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# O'Hara 2009

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## A Lake Nestled in Deep Time

Lucky geologist! The view across Lake O'Hara is outstanding. Here is what it represents.

### Late Proterozoic to Early Cambrian (740–513 million years ago)

The story began with North America departing from the supercontinent of Rodinia. A predecessor of the supercontinent of Pangea, Rodinia formed about a billion years ago. Now it was breaking up. One of the major fractures (rifts) opened along a line running through what is now central British Columbia. Everything west of that drifted away to become Siberia. (Eventually B.C. re-acquired its western half from elsewhere.)

Rodinia drifted apart during the world's greatest ice age, the Cryogenian Period, 850–630 million years ago. Every continent was covered with glaciers, and the surface of the ocean may have been frozen from pole to pole. The great ice sheets generated a lot of eroded debris and dragged it to the sea, where enormous quantities of mud and stones were dumped into the ocean along the newly torn-off continental edge.

These coarse sediments hardened into several kilometres of layered gritstone and slate. Today we know the whole works as the Miette Group. If you were to drill downward from Lake O'Hara for a couple of hundred metres, you would hit the top of the Miette Group, but let's not be doing that in the national park, especially when you can see the Miette Group very conveniently along the TransCanada Highway near Lake Louise.

Overlying the Miette Group is the Gog Group, a kilometre of pinkish Early Cambrian quartzite. This is the hardest rock in the Rockies. It began as soft sand, but it was *quartz* sand, and quartz ranks seven out of ten on the mineral-hardness scale. In the Gog Group, the sand is stuck together with yet more quartz, turning it into sedimentary quartzite, very tough.

Gog quartzite is seen at its best in the cliffs along the north shore of the lake. Back in 1972 I climbed a crack there and dang near fell off several metres above my last piton. Scary! Especially for my wife, belaying me from the trail. But it all ended well, and we celebrated with supper at the lodge, yum.

Back to the Early Cambrian. The edge of the continent was slowly sinking and the sand supply seemed endless, so the Gog Group, like

the Miette Group, grew quite thick. Worms and trilobites burrowed and scuttled in the seabed sand; their tracks and trails are scrawled across the ancient quartzite slabs.

### Middle Cambrian (513–501 million years ago)

Sea level was on the rise in the Cambrian, especially in the Middle Cambrian. Eventually the shoreline crept inland all the way to Manitoba–Winnipeg's first flood—leaving our area well out to sea. No Rockies yet; think of the Grand Banks, only much wider. This far from shore the water was clear, warm (North America was near the equator) and shallow (never more than about a hundred

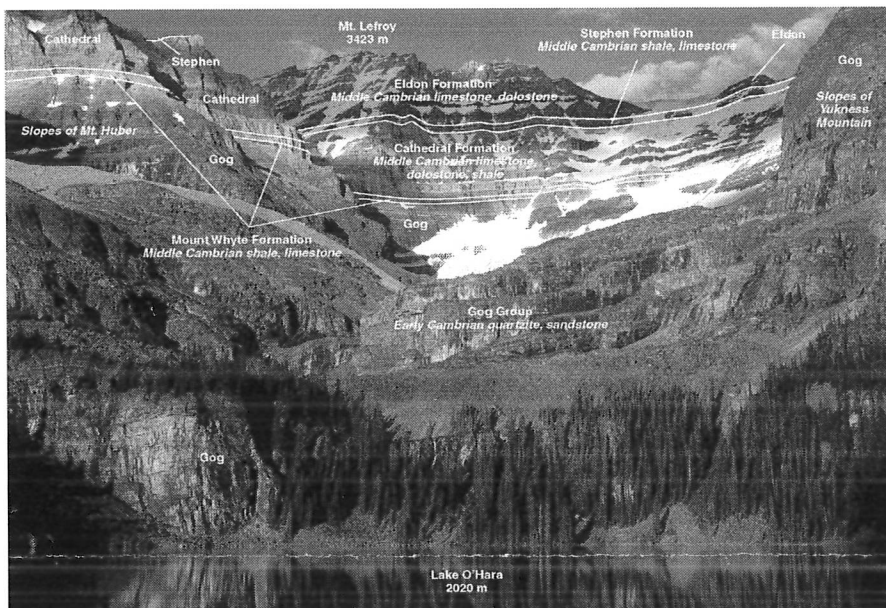
metres deep)—a terrific environment in which to make limestone. A great variety of floating, sedentary and swimming sea organisms formed lime crystals inside their cells or coated themselves with lime to form protective/supportive crusts, skeletons, shells and what not. So lots of limestone was deposited, beginning with the shaly limestone of the Mount Whyte Formation, about 60 m thick, then the massive gray limestone of the Cathedral Formation.

