

Castleguard Cave 2005

First ascent of the 200-foot aven

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Photos by Christian Rushfeldt, Bjørn Myrvold, Jørn Halvorsen, Marek Vokáč



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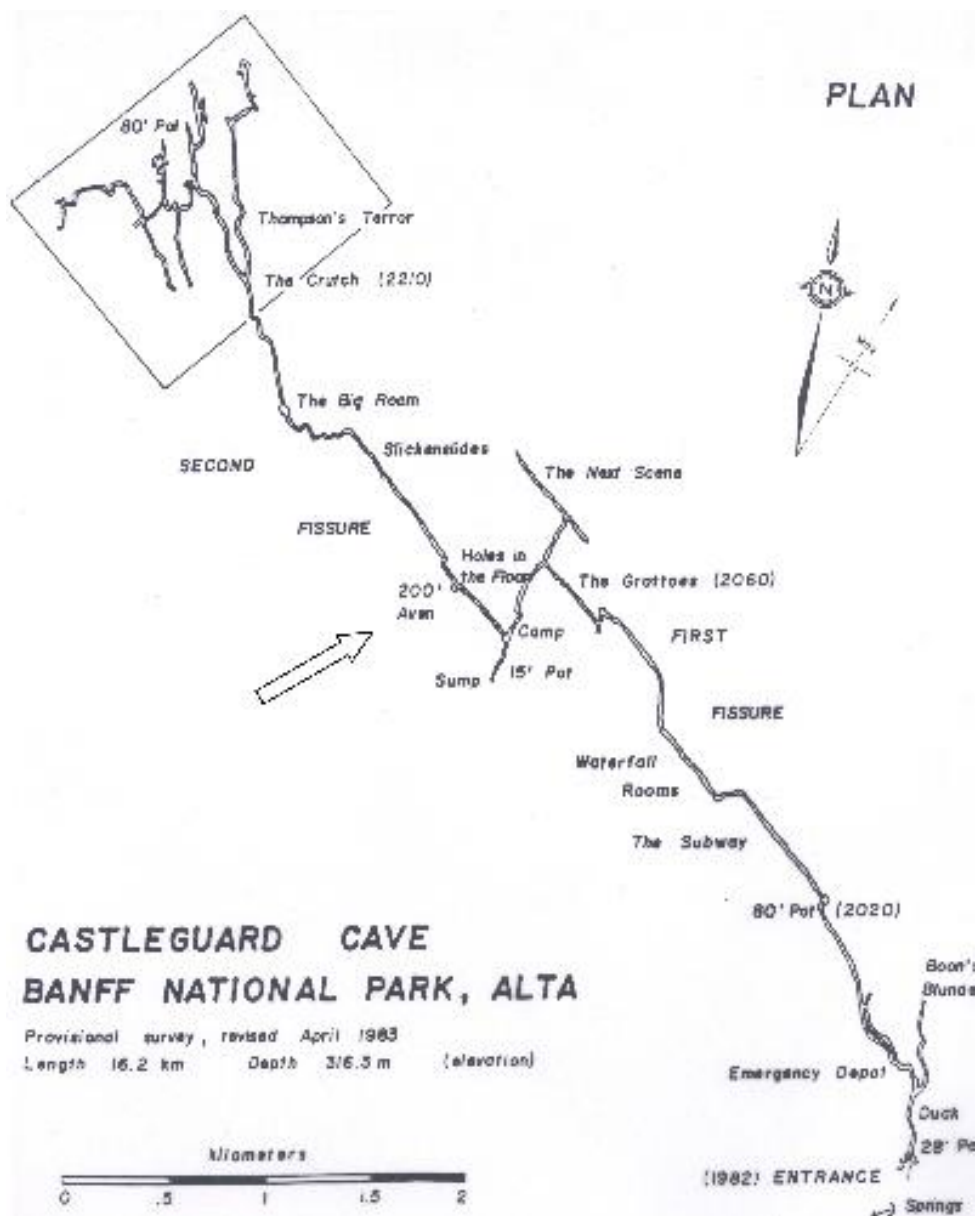
Cover photo: Marek Vokáč climbing the aven, by Christian Rushfeldt (CC05-064)

Dedicated to all whose generous support made this trip possible, and a success: my wife and children; the team; their families; and our colleagues and employers

Introduction

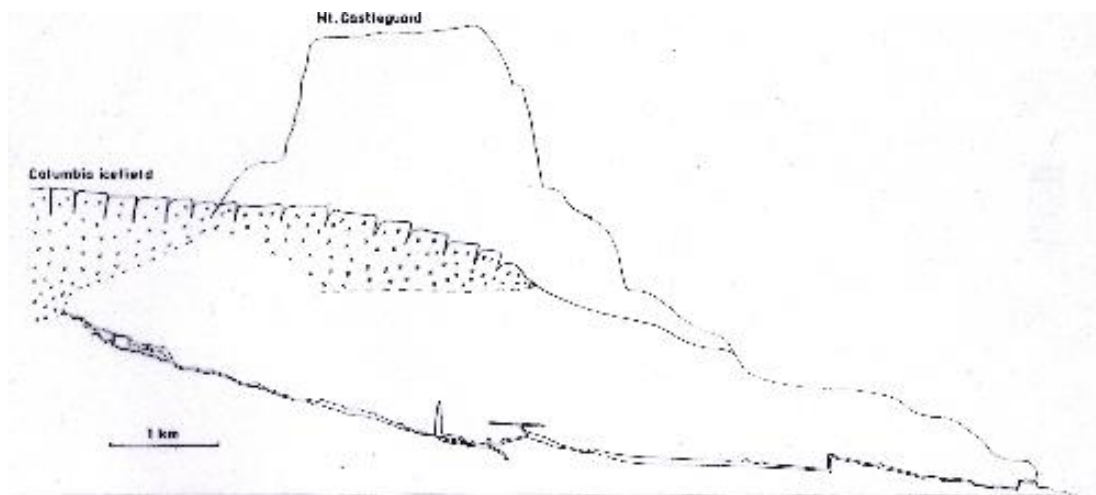
Castleguard Cave lies in the heart of the Rocky Mountains, close to the Saskatchewan Glacier. To get to the cave from Calgary, one drives the beautiful Icefields Parkway, past Lake Louise and Banff, preferably staying at the Saskatchewan Crossing hotel. Getting to the cave entrance is a full-day ski trip.

The cave itself was known early in the 1900's, and was visited by tourists with horses and mules. The biggest attraction were the sudden floods coming out of the entrance, where the dry opening would change into a roaring river in a few seconds. Modern cave exploration started in 1967, during the summer. The explorers were caught by a sudden rise in the water and trapped inside the first drop. After 18 hours the water level dropped enough for them to get out; soon after that, the waters rose again and ran for weeks. Future exploration was restricted to winter, with less water coming from the glaciers.



In 1970 Mike Boon reached the ice plug, apparently levitating up “Boon’s Aven” and leaving a rope and a frying pan for whoever came next. At the ice plug, the cave is hermetically sealed by ice from the overlying glacier. In the following decades large exploration efforts charted most of the cave, and a film was made in 1974 (using a staggering amount of car batteries to power the lights). Exploration tapered off as the new leads dwindled.

One feature that was discovered early (1968) was an aven—a vertical hole leading straight up—off the main path, about half-way into the cave. It was measured using a balloon and its height set at 200 feet (possibly the length of the spool). On the vertical profile it sticks out clearly; the area called “The Next Scene” leads up to about the same height as the aven top, though it is some distance away and not passable.



A formidable 275 metres of rock and ice remain between the aven top and the surface. Access from the outside is improbable; access from the side (via Next Scene) impossible. Yet climbing the aven was a far-fetched project. It’s a huge hole, the walls are either smooth, hard rock or jagged outcrops covered in sticky mud. Everything is wet and overhanging. Dripping water is smashed into mist and blocks visibility. Simply getting there is a challenge.

This is the story of my journey from open-mouthed rookie caver at the bottom of the aven in 1994, to the successful first ascent in 2005.

Part I

Summary

The purpose of this expedition was to perform the first ascent of the 200-foot aven half-way inside Castleguard Cave, and perform initial exploration and surveying of whatever might be found at the top. At the start of planning, in 2004, twelve people were interested in participating. During subsequent preparation and training, this was reduced to the six who actually travelled from Norway to Canada. Parks Canada approved our expedition and granted access. Conditions included the removal of all waste (including fæces), as well as surveying of any new areas.

Of the six, two had previous experience from Castleguard. Iain Schröder had been there three times, and Marek Vokáč twice; Marek's last time in 1997 was an attempt at the 200-ft aven that failed when two partners suffered acute claustrophobia.



Figure 1: Iain at the start of Saksatchewan Glacier, looking back (Marek: CC05-01-0074)

The ski trip in from Big Bend was tiring but largely uneventful. We spent about 11 hours, hauling sleds that averaged about 45 kilos. Getting off the glacier was the only hard part, with up to four people hauling one sled. Our time budget was for 2 days ski in, 6 days in the cave and 2 days ski out, with appropriate supplies. In addition to basic caving gear, we carried special equipment for the climb: a gasoline-powered hammer drill, a bolting platform, bolts, rope, climbing harness and other equipment. To insure against single points of failure, some critical equipment was duplicated, and we carried a

battery-powered drill to the cave entrance as a backup.

Entry into the cave was on day 2 as planned. The Ice Crawl proved to be almost frozen up, to the extent that only the three thinnest members of the team got through on the first attempt. The other three remained to hack a channel in the ice for about 30 metres to get more headroom. This forced us to redistribute and repack our loads, so that the first three could continue with enough gear to start climbing and have consumables for a few days.

The initial, three-man group continued and reached Camp One 13 $\frac{1}{2}$ hours after entering the cave. After sleeping well, we had a late breakfast and were pleased to welcome two of the remaining three members of the team. They were on a day trip, bringing in food and fuel, and planned to return immediately to the cave entrance. The last team member was unable to pass the ice constriction on account of claustrophobia, in spite of being one of the most experienced members of the team.



Figure 2: Iain going into the Ice Crawl squeeze (Bjørn: bilde-216-edited)

Our original planning had called for a climbing group of two or three, based at Camp One, with the remaining members forming an exploration/survey group that would go on to the Ice Plug. We ended up with just the three-man climbing group, plus the two who did the day trip. The result was that the trip to the ice plug was dropped, and we instead concentrated on the aven climb.

The climbing technique was centred on the use of a bolting platform, to give the climber a steady and high stance relative to the bolt, and a gasoline-powered hammer drill. The platform is based on designs from "Cave Parctice and Equipment", with an improved choreography of moves relative to the original design. The bolts were hollow expansion bolts with an integral, auger-driven cone, and 8 mm threads

for Petzl “Coudee” hangers. The platform and hangers are in aluminium, while the bolts are in A4 grade stainless steel. Drilling time for one 10 × 30 mm hole was from 15 to 40 seconds, depending on the stone hardness.



Figure 3: Marek on the bolting platform on excellent rock in the aven (Christian: CC05-061)

At the start of the climb, two bolts were set to provide an initial belay, and a third bolt provided the first anchor for the platform. Standing on the platform, I drilled the hole for the next bolt, cleaned it and set the bolt. Next, I hooked my belaying rope through the karabiner in the bolt, hung from it via my GriGri and stepped off the platform, which could now be loosened from its old anchor. I then climbed up the rope, using an Ascension clamp and the GriGri. In this position I could set the platform on the same bolt, and then climb up on to it, completing the cycle.

In this way, the climber is always belayed, using as many of the previous bolts as there are karabiners and hangers for as rebelay. On the smooth rock on the lower parts of the aven, a speed of up to 12 moves per hour was achieved, with about 1.7m per move. However, the rock was often not smooth enough for top speed, and one time-consuming traverse around an outcrop of flowstone consumed almost a dozen bolts during several hours, for almost no altitude gain.

The top was successfully reached after three days of climbing, expending 68 bolts, about half a litre of gas, and two drill bits. The drill bit had to be changed because the paint used to judge drilling depth had flaked off—the carbide insert in the drill was actually almost like new, but hole depth is critical with this kind of bolt. Since we carried 100 bolts and 1.5 litres of fuel, as well as 15 (!) drill bits, this was well within our plan. On day 5 in the cave, all three of us went up to the top to set up a proper top anchor for the rope, survey and photograph. It proved to be a wet, cold and tiring exercise, because the water drips more or less along the rope and on to the climber. This is almost inevitable, water chooses the easiest path, and there is really nowhere else to put the top anchor that will give a rub-free path for the rope.



Figure 4: Aven from above, with Marek holding the flash (Christian: CC05-109)

The top of the aven opens into a high chamber—christened “The Penthouse”, about 8 metres from floor to ceiling. The chamber meanders round a few turns, and then narrows abruptly into a crack that is barely passable, for another 2-3 metres (see sketch). It is possible to free climb to a fissure-like passage at the top of the chamber, which leads back to the actual aven top. The crack that is the inward continuation of the chamber goes on to a tight squeeze that we did not pass.

The sides of the crack are made up of dark-coloured rock with sharp, 2 cm deep horizontal ledges every 4-5 cm. It is very wet, since the small stream that drips down the aven comes in through the crack; the walls are also soaked and there is a thin mist in the whole chamber. It may be possible for a thin caver to pass the bend; dry spare clothing at Camp One would be advisable.

The rope is now anchored by two Petzl “Cœur Goujon” stainless bolts, 10 × 65 mm, with a balanced load. There are no rub points on the rope, and no rebelay. All the

anchors used for the climb have had their hangers removed, and the actual bolts are flush with the wall. At the bottom of the aven, there is one anchor close to the entrance, for fixing the rope out of the way of the water when it is not in use. This also serves to protect the rope from falling debris; the rock close to the top of the aven, just before reaching the upper chamber (uppermost 6-7 m), looks like slate ledges and is very cracked and fragile. During climb and descent one must expect rockfalls from this area whenever a climber passes it.



Figure 5: Thor Martin in the opening of the top chamber, taken from the aven. Plenty of fog from the drip! (Marek: CC05-05-0041)

After surveying and securing the upper chamber, we concluded the day by taking a number of pictures of the aven. One series was taken from the top, using a loose flash held by a climber descending the rope. Another series was taken horizontally, at different altitudes. The bolting platform was disassembled and packed, and all other gear removed from the aven.

