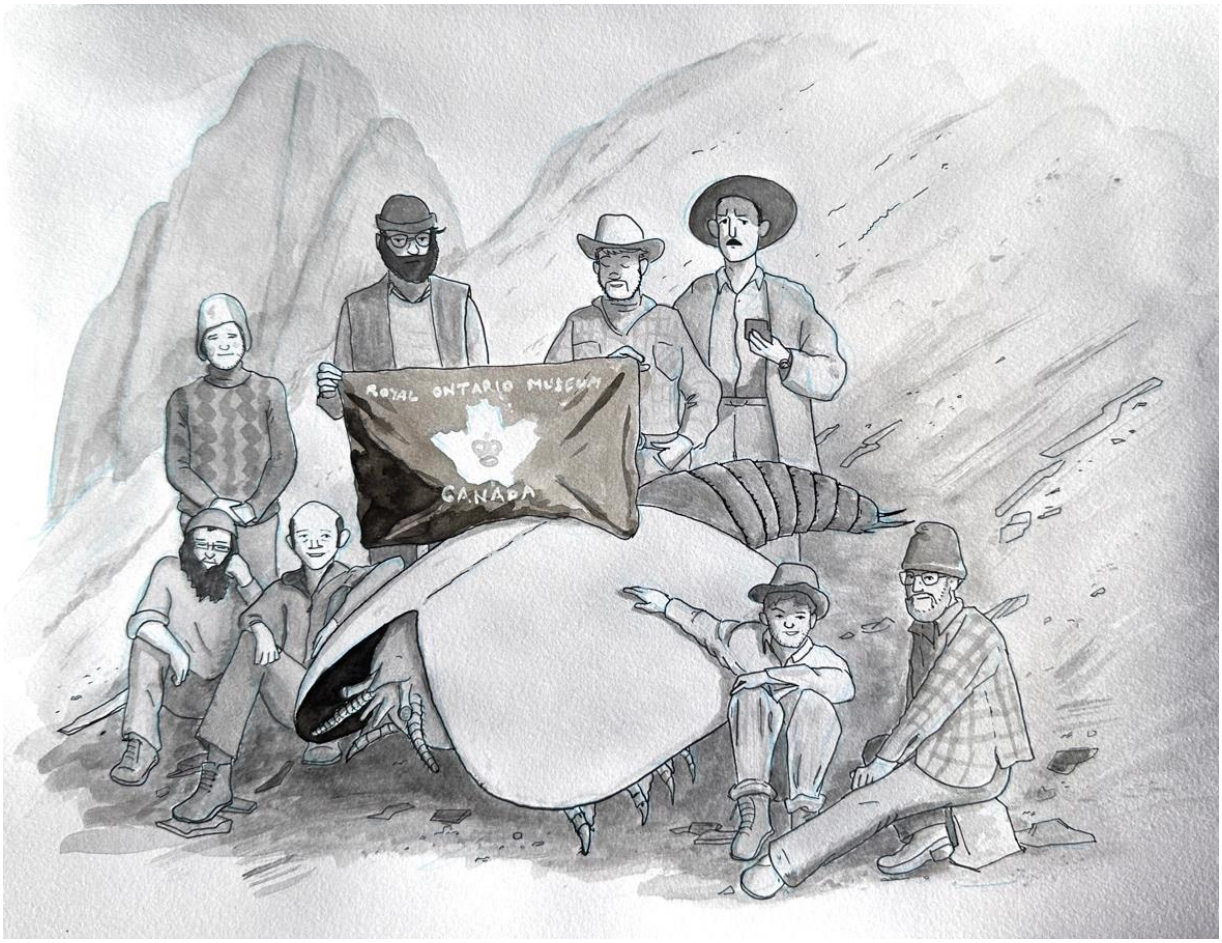

Figure 11: The ROM team in the Walcott Quarry in 1975, with a greatly-enlarged living Canadaspis perfecta*. Back row, left to right: Rod Fuller, Russ Barrows, Huibert Sabelis, and Desmond Collins. Front row, left to right: David Rudkin, Bruce Haugh,* Canadaspis perfecta*, Chandler Rowell, and Bob Barnett. Illustrated by the author.*

Thousands of kilometres away from the Rocky Mountains, parents and children are standing in front of wall full of fossils in a museum. “They’re all trilobites!,” I overhear. It is 2023, and my friend Muniq and I are wandering through the Dawn of Life gallery at the Royal Ontario Museum (ROM) in downtown Toronto. Gloves, a medicine bottle, and a broken chisel left behind by Charles Walcott’s team have become artifacts themselves, charting scientists’ work to document life’s evolution from underwater microbes to squirming, seeking multicellular organisms living all across the planet.

Fossils from the Burgess Shale are major characters in this gallery. Visitors squint at slabs of shale with shadowy fossils of *Wiwaxia*, *Canadia*, and *Hallucigenia*, beside models that depict the animals with colour and depth. In a dark blue room, an underwater Cambrian animation plays on a loop, with *Aysheia* and *Ovatiovermis* swaying on tiny sponges, trilobites crawling across the sand, and a five-eyed *Opabinia* swimming by to snatch up a clawful of prey. In every room, *Anomalocaris* hovers: in murals and information panels, in plastic models hanging from the ceiling, and in world-famous fossils behind glass. It is the most iconic and "charismatic megafauna" from the Burgess Shale today, and like almost every other Cambrian fossil in this gallery, these fossils were gathered by ROM paleontologists themselves. Back in the early 1970s though, it must have been hard to imagine a room like this, given that Parks Canada gave a flat no to the museum's first request to collect in the Burgess Shale.

There was a moment of change in the 1970s, a conflict between paleontologists and Parks Canada that revealed that discourses of "unimpaired" wilderness and nationalism were now fundamental to unlocking access to the Burgess Shale for paleontologists. In this chapter, I will present a case study of two different requests that ROM paleontologist Desmond Collins made to collect Cambrian fossils in the Burgess Shale: one that was denied in 1973 and one that was accepted in 1975.[1] Initially, he underestimated both the increasing sway of the "wilderness" discourse in Yoho National Park and the institutional influence of the Geological Survey of Canada (GSC) over Parks Canada officials. In 1975, he adapted to this reality by making an appeal to the discourse of Canadian nationalism, and getting an endorsement from the GSC. Parks officials found this second request impossible to refuse, because they could not imagine a

[1] Desmond Collins passed away in 2023, during the writing of this chapter.

way to deny a Canadian museum access to fossils which were already on display in Washington, London, and New York. They welcomed the ROM team to the Burgess Shale in 1975, opening the door to decades of ground-breaking research and new exploration for Cambrian fossil sites throughout Yoho and Kootenay National Parks.

Shifting Park Values

Only three paleontological teams excavated fossils in the Burgess Shale between Charles Doolittle Walcott's final field season there in 1924 and the Royal Ontario Museum's initial request in 1972. A Harvard University team led by Percy Raymond excavated more of the site adjacent to the Walcott Quarry in 1930. Three weeks of dynamiting overburden and gathering fossil slabs showed that there were still many fossils on the slope after Walcott left, including in a layer higher up the mountain.[2] The fossils that Raymond and his students removed were sent back to Harvard in the United States. Laval University physicist Franco Rasetti made two trips to Yoho in 1947 and 1948 to collect Cambrian trilobites.[3] Access to fossils in Canada's national parks became much more restricted by the 1960s, when the GSC and paleontologist Harry Blackmore Whittington led a significant re-examination of the Burgess Shale.

In Walcott's time, parks managers and CPR officials welcomed American tourists' and geologists' presence in the Canadian Rockies and their removal of fossils, because they served the dominant park discourses: that parks were tools for resource exploitation and recreation for wealthy, mostly white settlers and urbanites. This relatively inviting attitude towards fossil

[2] Collins, "Chapter 1: A Brief History," 19.
[3] Since Rasetti does not seem to have had a major influence on Burgess Shale literature or park management, I will not be further addressing his field work and research. Royal Ontario Museum, "Discoveries;" Franco Rasetti, "Middle Cambrian Stratigraphy and Faunas of the Canadian Rocky Mountains," *Smithsonian Miscellaneous Collections* 116, no. 5 (1951): 1–109.

collecting seems to have continued until at least the Second World War. In 1941, Banff's Eleanor Luxton wrote a revealing account about climbing up to both the Mount Stephen and Walcott Quarry fossil beds unimpeded, between visits to Emerald Lake and Lake O'Hara.[4] In her diary for September 1941, Luxton described a cold and rainy night staying in Field with her companion Bud on a trip to Yoho. The weather was too dismal to drive up to Takkakaw Falls the next morning, so they decided to pack a lunch of bread and beans and peaches and go up to the Mount Stephen Trilobite Beds above town instead. Though met by snow and showers, they made it up to the top by the afternoon. "We went along the ridge and up a steep slope of broken shale to the fossil beds," she wrote. "We got a few fossils and continued up."[5] Icy winds and a lack of gloves chased them down the mountain, not some encounter with an angry park warden.

Canada's first regulations governing all national parks technically required permission to remove "Any mineral, rock, stone, timber or any other public property whatsoever,"[6] but in practice parks authorities allowed tourists and scientists to remove fossils – or were unable to stop them. This changed amid growing societal concerns in North America that nature was under assault, and that more spaces needed to be protected as untouched wilderness. In the 1920s, controversy over the construction of the Spray Lakes hydroelectric dam near Kananaskis led to the formation of the Canadian National Parks Association, which lobbied the minister of the

[4] Eleanor Luxton became a locomotive designer and writer, her father Norman ran popular businesses in Banff as well as the Crag & Canyon newspaper, and her mother Georgina was known for being the first settler woman born in present-day Alberta and for her relationships with Stoney people through the McDougall Methodist Mission. Helena Walcott apparently bought porcupine quills from Norman's shop in Banff and wrote to ask him about the cost of making a muff and tippet out of brown marten skins. See: Mrs. C.D. (Helena) Walcott to Norman K. Luxton, 25 August 1907. Letters to Norman Luxton. Luxton family fonds. LUX / I / A - 28. Archives and Library, Whyte Museum of the Canadian Rockies.

[5] Diary of a trip to Field. 1941. Luxton family fonds. LUX / III / D - 5. Archives and Library, Whyte Museum of the Canadian Rockies.

[6] Regulations of the National Parks of Canada, 21 June 1909. *Canada Gazette*, Vol. 43, No. 2. P.C. 1340, 77-82. Accessed 7 October 2023: http://central.bac-lac.gc.ca/.redirect?app=cangaz&id=4178&lang=eng

interior to preserve natural wilderness areas and protect them from development that would harm their scenic values.[7] The 1930 National Parks Act showed some influence from citizen groups like this – and inaugural parks commissioner James B. Harkin – in re-envisioning Canada's parks as places protected from mining, logging, and hydro damming (partly by redrawing their boundaries to exclude these resources), though it doubled down on exploiting the commercial value of their scenery.[8] Amateur fossil collecting was not the same scale of threat to the scenery as a dam or a mine, but new regulations in 1947 perhaps reflected this "look but don't touch" trend: for the first time, they explicitly forbade removing or displacing fossils without permission from the parks branch director.[9] 1961 appears to be when Parks Canada introduced a formal policy requiring scientists to apply for permits to collect geological and biological specimens from parks.[10]

Historian Tina Loo has pointed to some of the grassroots individuals that led the push against industrial encroachment on wild spaces after the Second World War, like Alberta's Andy Russell. He produced the book and documentary film *Grizzly Country* in the 1960s to persuade audiences that human survival depended on protecting wilderness for bears and other species, and learning to see ourselves as just one part of a vast interconnected ecosystem.[11] The dominant

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[7] Leslie Bella, *Parks for Profit* (Montreal: Harvest House, 1987), 51.
[8] Bella, *Parks for Profit*, 58; Claire Elizabeth Campbell, "Governing a Kingdom: Parks Canada, 1911-2011," in *A Century of Parks Canada, 1911-2011*, ed. Claire Elizabeth Campbell, Canadian History and Environment Series 1 (Calgary: University of Calgary Press, 2011), 6-7.
[9] National Parks Act: Regulations of the National Parks, 8 December 1947. *Canada Gazette Part II*, Vol. 82, No. 3. SOR/47-1010, 169-174. Accessed 7 October 2023: http://central.bac-lac.gc.ca/.redirect?app=cangaz&id=13231&lang=eng
[10] James Gardner, "Banff National Park - A Museum or a Laboratory? Science in National Parks," in *The Canadian National Parks: Today and Tomorrow*, ed. James Gordon Nelson and R. C. Scace, vol. 1, 2 vols., Studies in Land Use History and Landscape Change, National Park Series 3 (Calgary: The National and Provincial Parks Association of Canada and The University of Calgary, 1969), 212–27; James S. Gardner, "The Continuing Role of Research in Canada's Mountain National Parks," 2008, https://prism.ucalgary.ca/server/api/core/bitstreams/64cdf755-3c75-4aac-8acb-5168e5755ba5/content.
[11] Tina Loo, *States of Nature: Conserving Canada's Wildlife in the Twentieth Century* (Vancouver, BC: UBC Press, 2006), 207.

paradigm, however, was what Asmita Kabra has described as "fortress conservation:" protecting nature by excluding human presence from "pristine" or "wilderness" areas.[12] In British Columbia (BC), for example, hunting outfitter Tommy Walker enlisted wealthy clients to lobby for a provincial park to protect the "primeval wilderness" of the Spatsizi Plateau from the hydro dams, helicopters, and natural gas exploration he saw swirling around.[13]

Yoho reflected these changing views of wilderness and parks. In the early twentieth century, the Monarch Mines on Mount Stephen and Kicking Horse Mine on the south slope of Mount Field were significant (if intermittent) employers in Yoho, and extraction of lead, zinc, and silver ore increased during the Second World War.[14] After the war, the number of tourists visiting the park increased, and industrial presence declined. With exhausted deposits on Mount Stephen and zinc prices too low to justify running the Kicking Horse Mine, both operations were shut down in August 1952. Warden Al Knowles said it all wrapped up so suddenly that when he visited the old lab at the mining site in 1956, "it almost looked as if the operation had come to an end on a Friday, they'd gone away for the weekend, and just never came back."[15] Park administrators were no longer willing to issue new mining leases within the national park. After years of sawmill fires and financial issues at Yoho's last timber berth, the department also stopped approving logging licenses in the park in 1968.[16]

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[12] Asmita Kabra, "Revisiting Canons and Dogmas in the Conservation-versus-Human Rights Debate," *Ecology, Economy and Society–the INSEE Journal*, Conversations 2: Forest Conservation, 1, no. 1 (April 2018), https://doi.org/10.37773/ees.v1i1.20, 83

[13] Eventually the BC government did create the Spatsizi Plateau Wilderness Park, though it was smaller and less strictly protected than Walker had hoped. Loo, States of Nature, 196-199.

[14] Charles S. Ney, "Monarch and Kicking Horse Mines, Field, British Columbia," *CSPG Guide Book Fourth Annual Field Conference Banff-Golden-Radium*, 1954, 119; W.F. Lothian, *A History of Canada's National Parks*, vol. 1, 4 vols. (Ottawa: Indian and Northern Affairs, Parks Canada, 1976), 41.

[15] Al Knowles, *Lake O'Hara*. October 9, 1977. Side B. Whyte Museum of the Canadian Rockies, Parks Canada fonds (S23/1-12).

[16] W.F. Lothian, *A History of Canada's National Parks*, vol. 4, 4 vols. (Ottawa: Indian and Northern Affairs, Parks Canada, 1981), 118.

The decline of CPR's Mount Stephen House seems symbolic of the company's waning influence in national parks. The formerly grand railway hotel was demolished in 1963 after years of sliding into such disrepair that local resident Fred Doyle recalled, "You couldn't find a level place to put a table in the dining room."[17] As the automobile competed with the train, writes Leslie Bella, "Loss of monopoly brought loss of influence."[18] By the 1960s, the CPR was no longer the powerful ally that Walcott and Vaux worked so hard to court to subsidize travels to the Rocky Mountains. The construction of the Trans-Canada Highway brought an astonishing increase in visits to Yoho – particularly the section to the west through Rogers Pass in Glacier National Park, which opened in the summer of 1962. Perry and Muriel Hein owned the Cathedral Mountain Chalet in Yoho at the time, and they remembered that on the eve of the opening, they filled up every one of their cabins. Still more people kept coming, so they quickly changed the linens for the rooms in their own basement that they kept for their sons and staff, and rented those out too. "It was backed up here because they had a designated time […] that the road would open," recalled Muriel. "So the night before, people came out from Calgary so that they would be the first to drive through Rogers Pass."[19] Yoho had about 65,000 visitors in 1960, and almost 690,000 in 1966.[20]

With recreational demands exploding, scientists saw that their presence in parks could not be taken for granted. In 1968, a few of them spoke on the issue at a conference on the past

[17] Fred & Marion Doyle, *Field, BC*. August, 1977. Side B. Whyte Museum of the Canadian Rockies, Parks Canada fonds (S23/1-6).
[18] Bella, *Parks for Profit*, 68.
[19] Perry & Muriel Hein, *Cathedral Chalet*. September 24, 1977. Side B. Whyte Museum of the Canadian Rockies, Parks Canada fonds (S23/1-7)
[20] C.J. Taylor, "The Changing Habitat of Jasper Tourism," in *Culturing Wilderness in Jasper National Park: Studies in Two Centuries of the Human History in the Upper Athabasca River Watershed*, ed. I.S. MacLaren, Mountain Cairns (Edmonton: University of Alberta Press, 2007), 227.

and future of parks organized by the National and Provincial Parks Association[21] and the University of Calgary. James B. Cragg, director of the university's environmental sciences centre, argued that given the number of present-day threats to the environment, national and provincial parks provided important reference points for studies of natural systems. He worried, however, that existing agencies weren't "sufficiently elastic"[22] to cope with scientists' needs: to protect them and their equipment from inattentive hunters and vandals, for example, or to give them enough space to disturb soil for long-term experiments. "Some problems can be studied by access to natural areas without complete control but," he said, "for many studies, and this will apply even more so in the future, complete control is essential."[23] He suggested that perhaps a new organization in Canada could focus exclusively on conserving natural areas and accommodating scientists, like the UK and US Nature Conservancies.