Under the right conditions, sea life will go on making limestone,

covering the continental shelf with it and building up deposits nearly to the surface. That is what happened here. But recall that the shelf was sinking all the while, so instead of making a hundred metres of limestone and having to quit because they were at the surface, the limestone-makers could continue, keeping in step with the subsidence. This is how 350 m of Cathedral limestone came to be deposited in less than 100 m of water. Some of this 350 m is dolostone, often called "dolomite" after the main mineral in dolostone. Dolomite is similar to calcite, but magnesium has been traded for some of the calcium, perhaps also by organic means.

After the Cathedral limestone was deposited, sea level took a jump upward. The faraway shore began moving eastward again, eroding the land, and bottom currents brought a layer of mud out across the shelf. This is now the shale of the Stephen Formation.

Eventually the shoreline stabilized, the muddy currents abated and organisms got back to making limestone again, this time producing the Eldon Formation, which is a lot like the Cathedral but thicker—530 m—and even more solid. It is Eldon rock that forms the summits of Mts. Lefroy, Huber, Victoria and Biddle;



Geology of Lake O'Hara, as viewed from Sargent's Point. Photo: Stan Munn.

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Odaray Mountain, Glacier Peak and Hungabee Mountain. Ringrose Peak and the southeast summit of Mt. Schäffer are of Cathedral rock, while Yukness Mountain is Gog right to the top.

Gog, Mount Whyte, Cathedral, Stephen, Eldon—these are all of the layers seen from the lake. The Miette is also important to our story, but it lies unseen under the lake. We needn't deal with the five kilometres of sedimentary rock deposited on top of these units before the mountains were built, except to say that it has all been removed in bits and pieces by erosion. In fact, twice that thickness of rock has been sent down the river. Say what? Yes, a greater thickness of rock was removed than was originally laid down. This is because thrust-faulting and folding during mountain-building thickened the stack considerably.

#### **The scenery arrives (100–55 million years ago) and undergoes a makeover**

I'll finish up by noting that the whole pile was shoved many kilometres northeastward of where it was originally deposited—more thrust-faulting—and that when it was over, the landscape still looked quite different than it does today. Imagine a high plateau, like that of Tibet, cut with a network of canyons deeper than that of the Fraser River. It took another 52 million years of erosion by water and three million years of erosion by glacial ice to produce the scene in the photo.

Lake O'Hara is probably a tarn, filling a glacially carved bowl like that of Lake Oesa or Lake McArthur, or it may be impounded behind glacial debris or even rock slides. Hmmm. Guess I'll have to head up to O'Hara this summer for some more geo-snooping.

*Ben Gadd, 2009. Much more geology can be found in Ben's latest book, Canadian Rockies Geology Road Tours. You can learn more about Ben at [www.bengadd.com](http://www.bengadd.com).*

perspective, for billions of years prior to this event life on Earth was essentially limited to a soup of bacteria and algae.

#### **Amazing & Awe-inspiring**

Most definitions agree: a natural wonder should be amazing, awe-inspiring and help instill a sense of awe. To that end, the Burgess Shale truly over achieves. Exquisitely preserved soft-bodied animals found at the Burgess Shale are thought to be amongst the earliest ancestors of modern-day animals. In fact, approximately 95% of all living animals can trace some of their earliest relatives back to the Burgess Shale, including snails, octopi, crabs, lobsters, clams, spiders, insects, sea stars, earthworms and, remarkably, humans.