When we came down, Bjørn and Jørn, our faithful porters, were waiting at the bottom. They had come in on another day trip to help us get everything out again. We ate dinner, said goodbye to our Canadian friends in Camp One, and started the trip back. Getting out through First Fissure, the Subway and the Ice Crawl took about seven hours, with the usual whenever-you-stop-you-freeze-to-the-floor experience on the ice. The cave entrance was reached late in the evening on day 6.

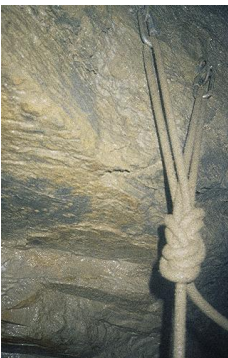


Figure 6: Final top anchor, using two bolts with balanced loading (Marek: CC05-05-0052)

By the morning of the next day, everything that had been wet was now frozen solid. We managed to “persuade” everything to fit in the sleds for the ski trip home, which was mostly uneventful and took another seven hours. Our chosen route down onto the glacier was closer to the summer trail this time, avoiding the rocky pass used on the way in. This was an easier route coming down, but large amounts of snow would have made it dangerously exposed to avalanches.

Our trip ended at The Crossing, where we consumed copious amounts of hot water (shower), steaks and beer. The only remaining task the next morning was to sort and weigh all the faeces: the research results were ambiguous, with no clear relation between the weight of the faecal matter and individual weight loss, which ranged from zero to 5,5 percent of body weight in eight days of activity.



Figure 7: Climbing the aven (Christian: CC05-068-crop)

Part II

Preparation

Background

I first heard of Castleguard Cave in 1993. At the time I had some experience exploring disused mines in southern Norway, and through this activity I was introduced to Iain Schröder, one of Norway's foremost cavers. He asked me if I wanted to join him for trips in the silver mines in Kongsberg, which are more than 1000 metres deep. After several trips, he told us of his plan for a trip to a Canadian cave of almost mythical size, difficulty and power: Castleguard Cave in the Rocky Mountains. I still remember the first time he rolled out the map, pointed out the scale bar, and started explaining about the Fissures.



Figure 8: *Training in 1993—who said “autumn”? This is a b... snowstorm!*
(Marek: (936))

We then had a year of systematic, no-nonsense training inspired by Iain's military background, including camping trips in snowstorms, multi-day underground sojourns and a trip to northern Norway and a 600 meter deep cave there. Finally, we arrived at Castleguard. It certainly turned out to be a major experience, and our successful, 4-day sporting trip left a deep impression. For me, the sight and feeling of the 200-foot aven stretching up into the darkness of unforgettable.

The aven preyed on my mind, and in 1997 I went back with two friends, one of whom had been on the first trip. We had all the necessary gear, food and fuel for several days, and one problem: there was no way we could carry it all. We planned on making two trips to get everything in, and again to get everything out again. However, two factors were against us—claustrophobia, and insufficient preparation.

After about eight hours travel into the cave, some distance beyond the Waterfall Room, one member of the party was overcome by claustrophobia, and we had to turn back. After a break at the Emergency Depot, he continued out while the two of us remained there, intending to go back in the next day. However, in the morning the second member also decided to turn back, and as Castleguard does not really invite solo trips, the whole expedition had to be terminated. We did, however, go back in for all our gear. In the space of two days we retrieved everything, and also moved a lot of old trash from the Emergency Depot to the outside of the Pools, thereby helping a little in the clean-up of the cave.

Two good things came from the 1997 attempt: a renewed understanding of what it takes to carry out such an ambitious project, and our meeting with Greg Horne and his friends. Among other things, the latter led to a very nice four-week ski trip on Ellesmere Island in 2001 and a wonderful family holiday for us in Canada in 2004.

Motivation

With the history from my two previous trips always on my mind, I decided early on that my second attempt at the aven would be properly prepared. The reader should also bear in mind the mental and monetary cost of doing this from Norway, as a contributing factor to the need for thorough preparation. While air travel isn't prohibitively expensive, there are further costs, such as car rental, park fees, and equip-

ment investment and wear. A lot of time is consumed: two weeks away from home at a minimum, plus all the training and preparation. Finally, there is always a certain risk of injury, possibly even fatalities. All of this has to fit into a busy family and work life...

As a result of all this, we approached the climb as an *expedition*, and all the preparation was designed and carried out in this mindset. A sporting or light surveying trip, organized and performed by people living close to the area, would of course be something different—though my feeling after three trips is that Castleguard is not to be underestimated.

Why go there for a third time, given the cost, effort and uncertainty? Well... the aven was *there*, waiting, it seemed, to be climbed. Yet no-one to my knowledge had made the attempt, despite the aven being known since 1972, and being mentioned in the papers of the 8th International Congress of Speleology in 1981¹. When I first stood there in 1994, it was a place like nothing I had ever seen. Watching Lars Tore Ludvigsen make a spirited attempt a free climbing brought home the scale of the thing. For some reason, in my mind it became *my* aven, and for a decade scarcely a week passed without my thinking about it.

This supplied the essential ingredient for all the preparation: motivation. Knowing exactly what I wanted to achieve made most decisions easy—any course of action that did not contribute to the goal could be discarded, and discomforts on the way could better be endured. It may sound pompous, however I believe that one of the biggest differences between the 1997 attempt and the 2005 climb was in the preparation; and crystal clear motivation is probably the most important ingredient.

After reading this chapter, the reader may be left with the impression that our preparation was thorough to the point of being ridiculous. *That is exactly the level I intended to achieve.* My experience from two previous trips to Castleguard, the Ellesmere Island trip and many smaller ventures has been unambiguous: preparation is *everything*. If I were to do it again, I would give even more attention to detail, to plug any gaps I found this time around. A trip like this, starting from Norway, represents at least a year of work, a considerable amount of money, and cannot be repeated more often than every three to five years. The cost of failure would therefore be prohibitive, and failure due to inadequate preparation is simply inadmissible.

Choosing the team

A trip to Castleguard Cave from Norway, carrying up to 20 kg of “extra” weight for the climbing gear, requires motivated people. As such, the team was more or less self-selected from my friends in the caving community. At the first call, there were 12 who were interested to a greater or lesser degree. This was quickly reduced to eight, and

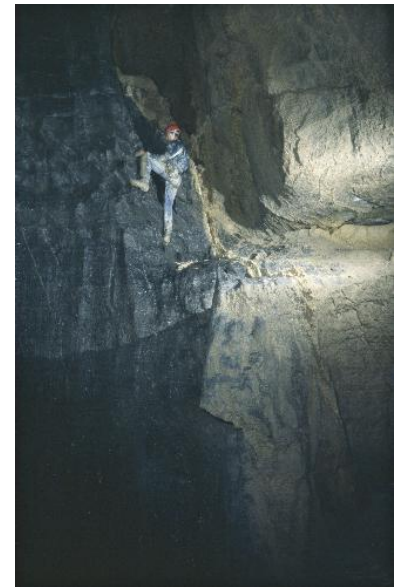


Figure 9: Lars Tore Ludvigsen, free climbing the lower part of the aven. Handholds and protection possibilities ran out pretty fast... (Marek-Misc: CC94-114)

¹D. C. Ford, P. L. Smart, and R. O. Ewers, *The physiography and speleogenesis of Castleguard Cave, Columbia Icefields, Alberta, Canada Arctic and Alpine Research*, Vol. 15, No. 4, 1983, pp. 437–450 (p. 444)

we planned one weekend trip every month between September 2003 and February 2004.

The trips were intended to make us better known to each other, rather than for honing any particular skill. All of us had experience from caving and guide work in mines, as well as climbing and single rope technique underground. However, the way one reacts when cold, tired, hungry and scared cannot be easily predicted or simulated, so this we set out to achieve.

About halfway through the year we “lost” one member, who reconsidered his priorities vis-à-vis his family. And at our Christmas party, another member of the party slipped on the ice and broke his leg, thereby excluding any possibility of participation (it takes at least six months to regain adequate bone strength).

Our sixth member, an experienced caver, M.D. and surgeon lives in Tromsø, far north in Norway. He was unable to participate in most of our training trips; however, two of us knew him well and we all agreed that his participation would be a bonus.

And then there were six:



Iain Schröder, 57, the grand old man of caving in Norway. He had been to Castleguard three times already, in addition to countless caves in Norway. His experience goes back more than 30 years. In spite of being 15 years older than the other participants, he still has at least the same level of physical fitness. He also has an excellent terrain memory and is uncanny at finding his way back to places he hasn't seen for years.



Bjørn Myrvold, 43, with strong experience from caves in Norway and on the Canary Islands, as well as the silver mines of Kongsberg with lots of vertical work. Bjørn was the gadget chief on the trip and brought digital cameras and a laptop computer. Not one to shirk his duties, he had a cracked rib when this picture was taken.



Jørn Halvorsen, 42, with roughly the same experience as Bjørn. In addition to being in general good condition, Jørn participates in long-distance ski and cycle races and thinks nothing of a 10-hour ski trip. Trying to keep up with him on ski trips really drove home to me just how much I could improve.



Thor Martin Klepaker, 29, the youngster but definitely not the newbie. He's a good deal stronger than he looks, and tends to the ascetic—except where beer and good food are concerned. He contributed an unshakable optimism, an “I'll do whatever it takes” spirit, and huge moral support during the climb by keeping vigil down below while I climbed and he steadily froze. And it was his idea for an improved bolting technique that gave me the climbing speed I needed.



Christian Rushfeldt, 42, our expedition doctor. In civilian life he is a surgeon, as well as being a caver and cave diver with several maps and explorations to his credit. Not one to get stuck in tight places (he's too small!), he's also the fine-arts photographer on this trip. Like Jørn he's the devil to keep up with on skis, sled or no sled.



... and myself, 41, planning my third trip to Castleguard. With upward of 10 years of experience from vertical work underground as well as a keen interest in logistics, I hoped that I would be up to the task of not only climbing the aven itself, but also of organizing and motivating the whole team for the expedition.

Training weekends

Purely physical training, such as doing sit-ups, jogging or cycling, was left to individual preference. Our first trip together consisted of a weekend, starting with a six-hour forced march over hilly country with a an 18-kg pack and followed by some simple tests of strength—simply to establish a starting benchmark, and to determine if there were any gross differences in the group. Happily, the differences were small enough to be of little significance. Given the conditions in Castleguard, this level of physical fitness is the minimum required.

Further weekend trips usually had a theme, such as underground exploration, ski/sled training, or equipment tests. The intention was always to push the limits, mostly to get to know each other better. This ideal was not realized very often, since all of us often had quite busy schedules, “my family expects me home not too late on Sunday”, and similar excuses.

One of our last trips was to a small cave only two hours drive from Oslo. This was the first time we tried our (new) caving packs with full loads and in harsh conditions (cold, wet, cramped, etc). It turned out to be quite an adventure, since the caving was tacked onto the end of a weekend trip. We had already pulled our sleds for many hours, built an eleven-foot diameter igloo² and camped out for two nights when we arrived at the cave. It's a fairly wet place, and after dragging our packs all the way in and almost out again, several of the other members were ready to call it a day.

²See <http://www.grandshelters.com> for an igloo-building tool that really, really works, in any kind snow

“No mercy” was my response, and we did it again—twice, without breaks. This test revealed some weaknesses in the construction of the packs, and was very useful, if a bit late in our schedule.

While much emphasis was on building the team for travelling to and inside the cave, the climbing preparations were different, serving a different purpose. In my mind, the whole point of the trip was to climb the aven. The climbing itself is a one-person activity at any time, given the bolting technique required. Having more than one qualified and motivated climber would be good, both to lighten the mental load, and to have backup in case someone could not complete the climb. However, I was always prepared to do the actual climb solo if required, and trained accordingly—much of it in solitude, in the darkness of early winter mornings on the façade of my house.

Taken together, the training sessions served their purpose. When we set off for Canada, we had the confidence in each other that was required, and as events turned out, that confidence was justified. Without the hours spent together, tackling the unexpected would have been a much greater challenge.

Climbing technique

The 200-foot aven is basically an irregular, slightly tilted cone. The walls are vertical or slightly overhanging, but vary from smooth, dark and very hard limestone to jagged, eroded and muddy cracks. From the bottom, visibility is limited to about 20 metres by the ever-present fog, the result of a small creek whose drops are shattered against the rock.



Figure 10: *The aven in 1994, taken straight up (Marek-Misc: CC94-117)*

In 1994 I took several slides of the aven, some of them straight up with the built-in flash plus two slave flashes. After scanning and enhancement, I thought that I could maybe see a trace of the ceiling, but it is at the edge of detection. The climb would therefore lead into the unknown.

Various techniques can be used for ascents in caves. Free climbing is obviously the first choice wherever possible, to due its speed and the small amount of equipment needed. Narrow cracks can be ascended by wedging, while a scaling pole³ can be used to ascend a precipice or small aven.

However, the 200-foot aven seemed to be accessible to only one technique: bolting. Its size precluded any kind of scaling pole; sheerness ruled out free climbing; and the height dictated the use of bomb-proof belays—in perfectly smooth rock. Bolts were the only answer.

³Norbert Casteret: *Ten Years under the Earth*, a real classic

Bolts and drills

Bolting requires drilling, and there are three ways of making holes in the rock: by hand, by electric power, or by a combustion engine⁴. Hand drilling was ruled out: we tried that in 1994, and wore out three self-drilling Petzl bolts without getting more than half of the required depth for one of them. The rock really is very hard.



Figure 11: *True love: Marek and the drill. I think we were made for each other... (Christian: CC05-055)*

Battery-powered hammer drills were virtually nonexistent in 1994, and quite impractical in 1997. By 2005, electric technology had made huge strides, but it was still not quite up to the task. Cold is the main enemy, as it reduces both the amount of energy that can be extracted from the batteries, and the rate at which it is possible to extract it, i.e., both the duration and instantaneous power of the drill.

There are drills on the market with constant-power electronics, which compensate for the loss of voltage, but they are extremely expensive. Without such compensation, the power of the drill falls sharply as the batteries discharge, and the drill times lengthen exponentially. Once the power has been reduced to the point where the hammer blows are insufficient to effectively crush the rock, the drill becomes useless, even though the batteries may still retain a significant charge.