Geomorphologist James S. Gardner, meanwhile, wondered if scientists were sometimes getting unfairly preferential access to the fire roads and remote accommodations they depended on in parks. "Land use conflicts have increased in number and complexity in Canada's National Parks," his conference paper explained. "Not only do scientific research interests conflict with other activities, they also conflict with each other."[24] Scientific land use in national parks and similar areas could be justified, he argued, if it gathered information for good management or interpretation of those environments, if the subject being studied could only be found in that area, or if it directly involved the national interest. On the other hand, he said, scientists were

[21] Predecessor to the Canadian Parks and Wilderness Society.
[22] J. B. Cragg, "Research in National and Provincial Parks: Possibilities and Limitations," in *The Canadian National Parks: Today and Tomorrow*, ed. James Gordon Nelson and R. C. Scace, vol. 1, 2 vols., Studies in Land Use History and Landscape Change, National Park Series 3 (Calgary: The National and Provincial Parks Association of Canada and The University of Calgary, 1969), 206.
[23] Cragg, "Research in National and Provincial Parks," 209.
[24] Gardner, "Banff National Park," 212.

reluctant to admit that their presence conflicted with other interests, like Banff's bid for the 1972 Winter Olympic Games. Scientific land use could also disturb terrain, remove the only examples of rare species, or require building facilities that impaired landscapes and introduced humans into new areas, such as the Cosmic Ray Laboratory and its roads in Banff. And Gardner pointed to the Mount Stephen Trilobite Beds as a cautionary tale of removing too many specimens from a landscape. "[T]his practice has led to impairment and depletion of the fossil beds," he said. "The blame cannot be shouldered entirely by science in this case however. Much of the damage is probably due to the removal of trilobites by casual visitors."[25] In sum, he argued, some parks could best manage competing interests by serving more as museums than labs: any research there should feed directly into their interpretation or management.

Institutional tensions sometimes translated into openly hostile interactions between park rangers and paleontologists in Western Canada around this time. To University of Alberta (U of A) naturalist and science communicator John Acorn, a prime example was the collecting career of his former graduate supervisor, Richard (Dick) Carr Fox. Fox was hired as the U of A's first vertebrate paleontologist in 1965. To Acorn, he typified the culture of entitlement among scientists at the time. "The idea that there would be any restrictions on what a scientist could do in their field just seemed completely out of place," he recalls. "It was very dominant, very pushy male authority figure professor types, and they just did whatever they wanted to do." On the other side, he says, there was a strong sense in park ranger culture that their primary job was to prevent poaching, "and poaching broadly defined includes taking anything of any kind out of any

[25] Gardner, "Banff National Park," 222.

park for any reason."[26] This made it very difficult for most rangers to let things go, or even admit that people from outside of the park knew more about it than the people who worked there.

Fox's most famous fights centred around two *Centrosaurus* skeletons in Dinosaur Provincial Park (DPP) in the southern badlands of Alberta, where he took a team of field assistants to collect fossils the U of A museum. The Alberta government had recently created the park to put a boundary between the fossils and potential collectors, personified in park ranger Bob Young and amateur paleontologist Hope Johnson.[27] In the version of the story that Acorn received from Fox and the ranger, Fox's team found the incredibly well-preserved skull of a horned *Centrosaurus*, which they built a plaster and burlap jacket for and removed by bulldozer. Although Young was aware of their presence, Fox was suspicious of his intentions and got to the site early the morning they were due to haul it away. "Sure enough, the ranger was loading the jacket onto his truck," says Acorn, "and Fox says, 'No no, we're loading it onto my truck,' and they got into a big argument." After a tense lunch of wieners and beans at Young's house, they called the provincial parks department in Edmonton, and reached the director's assistant, Tommy Drinkwater. "Drinkwater listened very patiently to both Fox and Young," recounts Acorn, "and then he said, 'Well… there's no point leaving it in the park because they don't know what to do with it. It's just going to sit in their garage. You might as well take it to Edmonton.'"[28] Young was reportedly angry, and felt that he had failed in his job.

[26] Interview with John Acorn, August 2023.
[27] Evans, "Badlands and Bones," 260.
[28] Interview with John Acorn, August 2023.

Their relationship degraded even further the next summer, when Fox returned for a whole *Centrosaurus* skeleton.[29] Fox and his team also found this specimen in 1969, but according to Acorn they didn't ask or even inform Young, because they were certain it was outside the DPP boundaries. They returned in September 1970 to remove it in three massive plaster jackets, with the aid of a 450 Squadron helicopter from the Canadian Armed Forces base in Namao (just north of Edmonton). It seems Young only learned about the event when he opened the Brooks Bulletin and read reporter/amateur paleontologist Irene Vanderloh's headline: "Helicopter assists dinosaur removal from burial ground."[30] "He completely hit the roof," says Acorn.[31] When Fox was forced to defend himself in front of the provincial parks minister, he was adamant the fossil was collected outside of the park… until a land title check forced him to admit he was wrong. The U of A was allowed to keep it, but Fox not only damaged his own relationship with provincial parks officials and the military, he made it more difficult for succeeding paleontologists to gain the trust of the rangers in DPP.[32]

This was the tense moment that the GSC/Whittington team stepped into when they requested permission to excavate fossils from the Burgess Shale in the 1960s. In paleontologist Simon Conway Morris' telling, these digs were motivated by the GSC's realization that the overwhelming majority of the Burgess Shale specimens were in places like Harvard and the

[29] Described at the time as a *Monoclonius* skeleton (UALVP 16248, collected in Quarry 136) but this genus is now considered an erroneous description for fossils from ceratopsians too young to show species-distinguishing characteristics. See Michael J. Ryan and David C. Evans, "Ornithischian Dinosaurs," in *Dinosaur Provincial Park: A Spectacular Ancient Ecosystem Revealed*, ed. Philip J. Currie and Eva B. Koppelhus, Life of the Past (Bloomington, Indiana: Indiana University Press, 2005), 327.
[30] Irene Vanderloh, "Helicopter Assists Dinosaur Removal from Burial Ground," *Brooks Bulletin*, September 17, 1970.
[31] Interview with John Acorn, August 2023.
[32] Philip Currie records this event as occurring in 1969, though that seems to be the year the fossil was discovered and jacketed, not the year it was removed. He describes the location in Dinosaur Provincial Park as Quarry 132. Currie, "History of Research," 16.

Smithsonian, and that it would be good to have a collection in Canada. "It was in the 1960s," says Conway Morris, "that the Canadians, notably Digby McLaren, who was director of the [GSC], realized that their country might well be host to a superb fossil locality, but ironically it had almost no specimens of its own."[33] The GSC remained a prestigious and influential scientific organization in Canada, and made the request in the context of its decades-long mapping program which had reached the southern Rocky Mountains of Alberta and BC by the mid-1960s, as well as GSC data which suggested more fossils remained in the Burgess Shale.[34] Whittington, recognized as the world's leading specialist in trilobites in the 1960s,[35] said that another major motivation was a lack of good stratigraphical data about the fossils. Knowing precisely which layer fossils are from is important to understanding the succession of biological specimens over time, as well as how each layer relates to geological formations around them. Whittington was working at Harvard University in the early 1960s, so was familiar with Raymond's Burgess Shale collection there. The earlier teams' use of dynamite to remove heavy rock on top of the fossils, said Whittington, probably explains why the stratigraphy of their samples was recorded so vaguely:

> Our methods of obtaining fossils were […] not so very different from Walcott's fifty years earlier. Admittedly, he did not have the advantage of the felt tip pen, to record on each piece of rock where it was collected and the level from which it came. We used blasting, but only in a limited way, to open up vertical cracks so that we could remove the rock carefully layer by layer. Walcott and Raymond probably used heavier charges, so that the layers were disrupted and blown out a short distance, hence exact levels could not be recorded.[36]

[33] Conway Morris, *The Crucible of Creation*, 45.
[34] Whittington, *The Burgess Shale*, 17; Simon Conway Morris and Harry B. Whittington, "Fossils of the Burgess Shale: A National Treasure in Yoho National Park, British Columbia," Miscellaneous Report (Ottawa: Geological Survey of Canada, 1985), iii.
[35] Conway Morris, *The Crucible of Creation*, 46.
[36] Whittington, *The Burgess Shale*, 20.

When the GSC applied for permission to remove fossils from Yoho, the GSC's own James (Jim) D. Aitken was put in charge of the overall collecting program, Cambrian trilobite and stratigraphy expert Bill Fritz was responsible for trilobites, and Whittington for the rest of the fossils.[37]

Parks Canada approved the GSC team's request, authorizing them to collect fossils in 1966 and 1967 and ship them to the GSC's facilities and to the University of Cambridge, where Whittington had just accepted a new position. This generation of paleontologists and geologists had absorbed the now-legendary stories of Walcott's field work in the Canadian Rockies and his frenetic pace of writing in Washington. Considering Walcott's administrative duties and personal tragedies after 1907, Whittington considered it "a truly remarkable feat to both make his collection and publish an account of it in the next fifteen years."[38] Aware of this legacy, Whittington reflected: "my first sight of his quarry was a great thrill."[39] Although Parks Canada initially consented to three consecutive years of excavation in 1966, they ultimately did not allow quarrying in the 1968 field season – the first time there is evidence of a dig being denied in Yoho.

Nevertheless, together with samples from the Smithsonian collection, these newly-collected fossils provided plenty of material for studies which revolutionized scientific understanding of the biota and geology of this underwater Cambrian ecosystem.[40] Whittington

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[37] Whittington, *The Burgess Shale*, 17.
[38] Whittington, *The Burgess Shale*, 15-16.
[39] Whittington, *The Burgess Shale*, 17. Whittington also recounts an amusing but possibly apocryphal story of the legacy of working in the Walcott Quarry: "We had to be sure that the packed lunch we took daily was safe from the numerous rock squirrels. Walcott's party, when blasting took place, would retire to a safe distance, and as Mrs Walcott [*which* Mrs Walcott is not specified here, though it is probably Vaux] wrote, often used to feed the squirrels. After a gap of several years, they returned to the quarry and resumed operations, and she records how, the first time a blast was fired, the squirrels appeared at once, expecting at this signal to be fed." Whittington, *The Burgess Shale*, 21.
[40] Conway Morris and Whittington, "Fossils of the Burgess Shale," 2.

and his team started re-evaluating Burgess Shale arthropods, beginning with *Marrella splendens*, *Sidneyia inexpectans* and *Burgessia bella*. In 1969, Whittington spoke about his work at a paleontology conference, concluding that *Marrella splendens* had many characteristics in common with other arthropods but didn't seem to fit into any known major group; "In this sense, *Marrella* was a zoological enigma,"[41] says Conway Morris. A picture began to emerge suggesting that life in the Cambrian was far more different from modern-day fauna than previously imagined. Whittington brought on Conway Morris and Derek Briggs as PhD students in 1972 to assist with the work of reinterpreting the Burgess Shale species. One of Conway Morris' most exciting studies was a re-examination of a 25 mm-long specimen that Walcott had labelled *Canadia sparsa*, believing it to be related to a bristly worm. Conway Morris realized it was in fact a quite novel life form with spines and tentacle-like legs that he re-named *Hallucigenia sparsa*, "as a tribute to its dream-like appearance."[42] He describes:

> boxes of specimens from the Smithsonian […] arriving in Cambridge at regular intervals, and stacked high in the research rooms are the fruits of the excavations made a few years earlier by the Geological Survey of Canada's collecting teams. Shelves are piled with books and journals, and the research files are also steadily accumulating: scientific reprints, negatives, and photographs, camera-lucida drawings, and notes ranging from jottings to detailed descriptions of particular fossils."[43]

The existence of these large collections, and the new studies by Whittington and his colleagues, were soon used as evidence to deny a new request by the Royal Ontario Museum to re-open the Burgess Shale quarries.

With tourist visits rising and many new national parks being created, Parks Canada invited public input on new master plans for the parks in the late 1960s and early 1970s. Yoho's

[41] Conway Morris, *The Crucible of Creation*, 48.
[42] Conway Morris, *The Crucible of Creation*, 54.
[43] Conway Morris, *The Crucible of Creation*, 52-53.

Provisional Master Plan, drafted from 1969 - 1971, leaned into the National Parks Act language of "unimpaired" nature by dividing up most of the park into zones with limited public access. The Burgess Shale fossil beds were included in the "special areas" zone along with some animal and plant habitats, where vehicles, trails, and campgrounds would be restricted. While management would encourage "natural progression of ecological changes" for vegetation and for mountain building and erosion, the fossil beds would be "protected to remain as they appear today."[44] Feedback from the Canadian Wildlife Service endorsed such zones as a tool to ensure that Parks Canada prioritized preserving "the wilderness character of National Parks"[45] and "nonconsumptive use"[46] in their borders, such as hiking. Most public comments on the mountain parks provisional plans supported setting aside Class 1 (special areas) zones. Authors of a report on the public hearings noted, "[t]he incompatibility of classifying an area as Class 1 and then allowing heavy use by scientific groups using elaborate equipment carried in by horse or helicopter, was pointed out."[47] Whittington and the GSC team, of course, had used both.[48]

Additional Excavation Cannot Be Recommended

The ROM first requested access to the Burgess Shale in 1972, through Curator of Invertebrate Palaeontology Desmond Collins. He made this request in an era of major expansion and public fascination in Canadian museums. Museums as public institutions emerged in the

[44] *Yoho National Park Provisional Master Plan*, Public Hearings on Provisional Master Plans for Canada's National Parks (National and Historic Parks Branch, 1971), 6.
[45] L. I. Retfalvi et al., *Some Ecological Considerations Relating to the Provisional Master Plans for Jasper and Banff National Parks, Alberta and Kootenay and Yoho National Parks, British Columbia* (Edmonton: Canadian Wildlife Service, 1969), 1.
[46] Retfalvi et al., *Some Ecological Considerations*, 8.
[47] *Preliminary Report of the Public Hearings on the Provisional Master Plans for Banff, Jasper, Kootenay and Yoho National Parks* (Ottawa: National and Historic Parks Branch, 1971), 6.
[48] Whittington, *The Burgess Shale*, 20-21.

nineteenth century, partly in the context of "the modernist idea of progress and scientific rationality,"[49] according to Laurajane Smith. They gained power from their assumed power to present objective "truth" in a time of radical change from industrialization and urbanization. "Also integral to the development of museums," she says, "was a liberal sense of pastoral care that the emergent historical disciplines and Victorian society as a whole identified as important in fostering national pride and social order."[50] Ruth B. Phillips places the ROM among Canadian museums born of what Smithsonian anthropologist William Sturtevant calls the first "museum age" (1840-1920), along with the Art Gallery of Ontario, the National War Museum in Ottawa, and the University of British Columbia Museum of Anthropology in Vancouver.[51] In his history of the ROM,[52] Lovat Dickson also attributes its origin to amateur naturalists and prominent businessmen who pushed for a natural history museum in Toronto.

The museum opened in 1914, and like many of its contemporaries it was embedded within a university: in this case, the University of Toronto. The site chosen for the museum was on the university's property along Bloor Street, its department curators were all U of T professors, and budget approval was given by the university. Acquiring new artifacts from abroad was a major preoccupation of its early leaders. Cultural critics like Dennis Duffy have argued that the self-described "good imperialists" who acquired Chinese stone lions and Middle Eastern art for the young museum helped shift Toronto towards the centre of global empire, power, and wealth.[53] The ROM began collecting dinosaur fossils in Western Canada in 1919,

[49] Smith, *Uses of Heritage*, 197.
[50] Smith, *Uses of Heritage*, 197.
[51] Ruth B. Phillips, "Re-Placing Objects: Historical Practices for the Second Museum Age," *Canadian Historical Review* 86, no. 1 (March 2005): 83–110, https://doi.org/10.3138/CHR/86.1.83.
[52] Commissioned by the museum itself, but well-contextualized and critical of some directors' choices. Lovat Dickson, *The Museum Makers: The Story of the Royal Ontario Museum* (Toronto: Royal Ontario Museum, 1993).
[53] Dennis Duffy, "Triangulating the ROM," *Journal of Canadian Studies* 40, no. 1 (January 1, 2006), 174.

with Alberta badlands expeditions that continued until 1954.[54] Invertebrate paleontology got its own assistant director in 1937, Madeleine A. Fritz. Dickson writes that field work seemed to raise the spirits of department heads, who were generally overworked and not always equipped for interacting with the public.[55]

After the First World War, the ROM and its contemporaries gradually moved away from the universities once considered essential to conducting advanced research and connecting them to the public. "[A]lthough the museum establishment continued to grow and evolve," Phillips explains, "the originary and organic bonds that linked academic disciplines to museums as sites of research and teaching began to erode as the mother disciplines – especially the social and natural sciences – moved away from the direct study of artifacts and specimens."[56] The ROM became an independent institution in 1968. After the Second World War, attendance was high, museum division heads had little time for undergraduate teaching, and a strong post-war Canadian economy fostered many industry associations eager to fund research in the ROM's scientific departments.[57]

Parks Canada files at Library and Archives Canada preserve much of the back-and-forth with the ROM about the Burgess Shale in the 1970s, but do not include Desmond Collins' first application to remove fossils there. Fortunately, it is possible to piece together the gist of it from Collins' published writing. In a 2009 primer on the history of the Burgess Shale, Collins wrote that his relationship with the fossil beds "began in 1970 as the need for Burgess Shale specimens