#### **The Burgess Shale is Mysterious**

Finally, a natural wonder should provide people with an element of mystery. Whether it's the appearance of bizarre 5-eyed animals or answers to questions like why some animal groups have survived while others have perished, any way you look at it, the Burgess Shale is full of mystery. Moreover, even though scientists have been studying Burgess Shale animals for 100 years, fascinating discoveries continue to be made. For example, in 2006, researchers from the Royal Ontario Museum identified an animal that may be the earliest living snail. Still, many mysteries remain unsolved, leaving us to wonder what the next great Burgess Shale discovery will be.

#### **It's Worth a Visit to the Burgess Shale**

Today the Burgess Shale is protected within a UNESCO World Heritage Site, which is only accessible through guided hikes led by either Parks Canada or the Burgess Shale Geoscience Foundation. Celebrate the centennial of Walcott's discovery and experience 505 million years of wonder by signing up for a guided hike today. Stop by the Parks Canada Visitor Info Centre in the town of Field for more info on guided hikes and other events celebrating the centennial of the discovery of the Burgess Shale.

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## **The Burgess Shale – 100 Years of Wonder**

The summer of 2009 will mark 100 years since the Burgess Shale was unearthed high in the back country of the Canadian Rockies. Steeped in serendipity, history, amazement, and mystery, the Burgess Shale is one of the planet's most important natural wonders. Here are a few reasons why you should consider visiting this 505-million-year-old fossil hotspot.

#### **A Serendipitous Discovery**

Like many great scientific findings (such as x-rays and penicillin), the Burgess Shale's discovery was completely serendipitous. In the summer of 1909, world-renown geologist Charles Walcott visited Yoho National Park in search of trilobites, common animal fossils that railway workers had found by the bucket load above the town of Field on Mount Stephen. Having identified and collected many of the trilobites, Walcott set his sights on exploring other parts of Yoho. Then on one fortuitous day late in August, on the western slopes of Mount Field, Walcott stumbled across what paleontologists refer to as the mother lode of all animal fossil beds—and the scientific community has been reaping the rewards ever since.

#### **Explosive History**

One thing natural wonders have in common is that they are likely to have some historical significance, be it geological or otherwise. At 505 million years of age, the Burgess Shale is older than the Grand Canyon, Great Barrier Reef, and Galapagos Islands combined and takes us back to a time when Canada was located near the Earth's equator and most of Alberta and British Columbia were still underwater. It also provides us with a glimpse into the Cambrian Period, when modern life is thought to have exploded and many of our present-day animal groups first appeared. To put things in



Anomalocaris, a mighty predator, was originally thought to be two smaller animals: one that looked like a shrimp and one that looked like a jellyfish. Eventually two fossils were located that fit together perfectly, illustrating that Anomalocaris was in fact a much larger animal. At up to 1 m. in length, Anomalocaris was likely the largest animal in the world's oceans 505 million years ago.

*Omar McDadi, Parks Canada*

## Traveling to O'Hara in 1909

It's hard to believe that 100 years has passed since the Alpine Club of Canada (ACC) held their annual mountaineering camp at Lake O'Hara for the very first time. In those days the most common modes of transportation were the horse and the iron horse (train), so simply making it to the lake was an adventure in itself!

Let's take the example of a camper arriving from Vancouver. The rail trip would typically take 2 to 3 days, which is a long time to make small talk with neighbouring passengers. Not to mention the discomfort of being dressed in one's very best formal clothes! In the days before sweat pants and casual wear, gentlemen would dress in full suits and top hats, while the ladies would garb themselves in corsets, bustles, fancy blouses and elegant skirts.