It was therefore easy to settle on using our trusted old Ryobi ER-7 gasoline-powered drill. This machine has a 20cc two-stroke engine with a powerful pneumatic hammer function. It weighs 6.5 kg including 0.4 l of fuel, and will drill over 2 metres of 10 mm hole in the kind of rock found in the aven, on one fuel tank. Best of all, it runs at full power to the last drop, and any desired amount of fuel can be carried in soda bottles (the Norwegian ones are virtually unbreakable). The feed pressure needed to keep the hammer action going is close to zero, making it surprisingly easy to handle, and it has proved its robustness on countless caving trips. Sadly, it is long out of production and we will have to make any needed parts ourselves⁵.



Figure 12: *Petzl Cœur Goujon stainless bolt and hanger vs. 10 × 30 mm wallplug (Marek-misc: 100-0387)*

Having made a hole in the rock, one is halfway to hanging there—the bolt is the other half. The standard climbing anchors made by Petzl, Hilti etc. are 10 mm thick by 60+ mm long, or even 12 mm thick. But these are for long-term placement and use, and for protection against heavy falls. Climbing up the aven is a different situation, where the bolts will carry lesser loads. They will be used only a few times, and drilling time (the product of diameter and hole depth) has to be minimized. Another factor is cave conservation: we wished to avoid bolts that stuck out of the wall after the climb. This can always be solved by drilling deep holes, so that the bolt may be ham-

mered all the way in after use—but then we would have to drill close to 100 mm every time.

We therefore decided to use a different kind of bolt, which is much shorter and does not stick out of the hole. It has an integral expansion cone and a threaded hole, and

⁴Unless you are Sylvester Stallone in “Cliffhanger” and have a bolt gun that fires them in—now that would really have been something

⁵As this report was being written, I had just made the first replacement part in my basement workshop

the type we used is only 30 mm long. It requires precise control of the hole depth, as it is set by hammering in the cone using a hardened-steel auger. A standard Petzl Coudee hanger with an 8 mm bolt is then screwed in; the illustration shows the bolt with the hanger screwed only a couple of threads in. Once the bolt is no longer of use, the hanger is unscrewed and reused; the bolt is left flush with the wall.



Figure 13: Petzl Coudee hanger and Würth stainless wallplug, with 8 mm connecting bolt (Marek-misc: Small-bolts-2)

To avoid any possibility of rust stains, high-grade (A4) stainless steel bolts were used. The bolts we used are manufactured by Würth of Germany, a maker of tools and construction items for professionals. Like the Petzl bolts, they are beautifully made, precisely machined from the inside and outside, and you can see the quality—nice when you know that you will be hanging suspended from one of them, all alone up there in the darkness.

We used short drill bits, also from Würth. The carbide tips have become so hard that even after 50 holes it is hard to discern any wear at all, and the 15 drill bits we brought were a huge “overkill”. In the event, only two were used, and only because

the paint that indicated the correct drill depth was flaking off.



Figure 14: Left: 50 holes; centre: 20 holes; right: unused (Marek-misc: Drill-bits)

The leftmost drill bit has made about 55 holes, the middle the remaining 20, and the rightmost drill bit is unused (30 mm hole depth). Not much wear here! However, the curved shape of the carbide insert precludes regrinding/sharpening in the field, so worn bits must simply be replaced.

Bolting platform

Standard bolting technique dictates that the climber hangs in the harness from one bolt while setting the next one, then uses one or two etriers to move to the new bolt. This limits the advance to about half a metre per bolt. Assuming that the 200-foot measurement in Arctic and Alpine Research was a minimum (it sounds suspiciously like they had a 200-foot spool of thread), this would mean at least 120 bolts, and easily more like 150.

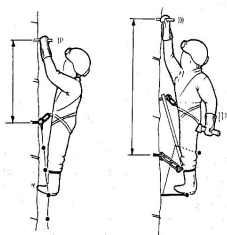


Figure 15: Height gain per bolt, with and without platform (Marek-misc: Platform-height)

A bolting platform provides an alternative technique that triples the height gained per bolt. Our sources for bolting platforms were “Caving Practice and Equipment” as well as the BCRA’s “Caves & Caving”, and Rune Damm, one of the 1997 team members, had very skilfully made several platforms out of square and round aluminium tubing. They were sized so that the parts would fit inside each other, ending up as two square rods and some rope for transportation.

The original bolting platform technique is quite complicated, requiring a number of moves to advance from one bolt to the next. Apart from the platform itself, one long and one short cows’ tail are required, as well as a short etrier fastened to the platform, and a long one with a Fifi hook. The climber is belayed by being bound into a rope that passes through a number of bolts below him. This rope is securely fastened at the bottom, and the surplus is in the climbers’ pack. The climber also carries the drill, a hammer and a set of bolts, hangers and karabiners.

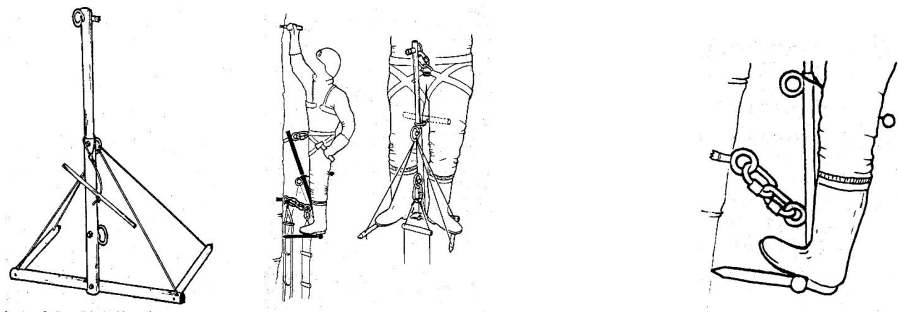


Figure 16: Standard bolting platform and stance

The steps of the technique are worth noting, since they dictate the time needed to move and therefore the speed of advance:

1. The climber is in position on the platform, secured to it by his harness. Using the drill, make the hole for the new bolt, clean it, and set the bolt. Secure a hanger to the new bolt.
2. Place a karabiner in the hanger of the new bolt
3. Secure the long cows' tail to both the new bolt (the new karabiner) and the current one.
4. Untie the belaying rope, pull more rope from the pack, pass it through the karabiner of the new bolt, and retie the rope to the harness
5. Unclip the long cows' tail (which was there to provide a dual anchor while the belaying rope was untied)
6. Place the long etrier's Fifi hook in the hanger of the new bolt, next to the karabiner
7. Unclip from the platform, and step on to the etrier, climbing down a few steps. Secure to it using the short cows' tail.
8. Unhook the platform from its bolt (the platform is hanging by a chain of two or three karabiners). The karabiner directly in the hanger is left there; the belaying rope still passes through it. Secure the platform to the other arm of the short cows' tail to preclude losing the platform.
9. Unclip from the long etrier, climb it up to the new bolt, and clip the short cows' tail to the etrier as a belay and to free both arms.
10. Secure the platform to the karabiner hanging off the new bolt. This karabiner is not loaded, since the climber's weight is on the etrier and its Fifi hook.
11. Unclip from the long etrier, and use the platforms' short etrier to climb onto the platform (an interesting balancing exercise, with a drill at the side and a pack on your back).
12. Clip into the top of the platform and clean up

During both training and actual climbs in the Kongsberg silver mines, three to four moves per hour were the absolute maximum. Any mistake made during the carefully choreographed advance would typically result in cows' tails, ropes or etriers being on the wrong side of something immovable, and required laborious backtracking.

There has to be a better way

It was Thor Martin Klepaker who came up with the key to simplify this technique: use a GriGri belaying device for both security and movement along the rope. This eliminated the long etrier and the long cows' tail. It did, however, mean that the karabiner in the new bolts' hanger would be loaded at the time when the platform should be placed on it, thereby making it impossible to place the platform as close to the rock. Since both height and stability would suffer, we wanted to avoid this.

On the façade of my house, I have a clear seven-metre stretch from ground to roof. With a couple of panels of chipboard to protect the wooden wall, I set about improving the technique. The key to further improvement was the use of Fifi hooks and a specialized sling to secure the climber while the platform is set. Incidentally, this (plus a length of chain linked to the platform) provided much-improved flexibility for the setting of the platform.



Figure 17: *Cows' tail with Fifi hook*
(Marek-misc: Custom-cows-tail)

With our modified technique, the climber has a platform, drill and hammer, one camming device with a foot sling, one GriGri, and one short length of web sling, permanently fastened to the harness at one end, and with a Fifi hook on the other end. For securing the platform, there is a karabiner with another Fifi hook directly on it; the platform has an eye bolt with a short length of chain permanently shackled to it. The platform still has a short etrier attached.

The belaying rope is fixed to a secure belay at the beginning of the climb. It runs up to the bolt the platform is currently secured to, through the climbers' GriGri, and thence free back down. The unused rope is in a pack or coil on the ground. The steps now are:

1. The climber is in position on the platform, secured to it by the harness. Using the drill, make the hole for the new bolt, clean it, and set the bolt. Secure a hanger to the new bolt.
2. Place a karabiner in the hanger of the new bolt
3. Pull rope slack through the GriGri, until there is enough to thread the belaying rope loop through the new bolts' karabiner.
4. Unclip from the platform and step off, hanging by the GriGri on the belay rope and the new bolt. Slide down a little using the GriGri as a descender if necessary.
5. Unclip the platform from its bolt, leaving the karabiner in the hanger in place—the belaying rope runs through it. Secure the platform directly to the harness.
6. Use the camming device and its foot-loop, plus the GriGri, to ascend the belaying rope to the new bolt

7. Place the Fifi hook of the harness sling in the hanger, next to the karabiner, and let the GriGri back down the rope until all the weight is on the sling. The karabiner is now unloaded.
8. Place the karabiner with the other Fifi hook in the bolts' karabiner, and place the Fifi hook in the platforms' eye bolt if possible—or in the closest possible chain link, to get the platform as high up as possible
9. Climb up onto the platform, unhooking the harness sling as it becomes unloaded (no backpack this time, just the drill to worry about)
10. Clip into the top of the platform and clean up

This sequence, as well as being shorter, is much simpler. A lot of gear weight is saved, the number of items clipped into the harness is reduced, and much flexibility is introduced. If the circumstances rule out the use of the platform, the next bolt may be fastened while hanging from the GriGri, without changing the basic sequence. A side effect was to eliminate the camming device usually worn on the harness for ascents, as the GriGri could take that role—not as efficient, but good enough. A separate descender was also not needed, eliminating yet more weight and items to be confused.

The platform itself was also improved. Instead of using static rope or Spectra cord for the guy ropes, we used 4 mm stainless steel cable. I made new front inserts for the platform legs out of high-quality steel, with sharp-edged flat tips to provide more stability and resistance to wear, instead of the old, worn aluminium tips. I knew that my lathe would become useful some day!



Figure 18: Old (above) and new platform tips (Marek-misc: Tips)



Figure 19: Making the tips on my lathe (Marek-misc: Lathe)

During rehearsals on my house façade, the new technique worked like a dream. At one point I was spending less than five minutes per move, but did not quite trust this number—there was only room for three moves, then I would run out of wall. However, it was a good sign and felt much more elegant than the old technique, with all its tying and clipping.



Figure 20: Marek on the bolting platform, showing the sequence (clockwise from top left): Stand on platform; drill hole; hang from safety rope while dismantling platform and climbing up; climb onto platform using its short etrier. After that—next hole! (Christian: CC05-058, 059, 060, 061)

Let there be light

One of the major changes to hit caving lately is the emergence of useable LED-based headlamps. The incandescent lamp is a very primitive device—a metal filament is heated by passing a current through it, thereby producing photons. Some of these photons have wavelengths in the visible spectrum, many of them do not, as the theory of black-body radiation will tell us. In short, it's an inefficient way of making light. The result is a huge pile of batteries or not much light.



Figure 21: Petzl Myolite 3 multi-led lamp (Marek-misc: Myolite3)

A light-emitting diode is a quantum-mechanical device, where atoms are “excited” into a state where their electrons have additional energy. These states are unstable and short-lived, and as the electrons “fall” down to the ground state, the extra energy is given up as photons of very distinct (single-colour) wavelengths. A “white” LED is an exceedingly precise and complicated piece of material that either emits a combination of blue and yellow, or has an integrated layer of phosphorus that converts the original colour (bluish to ultraviolet) to a white-like mix⁶. The colour is not the same as that of an incandescent bulb, and will tend to have a definite colour cast, usually somewhere between blue and green. The conversion of electricity to light is almost an order of magnitude more efficient than that of an incandescent lamp.

However, LEDs still have problem providing enough intensity. On this trip, we all had LED lamps, but of different kinds.



Figure 22: Petzl Duo lamp, with both LED's and a halogen bulb (Marek-misc: Petzl-duo)

Thor Martin and Iain had 7-diode Petzl Duo lamps; Jørn and Bjørn had Petzl Myolite 3 LED/halogen hybrids, Christian had a lamp with a whopping 22 LEDs, and I had a latest-generation high-power single-LED lamp. The rule is still that you get what you pay for, in terms of light output—more light means more batteries. But the inherent efficiency of the LEDs means that the baseline power consumption for any given intensity is much lower. Also, some of the lights had electronics that will give a constant light output regardless of the battery state, draining the batteries so completely that you can almost feel the dust in there.

Cold is enemy no. 1 for alkaline batteries. At caving temperatures, most are down to less than 40% of their rated power. At -20°C, they will be almost dead. There is also a close relationship between the output current and the total energy available: the faster you try to extract the energy, the less there is for you to extract. LED lights generally have lower power requirements and therefore make better use of the batteries, but the rule is not universal: my Nova single-LED light draws as much current as a small halogen lamp, but gives much more light.

As all our lights used, or could use, AA-sized cells, we standardized on this size. To overcome the cold and get maximum light for the weight we carried, we used single-use Lithium cells. These weigh about half of conventional alkaline cells, contain about twice as much usable energy, and are much less affected by the cold. For myself, I carried the batteries in a pouch inside my clothing to keep them warm and get as much as possible from them; the others used the standard battery cases on their helmets. The lithium cells are also much more tolerant of high current drains that would quickly kill

⁶See http://en.wikipedia.org/wiki/Light-emitting_diode for an excellent and detailed description of LED's

normal alkaline cells.