[54] Philip J. Currie, "History of Research," in *Dinosaur Provincial Park: A Spectacular Ancient Ecosystem Revealed*, ed. Philip J. Currie and Eva B. Koppelhus, Life of the Past (Bloomington, Indiana: Indiana University Press, 2005), 12.
[55] Dickson, *The Museum Makers*, 87.
[56] Phillips, "Re-Placing Objects," 84.
[57] Though not, as far as I can tell, fossil collecting. Dickson, *The Museum Makers*, 120.

in a planned ROM Invertebrate Palaeontology gallery."[58] The ROM was in the midst of a push to make its exhibits more immersive, having recently hired Ontario College of Art instructor Harley Parker to redesign the art and archaeology division displays. Parker worked with Marshall McLuhan, communications theorist and U of T professor of English, on new ways to engage visitors with sound, light, and film. Apparently Parker went overboard. Dickson writes that:

> When Parker designed the invertebrate fossil gallery in 1967, complete with a 'total environment' provided by films, stills, tapes, telephones, push-buttons, smells, and sounds, the resulting assault on the senses was so great that the display became known as the 'discothèque gallery'. Shortly after [new ROM director Peter] Swann's arrival, Parker resigned from the Museum to resume his career as a painter.[59]

Collins became Curator of the Department of Invertebrate Palaeontology in 1968, and sought fossils for a more conventional exhibit idea: to create the first permanent display of Burgess Shale fossils in Canada.[60] According to Collins, he noticed fossils were still available in Yoho during the 1972 International Geological Congress, which included a field visit to the Burgess Shale. The trip was led by the GSC's Jim Aitken, Brian Norford, and Bill Fritz, along with Harry Whittington. "The day of the visit was cloudy and showery," Collins later recalled, "but I could still see that there were Burgess Shale specimens in the talus [i.e. the discarded and fallen rock] below the Walcott/GSC Quarry that were better than the few then held in the ROM's collections." [61]

In late 1972, he asked Parks Canada for permission to collect fossils in Yoho the next summer.[62] "The idea was to collect and maybe to 'salvage' some of the fossils – salvage in the sense of collecting fossils on talus slopes which in principle will be damaged with time, by

[58] Collins, "Chapter 1: A Brief History," 21.
[59] Dickson, *The Museum Makers*, 153.
[60] Royal Ontario Museum, "Discoveries."
[61] Collins, "Chapter 1: A Brief History, 21.
[62] Desmond Collins, "A Palaeontologist's Paradise," *Rotunda*, Winter 1978-79, 14.

weathering or other things," says paleontologist Jean-Bernard Caron.[63] Caron is the current Richard M. Ivey Curator of Invertebrate Palaeontology at the ROM, focused on researching the museum's Burgess Shale collection and adding to it through fieldwork. These events happened decades before his time at the museum, but in many ways he is Collins' successor – including through his recent work as lead curator of the ROM's Dawn of Life exhibit, which features specimens that Collins helped collect in Yoho. Collins first accepted Caron as a volunteer field assistant in 1998, and Caron continued to join the ROM crews for the next two years. Collins became a co-supervisor for Caron's master's project on the Burgess Shale animal *Banffia constricta*. He initially served as Caron's PhD supervisor, but stepped down following some academic disputes. Caron says the two maintained a cordial relationship afterward, and the fossil material that Caron helped collect as a ROM field assistant became central to his PhD project on the Burgess Shale ecological community.[64]

Collins, says Caron, "was someone who was very private and in many ways obsessive about the fossils of the Burgess Shale, to the point where he had a hard time to share them with others."[65]

Though the ROM displays a mix of nature, culture, and art collections, Caron says he considers it a natural history museum, which comes with a mission to collect examples of the diversity of life and interpret those objects to the public. While some natural history museums only present exhibits, he believes the ROM staff are better able to explain their collection because of their additional mandate to collect and research. "Des was fascinated by exceptional

[63] Interview with Jean-Bernard Caron, 2023.
[64] Jean-Bernard Caron, "Taphonomy and Community Analysis of the Middle Cambrian Greater Phyllopod Bed, Burgess Shale" (PhD thesis, University of Toronto, 2005).
[65] Interview with Jean-Bernard Caron, 2023.

fossil deposits in general, not just the Burgess Shale, but by those particular sites of really spectacular fossils that he thought should be on display," says Caron. The ROM had only a few specimens of its own, and asking to borrow fossils from the GSC would have been less than ideal, aside from the fact that many were under active study at Cambridge. Creating one's own collection, says Caron, is "the only way you can control the way you want to showcase those specimens in a display, as opposed to loaning specimens from another institution and being under particular caveats of how to exhibit things and where to present them," including duration of an exhibit.[66]

Parks Canada officials turned to Brian Norford, Head of the GSC's Paleontology Subdivision, for help evaluating Collins' request to collect. Norford had just helped guide Collins up to the quarry a few months prior, yet he made a dispassionate, devastatingly thorough argument against the proposal. By doing so he implicitly defended the GSC's status as the only scientific body with access to the Burgess Shale. His reply to Parks Canada not only recommended against the request, it also questioned whether museum-quality fossils even *existed* at the Burgess Shale, given their small size, and argued that no one else should be allowed to excavate there for at least a generation.

Norford's letter began by establishing the GSC as *the* modern authority on the Burgess Shale, Canadian heirs to the Smithsonian's old title. The GSC/Whittington expeditions of the 1960s, he explained, gathered fossils "of critical importance for research studies," and the best-preserved examples would eventually be stored at the GSC's National Type Collection of Invertebrate Fossils in Ottawa for scientists to study under supervision. He then argued that

[66] Interview with Jean-Bernard Caron, 2023.

anything not good enough for this collection "[could not] be expected to show details of morphology sufficiently well to be useful for display purposes." This was because, essentially, they were too small for the public to understand. Displays without actual fossils, said Norford, would better show off their most important features and evolutionary significance for "the interested scientist, student or layman," since visitors would otherwise need microscopes to see the best specimens. He said the GSC would "consider" helping the ROM put together a display of photographs, drawings, and text instead. [67]

Next, Norford argued that while Collins was correct in observing many fossils had been left behind at the quarry, "whether the specimens in the talus heap are off sufficiently high quality to be useful for display purposes is very doubtful." Finally, he concluded that "Dr. Collins's suggestion of additional excavation at the Burgess Shale quarry itself cannot be recommended," since the GSC had collected enough material to allow a full modern redescription of the species there. He conceded that well-preserved specimens might still be embedded deeper in the quarry walls, but argued "the remaining material at the quarry [was] best left in its original state" for "possible future research studies […] not to be envisaged within the present generation." Not, at least, until unspecified "new methods of investigation" had been invented. [68] In each of these arguments, Norford positioned the GSC as the definitive experts on the Burgess Shale and its meaning – and implied that no one else should be allowed access to the site. Parks Canada took his recommendation seriously, and denied Collins' request. No other interest groups appear to have been consulted.

[67] Brian Norford to L.H. Robinson, January 25, 1973, *Burgess Shale - ROM Toronto (Dr. Collins)*, Folder 70/1-P11 1, Box 4, RG 84 – Parks Canada, LAC Winnipeg.
[68] Norford to Robinson, January 25, 1973.

This denial was a manifestation of new priorities and sites of discursive power within Parks Canada. The influence of Norford's letter shows how important the discourses of nationalism and wilderness preservation had become in Parks Canada's decision-making. In sum, Collins' request was evidently a mismatch for Parks Canada's new vision of the Yoho landscape.

A display of this unique and famous Canadian fossil fauna

Two years later, in 1975, Desmond Collins made a second request to collect specimens from the Burgess Shale. This time, he tapped into two strategically useful veins of the authorized heritage discourse: an appeal to nationalism, and an appeal to museums' unique role as places of contact between Canadians and the country's heritage. Collins also spent the intervening years cultivating support from the GSC, the agency that had stepped in to block his first request. Lastly, the ROM's plans in the Burgess Shale would now take greater account of Parks Canada's desire to leave the Burgess Shale in a "wild" or "undisturbed" state by picking through earlier teams' discarded material, rather than doing any new excavation. The results were very positive for the ROM.

The wording of Collins' request is important in understanding his use of these discourses. In his letter to Parks Canada's Western Region Office (WRO), which had the authority to issue permits in Yoho at the time, Collins asked permission to "pick over the shale dumps at the Burgess Quarry at Mt. Wapta," in his view "the only source of specimens suitable for our planned display on the Burgess Shale fauna."[69] He explained that he'd tried to source display

[69] Desmond H. Collins to L. H. Robinson, 24 January 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.

specimens elsewhere over the last two years with no success, and that – as Brian Norford himself had said – the GSC collection was mostly unavailable because it was under active study. He also led by explaining he now had the support of the director of the GSC, Digby McLaren. William T. Dean, head of the GSC's eastern paleontology section, wrote directly to the WRO to corroborate the GSC's newfound support of the application. Where Norford had argued that no one should be permitted to collect there for a generation, Dean said:

> The dumps of "waste" shale below Burgess Quarry are a potential source of specimens for display rather than research purposes, and colleagues more familiar than I with the area feel it would be appropriate to permit some organized collecting from the dumps[.] [70]

Note the shared language of "dumps" that Collins and Dean used. When the Walcott, Raymond, or GSC teams split pieces of shale, they would reveal a "part" (the fossilized body) and "counterpart" (essentially the negative impression) of an organism, but only take the part. To paleontologists, both are forms of fossils, with valuable scientific and display value, but there are physical limits to what you can carry out of a site. Much of what Collins expected to find was leftover counterparts. A more common geological term for rock debris like this would be a talus pile. The language of "dumps" and "waste," though, implied that these fossil-bearing slabs were a form of garbage, like the crumpled-up newspaper or glass bottles left behind by Walcott's team. This clever word choice implies that not only would their collection have negligible impact on the integrity of the fossil site, it would remove the untidy leftovers of previous scientists.

Collins said they would like to start work on Mt. Wapta that summer so the gallery display could be built before the end of 1975 – a very ambitious schedule. He requested permission to come back for a second season in case of bad weather or too much material to

[70] William T. Dean to L. H. Robinson, 15 January 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.

process at once. These were not outrageous demands, given the unpredictable snow and sunshine in the mountains.

It is the following section that made the most direct appeals to the authorized heritage discourse. "The ROM is the only Museum in Canada with a specific commitment to the display of invertebrate fossils," wrote Collins. "It is appropriate that Canadians be able to see a Burgess display here rather than having to go to Washington or London to see one which is the case at present."[71] In total, Collins repeated the terms "Canada" and "Canadians" five times in the last two paragraphs of this letter. Laurajane Smith's analysis of museums as guardians of national heritage sheds light on the power of this framing. "Nationalism is of particular importance to the sense of identity traditionally involved by museums," says Smith. "Museums in the nineteenth century also developed in the context of tensions over nation-state formation, and became inextricably bound with the expression of national identity – as 'national museums' formed to help define and express what it meant to be a citizen of a particular nation."[72] Seen in this light, Parks Canada and the ROM are both participants in the mission of creating and communicating an "authorized" national narrative for Canada. Never mind that Toronto and Washington, DC are both on the other side of the continent from these fossil beds. Binding Yoho and Toronto under the umbrella of "Canada" was a necessary element in the magic trick of persuading Parks Canada officials that the ROM could seriously be considered part of the same "here" as fossil beds 3,000 kilometres away.

Then Collins framed his mission as a way to save the fossils from destruction and theft. He stated that he knew display-quality fossils remained in the quarry because he saw them on the

[71] Collins to Robinson, 24 January 1975.
[72] Smith, *Uses of Heritage*, 197.

1972 tour, "and because similar specimens have been offered to us by amateur collectors." The ROM refused to buy them because they were acquired illegally, he said, "However, this just adds to the frustration of knowing that specimens are deteriorating in the shale dumps or are being collected by amateurs, when they could be used in an attractive and informative public display which emphasizes their significance in our understanding of the evolution of life in the remote past."[73] Dean echoed these dangers to the Burgess Shale in his letter of support from the GSC, describing "the progressive deterioration of the material there and the risk of unauthorized collecting by amateurs."[74] Finally, Collins dismissed the GSC's earlier offer to help the ROM develop an exhibit with photographs and illustrations of the fossils they collected: "Photographs are no substitute for the real thing, especially in a Museum context."[75]

The WRO's initial response to Collins indicated that in light of the GSC's new support of his plans, they were considering his request, and that they would further consult the GSC, the National Museum,[76] and the Superintendent of Yoho National Park before making a decision. Of these three, Yoho Superintendent Jean Pilon was the lone voice against the proposal, partly because of the experiences of his staff. Pilon turned to Yoho Chief Warden Hal Shepherd for his opinion. In a hand-written note to Shepherd, Pilon noted: "If we OKed every museum request we would not have a Burgess shale formation."[77]

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[73] Collins to Robinson, 24 January 1975.
[74] Dean to Robinson, 15 January 1975.
[75] Collins to Robinson, 24 January 1975.
[76] Itself a descendent of a museum founded by the GSC in 1856. It is now called the Canadian Museum of History.
[77] J. Crockett to Superintendent, Yoho National Park, 22 January 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg. Unfortunately, the GSC sent their letter of endorsement before Collins' actual request arrived. What Shepherd had in front of him when he weighed in was the 1975 letter of endorsement from Dean and a copy of Norford's adamant recommendation against the proposal from 1973, which was surely a bit puzzling.

Shepherd was a nearly 20-year veteran of the warden service, and an army veteran as well.[78] When it came to the Burgess Shale, he told an oral history interviewer, top of mind was the quartz that visitors had taken from Yoho's Crystal Cave. The cave, near Lake O'Hara, "was entirely stripped, nothing there but bare rock," he recalled. "There is some crystal in the back cave, but they walled that off with concrete blocks now. […] They literally did strip every ounce of crystal out of that first cave."[79] He had seen enough hikers take fossils from one of the Burgess Shale sites (probably Mount Stephen) to fear a repeat. "We charged a few people," he said. Wardens would follow them partway up the mountain and "pick 'em off when they got down to the bottom again." Some would-be thieves were more attentive, he recalled, and if they saw a warden coming up the trail "they'd just dump their load under the trees. Trilobites, all kinds of really good specimens scattered all along the trail up the hill."[80] Given this experience, it is not surprising that Shepherd told the WRO that park staff felt they must refuse Collins' application. "Burgess Shales have long been on the restricted list for collecting permits," he responded. "The Provisional Master Plan for Yoho National Park dictates that the Burgess Shales be given maximum protection; i.e. no trails through them and no collecting."[81]

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[78] According to a biography written for the Hong Kong Veterans Commemorative Association, Harold (Hal) Barlow Shepherd was born in England in 1919 and raised in Quebec, was believed to speak six languages, and "baffled the hell out of all of his colleagues with his brilliance one minute and his self-destructive nature the next." He wore an eye patch after a childhood incident with glass, abortively enlisted with the Finnish air force until they allied with Germany before he made it to Finland, and ended up joining the Quebec Royal Rifles regiment in the Canadian Armed Forces. He was among the allied troops who defended Hong Kong from Japanese invasion for 17 days, after which he was held as a prisoner of war and forced to work in a coal mine until the end of the Second World War. See P. W. (Winston) Smith, "Crucible Forged - A Conflicted Man." (Hong Kong Veterans Commemorative Association, 2012), https://www.hkvca.ca/submissions/Hal%20Shepherd%20by%20Winston%20Smith.pdf.

[79] Memoirs of the Warden Service: An Oral Account by Maryalice Stewart. Whyte Museum of the Canadian Rockies, Parks Canada fonds (S23/3-13).

[80] Memoirs of the Warden Service: An Oral Account by Maryalice Stewart. Whyte Museum of the Canadian Rockies, Parks Canada fonds (S23/3-13).

[81] Hal Shepherd to Director, Western Region, 23 January 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.