Despite the long journey, the train offered some truly spectacular views of British Columbia scenery, including the Fraser Canyon, Rogers Pass, and Kicking Horse Canyon. The last leg of the trip, Kicking Horse Pass, presented a bit of danger, due to Big Hill. The well-deserved nickname was given to the section of railway on the western slope of Kicking Horse Pass, between Wapta Lake and the town of Field. Two times steeper than the maximum allowed grade, the Big Hill was the steepest railway grade in all of North America! The hill was so steep that extra engines were needed to push trains on the way up and accidents were not uncommon on the way down. Despite a series of safety precautions, runaway trains occasionally derailed and crashed into the river below.

The Big Hill was eliminated on September 1st, 1909 when the Spiral Tunnels finally opened, replacing the dangerously steep track after 25 years of use. The ACC camp was from August 1st to 9th, so campers would have been among the last passengers to take the precipitous Big Hill route.

Upon arrival at Hector Station, passengers disembarked from the train and walked from Wapta Lake up to Lake O'Hara on the trail along Cataract Brook. While recounting the walk in the ACC journal, one woman described the effects of altitude as comparable to the feeling of someone sitting on her chest. Luckily for her, luggage was taken by packhorse, sparing campers the burden of additional weight as they hiked up to the lake.



Steam train in Kicking Horse Pass. Photo: Whyte Museum of the Canadian Rockies NA- 5413.

Once at Lake O'Hara, another adventure began. During the camp, visitors climbed peaks, led by Swiss Guides, sang songs around the campfire and heard the last speech given in the Canadian Rockies by legendary British climber, Edward Whymper.

One hundred years later, visitors still gather at Lake O'Hara in search of adventures, though getting there is a completely different experience now than it was in the days of the iron horse.

Join us all summer long as Yoho National Park, the Canadian Pacific Railway and the Friends of Yoho celebrate our proud railway history and the 100th anniversary of the Spiral Tunnels.

Kristy Putnam, Parks Canada. More information about centennial events is available at the Visitor Centre in Field and [www.friendsofyoho.ca](http://www.friendsofyoho.ca).

## Secrets of the Alpine Larch



Larches on Opabin Plateau. Photo: Nadine Fletcher

There is nothing more beautiful than the perfect fall day at Lake O'Hara. The gaze alights on the brilliant larch forest and the soul leaps in response, a smile of joy springs to the lips, it's an up-front, in-your-face experience of beauty. As the sun lights up the translucent needles, it seems impossible that the larch could be hiding anything but the larch has secrets that break all the rules and enable it to survive in some of the toughest environments in the Rockies.

To fully appreciate the larch, you need to know something about the competition – the evergreen. Evergreens practice a long-term “buy and hold” strategy; each needle is expensive to make but lasts a long time. The deciduous larch, in contrast, has adopted a short-term “buy and sell” strategy by making a cheap, disposable needle.

Is it better to invest in a long-term strategy of keeping your needles (buy and hold) or to put your energy into a set of needles that you throw away each year (buy and sell)?

You'd think evergreens, with their needles ready to go the moment spring temperatures are warm enough for photosynthesis, have more time to put on wood mass but this is one surprise of the alpine larch. They are equally successful, putting on just as much wood as evergreens immediately around them in the same growing conditions. What's the secret?

Secret # 1: Larch buds break dormancy early, budding out when air temperature reaches 4°C (42°F), often when there is still snow on the ground. This early budding evens the playing field with the ready-to-go evergreen.

Secret #2: Evergreens may have more total needle mass at any given time, but larches construct a larger needle area per gram of needle mass. More of the surface area of each needle gets exposure to the sun.

Secret #3: Larches pack nitrogen into their cheap needle boosting the capacity for photosynthesis. Larch photosynthetic rate is twice that of evergreens.

What about the plant equivalent of ground zero - treeline? Treeline is determined by the average temperature in July. Temperatures must average 10°C (50°F) during the hottest month of the year for trees to grow. Summer must be long enough for an evergreen to produce new buds and have them harden off - get their hard, waxy coating - before winter. If the waxy coating isn't in place when winter arrives, the moisture inside the needle escapes, the water can't be replaced and the needle dies. If this happens routinely, the tree simply cannot thrive.