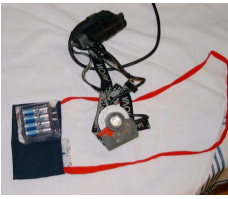


Figure 23: *Nova single-
led lamp (Marek-misc:
Nova)*

the cave.



Figure 24: *Christian's backup lamp, and
the head of the 22-led main lamp (Christian:
IMGP1300)*

The exception was Christian, whose ProLite II lamp ate 15 AA cells per day. At this rate Lithium cells would be prohibitively expensive, so he used standard alkaline cells instead. After two days he switched to his backup lamp, which provided adequate light with about one quarter of the consumption. By doing so he freed up batteries for his digital SLR camera, and was able to take a large number of excellent images. The camera was bought in Calgary because his film-based SLR broke, so he did not have the opportunity to test it and determine its power needs before going into

The issue of standardization comes up at this point. We could have standardized on one common type of lamp, choosing some appropriate compromise between power consumption and light output after through testing. However, all of us already had all our gear, so that would have been an extra expense, in addition to all the time and discussion. There is a delicate balance between “every man for himself” and military style *gleichschaltung*, where everything adheres to a single, common standard. Everybody had taken to heart the fact that we would be underground for six days, plus a contingency

margin; and Christian had sufficient backup options to change his gear appropriately when the combined power consumption of his camera and lamp turned out to be higher than expected. In any case, we could always pool our resources if anyone were in danger of running out.

My Nova lamp gave excellent light and consumed its 4 AA cells in 12-13 hours. I have never seen as much of Castleguard Cave before, simply because I now had better and more light—and the last time (1997), I was carrying a dozen D cells. For camp and backup use I had a Petzl Micro, refitted with a TerraLux “Spotmiser” LED-based light bulb that has a standard E10 screw socket. This, too, worked perfectly and would have provided light for a week if needed, on just two AA cells.

The argument for using AA rather than D cells is mostly one of bulk and redundancy. In terms of energy per weight they are actually equivalent, at least at low to moderate current drains. The AA cells do not make such a large lump, so they are more comfortable to carry (especially in a tight squeeze such as we had on the Ice Crawl). More importantly, multiple sets of AA cells are required—which means that if one set or one cell fail, there are others to replace them. If two D sets are all one carries, and the second set turns out to be a dud once the first set has been used up, there is a major problem.

Food and drink

Our climbing equipment was quite heavy, so we had to minimize weight wherever possible. From both short family trips and the four-week 2001 Ellesmere Island expedition, we had excellent experience with the “Drytech” brand of Norwegian-made dehydrated meals. These are of the type that is eaten straight out of the bag; not very reminiscent of a romantic restaurant evening, but they are tasty, nourishing and above

all practical. The dehydration method used is a closely held secret, and enables them to have surprisingly large chunks, thus lessening the “porridge factor”.

However, Canadian agricultural regulations are extremely strict, forbidding the import of even super-cooked, freeze-dried and vacuum-packed meals if they contain meat or poultry.

Knowing this, I bought samples of locally available products at MEC in Calgary during my 2004 summer holiday. On one of the training weekends in the Kongsberg silver mines, these samples were tested and consumed with much fanfare and teasing. We decided that while the taste and texture was nowhere near the Norwegian product, they would do—with the proviso that “2 servings” constituted one meal for us. Three meals a day were required, and our time budget was 2 days ski, 6 days cave, and 2 days ski—adding up to 30 bags per person. This was just too much to contemplate, and we did not really think we would require two days for the ski in and out, so we ended up with about 24 bags each.



Figure 25: Food for thought—two Alpine meals, and one Norwegian Dry-tech meal from Christian's special reserve. Protein bars worked but caused flatulence (ugh). The tiny bottle is “Unterberger” bitter spirit, a reward at the end of the day! (Christian: CC05-032)

I collected the individual taste preferences and set about ordering from MEC. As it turned out, some items were out of stock, so in the end I simply ordered what was available; then everybody would either find something they liked, or eat anyway. Hunger will quickly adjust taste preferences in any case. There was some grumbling in the ranks at this, but not to the extent that anyone offered to take over and provide a better solution. . . Christian also brought some Drytech meals (vegetarian) that were within the CFIA regulations.

The drinks issue was handled with less preparation, inevitably resulting in confusion at the Calgary Wal-Mart and a shortage of hot chocolate powder. Objectively speaking this was of no consequence, though some members had gotten used to a very

high standard of preparation and were surprised to learn that something had actually been overlooked.

We also brought a suitable quantity of rum, none of us being teetotallers. While no great revelry was planned, I have always found the prospect of a sip at the end of a hard day to be something to look forward to.

Packs

When I tell people about caving, especially in a major cave like Castleguard, I always bring up the subject of equipment wear and tear. When you have been going for upwards of twelve hours, being nice and caring to the pack is definitely not a high priority. Cave packs are subjected to immense wear while being pulled, rolled, kicked, carried, thrown and dropped for hours on end. Obviously, anything breakable inside them will be broken.

Both Petzl and other manufacturers make excellent, hard-wearing caving packs. However, as usual our demands and preferences were such that standard products would not quite do. Our main departures from the norm were volume and the placement of the back straps.



Figure 26: Cave pack by Ingebjørg Barland Ludvigsen. Back straps are mounted very high to avoid scraping the ceiling (Marek-misc: Large-pack)

Volume was required simply to get everything to fit inside. The equipment list (see appendix III, page 105) was formidable, but we found no way of making it smaller. The standard-sized packs were simply too small. Also, Castleguard has long stretches where the ceiling height is such that a crouch is the best way to proceed; standard packs will stick up over your head and hit the ceiling. Whenever this happens, progress is quite firmly halted.

The wife of Lars Tore Ludvigsen, my trusted companion on many adventures, is a professional seamstress and proceeded to make packs to measure for us. For me, this was actually the third generation pack she made, and it was consequently much improved. Our ruthless caving tests revealed one final weakness in the strap fastenings that I modified and sewed myself; after that I was satisfied. In Castleguard, the packs worked admirably, enabling me to carry more than before, with less discomfort and fatigue.

The “ideal” CC pack is 68 cm high, 35 cm wide at the back, and around 18 cm thick—though it will of course tend to assume a more cylindrical shape as every nook and cranny is stuffed. The shoulder straps are fastened at the very top and about 15 cm above the bottom, so it is carried low on the back. There are handles on both sides and the bottom, and lifting straps on the front and back. The handles are made of simple flat webbing and sewn with a very slight slack relative to the fabric, so that they can be grabbed but do not protrude so much that they catch on every passing rock. Every seam and part is constructed on the assumption that the pack will sooner or later be pulled by any available corner, strap or fold.

Still, we had more than could be carried inside the backpacks, and therefore also had auxiliary packs to carry on the chest. These were smaller, cylindrical standard Petzl “Classique” rope/gear bags. Initially we expected to have three of these, carrying them in rotation.

Skis and sleds



Figure 27: The weather is good, conditions are excellent, packs are crushingly heavy (> 35 kg). No-one who did this in 1994 wanted to do it again the same way (Marek: (997))

Because of the summer flooding, any Castleguard expedition must be undertaken during winter. Midwinter in the Rockies is not to be sneered at, so spring is better—and the need to be absent from home for two weeks dictates Easter as a good time, since Norwegians have fairly generous Easter vacations. This also guarantees a full moon, which is always useful for the ski in.

Previous Castleguard experience has been mixed with regard to the skiing. In 1984, Iain Schröder took part in an expedition that was partially airlifted and partially skied. On the way out he used only five hours (!), something of a speed record with 40+ kg on his back. In 1994 we had perfect conditions and used about 12 hours, carrying 35 kg packs. In 1997 we had 50 kg sleds, close to half a metre of fresh snow and a headwind, and spent two full days each way. We even did a sled-less run up to the Meadows on the way out to lay a trail in the deep snow, and had to hurry to use it before it snowed up again.

This time, our sleds would have a gross weight of about 40 kg each. After much discussion we decided to bring tents, in case we needed more than one day for the ski in. The value of a tent is debatable; one could always plan to sleep outside or in a bivouac bag of some kind. But the extra weight was not much, and the psychological reassurance was important. All of us are experienced winter mountain travellers, and we did not want to *challenge* the mountains; after all, the ski was simply a transport stretch, not the purpose of the trip.



Figure 28: Fairly chaotically packed sled for a day trip to a disused mine (Marek-misc: packed-sled)

For most of us, the pack vs. sled debate was no debate at all. The empty weight of a 100-litre pack is at least 4 kg, the sled weighs about 10 kg. Any smaller pack would be too small, and the net weight per person was in the 30 kg range. Going for 10-12 hours with 35+ kg on our backs was not an attractive option when we could pull sleds instead. However, this reflects our particular background, and other travellers may choose differently in the same circumstances.

Our sleds are of the standard type that Norwegians use for hauling kids, or a somewhat sleeker design intended for cargo only. They have stiff pulling rods, 3 m long, that connect the sled to a waist harness with shoulder straps. In flat terrain the pulling is with the hips, when going uphill the skier naturally bends forward and the strain is taken by the shoulder harness. Apart from this the upper body is free and this enables much better ventilation. On downhill stretches, the skier can grab the connecting rods and rest on them, providing great stability (also, there is no risk of being run over by the sled). The sleds are extremely durable, and the pulling rods will not break, even if the sled turns over 270° in extreme cold.

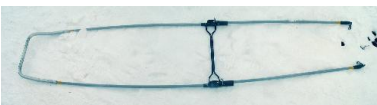


Figure 29: The pulling rods for the sled, about 3 m long. The sled will be on the left, nose pointing to the right (Marek-misc: pulling-rods)

The trick when packing a sled is to keep the centre of gravity low and to the rear, for maximum stability and the smallest pulling resistance. It is a good idea to seal any irregularities and wax the underside. This is partly from objective reasons, to minimize the drag, and partly psychological, to reinforce the feeling that nothing has been left to chance.

Christian wished to try another strategy, aiming to use the same boots, pack and possibly clothes both inside and outside the cave. This could save him a considerable amount of weight. His army boots can also be used as ski boots given the proper binding, and using the cave suit for the ski would save a layer of clothes as well. His aim was to reduce weight to the point where a pack could be reasonably used instead of a sled. It's easier to ski fast with a pack than with a sled. A pack-carrying skier also gets better traction when going uphill, since the weight of the pack helps push the skis into the snow. On the other hand, the full load is carried by the body and moves up and down with each step, even if that motion can be minimized with training.

The major disadvantage would be that he'd be sensitive to getting wet, especially on the way out; wet boots and clothes cannot be used in (not improbable) -20°C outside. There is also less room in a pack, limiting his ability to carry bulky items. In the end, his sums came out about the same as ours and he decided to use a sled after all. However, he only brought one set of boots for everything (including our city stay) and came close to achieving his goal, and on a slightly lighter trip it would have worked, with a ripple of good effects: smaller pack, faster ski, less fatigue, faster cave movement, etc.

What if ... ?

Any major caving expedition carries an element of risk. In Castleguard, where one must realistically expect a delay of at least three days before help can arrive inside the cave, and where even a bad ankle would be a major handicap, this has to be understood and taken into account by all team members. Obviously, if any of us had thought that there was a significant chance of not coming back, we would never have left our sofas... but some residual risk will always be there.

We were very fortunate in having Christian in our team. He is a medical doctor and surgeon by profession, and has experience with emergency treatment. He is also an accomplished caver and in great physical and mental shape. His presence meant that the consequences of any accident would be greatly mitigated.

Our first-aid kits were simple, reflecting the fact that the priority is to keep the patient alive and moving—cures can wait for later. Each of us carried a set of sticking plasters, disinfectant napkins and other small items, as well as some fairly powerful painkillers. Christian had a small set of surgical instruments, sutures and some more specialized anaesthetics. In case of fractures, a splint could always be improvised with pieces of bolting platform and the ever-present rolls of duct tape. By pooling our resources, we would be able to provide several layers of insulation for a patient, with a “space blanket” as a vapour barrier.

Our contingency plan was to self-rescue as far as possible. A full-scale rescue in Castleguard cave would be a huge operation, putting many people at risk and causing great damage to the cave. With the help of a surgeon and/or anesthesiologist it is probably much better to thoroughly anesthetise and stabilize a broken ankle, arm or leg and help the patient walk out, than to start any stretcher operations. Only a head or back injury, or a complicated fracture should require a real rescue operation.

Lesser accidents of a more technical nature must also be foreseen. Lamps break, batteries may turn out to be duds, tools are lost and fuel spilled. As much as possible, we aimed to avoid single-point failures, i.e., situations where a single equipment failure or trivial loss would make our goal impossible to reach. While we did not set up a formal failure tree, we did try to foresee the most probable problems. At the same time, carrying spare parts for everything would add so much weight that it would by itself preclude us from completing the climb. We therefore put the emphasis on standardization as a way to achieve redundancy among equipment that would have to be carried anyway, rather than carrying true spares.

Standardizing on AA batteries for our lamps gave us all the redundancy we needed on the subject of light. With six of us, each carrying at least two completely independent light sources (and all of us had a third backup of some kind), the spectre of darkness was banished. There would always be a light that worked and plenty of batteries to feed it.

We brought two identical cookers (MSR WhisperLite), so that we could cannibalize for parts and support a split into two teams. They run on White Gas and can use it both for pre-heating and as the main fuel, and have been absolutely reliable for a decade. Duct tape and quick-setting low-temperature epoxy paste, some steel wire plus a Leatherman tool for each of us provided the tools and materials to improvise repairs to most of our gear, should they be needed. Some of us also had small needle

and thread kits. Modern glass-fibre backcountry skis are virtually unbreakable, and poles can always be splinted. Failure of a sled was a non-issue: even if run over by a truck the remains would tend to hang together for a while, and cargo could always be redistributed among us.

We only carried two major items as actual spares, i.e., things we did not expect to use if everything worked: an electric hammer drill, and the upright part of a bolting platform. The drill was a personal loan from Greg Horne, and we left it in the sled at the cave entrance. A working drill was an absolute requirement, period, so we *had* to have a spare. The bolting platform upright was the only part that we thought might break under overload during the climb, but it was also left outside the cave entrance.