In the end, WRO Director William Turnbull recommended that the Director of National Parks approve the project anyway. He gave three main reasons: the samples were intended for museum display only, they would be gathered from a debris slope rather than the quarry face, and crucially, "no Canadian Museum or University has, or ever had, access to sufficient specimens to permit establishment of a high quality formal display."[82] Parks Canada had been justified in refusing several requests from universities to dig into the Walcott Quarry itself, he said, but a request to collect debris by a recognized Canadian museum was another matter:

> Can we, in all honesty, reject such requests when formal displays exist in Washington, London, and Paris, but nowhere in Canada? We suggest that the development, within Canada, of a formal display of such an important Canadian taxa is in the National interest.[83]

In March, Turnbull wrote to Collins to deliver the good news: the request to remove specimens had been approved… with some conditions. First, the ROM team would have to gather duplicates for any other museums and universities around the country interested in Burgess Shale fossils, "to ensure that all specimen requirements are satisfied by one collecting program."[84] On top of this, Parks Canada wanted the ROM to gather fossils for a small Burgess Shale exhibit for Yoho National Park itself. In a truly wild understatement, Collins later described this as "a tall order for one season."[85] The final significant condition was that Parks Canada was only offering the ROM access for this one summer, unless weather or other conditions made it necessary to come back a final time in 1976. Collins gratefully agreed to these

[82] William C. Turnbull, Director to Assistant Deputy Minister, Parks Canada and Director, National Parks, 25 February 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[83] Turnbull to Assistant Deputy Minister and Director, 25 February 1975.
[84] William C. Turnbull to Desmond H. Collins, 25 March 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[85] Desmond Collins, "A Palaeontologist's Paradise," *Rotunda*, Winter 1978/79, 15.

conditions.[86] Not only did the WRO disregard Shepherd's recommendation, as Yoho's chief warden he was then assigned to help the ROM team work out field logistics like accessing the area and figuring out where to camp.[87] Forwarding a ROM letter requesting information about pack horses and snow conditions, Superintendent Pilon handwrote a note to Shepherd: "Here they come! For the fossils."[88]

"Thus on a day early in July," Collins wrote in the ROM's magazine *Rotunda*, "I found myself hovering over Walcott's quarry in today's pack horse, a helicopter."[89] Dropped off in a grassy meadow below the Burgess Trail, he was struck by the beauty of their campsite, surrounded by Mount Burgess, Mount Wapta, Mount Field, and Emerald Lake. "It was a brilliant, clear day, with the sunlight reflecting dazzlingly from patches of snow all around."[90] He was also moved by the legacy he was finally a part of, about to sift through pieces of shale where Walcott, Raymond, and the GSC teams had once stood. In the days to come his team learned how to spot the characteristic dark stain of body fluids around *Marrella* fossils and the iron-red colour of *Canadaspis*, and ultimately collected around 8000 specimens. "Most were of indifferent quality,"[91] according to Collins, but they found a counterpart of a fossil that Walcott had donated to the GSC, many examples of the previously-undescribed goose barnacle *Priscansermarinus barnetti*,[92] and more specimens of the bivalved arthropod *Tuzoia* than even

[86] Desmond H. Collins to Charlie Zinkan, 28 April 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[87] William C. Turnbull to Desmond H. Collins, 7 May 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[88] Robert Barnett to Jean Pilon, 17 March, 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[89] A public-facing magazine celebrating the museum's work. Collins, "A Palaeontologist's Paradise," 14.
[90] Collins, "A Palaeontologist's Paradise," 14.
[91] Collins, "A Brief History," 22.
[92] Desmond Collins and David M. Rudkin, "Priscansermarinus Barnetti, a Probable Lepadomorph Barnacle from the Middle Cambrian Burgess Shale of British Columbia," *Journal of Paleontology* 55, no. 5 (September 1, 1981): 1006–15.

the GSC team had collected, suggesting an origin somewhere on the slope that hadn't been identified before. Thus, Parks Canada's restrictions on their work led the ROM scientists to collect so many samples on the talus slope that they unintentionally found evidence of more fossil-bearing areas on the ridge.[93]

From a museum collections perspective, the expedition was a success. The ROM's Burgess Shale fossil display opened in the museum's Invertebrate Fossils Gallery in September 1977 [94] – a two-year delay from Collins' stated timeline, but a realistic one given the need to sort, prepare, and describe the fossils. Duplicates were ultimately sent to twenty-two universities and three museums in Canada, including the University of Alberta in Edmonton, Memorial University in St. John's, and McGill University's Redpath Museum in Montreal.[95] They sent two sets of fossils to Parks Canada as well, of course.[96] Caron recently visited the Royal BC Museum in Victoria, which received one of these 1975 sets. He found they were still not on display, and says that is typical. "They were not necessarily all for display," he adds. "They were for teaching and having sets of representative material for collection purposes. But very few fossils I can think of have been put on display."[97]

Perhaps the most surprising outcome is that although Parks Canada was adamant that the 1975 season would be the ROM's only shot at collecting in the Burgess Shale, it was actually the thin wedge of decades of ROM expeditions in the Rocky Mountain parks. Ironically, this was the

[93] Gould interpreted Collins' search for new sites as a frustrated response to the bureaucratic obstacles he encountered trying to get permission to excavate fossils around the Walcott Quarry. "You sometimes get so angry that you do something useful as an end run around intransigence," he mused. Gould, *Wonderful Life*, 185.
[94] Collins, "A Paleontologist's Paradise," 19.
[95] Collins, "A Paleontologist's Paradise," 19; Charlie Zinkan to Desmond H. Collins, 7 May 1975. Burgess Shale - ROM Toronto (Dr. Collins) 1973 – 1975. RG 84 – Parks Canada, Folder 70/1-P11 1, Box 4, LAC Winnipeg.
[96] And offered to make display cases for Yoho at cost, which park staff declined. See: Zinkan to Collins, 7 May 1975. Bureaucratic obstacles delayed the Yoho display's completion for over a decade.
[97] Interview with Jean-Bernard Caron, 2023.

more enduring legacy of the 1975 field season. "After they came back from the summer," says Caron, "they realized there were new species in the shale that no one had described before, so therefore it must be important to continue doing research and exploration in the area." [98] It took six years for Collins to get that next permit, and Caron believes that was his biggest battle. Part of Parks Canada's reticence may have been the site's UNESCO World Heritage site designation in 1980, discussed in the next chapter. Finally in 1981 – with the support of the GSC and Harry Whittington – Collins received permission to begin a five-year program of identifying and excavating from new soft-bodied fossil sites in Yoho.[99] This program was explicitly focused on scientific research, not creating museum displays. Whittington's PhD students Derek Briggs and Simon Conway Morris joined in the 1981 season in Yoho. These expeditions were extremely fruitful: that summer, the team identified five new sites on Mount Field, Mount Stephen, and Odaray Mountain. By 1985, they had identified over a dozen throughout the park.[100] A new generation of ROM paleontologists, led by Caron, has continued to identify and excavate Burgess Shale-type fossil beds throughout Yoho and Kootenay National Parks to the present day. Caron says there are actually very few specimens from 1975 on display in the ROM's current Dawn of Life gallery, because they found so many better specimens afterward.

Belief in a national interest helps explains why Parks Canada approved Desmond Collins' request to collect in the Burgess Shale, but I do not find it totally explains why he wanted in. Certainly, he was right that many Canadians wanted to see the fossils, and that no museum in Canada had a comprehensive public exhibit yet. Caron believes Collins might have gotten a bit carried away in implying the ROM represented all of Canada in his request, but was mostly just

[98] Interview with Jean-Bernard Caron, 2023.
[99] Collins, "A Brief History," 22.
[100] Conway Morris and Whittington, "Fossils of the Burgess Shale," 2.

trying to speak the same language as Parks Canada. The scientific value of Collins' later expeditions may have been more questionable, though. Caron notes that Collins published some papers, "but very few compared to the kind of fossils he amassed during his career at the Burgess Shale." His lack of graduate students also limited his opportunities to increase his flow of research. Caron believes this lack of research productivity made Parks Canada hesitant to let Collins keep coming back to collect from the Walcott Quarry. Caron also says he has not had problems getting his own permit requests approved. He attributes that to being guided by research questions, involving new generations of researchers, communicating that research through the gallery and the media, and organizing a meeting of researchers in Banff for the 100th anniversary of Walcott's "discovery," which showed Parks Canada that the site is still internationally revered.[101]

The ROM expeditions have undeniably expanded the scientific understanding of life in the Cambrian. As Gould noted, "Many species once known only for a moment in time, at a dot in space, now have a broad geographic range and an appreciable, stable duration."[102] Seeing sites at different stratigraphic levels now showed, for example, that species like *Ottoia prolifica* persisted across over 15 million years. The ROM teams encountered previously undescribed species such as the spiny *Sanctacaris uncata* (a formal version of what Collins nicknamed "Santa Claws" in the field).[103] They collected enough whole and substantial examples of the predator *Anomalocaris canadensis* to help affirm a seismic reinterpretation of this genus and the closely-

[101] Interview with Jean-Bernard Caron, 2023; Jean-Bernard Caron and Dave Rudkin, "Preface," in *A Burgess Shale Primer: History, Geology, and Research Highlights. Field Trip Companion Volume, ICCE 2009.*, ed. Jean-Bernard Caron and Dave Rudkin (Toronto: The Burgess Shale Consortium, 2009), 5.
[102] Gould, *Wonderful Life*, 225.
[103] Derek E. G. Briggs and Desmond Collins, "A Middle Cambrian Chelicerate from Mount Stephen, British Columbia," *Palaeontology* 31, no. 3 (August 1988), 781.

related *Laggania*. For more than a century, parts of *Anomalocaris* were classified as unrelated species: its front claws as the back end of shrimp-like crustaceans, and its mouth as a type of jellyfish. Complete specimens like one collected by the ROM in 1991 showed definitively that they were part of a single large organism, now perhaps the most iconic ambassador of the Burgess Shale.[104] The announcement of new fossil localities in Yoho – together with the re-examinations of Burgess Shale fossils being led by the Cambridge group – added urgency and context to the search for other Burgess Shale-type fossil beds around the world. In 1984, paleontologists and geologists identified *Lagerstätten* of soft-bodied Cambrian life in Greenland (the Sirius Passet fauna) and China's Yunnan province (the Chengjiang fauna).[105]

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By the early 1970s, Parks Canada had the explicit regulatory authority to require scientists to ask for permits before removing fossils from parks like Yoho. Scientists at the ROM, led by Desmond Collins, failed in their first attempt to acquire a permit – mostly owing to a letter from the GSC that dismissed the display value of the remaining fossils and invoked Parks Canada's growing interest in preserving areas of "untouched" wilderness. Collins was successful in his second attempt because he gained the endorsement of the GSC, and because he invoked the discourse of nationalism to convince Parks Canada that his museum's work would be in the

[104] Desmond Collins, "The 'Evolution' of Anomalocaris and Its Classification in the Arthropod Class Dinocarida (Nov.) and Order Radiodonta (Nov.)," *Journal of Paleontology* 70, no. 2 (March 1996): 280–93, https://doi.org/10.1017/S0022336000023362. This story, and the debate over whether *Anomalocaris* was an ancient arthropod or something much weirder and more unique, is one of the most fascinating parts of both the Burgess Shale reinterpretation synthesized by Stephen Jay Gould in *Wonderful Life* and its critique in Simon Conway Morris' *The Crucible of Creation*.

[105] Conway Morris, *The Crucible of Creation*, 116; Ministry of Housing and Urban-Rural Development of the People's Republic of China, "World Heritage Nomination - Natural Heritage, China: Chengjiang Fossil Site," 2011, https://whc.unesco.org/en/list/1388/documents/, 59.

national interest – an interest which both institutions shared. He used the authorized heritage discourse to colour the Burgess Shale fossils with a question that only his museum was equipped to answer satisfactorily: if these fossils are a part of helping Canadians understand their own identity, where should Canadians be able to see them in their own country? These negotiations demonstrate that the tactics and arguments scientists use to access fossils in parks can affect not only their own success, but also how park managers value the fossils afterward.

The conversations between the ROM, Parks Canada, and the GSC were not really about the intrinsic heritage value of the Burgess Shale fossils so much as negotiations about their meaning in the present. Laurajane Smith argues that "the idea or substance of 'heritage' is not itself innately embedded in a physical relic or place." Instead, "heritage is most usefully perceived as a cultural process about meaning making – it is a discourse that individuals, groups, communities, nations and a range of institutions use to create and define identity and social and cultural meaning in and about the present."[106] In his book *Rescuing History from the Nation*, Prasenjit Duara similarly states that historical narratives appropriate specific elements of the past to reinforce one story, and simultaneously suppress other narratives. Historical and cultural resources are frequently mobilized, he says, to differentiate self from Other in constructing national identity. Particular cultural elements, such as language and religion, are often highlighted to harden boundaries between communities that have many other elements in common.[107] Fossils present so many invitations to reframe our past beyond national narratives. In the Burgess Shale, rich underwater ecosystems are preserved that have much in common with sites in modern-day Chengjiang, Sirius Passet, and Emu Bay in South Australia. Massive

[106] Smith, *Uses of Heritage*, 87.
[107] Prasenjit Duara, *Rescuing History from the Nation: Questioning Narratives of Modern China* (Chicago: University of Chicago Press, 1995), 65-66.

reshuffling of continents, body plans, and climates can be seen by comparing these fossil beds to their modern locations. The organisms in them pre-date not only the nation-building efforts of the colonial Canadian state, they predate humanity itself. Yet to access these fossils, and to study and interpret their stories, the GSC and ROM scientists had to tell stories that placed the fossils in the narrative of Canada's 'natural heritage.'

Benedict Anderson asserts that this projection into the past has been an essential element in modern nation-making. "If nation-states are widely conceded to be 'new' and 'historical,'" he argues, "the nations to which they give political expression always loom out of an immemorial past."[108] Seeking secular iconography in *Hallucigenia* and *Sanctacaris* fossils – as if they were simply waiting 500 million years to be recognized as symbols of unique Canadian-ness – certainly goes a long way to projecting the idea of Canada backwards in time. José E. Igartua has traced the ways both Quebec and English-speaking Canada quietly, radically redefined their national identities in the 1960s in ways that made these icons all the more important. In English Canada, he argues, the bottom dropped out from a British ethnic nationalism after the Second World War, and a form of civic nationalism filled in the gap, searching for Canadian identity in institutions, attitudes, and experiences like wrestling with a rugged environment.[109]

There are many other examples of fossils being used as raw materials for the affirmation of national identities and state boundaries. Laura Valls Plana has shown that Catholic naturalists used mammoth tusks unearthed in late 19th-century Catalonia, for example, "in constructing a

[108] Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism*, Revised edition. (London: Verso, 2016), 11.
[109] José E. Igartua, *The Other Quiet Revolution: National Identities in English Canada, 1945-71* (Vancouver: UBC Press, 2006), 166-167.

Catalan nature."[110] Newspaper articles, a concrete sculpture of a mammoth in Barcelona, and geological maps used the locations of fossils like these to help imagine – and thus legitimize – the idea of "a territory that persisted over time,"[111] "imagined by God and distinguishable from the rest of the Iberian peninsula."[112] Smith shows another example in Australia's Riversleigh landscape. The distinctive Miocene mammal fossils there have captured the public imagination, including marsupial lions and an animal with horizontal incisors nicknamed "thingodonta."[113] Non-Indigenous Australian locals also see the land itself as representative of "the rugged and dangerous bush that 'made' 'Australia'."[114]

Granting paleontologists permission to collect fossils in the Burgess Shale allowed Parks Canada to amplify the fossils' value as icons of Canadian heritage. Yet perhaps the agency was wise to be cautious of which scientists it allowed into the parks, given the way they consequently helped shape park values. Stephen Bocking argues that what scientists pay attention to matters a lot – more than many environmentalists are willing to admit when they look to science to provide the ethical foundation for protecting nature. Science does not simply provide objective, independent knowledge, he says: "it constrains our awareness of which choices are available, and it warrants that certain choices reflect not simply political or economic preferences, but the actual state of the world, and are therefore viable and realistic."[115] The work of chemists and biotechnologists provides tools to exploit resources, while conservation biology may provide

[110] Laura Valls Plana, "A Mammoth in the Park: Palaeontology, Press and Popular Culture in Barcelona (1870-1910)," *Centaurus: Journal of the European Society for the History of Science* 58, no. 3 (August 2016): https://doi.org/10.1111/1600-0498.12124, 193.
[111] Valls Plana, "A Mammoth," 197.
[112] Valls Plana, "A Mammoth," 195.
[113] Smith, Uses of Heritage, 167.
[114] Smith, Uses of Heritage, 175.
[115] Bocking, *Nature's Experts*, 48.

tools to protect them. Science, Bocking says, "strengthens the hand of those who wield it."[116] Time spent in the Burgess Shale by the GSC helped give their geologists and paleontologists influence over parks officials and an air of objectivity behind their advice on permitting requests, even as that advice shifted dramatically.

[116] Bocking, *Nature's Experts*, 48.

Chapter 3: A Priceless Heritage (1979 - 1988)

Figure 12: An underwater Cambrian scene. In the background, Anomalocaris canadensis *tries to make a meal of escaping* Marrella splendens *and* Nectocaris pteryx. *In the foreground, more* Marrellas *swim between* Hazelia conferta *sponges, a five-eyed* Opabinia regalis *swims from behind a* Takakkawia lineata *sponge and extends an appendage towards* Vauxia bellula *sponges. Illustrated by the author.*

November 2021. We have travelled to the Rockies with our friends Aly and Matt for some hiking, hot springs, and a quick visit to Field. While my husband takes a break with his sketchbook at the Truffle Pig restaurant in town, the rest of us drive over to Emerald Lake across the highway, in sight of the Walcott Quarry. I am absolutely thrilled to be so close to the fossils. Surrounded by a bowl of snowy mountains, the water seems more like cool jade today, with the Emerald Lake Lodge and its trees floating above their reflection. We decide to walk the loop around the lake, and have barely started when I tell my friends we have to stop to read the

information panels about the Burgess Shale. “Always read the plaque” is a motto I take seriously.

A half circle of signs is set up by the shore, with a couple of telescopes mounted so you can look across the water and see the Walcott Quarry on the ridge between Wapta Mountain and Mount Field. One of the signs shows what to look for, promising “YOU CAN SEE IT FROM HERE!” There is a little illustrated *Marrella splendens* above the text, and on the other half of the sign is the iconic UNESCO World Heritage symbol. “A Priceless Heritage,” it reads. “The Burgess Shale’s designation as a UNESCO World Heritage Site reflects its global significance to science. In order to protect this priceless heritage, Parks Canada has *restricted public access to the Burgess Shale*.” Then it explains how to call a warden if you spot a tiny figure climbing in the quarry.

These signs feel strangely like they are teasing us: simultaneously showing off the beauty and importance of the Burgess Shale and explaining why we cannot enter on our own. Stranger still is the story behind this site’s designation. Far from a passive, inevitable recognition of its global significance, the process was driven by national interest, insecurities, and many passionate scientific experts. In this chapter, I will investigate how the Burgess Shale was nominated to the World Heritage List in 1979, what kind of information and arguments were used to lobby for a spot, and how the designation changed the space. Paleontologists supported this designation by helping draft the nomination package and adding their endorsements. We will see that in these early days of the World Heritage program, the designation was driven by idiosyncratic decisions made by individuals trying to digest and interpret much larger discourses on heritage, parks, and conservation. The designation led to an increase in tourist traffic and fossil theft that overwhelmed Parks Canada staff, which they tried to limit by restricting public access. By the

time the Yoho National Park Management Plan was published in 1988, the fossil beds were embedded in new restricted zones. I will put the Burgess Shale in context with two other fossil sites in Canada: Dinosaur Provincial Park and the Joggins Fossil Cliffs, which were also added to UNESCO's World Heritage List for their geological values. The process invites us to ask whether World Heritage designation can limit the ways of experiencing wilderness and knowing nature that attracted designation in the first place.