Secret #4: At treeline the “buy and sell” strategy is the great advantage of the larch. Needles can't die if they are not there!

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The larch is out of the market during the downturn and happily for the larch, this yearly downturn is totally predictable.

Where evergreens and larches stand side by side, the larch is equally successful but why don't they grow everywhere? The answer is simple: the larches' secrets become disadvantages. When it comes to sunlight and water, the larch can't afford dense competition. To get high leaf surface and high photosynthetic rate to work to advantage, larches must maximize exposure to sunlight. With a high photosynthetic rate and without a waxy coating on their needles, the larch tree is a water pig. As a result, the best spots for the larch are sheltered, north-facing basins. It's no surprise that larches flourish on Opabin Plateau but can't be found on the steep, south-facing slopes of Wiwaxy.

The larch may be limited in where it can grow, but where they stand side by side, things are pretty much equal between an evergreen and a deciduous conifer. The next time you are on Opabin Plateau, look around. There are a number of small patches of scraggly evergreen krummholz right next to larch trees standing proud and tall. Now you know the secrets that make it so.

*Nadine Fletcher is owner and guide with Great Divide Nature Interpretation. Great Divide offers a larch-themed hike that reveals even more secrets of this marvelous tree. Get more info at [www.greatdivide.ca](http://www.greatdivide.ca).*

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## Plein Air at Lake O'Hara

Last September I joined some friends for our annual painting trip to Lake O'Hara. We were gifted with 3 days of sunshine and blue skies. It was unusual to paint without layers, hats and gloves, without scraping accumulating snow out of our palettes, or seeking a rapidly disappearing subject out of the closing fog. This departure caused me to reflect on why we return every year to paint in often adverse weather conditions.

I have decided there is something uniquely Canadian about this experience. The wildness of the weather imparts an energy that shows up on the canvas in the most unexpected ways. I am driven to work quickly, seeking to extract the essence of the scene in front of me before my hands are frozen, before the subject has changed dramatically or vanished altogether.

Of course it is also about the camaraderie that always seems most deeply felt when enduring challenges. We joke among ourselves that these experiences build character, often followed with a discussion debating the value of character as we resurrect our wind-topped easels, or dig about in the snow for dropped tubes of paint.

Character aside, rain or shine, Lake O'Hara is one of the most magical places on earth to paint. It holds endless opportunities for inspiration. Each time I leave thinking it will be my last, that I have painted all there is to paint in this place, but without fail I return with the realization its charm will never stop drawing me back.

*Elizabeth Wiltzen. To learn more about Ms. Wiltzen and her work check her web site at [www.mountainartist.com](http://www.mountainartist.com)*



*Preservation through  
Appreciation*



Morning Paper (study). By: Elizabeth Wiltzen

## LOTC Art Raffle

### 2008 Raffle Results

In 2008, two LOTC members generously donated to the club "Morning Mists on Cathedral Mountain", an original framed pastel by Canadian artist Horace Champagne, to be given away as the prize in the LOTC's 2009 art raffle. Through this generous gift, we were able to raise \$2,130, which will be used to further our educational activities in the O'Hara area. Our lucky winner was Pam Hess of Dutton Alabama with ticket number 333. Thank you to all who bought tickets.

### 2009 Art Fund Raiser

In 2009 we are thrilled to have an original, framed, 9" x 12" painting "Morning Paper (Study)" painted by Banff artist Elizabeth Wiltzen and generously donated by the artist. Details will be available at Le Relais and Lake O'Hara Lodge this summer season.

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## You can make a difference.

Be a part of O'Hara by becoming a member of Lake O'Hara Trails Club and/or making a donation.

Membership is \$25 and entitles you to receive the annual newsletter in your mailbox each year. Memberships fees and donations are fully tax deductible.

Forward your full name, address and phone number with membership and/or donations to:

Lake O'Hara Trails Club  
PO Box 98, Lake Louise, AB.  
T0L 1E0

**2009 Annual  
General Meeting**  
Le Relais at 8:30 PM  
Thursday, July 23, 2009  
*All Members Welcome!*