An extra auger for setting bolts, and a spanner for the hangers were also in our kit. The axe we carried for hacking a path through the Ice Crawl could double as a spare hammer. Apart from that, we carried more fuel for both the cookers and the drill than we expected to use, but one can always drink more hot drinks... and running out of drill fuel would just be too silly to contemplate.

What to wear

With regard to clothing, there seem to be two camps among cavers—those who get wet from the inside, in waterproof suits, and those who get wet from every side⁷. One of the interesting features of Castleguard is the series of pools, known simply as The Pools. It is located roughly 700 metres inside of the entrance, and ensures that anyone going in or out gets thoroughly soaked up to the middle of the thigh, if not worse.

The simple way of handling the pools is to ignore them: just go. After the last one, empty the boots, wring out the socks, and keep going. This approach may sound brutal, but it has several advantages. It is fast, requires no extra equipment, and it doesn't really matter anyway. The exertions needed to get through First Fissure to Camp One will completely dry out the clothing, and on the way out you have your outside clothing waiting in the entrance.

I have tried other ways of tackling the pools—either use long plastic bags to keep dry, strip, or carry a change of clothing. All of these methods carry some penalty in terms of time, weight or both. Standing still in order to change makes one cold. With four widely spaced pools, the overhead tends to add up. Christian tried the stripping method, and brought neoprene socks to use for the crossings, to keep his single pair of boots dry. It worked, but took some time and overloaded his pack during the actual crossings. My considered opinion is still that the fast way is the best—but if you do want/need to keep your clothes dry, his method is the best I've seen.

Given this tactic for the pools, the clothing selection became simple. We used woolen underwear and nylon oversuits. Wool retains at least some warmth even when wet, and the nylon dries quickly and transports perspiration moisture well. Most of us wore a combination of mesh underwear and a layer of wool, either as separate garments or as a combined one.

⁷Norbert Casteret emphasized the advantages of using worn-out boots full of holes, so that the water would quickly drain



Figure 30: Christian Rushfeldt stripping before crossing one of the Pools. He kept his clothes and (only) boots dry, but had to change for every Pool. (Marek: CC05-02-0082)



Figure 31: Wool underwear with mesh layer. The brand name "Brynje" translates as "chain mail"! (Marek-misc: Brynje-Arctic)



Figure 32: "Armoured" suit, with camera pockets, gear loops, and overarm tool pockets with fastening loops for tool yoyo's. My sewing may not be pretty but it never falls apart (Marek-misc: Suit)

We had modified our suits with padding on the knees, and in some cases (mine among them) with additional padding on the arms, elbows, shins and shoulders. Thor Martin even had a loose pad that he mostly wore on his behind, an idea worthy of copying. When sitting down he immediately had something to sit on; while on the Ice Crawl he could have the pad under his chest and thereby get valuable insulation.

I outfitted my own suit with the padding, a waterproof and padded pocket for my camera, and several extra loops and pockets to carry tools (like the spanner on the spring-loaded yoyo) and for keeping the special Fifi-hooked cows' tail out of the way. All these details save valuable time and fatigue, which accumulates on a multi-day climb.

Most of us wore Norwegian Army boots, whose synthetic soles have excellent grip on mud and ice. Apart from that, the boots are simple and not very expensive, as well as being very hard wearing.

In addition to what we had on, each of us had one warm jacket of some kind. I had intended to bring my trusty fleece, but bought a Northern Lite jacket at Mec (5007-775) during our two-day stay in Calgary. This jacket seemed to offer the right combination of lightness, compressibility, warmth and durability, so I left my fleece outside. Happily I never regretted my choice of this excellent garment. Apart from this we carried no additional clothing. None is really required, and there is no room anyway!

Photography

The reader can decide whether the pictures that accompany this narrative are worth more than the words. At the best of times, cave photography is difficult, due to the darkness, ever-present mud and moisture, the mist in the air and the cold. In Castle-guard the sheer stress of travelling with heavy packs is enough to preclude frequent photo breaks.



Figure 33: My trusty Leica Mini II; more robust than you would believe (Marek-misc: Leica-mini-ii)



Figure 34: Padded and waterproof camera pocket on my suit (Marek-misc: Suit-details)

In this situation there is no single answer, and I, Bjørn and Christian each found our own. My choice and ambition has always been to get good action shots—unposed pictures of what is happening as it happens. For that I have used a Leica Mini II for over a decade and several thousand shots, invariably loaded with Fuji Provia 400 fine-grained, high-speed slide film. A Reflecta DigitDia magazine scanner (that will scan a whole tray unattended) takes care of digitization afterwards.

I have made a special camera pocket on my caving suit, waterproof (against both the inside and outside) and padded, and accessible at any time. With one hand I can pull out the camera, take a shot and get it back again within seconds, and without making anyone stop. Looking through the viewfinder is purely optional; over the years I have accumulated enough experience to get good shots at arms' length. That is just as well, for with mud, condensation and darkness most viewfinders are useless, and the best angle is generally seldom from where my eyes are anyway.



Figure 35: Up close—getting a good shot of a bighorn sheep with a wide-angle lens! Other people have more brains and stay in the car (Marek: (1104))



Figure 36: On the job—taking pictures in CC in 1994. The pack sat higher on my shoulders then, leaning forward is not a good idea here! (Marek: (1103))

This technique has its limits. The fixed 35-mm lens is not suited to telephotos. The built-in flash has limited power, so big scenes are out of scope. Its placement close to the lens creates problems with backscattering in misty conditions, and does not give enough shadow for macro shots. To mitigate this, I had attached slave flashes to the helmets of two of my friends. The flash was mounted in front, in conjunction with the headlamp, while the photo-cell and electronics were on the back, in robust boxes. The batteries were carried in a pouch on the body, and four C cells were enough to keep the flash going for a week—thus it could be on and permanently ready. This would give me added depth to the shots whenever possible, without inconveniencing anyone.

Christian's answer is at the other end of the spectrum. For this trip he carried a digital Pentax istD SLR housing with a macro/zoom lens, a large detachable flash and some auxiliary gear, in a shockproof Pelican 1100 case. For him, taking a picture meant at least ten minutes—but then he could take pictures of a kind and quality that I could not match. One of the problems of a digital SLR is the battery consumption, which is not tailored to trips like this. However, Christian had kept his options open, switched headlamps and in that way freed up sufficient batteries to keep the camera going.



Figure 37: *On the job—Christian getting ready photograph the aven, from the top. He had to sit still for the whole of my descent, to avoid sending rocks on to my head (Marek: CC05-05-0057)*



Figure 38: *Pentax istD digital SLR, Christian's happy choice (Christian: IMG-0042)*

Bjørn had an ultracompact solid-state digital video camera (Panasonic SV-AV50), as well as a Ricoh Caplio 300G waterproof digital still camera. We were therefore well equipped to take both action snapshots and exacting macro or tele exposures.

Logistics and permits

One does not simply walk up to Castleguard Cave and crawl in. Apart from the Parks Canada regulations, there is a quite seriously designed steel barrier that emphasises the restricted nature of the cave. We therefore needed the formal permission of Parks Canada for our expedition.


Parks Canada		Special/Restricted Activity Permit		Form 20-Inv-05	
Permit Number:	2738	Issuing Office:	JASPER DISPATCH		
Function:	BACKCOUNTRY	Program:	SPECIAL PERMISSION		
Special Activity:	ENTER A CAVE				
APPLICANT INFORMATION:					
Company Name:	Private Group				
Last Name:	Young	First Name:	Mark		
Mailing Address:	Tharviks Allé 5c				
City:	Oslo	Province/State:	Norway	Postal Code:	0455
Phone Number:		Fax Number:			
VEHICLE INFORMATION:					
Make:	unknown	Model:		Color(s):	
License Vehicle:		Province:			
License Trailer:		Province:			
Commodity Carried:					
PERMIT INFORMATION:					
Route/Location:	From Hwy 93, Big Bend, to Castleguard Cave				
Purpose:	Exploration - 200 foot aven in Castleguard Cave				
Permit Valid From:	05/03/2005	Permit Valid To:	25/05/2005	Delivered by:	MAILED
Permit Issued By:	Janis Stewart	Approved By:	Greg Horne		
Comments and/or Special Conditions:	see attachment for special conditions				
GENERAL CONDITIONS					
<ol style="list-style-type: none"> The National Parks Act and Regulations apply. Activities follow conditions of permit provisions in legislation. The permit must be carried by the permit holder and shown to a Park Warden, Park Officer, or Peace Officer on demand. This permit may be cancelled at any time by written or verbal notice. This permit is valid only for the dates and locations shown. This permit is not transferable. If the permit, all items and equipment are returned supervised at all times. If this is a vehicle permit, permit is for one-way directions on Hwy 93 and does not allow through travel. Notwithstanding any other provisions of this permit, the permit holder, including Parks Canada Inventory and all facilities, costs, damages, claims, and/or liability arising from: <ol style="list-style-type: none"> any damage to property or any injury to a person or persons including death, committed by the permit holder in his/her occupation or in his/her activities resulting from the permit. 					
Authorization Signature:					
For additional information contact Jasper Dispatch and Emergency Services: Phone: (587) 852-9122 or Fax: (587) 852-2585 or E-mail: jasperdispatch@pc.gc.ca					

Figure 39: Worth its weight in gold? Our permit for travel in the Cave (Marek-misc: Permit)

Climbing the 200-foot aven was a worthy goal. Our previous experience in the cave was an asset, as were the qualities of the other expedition members. Last but not least, I had met Greg Horne there in 1997. The impression we made then must have had some good points, in spite of the fact that the 1997 trip was technically a failure. He invited two of us to accompany him and Marshall Netherwood on Ellesmere Island in 2001, and I visited both of them with my family in 2004. The personal contact meant that Greg knew what I stood for; however I am confident that this merely simplified his collection of information about our expedition team, and that we would have qualified in any case.

Who in his right mind would welcome six Norwegians with huge packs, sure (during the return) to contain piles of suspect underwear and cave muck? Canadian cavers, that's who. My first experience of Canadian caving hospitality was stunning, in 1994. Together with Lars Tore Ludvigsen we arrived in Calgary, several days in advance of

the other two members of that team. Iain Schröder had met Ian McKenzie during the 1984 trip, and had been promised that we could stay with McKenzie for a day or two. Accordingly, we phoned and were promptly picked up by a smiling Ian. At his home, he told us that he was actually going away for the week — “so these are the keys to the house, those are the car keys, and have a good time”. Then he left: amazing.

Having experienced this for four times out of four possible, I’m beginning to wonder whether this is some kind of norm. In 1997 we imposed on Ian McKenzie again; during the summer of 2004 I came to Greg and Marshall with my whole family, and for the 2005 trip Marshall generously offered us room & board, plus the (inevitable?) banged-up pickup truck.

McKenzie’s old Nissan, blessed with about 10 cm of dead travel in the steering had by now expired, but Marshall’s Toyota with a three-out-of-four-speed gearbox (the third gear having been stripped at some time) more than made up for the loss. Together with a hired station wagon we were all ready to roll. Certainly, this level of hospitality is something to remember. Canadian cavers who come to Norway will find us equal to the standards thus set!

There were a number of other things to settle as well. It is a good idea to keep a big list of things to do, even though it may become mind-numbing at times. Marshall had picked up pre-ordered food from Mec and batteries from GPS Central. We were to stop at the Parks Canada Warden Office in Banff to pick up the key, and the Information office to pay our wilderness passes. A Warden (Terry Damm) living close to The Crossing served as a handover point for Greg’s drill and beautiful cave maps. We stayed at The Crossing on the night before skiing in, thereby also picking up a good-sized breakfast.

Speaking of breakfast, what goes in must sooner or later come out again. In a cave, that’s serious business!



Figure 40: No shit... this is serious stuff. Do we have a public training session on this, too?

Fortunately for the logistics planner, Canada is a country where bookings, orders and agreements work, so everything was waiting for us—a great convenience. We used a Yahoo mail distribution group to disseminate email between the team members, providing a good channel for discussion as well as an archive.

“Someone should have taken care of XXX”

There are many ways of organizing the logistics of an expedition. The simplest case is a solo trip: you do everything yourself, you decide as you think best, and there is no doubt about this procedure. You obviously cannot leave the important planning to someone else!—at the same time, you still need a sparring partner for your ideas, or you’ll end up forgetting something vital.

On a team trip the choice is wider. At one end of the spectrum is the solo model—there is still one person deciding and fixing virtually everything. At the other end is the self-organizing, potluck model—a general call for participation goes out, and everyone interested does and brings whatever seems to be most practical. Deciding on the organization model for this expedition was a mix of easy and difficult. I’m not usually a control freak, but since this trip was on my initiative, and its primary purpose frankly was to achieve my personal goal, a fairly centralized model with me at the helm seemed natural. The fact that I had the personal connections with people in Canada also worked in this direction.

On the other hand, the other members of the team were certainly capable people and would no doubt do an excellent job if given the opportunity.

What to do? In the end, we coalesced around a fairly centralized model. This meant that I raised what I considered to be the important issues regarding equipment, modes of travel, supplies, accommodation and logistics in Canada, permits, etc. I was the one to draft the application for permission, order batteries and food, keep track of things to do, follow up tasks that had been delegated—in short, being both the boss and the guy on the floor. It was not a very structured decision, more a case of me being the one with opinions on most things.

For most of the team this seemed to work well, and I think our results bear this out. That does not mean it was necessarily the perfect or even the best choice. Christian Rushfeldt certainly had refreshingly different views on a number of points, ranging from boots and backpacks vs. sleds to how we should cross the Pools and how we would organize the distribution of items between us. His physical separation from us, and consequent non-participation in our training trips, made it somewhat harder to synchronize our thoughts.

One potentially sore point is who carries what. The seemingly obvious solution is to pile up all the team gear, weigh it and divide by the number of people. Next, everybody dives into the pile and picks out enough items to make up the assigned weight. End of problem.

But... that doesn't work if there are items significantly bigger than the individual "allowance". Both the drill and the 100m rope were a lot heavier and bulkier than $\frac{1}{6}$ of the total. Now what? I take the drill, but throw my sleeping bag into the common pool to make up for the overweight, plus a bunch of food bags because of the drill's bulk. Now someone else has a volume problem, since there is no way to get enough room for the allotted weight in the pack, given the radically different densities of a drill vs. a sleeping bag. On the other hand, the box of 100 bolts was almost a solid block of steel.