In the preceding chapters, we examined how paleontologists from the Smithsonian Institution, the Geological Survey of Canada (GSC), and the Royal Ontario Museum (ROM) negotiated access to the Burgess Shale. Charles Doolittle Walcott and Mary Vaux Walcott's writing, photography, taxonomical work, and trail riding in the Rockies helped win them favour with parks and railway authorities. After a joint GSC/Cambridge University collecting program in the 1960s, GSC paleontologist Brian Norford tried to fend off the ROM's entry there by emphasizing the value of what his team had collected, the challenges laymen would face understanding the fossils, and the need to leave the remaining material at the quarry in its "original state." The ROM's Desmond Collins overcame Norford and park staff's objections to his collecting program by arguing that the fossils' natural heritage value made it essential for Parks Canada to allow him to collect specimens for a museum display in Canada. In turn, all of these arguments created a mythology and iconography that coloured the fossil beds, attracting more scientists and visitors, but creating anxiety for future park staff about protecting the natural heritage there.

To some paleontologists, excavating fossils from the Burgess Shale has been an integral part of recognizing their sacredness. Gould wrote that:

> The animals of the Burgess Shale are holy objects—in the unconventional sense that this word conveys in some cultures. We do not place them on pedestals and worship from afar. We climb mountains and dynamite hillsides to find them. We quarry them, split them, carve them, draw them, and dissect them, struggling to wrest their secrets. We vilify and curse them for their damnable intransigence. They are grubby little creatures of a sea floor 530 million years old, but we greet them with awe because they are the Old Ones, and they are trying to tell us something.[1]

This perspective is important for understanding the conflicts that emerged when the sites were put on the World Heritage List. Environmental historian Richard White has written that such active ways of knowing nature sit uneasily with modern, middle-class environmentalism. What the movement has failed to grasp is that "human beings have historically known nature through work," says White.[2] "Environmentalists stress the eye over the hand, the contemplative over the active, the supposedly undisturbed over the connected."[3] The aesthetic of keeping natural heritage spaces "undisturbed," though, would eventually make its mark on the Burgess Shale.

Heritage Discourses and Institutions

Modern Western ideas of parks and heritage both have their roots in eighteenth and nineteenth-century industrializing societies in Europe and North America. Anxieties about increasing urbanization and alienation from nature are deeply tied to the emergence of the first national parks in the United States, as places of spiritual refuge. "A simple scarcity theory of value," writes Roderick Nash, "coupled with the shrinking size of the American wilderness relative to American civilization, underlies modern wilderness philosophy."[4] In her book *Uses of*

[1] Gould, *Wonderful Life*, 52.
[2] Richard White, *The Organic Machine: The Remaking of the Columbia River*, Critical Issue (New York, NY: Hill and Wang, 1996), x.
[3] White, *The Organic Machine*, x.
[4] Roderick Frazier Nash, *Wilderness and the American Mind*, Fifth Edition (New Haven, CT: Yale University Press, 2014), 249.

Heritage, meanwhile, Laurajane Smith argues that standards of cultural heritage "are linked to the development of nineteenth-century nationalism and liberal modernity, and while competing discourses do occur, the dominant discourse is intrinsically embedded with a sense of the pastoral care of the material past."[5] This discourse, infused with claims to Enlightenment rationality and progress, helped Europeans see themselves at the top of a hierarchy that justified colonialism and imperialism.

Upper classes in Europe started advocating to protect rural homes and churches in the nineteenth century, and pushed for legislation to conserve monuments and buildings.[6] Archaeologists and conservation architects began to drive international standards of cultural heritage authenticity through meetings and agreements like the 1931 Athens standards of authenticity and 1964 Venice Charter.[7] They were trying to codify a break with specific European trends to "restore" buildings to idealized medieval appearances. Instead, they advocated for preserving these structures as they looked "now." This reaction began to be universalized as a worldwide standard of authenticity in conservation as these interest groups began to dominate conversations about not just *which* heritage matters, but *who* should be allowed to decide which heritage matters.[8] Not surprisingly, they pushed for professionals to be privileged in these conversations, through non-governmental organizations like ICOMOS – the International Council on Monuments and Sites. In the 1960s and 70s, across the Western world there was growing concern about natural and cultural heritage, and a flurry of legislation and policy to protect it. Smith suggests this was due to increasing leisure time, more widely available

[5] Laurajane Smith, *Uses of Heritage* (New York, NY: Routledge, 2006), 17.
[6] Aurélie Élisa Gfeller, "The Authenticity of Heritage: Global Norm-Making at the Crossroads of Cultures," *The American Historical Review* 122, no. 3 (June 1, 2017): 761, https://doi.org/10.1093/ahr/122.3.758.
[7] Gfeller, "The Authenticity of Heritage," 765.
[8] Smith, *Uses of Heritage*, 26.

cars, more middle and upper class "mass consumption of heritage tourism" – and more concerns about protecting places attracting those tourists.[9] Annual visits to the Rocky Mountain parks went up astronomically over this time, with over 867,000 visitors entering Yoho in 1969-70.[10]

Efforts to codify protection of heritage sites culminated in 1972 within the United Nations Educational, Scientific, and Cultural Organization – or UNESCO. UNESCO member states worked together to develop a new World Heritage Convention, intended to conserve national heritage in each of these states and to build a list of sites and monuments of "outstanding universal value." Initially, the Convention was exclusively focused on cultural heritage. The draft text did not allow countries to nominate sites directly to the new World Heritage Committee. Instead, countries' nominations would be filtered through the professional cultural heritage experts at ICOMOS (such as architects, anthropologists, and historians). ICOMOS would judge the proposals and advise the World Heritage Committee which sites should be on the list. President Richard Nixon's administration in the United States, though, started promoting the idea of a parallel "World Heritage Trust," which would "provide … private and public support for conservation areas and sites [like] national parks."[11] The idea attracted support from the IUCN – the International Union for the Conservation of Nature. UNESCO's Director General panicked, fearing that UNESCO might lose its "position as the designated world intergovernmental body for all the sciences."[12] He proposed integrating natural heritage into the World Heritage Convention too. In every place where the Convention mentioned

[9] Smith, *Uses of Heritage*, 25.
[10] *Yoho National Park Provisional Master Plan*, Public Hearings on Provisional Master Plans for Canada's National Parks (National and Historic Parks Branch, 1971), [insert between pages 2 and 3].
[11] Patrick J. Boylan. "Geological Site Designation under the 1972 UNESCO World Heritage Convention." Geological Society Special Publications 300 (2008): 279–304. https://doi.org/10.1144/SP300.22. 280.
[12] Boylan, "Geological Site Designation", 280

ICOMOS as the body reviewing cultural heritage sites, IUCN was swapped in to review natural heritage submissions.[13]

Canada was one of the first countries to adopt the Convention, perhaps motivated by potential for political prestige, public awareness of the country's heritage, and tourist cash.[14] There is also evidence of genuine desire to protect Canada's heritage by civil servants, and diplomatic soft power to be gained in offering technical expertise and cash to countries in the Global South taking care of their own World Heritage Sites.[15] The Canadian government decided to channel most of its World Heritage responsibilities through Parks Canada, which was responsible for managing both parks and historic sites around the country. Parks Canada staff would be in charge of picking sites to nominate to the World Heritage List, taking care of them if they were successfully designated, and managing the budget for World Heritage Convention duties – like paying into the international fund for sites in danger.[16] Canada successfully nominated some of the first sites on the list, and by 1979, Dinosaur Provincial park, Nahanni National Park, and L'Anse Aux Meadows were there beside Yellowstone in the United States, Rock-Hewn Churches in Ethiopia, and the Giza pyramids in Egypt.[17]

[13] Boylan, "Geological Site Designation", 281.
[14] Gfeller, "The Authenticity of Heritage," 761.
[15] Peter H. Bennett, "Preserving Our Heritage," *Conservation Canada* 3, no.4 (1978), 11, http://parkscanadahistory.com/series/conservation-canada/v4n3-1978.pdf
[16] Cabinet Committee on Federal Provincial Relations, "Unesco Convention for the Protection of the World Cultural and Natural Heritage," July 22, 1976, RG2, Privy Council Office, Series A-5-a, Volume 6496, LAC, http://central.bac-lac.gc.ca/.redirect?app=cabcon&id=42241&lang=eng; Interview: Hal Eidsvik 2009.
[17] "UNESCO World Heritage Centre - World Heritage List," UNESCO, accessed February 2, 2024, https://whc.unesco.org/en/list/&order=year#alpha1978.

Nominating the Burgess Shale

The main character of the Burgess Shale's nomination seems to be Peter Hally Bennett (1913?-1999), Special Adviser to the Parks Canada Assistant Deputy Minister on the UNESCO World Heritage Convention. Essentially, Bennett was tasked with identifying sites and monuments in Canada to put on the list. He was the Parks Canada official who signed the Burgess Shale nomination package that Canada submitted to UNESCO in 1979.[18] Bennett had a decades-long career as a civil servant, apparently beginning in the British Foreign Service.[19] He was also an alpine sport enthusiast. In 1954 he led the first attempt to ski across all eight of the main icefields in the Canadian Rockies, and he was the founding director of an association that helped develop Whistler, BC's unsuccessful bid for the 1968 Olympic Winter Games.[20] By this time, Parks Canada now had a National Historic Sites Division charged with evaluating historic buildings and recommending their preservation. Bennett was assistant director of this office in 1967,

Figure 13: A photograph of Bennett from an article he wrote about the new World Heritage Convention. Peter Bennett, "Peter Bennett on the Future of World Heritage," Media World*, Summer 1980.*

[18] Canada, "World Heritage List: Nomination Submitted by Canada; Burgess Shale Site," December 28, 1979, UNESCO Digital Library, https://unesdoc.unesco.org/ark:/48223/pf0000038325?1=null&queryId=531a9535-46a6-435e-9c7c-9b7da2044901.
[19] "Obituary: Peter Hally Bennett," *The Globe and Mail*, September 2, 1999, https://www.legacy.com/ca/obituaries/theglobeandmail/name/peter-bennett-obituary?pid=189708705.
[20] "Obituary: Peter Hally Bennett;" Whistler Museum and Archives Society, "Garibaldi Olympic Development Association," *WHISTORICAL* (blog), February 18, 2020, https://blog.whistlermuseum.org/tag/garibaldi-olympic-development-association/. The 1968 Olympic Winter Games were held in Grenoble, France. By coincidence, that city is where I took a French course in 2023 to complete the language requirements for this master's program.

helping decide how to preserve structures like the old Hudson's Bay Company buildings at York Factory in Manitoba.[21]

Bennett seems to have had a mixed record of consulting communities while identifying heritage sites, sometimes caricatured by his opponents. In the early 1970s, Bennett was the director of a National Historic Sites survey of Canada's old buildings. The BC Historical Association's newsletter in 1973 criticized him for "labour[ing] under the delusion that we here on the Pacific West […] have no historic buildings other than log cabins built in the gold rush days. It's a pity," they say, "that none of us historically minded people was not consulted [sic] when decisions were being made for us."[22] In Haida Gwaii a few years later, he apparently worked together with the Haida Gwaii Watchmen program and the Skidegate Band Council on the nomination of the Sgang Gwaay island World Heritage site, with its old cedar longhouses and big mortuary poles.[23] When the Wood Buffalo Park in northern Alberta was designated a World Heritage site in 1983 though, local Indigenous groups said they didn't even know it was nominated, and the federal environment minister was so out of the loop that he approved more commercial logging in the park.[24]

We can see self-consciousness in which sites Bennett helped nominate. Parks Canada published a magazine called *Conservation Canada*, and in 1978, Bennett contributed an article

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[21] Robert Coutts, *Authorized Heritage: Place, Memory, and Historic Sites in Prairie Canada* (Winnipeg: University of Manitoba Press, 2021), 107.
[22] British Columbia Historical Association, "Editorial," *BC Historical News*, February 1973, 2.
[23] The founder of the Haida Gwaii Watchmen Program, Captain Gold, had taken on responsibility for watching over the island village of Sgang Gwaay, with its old homes and 200-year-old poles. He hoped to fend off logging pressure. Bennett came with a group to see the island in 1980, and "Just as he was about to leave, Bennett ran back to ask Captain Gold what he thought of the idea of nominating Sgang Gwaay as a World Heritage Site. 'Peter Bennett was in love with the area and wanted to save it,' says Captain Gold." Jennifer Iredale and Ursula Pfahler, "Community Involvement in the Nomination and Management of the Sgang Gwaay World Heritage Site"
[24] Kevin McNamee. "Wood Buffalo World Heritage Site: Threats and Possible Solutions." In *World Heritage Twenty Years Later*, edited by Jim Thorsell and Jacqueline Sawyer, Gland, Switzerland and Cambridge, UK: International Union for Conservation of Nature and Natural Resources, 1992, 53.

about the World Heritage Convention. In it, he said Canada is "unlikely to get many properties on the List. Of those that are accepted, most will probably be natural sites. The difficulty in nominating Canadian cultural sites is always likely to be justifying them as 'of outstanding universal value' (and not just of national significance)."[25] I suspect that putting natural heritage front and centre was also a way for Bennett and his colleagues to send a message that Canada was a nation with a history just as ancient as the old churches and pyramids that were likely to be shoo-ins for the list.

Dinosaur Provincial Park, for example, was successfully nominated as a natural heritage site in 1979. The fossils there date back to the Cretaceous, around 75 million years ago. This landscape is a combination of grasslands and badlands today: a dry, hilly ecosystem with hoodoo landforms easily eroded by wind and rain. Research teams from the Royal Tyrrell Museum and the University of Alberta run field expeditions in the park most summers now, and the site is a major tourist attraction in the province. Access to most of the backcountry is forbidden to the general public, but there are campsites, a small visitor's centre, and guided hikes that allow visitors to see fossils for themselves.

The Alberta government supported the nomination of Dinosaur Provincial Park, and worked with Bennett and his office to help write the proposal and to "delineat[e] a core area, free of minerals, which fully represents the Park's unique features."[26] This provincial support likely pushed it to the top of the priority list for Bennett and his superiors, along with the fact that it would stand up as a natural heritage site, was not the subject of current Indigenous land claims, and was already protected by park boundaries. In reviewing the proposal, the IUCN agreed that

[25] Bennett, "Preserving Our Human Heritage," 12.
[26] J. Hugh Faulkner to J. Allen Adair, January 23, 1979. Committees, Boards, Councils, Commissions – UNESCO 1977-1985. RG 84 – Parks Canada, Folder 1165-36 / U88 & ENV, Box 38, LAC Winnipeg.

the site had outstanding universal value, "unmatched in terms of the number and variety of high quality specimens"[27] of Cretaceous species like nodosaurs, tyrannosaurs, and pachycephalosaurs. The "exceptional natural beauty" of the present-day steppes and wetlands was another factor, though described in a way that reinforced the park's "undisturbed" wilderness narrative.[28] Finally, the IUCN was convinced that the site's integrity would be preserved by the size of the protected area and that "any palaeontological resources found outside the area are protected by the Alberta Historical Resources Act of 1978."[29]

We can see also why Bennett did *not* nominate some sites. A potential Bering Land Bridge site in Yukon was rejected because of pushback from both the territorial government and the Old Crow band government of the Vuntut Gwitchin First Nation, as well as concerns that it would further confuse land claims and park discussions in the area.[30] In 1979, Parks Canada representatives debated whether to nominate the entire Rocky Mountain parks area in Alberta and BC, or just the Burgess Shale.[31] The director of the Western Region Office of Parks Canada supported nominating the whole mountain park system. A staffer told him that Bennett and his advisors dismissed that idea because "the proposal would not stand up as being more significant in the mountain ranges of the world than some others."[32]

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[27] International Union for Conservation of Nature and Natural Resources (IUCN). "IUCN Review - World Heritage Nomination, Dinosaur Provincial Park." IUCN, February 14, 1979. https://whc.unesco.org/document/154077.
[28] IUCN, "IUCN Review – Dinosaur."
[29] IUCN, "IUCN Review – Dinosaur."
[30] T. Heggie to Audrey Stewart, November 6 1979, World Heritage Convention 1979 – 1986. RG 84 – Parks Canada, Folder 1165-117x, Box 38, LAC Winnipeg. For more on this period, see: Paul Nadasdy, "Imposing Territoriality: First Nation Land Claims and the Transformation of Human-Environment Relations in the Yukon," in *Ice Blink: Navigating Northern Environmental History*, ed. Stephen Bocking and Brad Martin, Canadian History and Environment Series 7 (Calgary: University of Calgary Press, 2017), 333–76, https://library.oapen.org/bitstream/20.500.12657/57501/1/9781552388556.pdf.
[31] A.T. Davidson to W.C. Turnbull, November 23 1979. Committees, Boards, Councils, Commissions – UNESCO 1977-1985. RG 84 – Parks Canada, Folder 1165-36 / U88 & ENV, Box 38, LAC Winnipeg.
[32] W.C. Turnbull to Peter. H. Bennett, 14 November 1979, Committees, Boards, Councils, Commissions – UNESCO 1977-1985. RG 84 – Parks Canada, Folder 1165-36 / U88 & ENV, Box 38, LAC Winnipeg.

Bennett apparently spoke to the Assistant Deputy Minister of Parks Canada about the Burgess Shale idea, and they agreed it met the conditions for a natural property of outstanding universal value, based on "a review of some of the recent literatures on the Burgess Shale and discussion with paleontologists."[33] It must have seemed like an easy win. Scientists agreed on its international significance, its small size was a safer bet than a whole mountain range, and Parks Canada considered Yoho to be uncontested territory vis-à-vis Indigenous land claims. Bennett's office asked Jim Aitken to help write the nomination. Aitken worked at the Institute of Sedimentary and Petroleum Geology in Calgary at the time and had overseen the Geological Survey of Canada's overall fossil collection program in the Burgess Shale in the 1960s.

Like the Dinosaur Provincial Park proposal, the Burgess Shale nomination package highlighted how ancient the fossils were. "The Burgess Shale is an outcropping mass of rock, part of the Stephen Formation of Middle Cambrian age, that is characterized by its profuse and unique fossil fauna," it said.[34] The proposal described the Walcott Quarry as "little disturbed by man," except for a hiking trail below and some rock debris that "is scarcely distinguishable from the natural talus."[35] It also described the Mount Stephen Trilobite Beds, and made an argument that the Burgess Shale fit two criteria for a natural heritage site on the World Heritage List:

> First, under criterion "i", it is a unique and superlative natural phenomenon, certainly one of the three most significant fossil localities in the world, and in some opinions, the most significant. These other significant fossil sites, the Olduvai Gorge in Tanzania and Dinosaur Provincial Park in Canada, embody fossils from a different geological age and fossil group. Second, under criterion "ii", it is a unique sample of a major stage in earth's evolutionary history.[36]

[33] Davidson to Turnbull, November 23, 1979.
[34] Canada, "Burgess Shale Site", 2.
[35] Canada, "Burgess Shale Site", 2.
[36] Canada, "Burgess Shale Site", 8.

The proposal mentioned that the majority of the fossils found there were soft-bodied – which is extremely rare – and also found nowhere else in the world.

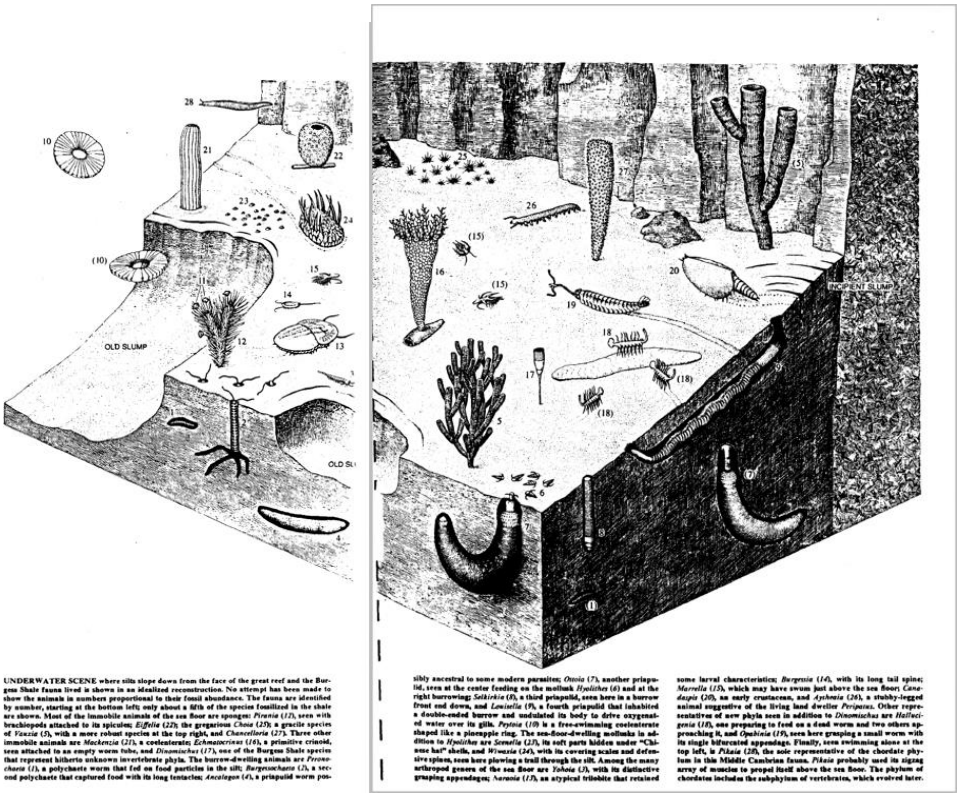

Figure 14: Illustration of underwater Burgess Shale fauna, from a Simon Conway Morris and H.B. Whittington article included in the nomination package. Species include Wiwaxia *(24),* Echmatocrinus *(16), and trilobite* Naraoia *(13). Canada, "Canadian Rocky Mountain Parks," 83-84. The pineapple ring-shaped organism at top left is an erroneous depiction of what was then believed to be a complete organism, but is now known to be the mouth structure of* Anomalocaris.

Under the box for "State of preservation/conservation," the application said that "[e]xcept for the quarry excavation itself, the immediate area of the Burgess Shale is very nearly in its natural state. Inconspicuous foot trails provide access, and the campsite 800 feet […] below bears some scars of occupation."[37] This was the only real reference to the lead and zinc mining

[37] Canada, "Burgess Shale Site", p 7.

near both these sites until 1952, and commercial logging conducted until 1968.[38] The proposal argued that the area already had strong protection under the National Parks Act and Regulations, and Parks Canada staff in Field to enforce it. The bibliography was almost entirely scientific literature based on fossils from the Burgess Shale about trilobites, annelid worms, and species like *Opabinia regalis* and *Marrella splendens*.[39] The attachments featured strange and beautiful photos and illustrations of the fossils and what their sea bed might have looked like 500-odd million years ago.

We can see in this document that the argument for the Burgess Shale's nomination was being supported by scientific research, and by trust in Parks Canada's regulations and staff. I cannot see any evidence that Bennett or other Parks Canada staff consulted with other interest groups with a vested interest in this site, such as First Nations, locals in Field, or climbing, hiking, and horseback riding groups. Nevertheless, this submission was a perfect fit for its audience, which happened to be a Canadian living in Switzerland who worked for Parks Canada.

Hal Eidsvik was the one who received this package. UNESCO had delegated responsibility for reviewing World Heritage Site applications to the IUCN. Within the IUCN, that responsibility was further delegated to Eidsvik. Eidsvik had been Parks Canada's Chief of Planning, and was involved with Canada's world heritage nomination process, building a list of potential sites. In the late 70s he was "loaned" to the IUCN in Switzerland on an exchange

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[38] Robert W. Sandford. *Emerald Lake Lodge: A History and a Celebration*. (Canmore: Canadian Mountain Resorts & Robert W. Sandford, 2002), 23; Murray Coppold and Wayne G. Powell, *A Geoscience Guide to the Burgess Shale: Geology and Paleontology in Yoho National Park*, 2nd ed. (Field: Burgess Shale Geoscience Foundation, 2006), 1.

[39] The attachments are: the Parks regulations for Yoho National Park; a Geological Survey of Canada paper on the geological setting of the Burgess Shale, with maps from above and in cross-section of the geological formations; a paper on the history of Burgess Shale fossils and research by Harry Whittington, one of the foremost paleontologists studying these fossils at the time; Parks Canada's Resource Management Statement on Yoho; and a Scientific American article by two paleontologists about the animals of the Burgess Shale.
Canada, "Burgess Shale Site", p 3-6.

program. He was interviewed about this for the oral archives of the World Heritage Convention, and said: "Everybody else was busy. They did their own stuff. They said OK, your responsibility is the World Heritage Convention. So it was on my desk for three years."[40]

Eidsvik certainly valued professional scientific expertise. I emailed him about his memories of this time, and he said that the concept of world heritage was still in an evolving state, and it wasn't clear whether a site like the Burgess Shale or Peyto Lake (known for its outstanding natural beauty) should be nominated. When the nomination arrived on his desk in 1979, he tried to answer that question by consulting "recognized fossil authorities," like the Canadian Museum of Natural History, Queen's University, and the Smithsonian Institution in Washington, DC. "All of the responses supported the nomination," he said. As he remembers it, the Smithsonian representative told him: "If there should be only one fossil site on the World Heritage List—this is it." [41] Harry Whittington wrote from the University of Cambridge to add an enthusiastic endorsement.[42] Eidsvik thus made a positive recommendation on behalf of the IUCN, based on documentation about this site's scientific value, the idea that it was "very nearly in its natural state," scientific articles from geologists and paleontologists, phone calls to museums and universities, and presumably his own experience working for Parks Canada. At the time, the IUCN did not carry out field evaluations of proposals.[43]

[40] Christina Cameron, Oral Archives: Hal Eidsvik, July 3, 2009, Oral Archives of the World Heritage Convention, https://whc.unesco.org/en/oralarchives/hal-eidsvik/.
[41] Email from Hal Eidsvik 2022
[42] Harry B. Whittington to Hal K. Eidsvik, February 25, 1980. Committees, Boards, Councils, Commissions – UNESCO 1977-1985. RG 84 – Parks Canada, Folder 1165-36 / U88 & ENV, Box 38, LAC Winnipeg.
[43] Email from Hal Eidsvik 2022.

The World Heritage Committee accepted his recommendation in 1980,[44] and in 1981 held a formal dedication ceremony in Yoho National Park.[45]

Figure 15: "Peter Bennett [...] addresses a gathering to witness the unveiling of a plaque commemorating Yoho Park's Burgess Shale beds as a world heritage site." From: "Burgess Shale Dedicated for Future Generations," The Golden Star, July 22, 1981. Used with permission of Golden Star. (https://www.thegoldenstar.net/)

In 1984, Canada asked UNESCO's World Heritage Committee to inscribe all of the Yoho, Banff, Jasper, and Kootenay national parks onto the World Heritage List as a vastly expanded natural heritage site, absorbing the Burgess Shale site. The IUCN's evaluation of this proposal was very positive, noting that although the Burgess Shale would be just one of many natural features of the new Canadian Rocky Mountain Parks site, it would help justify the parks' inclusion on the list by helping tell the story of Earth's evolutionary history.[46] The story of that

[44] "Yoho Fossil Bed Declared World Heritage Site," *The Golden Star*, September 17, 1980.
[45] "Burgess Shale Dedicated for Future Generations," *The Golden Star*, July 22, 1981.
[46] International Union for Conservation of Nature and Natural Resources, "World Heritage Nomination - IUCN Technical Evaluation, 304 - Canadian Rockies (Canada)," March 1984.

nomination has been somewhat explored by others,[47] but is too complex to address in depth here – except to say that park staff continued to invoke the World Heritage List when discussing the need to protect and interpret the Burgess Shale.

Changes on the Ground

It is worth noting that despite intermittent promotion as a tourist attraction, the Burgess Shale sites do not seem to have been a major draw to Yoho before the World Heritage designation. A 1970s master's thesis project looking at visitors and trails in the Yoho Valley (quite close to both the Walcott Quarry and Mount Stephen) did not show any evidence that road users or backcountry users had come to Yoho to see the Burgess Shale fossils specifically. Road users mentioned being drawn by experiences like seeing Takakkaw Falls and the Emerald Lake/Natural Bridge area, getting away from it all and escaping civilization, and experiencing the natural state of things.[48] Backcountry users mentioned enjoying the beautiful scenery, alpine meadows/wildflowers, the Yoho Glacier area, "colors and fragrances," and geology/interesting rocks (we can speculate whether fossils might have been lumped into this category, cited by 3% of respondents). Nothing is explicitly mentioned about the Burgess Shale, trilobites, or fossils.[49] Parks Canada brochures for Yoho through the 1960s-1980s do not consistently list the Burgess

[47] Sandford, *Ecology & Wonder;* Groat and Anderson, "Holding Place." In 1990, the site was expanded to include the adjacent BC provincial parks of Mount Robson, Hamber, and Mount Assiniboine.
[48] Terje Vold, "A Resource and Visitor Inventory of Yoho Valley, Yoho National Park, British Columbia" (University of British Columbia, 1976), https://doi.org/10.14288/1.0100123, 112
[49] Vold, "A Resource and Visitor Inventory," 113

Shale as one of the park's attractions. More commonly, these brochures mention the lure of waterfalls, orchids, and fishing spots.[50]

After 1981, the number of tourists increased, though – and so did fossil theft. If you consulted the Canadian Rockies Trail Guide in 1978 and you were looking for a day hike from Field, you would find a recommendation to see the Stephen Fossil Beds. The guide mentioned that there was no need to get a permit to access the area because this wasn't a back country hike, but cautioned that it was illegal to remove any fossils in a national park.[51] After the designation, Parks Canada staff started to feel this open access wasn't tenable anymore. A *Calgary Herald* article in 1982 mentioned that according to the chief warden, "The number of visitors – and potential thieves – to the fossil beds has nearly doubled since the publicity that accompanied their designation as a United Nations' world heritage site".[52] "Last year," the reporter said, "a Calgary man was charged and convicted under the National Parks Act for removing a natural object from a park after wardens caught him splitting open specimens from the unique fossil beds".[53] "We don't want to cut the public off from the fossil beds," chief warden Gordon Rutherford was quoted as saying. "But we are concerned about their protection."[54]

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[50] National Parks Branch, "Yoho National Park," 1961, Parks Canada History eLibrary, http://parkscanadahistory.com/brochures/yoho/brochure-1961.pdf; National and Historic Parks Branch, "Yoho National Park," 1972, Parks Canada History eLibrary, http://parkscanadahistory.com/brochures/yoho/brochure-1970.pdf; Parks Canada, "Yoho National Park," 1980, Parks Canada History eLibrary, http://parkscanadahistory.com/brochures/yoho/brochure-1980.pdf.

[51] Brian Patton and Bart Robinson. *The Canadian Rockies Trail Guide: A Hiker's Manual to the National Parks*. Rev. ed. (Canmore: Devil's Head Press, 1978), 181. Interestingly, the 1986 guide reprinted the description for this hike almost verbatim, despite new access restrictions in place on Mount Stephen by then. The authors did not update the text to reflect these changes until 1994. In our interview, former park warden Randle Robertson noted that communicating these changes to authors was sometimes difficult.

[52] Catherine Butlin, "Light-Fingered Public Pockets Fossils," *Calgary Herald*, June 12, 1982. This figure may be an exaggeration, since visits to Yoho didn't double in that time. See: Canada, "Canadian Rocky Mountain Parks," 118.

[53] Butlin, "Light-fingered public pockets fossils"

[54] Butlin, "Light-fingered public pockets fossils"

Randle Robertson was a warden in Yoho at this time. Originally from Alberta, he began working in the park in the 1970s, and remembers visitors from Calgary (especially geologists and geoscientists) being drawn to Yoho on the weekends. That went way up after the designation, he said, and many people would walk up the Mount Stephen fossil beds and pocket some of the trilobites. According to Robertson, he was the one that convinced the chief warden and the superintendent that it was time to close those areas permanently. To the best of his recollection, this happened in 1981. Wardens could – and did – search visitors' backpacks for contraband. It was obvious that fossils were still disappearing though, and there weren't enough park staff to monitor this new volume of visitors. So, according to Robertson, he drew up maps of areas he thought should be restricted around the Walcott Quarry and the Mount Stephen fossil beds, which the superintendent approved:

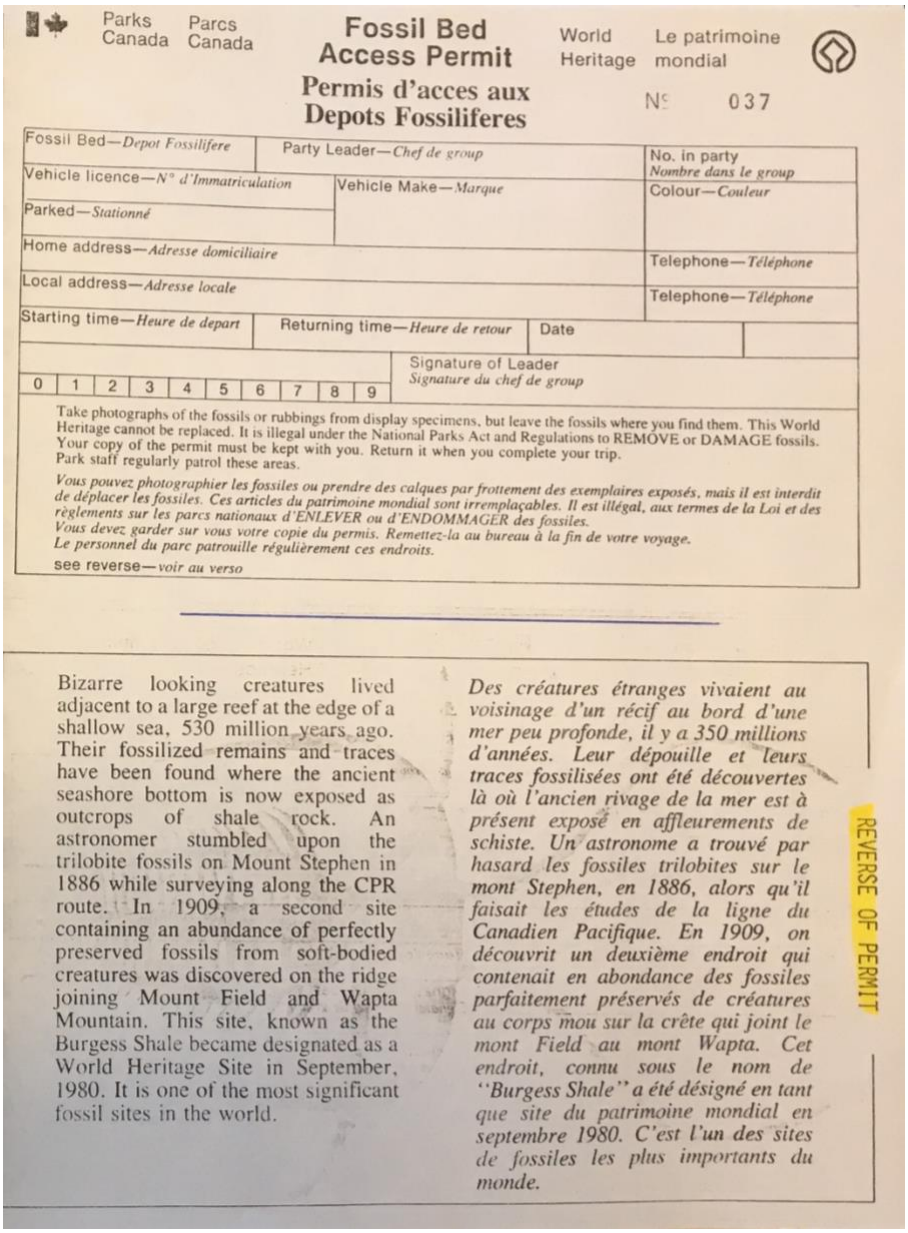
> I did the UTMs. Mapped it out in my handwriting, on a topographical map. Took it to the Xerox machine, made a copy. And I took it to the chief warden, and I said this is what we need to do. And I put it on an eight and a half by eleven piece of paper […] and then I gave it to the chief warden and the superintendent to sign, and that was it.[55]

Robertson got a local carpentry shop to make a wooden sign for him, inserted a plasticized version of the map, and stuck it up on the trailhead.