A complicating factor is that people have different equipment and ideas on what is a personal minimum equipment list. Suppose Thor Martin buys an expensive, high-quality down sleeping bag. It's ultra light and compact, and when he also drops the extra sweater, suddenly his pack seems quite empty. A good opportunity to stuff in my left-over sleeping bag and some other items, but now he's suddenly cheated out of the upside of his investment in high-tech, low-weight gear. And Christian is carrying a big camera in a bullet-proof case, and Jørn has a huge sleeping-bag (which is probably unavoidable as he is a big guy). We could demand that everyone switches to down sleeping bags, but those are very expensive—too expensive to be practical.

Of course, all of this can be solved through a combination of meticulous lists, good will and cooperation—and it was, but with a perhaps too large addition of improvisation. However, when a number of important items simply are not available in advance (for instance, the food bags were bought in Canada), one *cannot* do a comprehensive packing exercise. We tried twice, with "stand-ins" for the missing items, but this proved to be far from perfect. Also, I think we did not take this seriously enough, in the sense that we could and should have had more realistic packing exercises earlier on. In the end, the claustrophobia on the Ice Crawl squeeze forced a radical repacking anyway, because the team split—so improvisation will always be with us.



Figure 41: *Realistic packing at last—I do wonder if there's room for all of this stuff*

Keeping equipment lists, food lists, to do lists and sundry other lists is quite time consuming. It's easy to say that there should be a comprehensive list of equipment, including weights—and we came quite close, as can be seen in the Appendix. Who keeps what list and how the responsibilities are divided can be something of a challenge. As an indication of the amount of record-keeping required, I spent at least 2-4 hours per week for a year handling all the logistics.

A more interesting problem is when there is actual disagreement on what should be carried, how things should be divided, or how the trip should be carried out. The art is to standardize what must be standardized, and enforce compliance, without tipping over into dictatorship. The line between individual choice and team decisions can be blurry, since things like individual pack weight and volume vs. physical fitness and caving skills will influence speed of progress, fatigue and other factors during the trip. Happily we were able to resolve all such differences with few problems.

Our intent was to travel together as a group at all times. From my personal experience, this by no means seems to be the obvious choice, nor even the most usual. On most trips I've been, people have gone pretty much at their own speed, individually or maybe in pairs or threes. That's fine when the circumstances allow—the route is known, there is little risk of injury, etc.

In my opinion, Castleguard is close to the opposite, both inside and outside. A sprained ankle will immobilize the unlucky caver, and if the distance to the next one is half an hour, and the others are 20 minutes ahead, actually achieving something useful will take hours—with the cold and loneliness creeping in. The psychological pressure of being alone can also be distressing, though having trouble to keep up with a group that does not seem to care is at least as bad.

Travelling in a group means that most of the time, most people will be going at speeds that are not their own. This takes some mental and physical effort to handle, and all

the team members need to agree on the need for this, otherwise the group will fall apart. In this respect we had solid success; I don't think I have seen as good group cohesion on any other trip I've made. I certainly think that was the right strategy, and it speaks volumes about the spirit and will to cooperate of everyone who participated.

All these large and small issues are part of the inevitable friction inherent in organizing an expedition. On easy trips the consequences of inadequate planning or disagreement are invisible, or can be shrugged off. Going to Castleguard, from Norway, failure due to such causes would be more than embarrassing. I therefore wanted to err on the side of caution as far as possible, and would rather risk being thought obsessive than careless.

Finally, everything was set. The preparations were over, and we were all set for the big adventure. . .

Part III

Execution

Half-way round the world to reach a cave...



Figure 42: We came a long way—from Tromsø and Oslo in Norway, via Frankfurt and Calgary to The Crossing, Big Bend and finally Castleguard (Marek-misc: norway-canada-map)



Figure 43: Where is Castleguard, anyway? In the middle of the Rockies, on the beautiful Icefields Parkway (Marek-misc: canada-map)

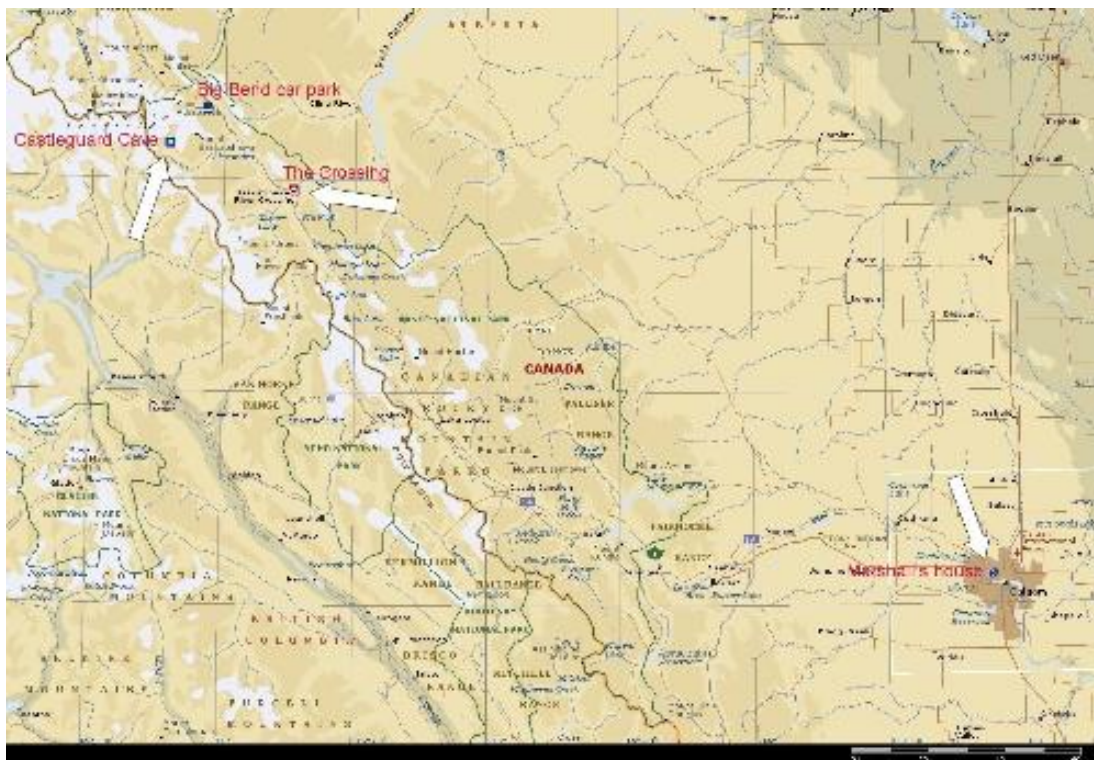


Figure 44: How to get there: From Calgary via Banff and Lake Louise (Marek-misc: calgary-cc-map)

The last few days before departure brought some uncertainty. Iain Schröder has led an active life to say the least, and several years ago his hips started to trouble him. The diagnosis of worn-out joints led to hip implants, but going into Castleguard thus equipped was a true challenge. Some weeks before departure something started to cause intense pain, and he was ready to resign from the trip. At the last minute the pain cleared and he was able to come with us.

From Oslo to The Crossing

Apart from the consternation caused by our baggage at the airport, and some frantic repacking to get under the 22-kg-per-item limit, the flight went without a hitch. Everything arrived, and Marshall was waiting for us at the airport in Calgary. We stayed with him and his wife Barbara for two nights. They are wonderful people, and I think Thor Martin was absolutely charmed by Barbara—as were we all. Marshall graciously lent us his old pickup truck, which meant we had to hire just one car. This saved us a lot of money and we will remember.



Figure 45: Excess baggage coming up—and the ski pack won't fit on the conveyor either (Marek: CC05adj-01-0001)



Figure 46: Maybe next time? Greenland from 41 000 feet (Marek: CC05-01-0011)



Figure 47: The Netherwood Cavemobile, complete with big Petzl sticker (Marek: CC05-01-0024)

Apart from Marshall and Barbara, Calgary had one main attraction for us: Mountain Equipment Coop. Norway has similar stores that are almost as large, but the selection at MEC is still superior. More important, the prices are from half to one third of what we are used to paying. The price difference is especially large for textiles, whether Gore-Tex or other items. We visited MEC several times, leaving our credit cards smarting.



Figure 48: A royal welcome at Marshall's house. Just the thing for cavers going out for a looong trip! (Bjørn: bilde-016)



Figure 49: Marshall, Barbara and Bjørn having a good time (Bjørn: bilde-020)



Figure 50: Look at my new jacket! Smart, eh? Marek showing off to Iain and Jørn (Bjørn: bilde-026)



Figure 51: It'll never fit.! Finally we have all our real gear and do a packing exercise. Oops. Good thing we brought the extra packs (gray) for use in the cave (Marek: CC05-01-0022)



Figure 52: Chicken Gumbo by the cartonload. The meanings of logistics and bulk start to sink in (Marek: CC05-01-0020)



Figure 53: Ten minutes to blast-off. Iain has been assigned to the pickup, and is performing the pre-flight check in preparation for engine start & rollout. Co-pilot and documentation crew are standing by (Bjørn: bilde-060)

From Calgary our way went via Banff to The Crossing, on the Icefields Parkway. In Banff we picked up the cave key and our Wilderness Passes, and just before The Crossing we got Greg's drill, a satellite phone for emergencies and a set of cave maps from Terry Damm, a friendly Warden. The atmosphere at dinner that evening was solemn. Two of us knew what lay ahead, the rest had heard the tales and seen the pictures. I rescued Thor Martin from the bar and we all went to bed.

The next morning we presented ourselves for breakfast at the earliest possible moment. While the rest were studying the menu, I ordered six steak & eggs—big ones, with lots of everything. The man behind the counter looked at me once and understood. We got a real breakfast, something to keep us going for a good while.



Figure 54: Guess who's eager to get up? (Bjørn: bilde-113)



Figure 55: Who said "fruit"? A big steak is the only possible breakfast on a day like this! (Marek: CC05-01-0045)



Figure 56: Loading up at the Crossing (Bjørn: bilde-125)

After eating, all that remained was to check out. The cars were loaded, everything was ready. We drove the last half hour, through occasional snow squalls, up to the parking lot at Big Bend. We stopped rather suddenly at the Weeping Wall for pictures, nearly causing an accident in the poor visibility. As we stopped at Big Bend the other car stopped too, but when they saw that there were six of us they changed their minds and went on.

We unloaded, took a picture and started.

Skiing in

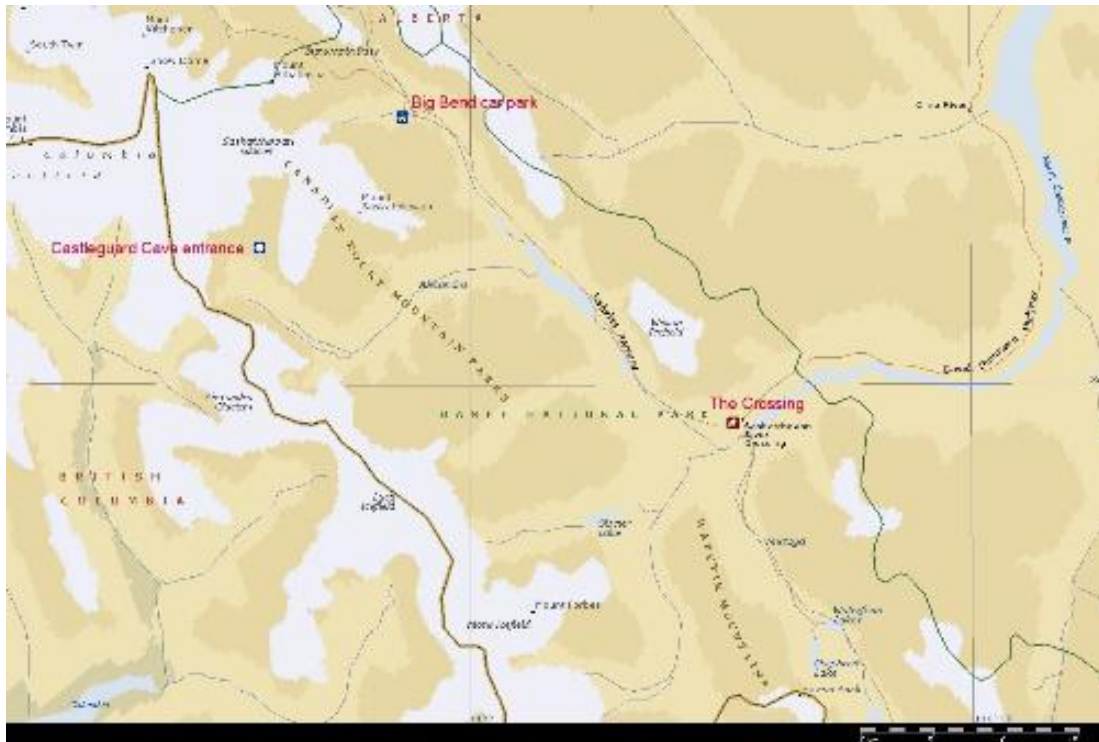


Figure 57: The last miles by car. All overview maps from Microsoft Encarta, 2001 edition (Marek-misc: crossing-cc-map)



Figure 58: Composite image of the valley leading up to the Saskatchewan Glacier. Big Bend to the left, exit from the glacier to the far right. This picture was taken from Parker Ridge, summer 1994, and shows about half the ski trip—from the left, along the valley bottom, and up the glacier to the right. (Marek-misc: cc-summer-panorama)