For the next few years, visitors could still hike up to the Mount Stephen Trilobite Beds or the Walcott Quarry on their own, so long as they went to one of the park offices in Yoho to get a permit first. It recorded information like the size of their group, the make and colour of their vehicle, and when they expected to return. "Take photographs of the fossils or rubbings from display specimens, but leave the fossils where you find them," it warned. The parks service believed that since any person or group was eligible to get a permit, it was not an impediment to

[55] Interview with Randle Robertson, 2022.

site access, according to an internal information package on the Burgess Shale. It gave staff an opportunity to brief hikers on the fossils and their regulations, though, and to direct them to the displays and handouts they were developing. [56]



Parks Canada Parcs Canada

Fossil Bed Access Permit

Permis d'acces aux Depots Fossiliferes

World Heritage Le patrimoine mondial

N° 037

Fossil Bed—*Depot Fossilifere*	Party Leader—*Chef de group*	No. in party *Nombre dans le group*
Vehicle licence—*N° d'Immatriculation*	Vehicle Make—*Marque*	Colour—*Couleur*
Parked—*Stationné*		
Home address—*Adresse domiciliaire*		Telephone—*Téléphone*
Local address—*Adresse locale*		Telephone—*Téléphone*
Starting time—*Heure de depart*	Returning time—*Heure de retour*	Date

Signature of Leader
Signature du chef de group

0 1 2 3 4 5 6 7 8 9

Take photographs of the fossils or rubbings from display specimens, but leave the fossils where you find them. This World Heritage cannot be replaced. It is illegal under the National Parks Act and Regulations to REMOVE or DAMAGE fossils. Your copy of the permit must be kept with you. Return it when you complete your trip. Park staff regularly patrol these areas.

Vous pouvez photographier les fossiles ou prendre des calques par frottement des exemplaires exposés, mais il est interdit de déplacer les fossiles. Ces articles du patrimoine mondial sont irremplaçables. Il est illégal, aux termes de la Loi et des règlements sur les parcs nationaux d'ENLEVER ou d'ENDOMMAGER des fossiles. Vous devez garder sur vous votre copie du permis. Remettez-la au bureau à la fin de votre voyage. Le personnel du parc patrouille régulièrement ces endroits.

see reverse—*voir au verso*

Bizarre looking creatures lived adjacent to a large reef at the edge of a shallow sea, 530 million years ago. Their fossilized remains and traces have been found where the ancient seashore bottom is now exposed as outcrops of shale rock. An astronomer stumbled upon the trilobite fossils on Mount Stephen in 1886 while surveying along the CPR route. In 1909, a second site containing an abundance of perfectly preserved fossils from soft-bodied creatures was discovered on the ridge joining Mount Field and Wapta Mountain. This site, known as the Burgess Shale became designated as a World Heritage Site in September, 1980. It is one of the most significant fossil sites in the world.

Des créatures étranges vivaient au voisinage d'un récif au bord d'une mer peu profonde, il y a 350 millions d'années. Leur dépouille et leurs traces fossilisées ont été découvertes là où l'ancien rivage de la mer est à présent exposé en affleurements de schiste. Un astronome a trouvé par hasard les fossiles trilobites sur le mont Stephen, en 1886, alors qu'il faisait les études de la ligne du Canadien Pacifique. En 1909, on découvrit un deuxième endroit qui contenait en abondance des fossiles parfaitement préservés de créatures au corps mou sur la crête qui joint le mont Field au mont Wapta. Cet endroit, connu sous le nom de "Burgess Shale" a été désigné en tant que site du patrimoine mondial en septembre 1980. C'est l'un des sites de fossiles les plus importants du monde.

REVERSE OF PERMIT

Figure 16: A sample permit included in an information package for parks staff. From: Burgess Shale Interpretive Management Unit Information Package, 1984.

[56] Burgess Shale Interpretive Management Unit Information Package, August 1984. *Development and Planning – Interpretive Planning – Concept and Unit Planning – Burgess Shale.* RG 84 – Parks Canada, Folder 8320/Y3-2-1-109 and ENV 1, Box 75, Vol. 1. LAC Winnipeg

Figure 17: "Fossil rubbings are an excellent souvenir, but only for hard-bodied fossils." From: Burgess Shale Interpretive Management Unit Information Package, August 1984. Development and Planning – Interpretive Planning – Concept and Unit Planning – Burgess Shale. Folder 8320/Y3-2-1-109 and ENV 1, Box 75, Vol. 1. RG 84 – Parks Canada, LAC Winnipeg, 5.

Figure 18: "Visitors searching for fossils at the Walcott Quarry." From: Burgess Shale Interpretive Management Unit Information Package, 1984, 7.

Interviewed for a BC travel magazine in 1983, the Royal Ontario Museum's Desmond Collins seemed to support this balance. "These fossils don't belong to anyone," he said. "And they shouldn't. They really belong to the people of the world. They should be left for future generations to pick up and look at and then to leave behind for later generations still. They should be there to tell everyone for all time about the beginning of the evolution of life."[57] Amazingly, for four years a small volunteer group gave up their weekends to talk to visitors at the trail head and on the slopes of the Mount Stephen, to see whether they were actually carrying permits and to educate them about the fossils. Field resident Shirley Green apparently led this volunteer team – called "Fossil Watch" – from 1982-1985, which park administration supported by covering basic expenses, providing brochures to distribute, and giving them pins to wear.[58] It

[57] Daniel Wood, "Discover BC: Spiny Thing Three," Westworld Magazine, October 1983, 63.
[58] Burgess Shale Interpretive Management Unit Information Package, August 1984. LAC Winnipeg

is not clear from the documents whether anyone besides Green signed up to do this work. According to Robertson, Green was an employee in the park superintendent's office who volunteered to do this work in her spare time. He remembers her doing this job alone, and that she was given a radio and orders to call in issues rather than confront people on the trails. Robertson describes her as combative and outdoorsy – "a big hiker" with "great sincerity and integrity."[59] Regardless of the official guidance Green may have been given not to confront hikers directly, it is easy to imagine she encountered hostile visitors unhappy to be approached about permits and the legality of fossil collecting.

This permit system – and the Fossil Watch program – came to an end in August 1986, when the trails were closed for unaccompanied visitors.[60] Evidently this was one outcome of the creation of Yoho's management plan, which was expected to classify the main Burgess Shale sites as Zone One special protection areas.[61] Parks staff offered three guided interpretive walks per week in the summers, which all fully booked up. "With closure of the fossil beds to public accession in 1986," a 1987 funding proposal noted, "there is increasing demand for educational materials about the fossils, and visitors are demanding to see specimens."[62] Throughout the 80s, Yoho staff asked Parks Canada's Western Regional Office for funding to improve interpretation with new indoor and outdoor exhibits, brochures, educational aids for interpreters on the hikes, and media kits for tour bus operators. Even after the Burgess Shale was absorbed into the Canadian Rocky Mountain Parks World Heritage Site in 1984, staff pointed to the original

[59] Phone conversation with Randle Robertson, November 1, 2022
[60] Environmental Assessment and Review Process: Burgess Shale Media Implementation, December 5, 1986. *Projects – Burgess Shale OSX Master*, Folder 4061/Y3/85329, Box 19, Vol. 1. RG 84 – Parks Canada, LAC Winnipeg.
[61] Burgess Shale Interpretive Management Unit Information Package, August 1984. LAC Winnipeg
[62] PIP: Burgess Shale IMU, January 15, 1987. *Projects – Burgess Shale OSX Master*, Folder 4061/Y3/85329, Box 19, Vol. 1. RG 84 – Parks Canada, LAC Winnipeg.

designation to demonstrate the need to fund these projects. One funding proposal stated: "At present the park provides only seasonal guided walks, seasonal theatre shows, a photo-copied handout, and a poorly designed fossil display, for Canadians wishing to learn about this important part of their heritage."[63] A museum gallery in Toronto did not, it turns out, satisfy the desires of all visitors seeking contact with the fossils.

This is how a system emerged where members of the public can only visit these sites with a permit, or on an interpretive hike led by Parks Canada or the Burgess Shale Geoscience Foundation. The Burgess Shale site restrictions emerged because Parks Canada was not as prepared for visitor traffic as Peter Bennett had hoped, and staff on the ground believed this was the only practical way to cut down on fossil theft.

Scientists already needed permission from Parks Canada to scout or remove fossils, but the World Heritage designation apparently made access even more difficult. As discussed in the previous chapter, Collins' team from the ROM struggled to get permission to collect fossils for the museum's gallery in the early 70s until they limited their request to collecting specimens from the talus pile at the Walcott Quarry, secured the endorsement of the Geological Survey of Canada (GSC), and tailored the language of their request to better match Parks Canada's focus on wilderness preservation and building Canadian national identity. Around the time of the World Heritage designation, Collins team applied for permission to return to scout for new sites and actually excavate fossils in Yoho.[64] Collins told the *Calgary Herald* that he was worried the new designation "might hamper exploration in the future."[65] It is true they weren't allowed to use

[63] PIP: Burgess Shale IMU, January 15, 1987. LAC Winnipeg
[64] Collins, "A Brief History," 22.
[65] Bruce Patterson, "Yoho Park fossils on worldwide list of heritage sites," *Calgary Herald*, July 17, 1981.

dynamite when they asked, but the ROM teams got permission to look for new sites and to actually excavate new specimens, as discussed in the previous chapter.

Todd Keith is the current Parks Canada land use manager for Yoho, Kootenay National Park, and Lake Louise. In an interview over the phone, he told me that all known Burgess Shales in Yoho today are classified as Zone I Special Preservation areas by default, and the Walcott Quarry is in an area classified as Zone II – Wilderness, "intended to be left in a natural state with minimal human interference," he explained. Keith said he believes there are trade-offs to the site restrictions. It puts a burden on their staff to maintain the closures and communicate them to the public, and it limits visitors' freedom to engage with this landscape on their own terms, at their own pace. Still, he told me the restrictions are basically necessary because enforcement is so difficult for Parks staff trying to prevent fossil theft. Keith added that part of the scientific value of these fossils is where they are in the rock – literally which layers are on top of what – and removing fossils destroys that value. He also said that the experience I had – of being in awe of stepping all over trilobite fossils – is part of what they're trying to protect too.[66]

Not every fossil bed in a World Heritage Site limits site access to prevent fossil theft and protect this type of visitor experience. One factor may be how easy it is to remove the fossils. Keith previously worked at Newfoundland's Gros Morne National Park, for example, also on the World Heritage List. He did not recall situations where areas were closed to protect the fossils in the park. "They weren't loose from my recollection," he told me, "they were mainly in outcrops, so you couldn't really get them without doing some hammer and chisel work."[67]

[66] Interview with Todd Keith, 2022.
[67] Interview with Todd Keith, 2022.

Closer contact with fossils is also possible at Nova Scotia's Joggins Fossil Cliffs, added to the World Heritage List in 2008, which hold evidence of Carboniferous era forests, giant invertebrates, and the oldest known reptiles in the world. It is a slice of the Pennsylvanian or Late Carboniferous period, from around 310 million years ago.[68] The tilted arrangement of the fossil and coal layers there was studied by modern geology founder Charles Lyell, used as evidence in the first debates on evolution, and was cited in Charles Darwin's *On the Origin of Species*. The cliffs are part of the Bay of Fundy coastline, where tides rise and fall between 12 and 16 metres.[69] Hiking out there in 2022 with our friends and their dog was fascinating for me, having lived most of my life on the prairies. I was not used to thinking of the rhythm of tides, but our guide kept pointing out how much more of the beach was exposed within just the couple of hours we were there. He gave us hardhats to wear, because the intense tides are part of the reason new fossils are always emerging at Joggins: the waves are constantly ripping away at the cliffs. We would see half of an ancient tree trunk embedded halfway up the cliff, and we would also see many around us that had fallen and shattered out of those rocks.

The non-profit Joggins Fossil Institute runs a museum just above the cliffs.[70] On the beach, though, a combination of local and provincial laws prohibit construction, mineral exploitation, and land uses that might interfere with the erosion processes "or the aesthetic qualities of the views and natural vistas along the shoreline."[71] Nova Scotia's Special Places

[68] Calder, *The Joggins Fossil Cliffs*, 7.
[69] Government of Canada Parks Canada Agency, "World's Highest Tides - Tides in Fundy National Park," March 17, 2023, https://www.pc.gc.ca/pn-np/nb/fundy/nature/environment/marees-tides.
[70] Melissa Grey and Deborah M. Skilliter, "Collections Management at the Joggins Fossil Cliffs UNESCO World Heritage Site; a New Model?," *Geological Curator* 9, no. 5 (May 2011), 276.
[71] J. Boon and John H. Calder, "Nomination of the Joggins Fossil Cliffs for Inscription on the World Heritage List" (United Nations Educational, Scientific, and Cultural Organization, January 2007), www.whc.unesco.org/en/list/1285/documents, 15.

Protection Act only allows fossil collection by scientists with a Heritage Research Permit, so members of the public cannot collect common loose fossils, as they can at the UK's Dorset and East Devon Coast World Heritage Site.[72] The provincial government's logic in not allowing amateur collection of common fossils is that it is difficult or impossible for casual collectors to know whether they're looking at something common, rare, or one of a kind.[73] This is one of the most interesting ironies of the site as it is managed today. Visitors are welcome to walk down the beach on their own, so there is an understandable risk of visitors removing important and unusual fossils, but twice a day the Bay of Fundy tears many of those same rocks into the water.

Interestingly, not every Burgess Shale bed has limited access. Surveys by ROM teams have identified over a dozen new Burgess Shale sites beyond the Walcott Quarry and Mount Stephen Trilobite Beds.[74] One of the best known is near Stanley Glacier, in nearby Kootenay National Park. Keith told me a debate emerged about what to do when a team led by paleontologist Jean-Bernard Caron identified interesting fossils below the glacier in 2008:

> [We] thought, well, so are we going to close that area or do we just kind of not say too much about it? So what we ended up doing is we went in and had a look at it with Jean-Bernard and felt that the risk of losing stuff, particularly important scientific stuff, was quite low. Given that the rock, the shale there is quite hard, it was difficult for them to excavate and split, and they didn't leave much behind from the work they did.[75]

Another consideration, according to Keith, was the size of the valley and its popularity with hikers. They decided the area was too big to effectively monitor, so instead of closing it, Parks

[72] Jurassic Coast Trust Trading Co, "Fossil Collecting," Jurassic Coast Trust, accessed December 7, 2023, https://www.jurassiccoast.org/fossil-collecting.
[73] Calder, *The Joggins Fossil Cliffs*, 48.
[74] Collins, "A Brief History," 23.
[75] Interview with Todd Keith, 2022.

Canada has focused on putting up signs and leading interpretive hikes notifying visitors about the importance of the fossils, and how to report suspicious activity.[76]

Given his role in extending the definition of the Burgess Shale, Caron has a unique perspective on these site restrictions. Although the restricted area boundaries haven't caught up with the new sites the ROM teams have identified, he says they serve their purpose in allowing people to realize they're in a special place somewhere like the Walcott Quarry. "Since we know now that there are fossils in many different places, the problem is how to protect these zones all at once," he adds.[77] Holding back from creating protected areas is also a strategy to avoid advertising them. He worries about people following in his footsteps to steal fossils, like a Quebec resident who was fined $20,000 in 2022 for taking 45 fossils from Yoho, Kootenay, and Jasper national parks.[78] The most surprising part to Caron was that some of them were taken from a site he discovered in Marble Canyon, which has no trail.

I have heard Keith and a Parks Canada interpreter at Stanley Glacier tell me the same story about *Ovatiovermis cribratus* in scientific defense of this system. Back in 2011, a visitor on one of the guided hikes picked up a rock and saw a tiny fossil, which looked a bit like a smushed shrimp. He apparently thought it might be an animal called *Hallucigenia*, which is pretty rare. The interpreter brought it down to the Parks Canada office in Field. At the end of the season, Keith showed it to Caron. The paleontologist was reportedly in awe, because he had just submitted a scientific paper describing a new species found in the Walcott Quarry –

[76] Interview with Todd Keith, 2022.
[77] Email from Jean-Bernard Caron, 2023.
[78] The Canadian Press, "Parks Canada Recovers 45 Fossils Stolen from Burgess Shale, Levies $20K Fine," Toronto Star, May 12, 2022, https://www.thestar.com/news/canada/parks-canada-recovers-45-fossils-stolen-from-burgess-shale-levies-20k-fine/article_80443c00-4d93-5b80-a7be-d3f504ff893d.html.

Ovatiovermis cribatus – from one specimen, and this would be the second.[79] The moral of this story, I believe, is: sure, if you come to Yoho, it might be a bummer you can't hike up to the fossil beds on your own, but you can still have a cool experience. If you don't go rogue and you don't pocket what you find, you are embedded in a system of scientific expertise, and maybe you can contribute something to the conversation too.

Anxieties about fossil theft are understandable. Yet by leaning on the idea of wilderness to protect the Burgess Shale, I wonder if Parks Canada has overly limited opportunities for visitors and scientists to feel some of the most powerful things about fossil sites: first-person contact with ancient relatives, and a way to see ourselves as part of nature.