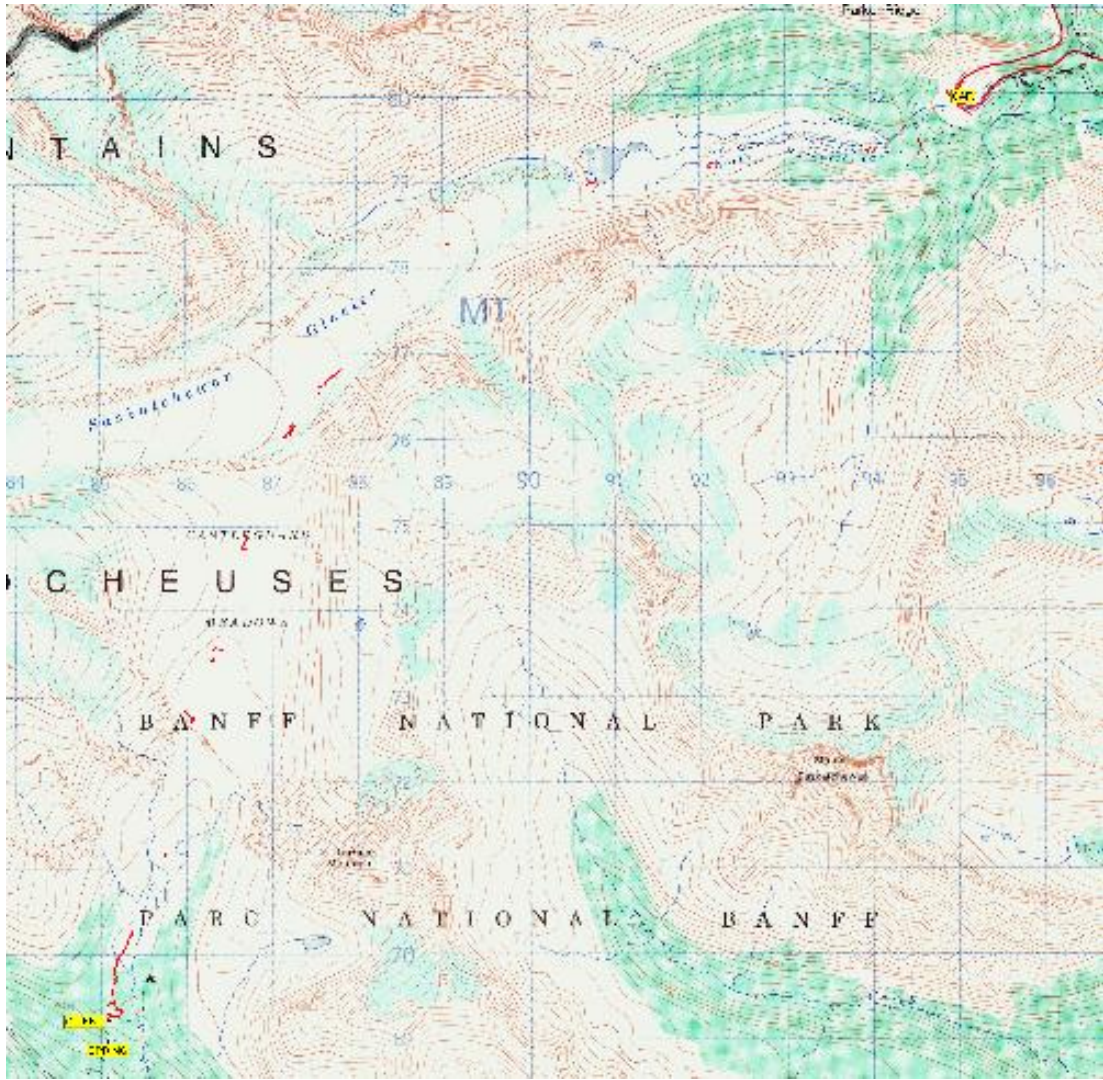


Figure 59: Cutout from 1:50 000 scale map, showing the ski in from 1997 (no operating GPS was carried in 2005). Red squiggles are track fragments, yellow flags are waypoints for the parking lot at Big Bend, the cave entrance and the springs further down the slope. The blue grid is 1 km. NRCCan Topographic Maps sheet 83 C/3; OziExplorer software; Garmin GPS 10XL. Cave entrance position is 11U 485080E, 5769192N (WGS-84) (Marek-misc: cc97-endpoints)

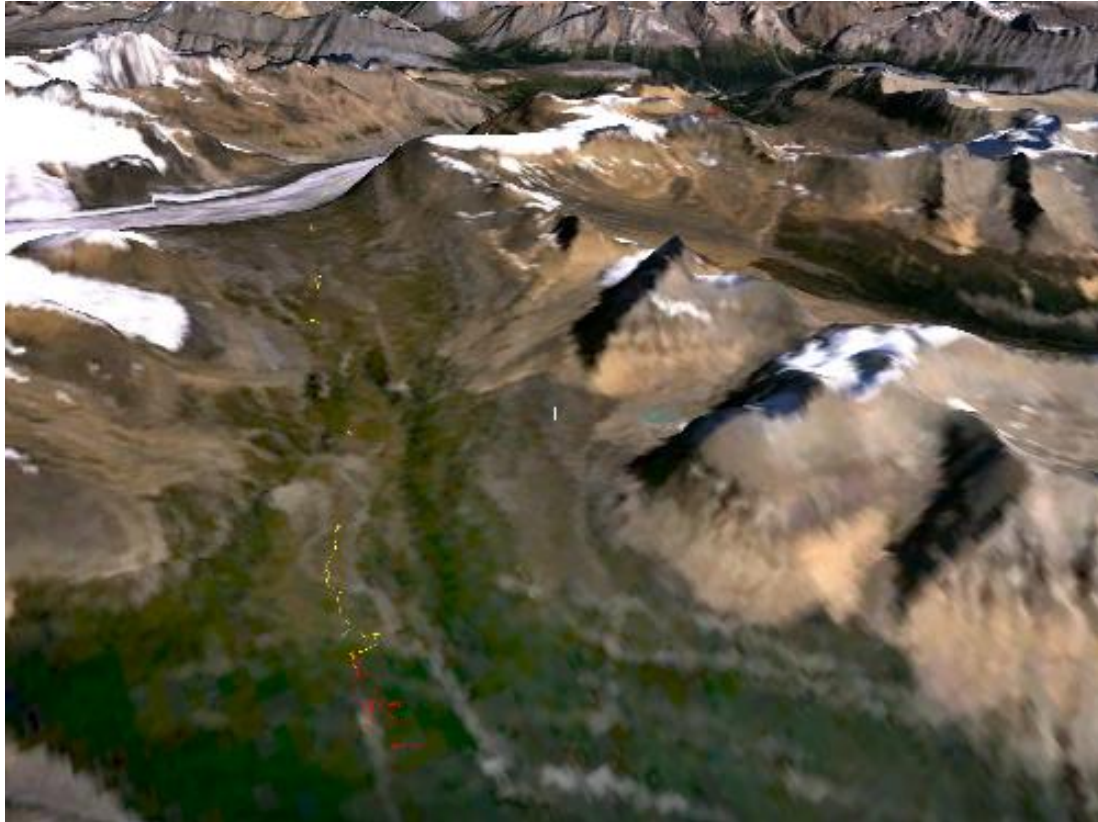


Figure 60: Screenshot from NASA's WorldWind application. This is a composite Landsat image overlaid on a terrain altitude grid, and shows the Meadows including the track fragments and waypoints (red) from the 1997 trip. Straight up is heading 30 (true north), from a simulated altitude of about 3000 m. Castleguard Mountain is just out of sight to the left; Terrace Mountain is the marked pyramid to the right of the Meadows valley. (Marek-misc: cc97-from-southwest)



Figure 61: At the Big Bend parking lot, preparing to go (Marek: CC05-01-0048)

The ski conditions were quite reasonable. There was some fresh snow, overcast and a very flat light. The temperature was mild, and the snow was not deep enough to be a cause for concern. To get to Castleguard Cave from Big Bend there are many different stages. First a small creek close to the parking lot must be crossed, followed by a light climb along a forest track over the first, small hill. On the other side lie the valley bottom and the river delta leading up to the Saskatchewan Glacier. Towards the end it rises in a series of moraines up to

the start of the glacier itself.



Figure 62: Simply getting out of the parking lot can be hard enough... (Bjørn: bilde-145-edited)

The glacier is steep to begin with, and then levels out into a smooth, long climb. The centre is generally free from crevasses and poses little danger. Towards the upper plateau one has to exit to the southwest, over the steep side moraine. This path leads to the somewhat chaotic terrain of the upper Meadows, from where one descends down onto a beautiful plateau. At the end of it comes the treeline and the descent into the Castleguard River valley, and the cave is located on that slope. The total distance is about 18 km in a straight line, with an altitude gain of 600 m and subsequent loss of about 500 m.

The skiing was uneventful until we got onto the glacier. On the steepest part I stopped beside Thor Martin to catch my breath, and experienced an episode of heart arrhythmia, where the pulse becomes fast and very shallow. It is something that happens for a few seconds once or twice a year, but this time it continued for over a minute and thus became noticeable. My friends accepted my explanation that it would pass and was not serious, but some weight was taken from my sled and put into some of the others'.



Figure 63: *The glacier foot is steeper than it looks. Fortunately there was enough fresh snow to ski on, though with projections of blue ice everywhere (Marek: CC05-01-0077)*



Figure 64: *Sheer blue ice beside a meltwater pool (Christian: CC05-011)*



Figure 65: *Up the moraine, towards the exit ravine. The loose snow and heavy sleds make it quite difficult (Marek: CC05-01-0091)*



Figure 66: *Pulling a sled up the exit ravine (Marek: CC05-02-0008)*



Figure 67: *Real men don't need much help: Bjørn and Jørn take one sled on their own (Marek: CC05-01-0095)*



Figure 68: *This time there are more people on the job (Christian: CC05-019)*

A short time later it was Thor Martin's turn to lag behind. He asked if he could switch sleds with me, which we did. We were both shocked at the difference. It turned out that the underside of his sled was encrusted with ice from crossing a stream earlier on, while mine was lovingly smoothed and waxed. It is quite probable that Thor Martin was also feeling the after-effects of a quick trip to Kilimanjaro (ascent successful) and subsequent severe diarrhoea about six weeks earlier.

In the end, I pulled Thor Martin's heavy sled all the way to the cave, while he got mine. We both got there at the same time. My heart has not troubled me since.

The exit from the glacier became a tour de force. We used a fairly steep, rocky ravine that we also used in 1994 and 1997. It is not a hospitable place, but it is fairly well protected against avalanches, something we always keep in mind. Our preferred technique was to use one man in front, one on each side and one behind the sled, to get a single sled up. This was quite exhausting and it took us about two hours to get off the glacier. In 1997 darkness had fallen on us at this point, but this time we were in better shape and had easier conditions.



Figure 69: Inside the entrance, packing for the cave (Christian: CC05-023)

Due to some mis-coordination we only had an ancient Magellan GPS unit with us. As it turned out, it provided no useful guidance and we had to rely on Iain Schröder to find the cave. His terrain memory is fantastic and did not fail us, though it took some time to locate the entrance. About two hours after dark, having spent 11 hours on the skiing, we were at the entrance. The mountains had let us pass, and we were one day ahead of our worst-case schedule.

The entrance passage of Castleguard Cave is a cold and draughty place, but it is still better than the loose snow outside. We could lay out our gear on the mixture of rocks and ice without getting snow into everything. Iain, Jørn and Bjørn put up their tent, while Christian, Thor Martin and I preferred to do without.

The lock on the gate was frozen solid, but by holding the cooker under it at full blast for a few minutes it was easily thawed. The key proved to be the right one (relief!) and the gate was open. We were ready for the next stage of our journey.



Figure 70: Thawing the lock (Marek: CC05-02-0020)

Entrance to Camp One

As with the ski from Big Bend, the distance from the cave entrance to Camp One consists of a number of distinct stages, each with its own nature. Immediately inside the entrance lies an 8 m drop, leading down to the Ice Crawl. On the crawl the floor is completely covered in ice, and the clearance to the ceiling narrows to one helmet high.



Figure 71: Looking out of the cave entrance... the last daylight for five or six days (Marek: CC05-02-0029)



Figure 72: Breathtaking view across the valley towards the Watchman. Can you see the face? (Marek: CC05-02-0031)

Inside of the Ice Crawl is a long rocky crawl, where everything breakable in the packs breaks. After that come the Pools, and ensure that no-one escapes the right atmosphere and mindset. The cave continues with walking and crawling stretches, past the sandbank of the Emergency Depot, and leads to the top of the 80-foot pot.

Here one descends by fixed rope, through a dried-mud squeeze and into the Subway. This is the only easy stretch of the entire cave, in the form of an 800 m long tube, round in cross-section, 3-4 m in diameter and straight like a laser. In this phreatic passage the water was under pressure and the rock around it was uniform and without major faults, yielding the perfect tubular shape.



Figure 73: Going down the first pitch. Sure hope that icicle stays in place! (Marek: CC05-02-0046)



Figure 74: Thor Martin on the Ice Crawl. So far, so good (Marek: CC05-02-0052)



Figure 75: *Not quite as funny any more. Is there going to be a lot more of this thickening-ice-on-the-floor thing (Bjørn: bilde-207)*

The Subway ends at the Fallen Slab, a block the size of a bus that has broken loose from the wall. Inside of it is the First Fissure, a seemingly never-ending vertical crack. Here, progress is laborious, first walking on one wall, then the other, then between them, up a bit, and down again. This goes on for a good 3 km and is a real test of staying power.

After the First Fissure peters out into a more easily passable corridor, the Grottoes begin. Here are fabulous calcite formations that the caver passes with care and some awe. And finally, the chamber of Camp One is reached.

How one perceives the trip from the Entrance to Camp One depends very strongly on the combination of physical strength, motivation and baggage load. Unloaded and in high spirits it's a mere four hours. In 1997, with insufficient preparation, two days of arduous skiing behind us, heavy packs and the prospect of doing it three more times within the next few days it was enough to break the will of one of the strongest people I know. This time around I was determined that we would get through in good order.

The cave is frozen ... or is it?

I experienced a strange combination of familiarity and surprise on the way in. On the one hand, I had passed these places several times, even building the big pebble arrow that leads travellers away from the Boon's Blunder passage. On the other hand, everything was new to me in 1994, and in 1997 I was too tired and too concentrated to notice much around me. I also had much, much better light this time, especially for peripheral vision.

But the Ice Crawl at least was familiar. Here was the low roof and the expanse of ice on the floor, with steps as the ice got thicker on the way in. There seemed to be a surplus of these steps, and the passage got lower and lower... until there was a final step. My heart sank as I thought that the cave was frozen solid, but then I saw that it was still barely passable.