In their book *Inhabited*, Philip and April Vannini have considered the ways in which Canadians value a sense of "wildness" at UNESCO-designated natural heritage sites. "Wild places are central to Canadian culture, identity, and history," they note, and in Canada "the notion of wilderness evokes images of vast, remote, and untouched landscapes and seascapes." For many Indigenous peoples, they add, the term is just a colonial invention: "'wild' places are the places that they have always called home, their land, places of which they have been dispossessed."[80] Park zoning and World Heritage designation made it ever more important for Yoho staff in the 1980s to reify the idea of "untouched" wilderness at the Burgess Shale sites. This idea is certainly part of their attraction for many tourists, but sits uneasily with Yoho's history as a homeland for Indigenous peoples, and with the Burgess Shale's recent history as a site where scientists blasted and chiseled so much rock out to better understand nature.

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[79] Interview with Todd Keith, 2022; Mary Beth Griggs, "Scientists just found a 500-million-year-old worm with legs," Popular Science, February 1, 2017;

[80] Phillip Vannini and April Vannini, *Inhabited: Wildness and the Vitality of the Land* (Montreal: McGill-Queen's University Press, 2021), http://ebookcentral.proquest.com/lib/ualberta/detail.action?docID=6728660, 6.

Vannini and Vannini argue that there is, in fact, no one nature: "Nature is instead something that you do; it is something that you perform as you engage with it."[81] There is no one right way to perform it either, they say. Walking on the glass-covered Glacier Skywalk to see the Columbia Icefield, playacting as a Centrosaurus on an interpretive hike at Dinosaur Provincial Park, and watching a fisherman clean a cod at Gros Morne National Park: they see each as a pathway into understanding a landscape, and argue that by seeing even hiking as an act of performance, we can begin to see ourselves as part of the landscape when we do it too. "It is logical to categorize a place as a wilderness is you are unfamiliar with it. But as you begin to 'do' a place […] a wilderness eventually begins to feel like home."[82]

At the Burgess Shale and many other fossil sites on the World Heritage List, nature is more than the fossils themselves: it is also a performance of scientific research and visitor hikes. Offering room at these fossil sites to recognize these sites as part of cultural landscapes too, and leaving space for amateur collecting, could benefit many people already alienated from nature, who need so many more points of contact with wild things and the living world.

A last note about naming: Caron and his colleagues have given the name *Yawunik kootenayi* to an arthropod found in the Marble Canyon fossil beds, to recognize the local Ktunaxa peoples. The genus name *Yawunik* is a latinized version of *Yawu?nik'*, a sea monster who plays a crucial role in Ktunaxa creation stories. The species name *kootenayi* is derived from

[81] Vannini and Vannini, *Inhabited*, 121.
[82] Vannini and Vannini, *Inhabited*, 134.

Kootenay, a variation of the name Ktunaxa, as well as the name of the mountain region and the national park where the fossils come from.[83]

* * *

As UNESCO began accepting nominations to the World Heritage List in the late 1970s, Canadian heritage officials were eager to gain the prestige, tourism, and conservation incentives of adding sites to the list. Nominations were delegated to Parks Canada staff, who worried that Canadian cultural sites would not be perceived as having "outstanding universal value." While the World Heritage Convention allowed for "mixed" sites, they worked within the authorized heritage discourse's strict boundaries between natural and cultural heritage, and considered the Burgess Shale a superlative example of natural heritage. The World Heritage Site process then dictated the nomination would be evaluated by IUCN – an environmental conservation-focused agency that privileged the opinions of scientists. Paleontologists supported this nomination by drafting its text, adding at least one letter of endorsement, and advising the IUCN to endorse the nomination. After the designation, rising tourism and fossil theft led Parks Canada staff to restrict access to these fossil beds, with complicated implications for human relationships with knowing the fossils themselves.

From a scientific perspective, the World Heritage designation seems to have massively raised the profile of the Burgess Shale. Books like Stephen Jay Gould's *Wonderful Life* in 1989 made the site and its fossils world famous. ROM scientists have done decades more work in Yoho and Kootenay Park, near the Walcott Quarry but also in "new" Burgess Shale beds

[83] Cédric Aria et al., "A Large New Leanchoiliid from the Burgess Shale and the Influence of Inapplicable States on Stem Arthropod Phylogeny," *Palaeontology* 58, no. 4 (July 2015): 629–60, https://doi.org/10.1111/pala.12161; Ktunaxa Nation, "Creation Story: Ktunaxa Nation," accessed December 11, 2023, https://www.ktunaxa.org/who-we-are/creation-story/.

previously unknown to scientists. The World Heritage Site designation for these two little slopes expanded in 1984 to encompass four national parks (and now three more provincial parks) in the Canadian Rocky Mountain Parks natural heritage site.

Most sites on the World Heritage List are cultural sites. Natural heritage sites are rare, and places recognized for their geological or paleontology value even more so. In 1996, the IUCN asked Australian paleontologist Roderick Wells to provide a framework for evaluating new World Heritage List candidate sites focused on earth's geological history. Wells concluded that sites should be selected based on their significance in telling the story of evolution, and particularly that "[t]he 'events' to be represented in the history of life should where possible, encompass the iconography of a tree of life not a ladder of progress."[84] He pointed to many under-represented "events" on the World Heritage List, like the evolution of fresh water and terrestrial invertebrates, but pointed to the Burgess Shale as a significant site for telling the story of "the Cambrian explosion in body plans" in marine environments.[85]

According to Parks Canada, Ktunaxa and Secwépemc First Nations are now involved in management planning for Yoho, though not specifically for the Burgess Shale.[86] Authors Cody Groat and Kim Anderson note that the strict division between natural and built environments in Canadian and international public history does not reflect Indigenous ways of knowing-maintaining. The Burgess Shale and Canadian Rocky Mountain Parks nominations to the World Heritage List failed to mention any of the Indigenous groups that have occupied these mountains. Groat and Anderson call this "a good example of missing the mark on relationality": what they

[84] Roderick T. Wells, "Earth's Geological History : A Contextual Framework for Assessment of World Heritage Fossil Site Nominations" (IUCN, February 1, 1996), https://www.iucn.org/content/earths-geological-history-a-contextual-framework-assessment-world-heritage-fossil-site-nominations, 12.
[85] Wells, "Earth's Geological History," 22.
[86] Interview with Todd Keith, 2022.

define as "what informs time and holds us through the generations–those relations between human, natural, and spirit worlds."[87] Only recently have the Canadian government and UNESCO begun to recognize Indigenous cultural landscapes. Pimachiowin Aki, a wetland and boreal forest site incorporating Anishinaabeg communities in Manitoba and Ontario, became Canada's first mixed World Heritage site in 2018.

Whether there is enough space left at the Burgess Shale for humans to know nature is worth wondering as the World Heritage List continues to grow, with new fossil beds on the horizon.

[87] Groat and Anderson, "Holding Place," 480-481.

Conclusion

In this thesis, we have journeyed through a century of collecting in Yoho to understand how scientists gained access to the Burgess Shale and permission to remove specimens. Historians like Ramachandra Guha and Harriet Ritvo have argued that scientists sometimes get an outsized voice in claiming space for parks and empires, and in determining who is allowed to enter. The case studies here show that paleontologists and geologists negotiated access to the Burgess Shale by building alliances between institutions, showing their value in attracting tourism, and facilitating wildlife exchanges. They also tapped into the discourses of heritage, nationalism, and wilderness. In turn, the arguments and tactics they used influenced the park's development.

Scientists' relationships with the Burgess Shale fossil beds, and the negotiation tactics they used, changed dramatically throughout the twentieth century. Between 1907 and 1925, the Dominion Parks Branch does not seem to have had the explicit authority to limit scientists' access to the Burgess Shale or collecting activities there, and both the parks agency and the Canadian Pacific Railway Company (CPR) saw the fossil beds as a resource to promote tourism in Yoho. Nevertheless, given the cost of travel and operating a summer field camp, Charles Doolittle Walcott, Mary Vaux Walcott, and the rest of the Smithsonian Institution team had an easier time accessing the space because of Charles' authority as Secretary of the Smithsonian and their status as white upper-class lovers of the outdoors. They also made their work easier and cheaper by doing favours for CPR and park authorities, like arranging for swaps of elk and sheep between American and Canadian parks and promoting mountain tourism through writing and photography.

Collection and research by scientists like Walcott massively transformed our collective understanding of the origins of life, and offered a rich and unique window into Cambrian ecosystems. In turn, these scientists' presence helped the CPR and the Dominion Parks Branch legitimize their presence in the Rocky Mountains. One way Walcott did this, like the Victorian taxonomists studied by Ritvo, was by giving the species Linnaean names derived from places like Laggan, Leanchoil, and Mount Odaray – all names recently added to the colonial map. Ktunaxa, Stoney, and Secwépemc peoples have called this place home for a very long time and continue to do so today. Walcott's deference to settler-colonial maps, though – and the mythology of Helena Walcott "stumbling" upon a fossil slab on a trail above Emerald Lake – reinforced the idea that the Kicking Horse Pass was uninhabited before scientists "discovered" places like the Walcott Quarry.

By the early 1970s, the Dominion Parks Branch, now Parks Canada, had the explicit regulatory authority to require scientists to ask for permits before removing fossils from parks like Yoho. Paleontologists at the Royal Ontario Museum (ROM), led by Desmond Collins, failed in their first attempt to acquire a permit. This was mostly because of a letter from the Geological Survey of Canada (GSC) that dismissed the display value of the remaining fossils and spoke to Parks Canada's growing interest in preserving "untouched" wilderness. Collins was successful in his second attempt because he gained the endorsement of the GSC, and because he invoked the discourse of nationalism to convince Parks Canada that his museum's work would be in the national interest – an interest which both institutions shared.

In field work and in negotiations like this, scientists created a heritage resource and icon of Canadian identity for many actors to struggle over, including future generations of paleontologists and geologists, hikers and rockhounds, recreation groups, educators, the GSC,

and parks and heritage officials. Scientists' work built global recognition of the significance of these fossils for understanding the evolution of life. ROM collecting efforts led to the development of high-quality museum displays where the public can understand the fossils, their setting, and what they tell us about the Cambrian and the evolution of multicellular life.

The ROM's collection and displays, together with re-examination of fossils done by the GSC and paleontologists at the University of Cambridge, made the Burgess Shale an attractive candidate as one of Canada's first nominations to the UNESCO World Heritage list. Scientists supported this nomination by helping supply its text, illustrations, and endorsements. Since the authorized heritage discourse and the World Heritage Convention invested most decision-making power over natural heritage nominations in scientists, their support was essential in making this nomination succeed. Scientific support for the Burgess Shale's nomination to the World Heritage list raised Canada's prestige and image as a state with a deep past and unique nature.

The World Heritage Site designation, along with the photography and writing of scientists like Walcott, Vaux, Collins, Gould, and Simon Conway Morris, attracted more visitors than ever before, seeking contact with the deep past they described, in context on the mountainsides. Park staff responded to increased numbers of scientists, visitors, and fossil "thieves" by making it more difficult for all of them to access the site. They did so by using explicit regulatory authority that allowed them to require permits before collection, by exercising the superintendent's authority to limit access to sensitive areas, and by tapping into the familiar discourses of wilderness, nationalism, and authorized heritage.

This thesis suggests that although paleontologists' actions and relative power among other groups did not rise to the level of "authoritarian" in Yoho, they did support a colonial parks system which restricted access to these unique remains of our ancient marine relatives. I hope

this study contributes meaningfully to the historical literatures of science in Canada, the authorized heritage discourse, parks and wilderness, and protection of fossil sites. There are many rich topics for future historical studies about the Burgess Shale, including Indigenous perspectives on the fossil beds, how the Burgess Shale Geoscience Foundation started leading guided hikes and attempted to build an education centre in Field, the emergence of paleoart of the Burgess Shale fauna, and how the ROM's presence has affected other scientists' ability to access the Burgess Shale.

After all this discussion of *how* fossils were managed in a national park, I want to keep in mind why it matters. One reason park managers protect fossil sites is because they are trying to fulfil their mandate to preserve them: "to leave them unimpaired for the enjoyment of future generations."[1] In this thesis' introduction, we considered David Spalding's lament that a park would probably have protected dinosaur footprints in the Peace River canyon from being flooded out by a hydro dam in the 1970s. These case studies suggest he was correct. Yoho's status as a national park provided a legal framework to prevent fossils in the Burgess Shale from being damaged or removed, while facilitating access for paleontologists and public education. The same would likely have been the case for the Peace River trackways. Making a place a park doesn't necessarily protect fossils though, cautions John Acorn.

The main reason he identifies is the relentless process of erosion. Rain, ice, wind, tides, and landslides gradually reveal new fossils and degrade existing ones over time. Another dinosaur trackway in the Peace River canyon, Acorn points out, slumped into a river on its own. "You're protecting this brief interval geologically between the exposure of a fossil on the surface

[1] Canada National Parks Act, https://laws-lois.justice.gc.ca/eng/acts/N-14.01/ (accessed December 7, 2023)

and its demise through erosion," he says. Unless there is continual renewal of visible fossils capable of serving as a "heritage resource," he muses, it's not such a bad idea to move them to a museum.

"Or just to admit to yourself," says Acorn, "which very few people ever do, that in some sense these things are super interesting but transient. And the example I like to use is sunsets. I mean, there's lots of places in parks where the sunsets are extremely beautiful, but no one has this delusion that they can preserve the sunsets other than photographically, right? You just know that it's a renewable process. Some nights you get a good one and some nights you don't, and the clouds being what they are, they're never quite the same. But somehow, we expect lots of other aspects of the of the non-human world not to behave like sunsets. We expect them to just sit there and be important for us. And that if we respect them, they'll somehow respond by being there for us. It's kind of a weird expectation."[2]

Another one of the most fundamental reasons to protect fossil sites is that as records of ancient ecosystems, they can help us understand nature. Again though, park values and regulations can limit this work. Stephen Jay Gould has argued that blasting hillsides and digging out specimens is a form of knowing and listening to ancient species. Walcott and his team regularly used dynamite in the Burgess Shale. Ellis Yochelson explains that such explosive techniques would have been helpful because the shales at the Walcott Quarry are gently inclined back into the mountainside, so accessing big pieces with large and complete specimens would require removing quite a bit of overburden.[3] Dynamite can certainly expedite the process. Recall that field work was a family affair for Walcott and his family, and at least one of the children

[2] Interview with John Acorn, August 2023.
[3] Yochelson, "Discovery," 487-8.

joined in each year until 1918.[4] In Walcott's field notes, Yochelson finds references to his children taking the horses from their field camp at the Burgess Shale outcrop "down to Field for mail or supplies."[5] On August 27, 1910, "supplies" included explosives. Walcott wrote:

> Out with Stuart all day. A few rare finds & Helena found some good things. Sidney & Helen went to Field for dynamite and mail. Cool, smoky day.[6]

For many reasons, sending teenagers into town to grab dynamite would no longer fly. All known Burgess Shales in Yoho today are classified as Zone I Special Preservation areas by default, and the Walcott Quarry is in an area classified as Zone II - Wilderness.[7] Parks Canada's Guiding Principles and Operational Policies state that Zone II areas "are good representations of a natural region and […] will be conserved in a wilderness state. The perpetuation of ecosystems with minimal human interference is the key consideration."[8] During the ROM expeditions, Collins and Dale Russell asked for permission to use explosives in the Walcott Quarry. According to Collins, "After public review, which was negative, the joint request was denied."[9] In our interview, Parks Canada's Todd Keith told me that he would probably make the same recommendation today. "It's not consistent with our wilderness policy of minimal human interference," he said. He also did not believe it was a good scientific approach, because explosives could leave you with a jumble of rock, making it hard to see which layer the fossils came from, and thus how the organisms changed over time. When the GSC team used dynamite to open up vertical cracks, they mitigated this risk by using smaller charges.[10]

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[4] Yochelson, "Discovery," 473-4.
[5] Yochelson, "Discovery," 486.
[6] Yochelson, "Discovery," 486.
[7] Interview with Todd Keith, 2022.
[8] Government of Canada Parks Canada Agency, "Guiding Principles and Operational Policies - Parks Canada Guiding Principles and Operational Policies," September 9, 2008, https://www.pc.gc.ca/en/docs/pc/poli/princip/sec2/part2a/part2a4.
[9] Collins, "A Brief History," 27.
[10] Whittington, *The Burgess Shale*, 20.

This is not a very incendiary issue at the moment, since paleontologists currently working in the Burgess Shale prefer using hand tools. As a middle-class urbanite who loves the look and feel of "wilderness" in these places, I can sympathize with the aesthetic and scientific arguments for limiting the use of dynamite, and restricting access to prevent every fossil from disappearing into a backpack. But these relatively hands-off approaches are not the only ways to know nature.

Vincent Santucci, Peter Newman, and Derrick Taff have identified a broad range of values that humans place on fossils, including "scientific, educational, recreational, spiritual, commercial, and even aesthetic values."[11] The fact that they are non-renewable is part of what gives them value both for scientists and for commercial interests. Fossils can create or reinforce identity, like through state or provincial fossils. Colour, detail, and symmetry can evoke aesthetic connections with fossils. They can have recreational value as destinations for family vacations, their sale can be very lucrative, and they can be part of spiritual ceremonies and beliefs. On our visit to the Joggins Fossil Cliffs in Nova Scotia, our guide told us it used to be so common for people to take forearm-thick *Stigmaria* roots home that locals called them Joggins doorstops.

Something keeps compelling scientists and hikers to come see and take fossils from the Burgess Shale. For some, they are objects of research, teaching tools, or mementos of a challenging and beautiful experience. I suspect that just as many feel what I felt when I held that *Anomalocaris* claw in the Walcott Quarry: a sense of awe meeting a distant relative, a sense of falling through deep time, and a powerful desire to hold onto that feeling for as long as we can.

[11] Vincent Santucci, Peter Newman, and Derrick Taff, "Toward a Conceptual Framework for Assessing the Human Dimensions of Paleontological Resources," *New Mexico Museum of Natural History and Science Bulletin 74* (September 1, 2016), 239.

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