Figure 76: *Time to consider repacking?* (Bjørn: bilde-212-edited)



Figure 77: *Definitely getting impractical* (Bjørn: bilde-216-edited)

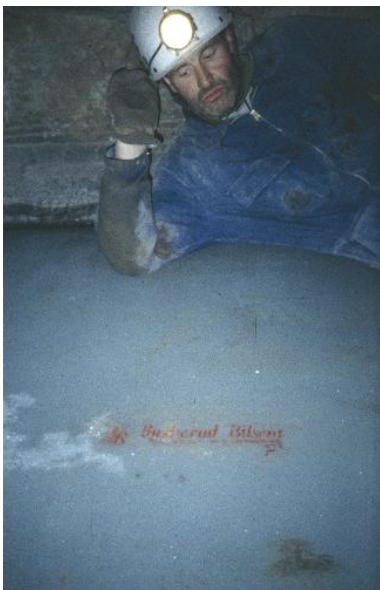


Figure 78: *In 1994, We lost the sticker from a pack on the way in; three days later it's covered with 3-4 cm of fresh ice* (Marek-Misc: CC94newIce)

We had come too far to turn back easily. I let my pack lie and slithered inwards into the narrow darkness. After about 30 m and a corner, out of sight of my friends, the ice relented and the passage widened. The cave was passable after all, without even having to remove the helmet: a squeeze, but not a desperate one. I crawled back, remembering that the technique here is to get purchase on the roof with my legs, the ice being smooth and useless for pushing against. I told my friends the happy news.

We had already discussed the real possibility of being frozen in, and had brought a nice little axe for that eventuality. We planned to leave the axe safely inside of the ice crawl. On the way out, motivation would not be a problem and we expected to be able to hack our way through any new ice that might appear while we were inside. Prior experience from 1994 told us that we could easily get 3-4 cm of ice in the same number of days.

However, the psychology of these things cannot be reliably predicted. Thor Martin and Christian negotiated the narrowest part with no problems. As for myself, I can honestly say that I do not know what claustrophobia is about—and I do not hope to find out. For Iain it was different. He has never been completely comfortable in close quarters, despite being one of Norway's most experienced cavers. He is also a large man and felt the constriction more than us skinnies. Whatever the reason, he could not make it through, and his inability propagated to Bjørn and Jørn.

We agreed that they should use the axe to hack out a groove in the ice, following the marks I had made. They would thereby get the room they felt they needed to get through. In the meantime the three of us who had gotten through would go on to Camp One.



Figure 79: *Hacking away—a small sea of ice chips where the trough was made (Bjørn: bilde-223)*

This necessitated a hurried repacking, to ensure that the three of us brought in all the gear we needed for climbing, just in case the rest were prevented from following us.

As usual, I assumed the task of tracking every item of gear to make certain that everything was where it should be, and nothing vital was forgotten.

As the three of us continued inwards, the sounds of the axe hacking against the ice quickly grew faint behind us and died out. When we reached the Fallen Slab at the end of the Subway, it was already 7 pm and we decided to have “lunch”, i.e., Chicken Gumbo from the bag. The only major problem with

our food was that it was flatulent, and walking downwind of any one of us could be a risky proposition.



Figure 80: *Christian carrying two packs on the rock crawl, nice posture for curing back problems (and incidentally smashing anything breakable in the packs) (Marek: CC05-02-0062)*



Figure 81: *These Pools are just sooo cool! But the central heating seems to be broken... and could I have a smaller bag please? (Marek: CC05-02-0066)*

We each now carried an overstuffed pack on our backs, plus two of the auxiliary packs between the three of us. This way, one of us had his hands free while the two others had to contend with a chest pack in addition to the backpack. This was quite tiring, the more so as the chest packs tended to obscure the vision needed to place the feet exactly right. In the Fissures of Castleguard there is not very much room for error or even choice in where you place your feet. Naturally, most of my pictures are from the times I was not carrying an extra pack—even if my camera only demands one hand for a few seconds, that hand has to be free from worrying a pack that wants to fall off my shoulders. Our pace was slow.



Figure 82: Thor Martin wedging in First Fissure; there are kilometres of this (Marek: CC05-03-0021)



Figure 83: The extra bag can be carried in many ways, none of them convenient (Marek: CC05-03-0008)

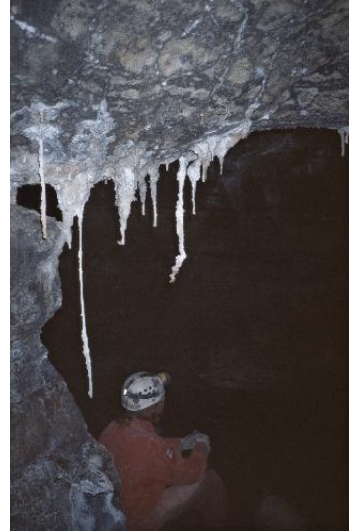


Figure 84: Time for a rest, and some philosophy under the helictite (Marek: CC05-03-0015)

First Fissure seemed endless. The flowstone in the Waterfall Room was a welcome landmark and distraction, and I made several shots of my friends and myself there. I recognized the place where we turned back in 1997 and was glad to pass it. What really surprised me was the distance between the end of the Fissure and Camp One. It was so great that I spent about half an hour going rapidly ahead, alone and without my pack to make sure we were in the right place, though there is no real possibility of going wrong there.



Figure 85: Checking the map (Christian: CC05-042)



Figure 86: A drink (Christian: CC05-043)



Figure 87: If you slow down, you slip (Marek: CC05-03-0033)



Figure 88: Two bags, both hands free (Marek: CC05-03-0009)



Figure 89: Fascinating colours (Marek: CC05-03-0039)



Figure 90: Slightly tricky (Marek: CC05-03-0048)



Figure 91: Rather more tricky (Marek: CC05-03-0050)



Figure 92: A helping hand prevents a slide (Marek: CC05-03-0035)



Figure 93: One of many rest breaks (Marek: CC05-03-0040)



Figure 94: Welcome to Camp One! (Marek: CC05-03-0061)



Figure 95: Just like p. 98 of the Castle-guard book (Marek: CC05-03-0030)



Figure 96: Folded rock in the Waterfall Room (Marek: CC05-03-0026)



Figure 97: Christian annexes Canadian soil (Marek: CC05-03-0064)

When we finally arrived at Camp One, we had been en route $13\frac{1}{2}$ hours from the cave entrance, and awake for over 20. We forced ourselves to eat, and then immediately retired to our sleeping bags under the overhanging roof. Christian had brought a Norwegian flag, which he planted with some ceremony in the silt beside his sleeping pad. I doubt that even the Norwegian Government will ever try to collect tax from this place.

Climbing



Figure 98: Warming duct tape to set the slave flash (Christian: CC05-054)



Figure 99: Final assembly adjustments (Christian: CC05-057)



Figure 100: Thor Martin sets the first bolts (Christian: CC05-056)



Figure 101: On the platform, ready to move (Christian: CC05-059)



Figure 102: Platform loose, climb up the rope to the next bolt (Christian: CC05-060)



Figure 103: Getting onto the platform again (Christian: CC05-061)

Commuting between Camp One and the avenThe next morning was Day 2 in the cave, though “morning” was a relative term. We got up around 4 pm, and in the middle of our breakfast we were pleasantly surprised by visitors: Jørn and Bjørn had come in on a day trip, bringing much-needed supplies. This literally took a load off our minds, since we now would not have to worry about supply logistics any more. We also got news. Iain had valiantly tried but failed to pass the constriction on the Ice Crawl, so he was stuck outside. Bjørn and Jørn had decided to stay with him, and just make the day trip in to Camp One with our supplies. They planned to make another trip on cave day six, to help us carry everything out again.



Figure 104: *Classic Holes in the Floor scene (Christian: CC05-072)*

Around 4 pm we set out, heading for the Aven. It lies more or less at the end of the Holes in the Floor passage, about 20 minutes from Camp One. Holes in the Floor is an interesting place, where an early phreatic passage later acquired a keyhole-like shape from a brook running on its floor. With the mud and clay left over in the upper part, what remains is a passage with fairly steep sides and a longitudinal hole in its floor. The hole is from a few cm to a meter wide, and quite deep. At one point one has to travel by sitting on one side with the feet pressed against the other side of the hole. Later there are climbs up and down over clay barriers and along ledges.

On the 1994 trip, we had brought 4-point crampons to help us safely negotiate Holes in the Floor, and they were along this time, too. We put them on and headed into the clay. Except for taking a few pictures of the beautiful cave pearls and other formations, nothing much was said—we were all too focused on what lay ahead. At the Aven turn-off we crawled through the side passage, and finally came to our goal, the 200-foot Aven.



Figure 105: *Easy, except for the backstabbing stalactite (Marek: CC05-03-0084)*

Standing there, on the bottom of the Aven, was a big moment, the culmination of an 11 year long dream. It was just as I remembered it, a monster of a hole leading straight up into the black unknown. It is a cold and damp place, from the drops of water falling down, so we lost little time in assembling the platform, the drill and other gear. Nothing had been left behind, so all my paranoid record-keeping had paid off.

Where to start? The climbing technique requires good, solid rock for setting bolts; but a dry place is better than a wet one, given choice. After some hesitation and surveying we found that there was really only one place to start, fairly close to the drip. Other possibilities were excluded either by the presence of clay, major cracking, or a suspicion (correct as later proved) that we would be heading for a dead end.



Figure 106: *Assembly complete, ready to start. Christian holds his camera case (Marek: CC05-03-0088)*

The bottom belay bolts were set, then the first platform bolt. I set up the platform, took a deep breath, and climbed on to it. The first few bolts are the most exposed to falls, since the ground is too close. By the third bolt I was safe, because if it broke I would not reach the ground when hanging from the second one. I was pleasantly surprised by the speed and flow; it really was like climbing my house façade.

Having passed the first few bolts and made some minor equipment adjustments, I settled down into a nice rhythm. My audience timed me and could later tell me that my highest speed was a mere five minutes per move—much faster than we had hoped for. In the old 1994 slides we had seen what looked like a formidable, overhanging skirt of calcite that would have to be passed. When I came up to it, it turned out to be trick of the light.



Figure 107: (Christian: CC05-062)



Figure 108: (Christian: CC05-063)

It is not a skirt, rather a triangular recess that runs around the aven. By adjusting the interval between bolts, I was able to place one bolt directly below and the next right above it, passing it with no delay or difficulty. A few bolts later I had run out of my supply of 15 hangers. Further advance would involve cleaning out hangers from below to reuse them on new bolts. That sounded like work for tomorrow, so I called it day, stepped off the platform and slid down to my faithful watchers.



Figure 109: (Christian: CC05-064)



Figure 110: (Christian: CC05-066)



Figure 111: (Christian: CC05-068)

The trip back to Camp One was uneventful, and supper passed in quiet but upbeat mood. So far, the aven had yielded without a hitch. We went to bed at midnight and slept soundly the whole night.

Next morning saw us up at 9 am, ready to go right after breakfast. We had used the four-point crampons the day before to pass the steeper parts of Holes in the Floor, but today we decided to try without. This was partly because we wanted to see what it would be like without them, and partly out of laziness, as it takes time to get them on and off.

As it turned out, going without crampons was a little more “interesting” than with them, but still no problem. As before, we snapped a few pictures of the stalactites on the way, and were soon at the bottom of the aven again.



Figure 112: Holes in the floor, our commute to work (Christian: CC05-079-cut)



Figure 113: *The beauty of the Grottoes*
(Marek: CC05-03-0097)



Figure 114: *Good morning!* (Marek: CC05-03-0065)



Figure 115: *Evening mood in Camp One*
(Marek: CC05-03-0066)



Figure 116: *The Grottoes—careful!* (Marek: CC05-04-0007)



Figure 117: *Entrance to the Aven* (Marek: CC05-03-0094)



Figure 118: *A good (and rare) cup of hot chocolate* (Marek: CC05-04-0093)

This time I started by collecting hangers on the way up. Using a single rope clamp plus the GriGri to climb any significant length of rope is nowhere near as efficient as using dual clamps, but it was still workable. I was soon on the platform, slightly wet and ready to go. After less than ten bolts I came up into an area where there was a layer of calcite on the rock face. It grew to a thickness that became worrisome, since it did not provide a firm anchor for my short bolts. At the same time, I was beginning to discern a ledge in the corner above me. Soon I had to traverse directly to the right to avoid the calcite, actually setting a bolt below (but on the opposite wall of a corner) my last one.

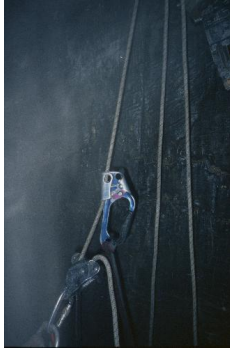


Figure 119: GriGri replaces chest clamp, hand clamp with foot strap as usual (Marek: CC05-04-0072)



Figure 120: Bottom anchor with spanner on right-hand bolt; the rope was long enough to give a negligible fall factor (Marek: CC05-04-0070)



Figure 121: Calcite layer on top of bedrock—to be avoided! (Marek: CC05-04-0026)



Figure 122: Pearls (Christian: CC05-091)



Figure 123: Pearls (Christian: CC05-096)



Figure 124: Pearls (Christian: CC05-092)



Figure 125: Terraces (Christian: CC05-099)



Figure 126: Pearls (Christian: CC05-095)



Figure 127: Balcony (Christian: CC05-100)



Figure 128: *The ultimate pearl image?* (Christian: CC05-098)

It took me about another seven bolts to change walls in the corner, get on to the ledge and set a bolt on the original wall, so I could start to advance properly again. The calcite stopped at the ledge level, so that would no longer be a problem. The value of having an almost unlimited budget for holes and bolts was becoming very obvious at this point.

However, I had again run out of hangers, and would have to collect more before I could go on. I would also have to shift my bottom anchor to avoid running out of rope, and I was being soaked by the incessant drip. Lunch seemed like a good idea, so I went down to Thor Martin and Christian. The way back to Camp One became a photo safari. Christian had his big camera and flash out, and we took a number of very beautiful images of stalactites, stalagmites and—not least—the cave pearls. His digital Pentax has an amazing macro lens, and with me holding the flash on a long cable we got an image where two pearls fill the whole frame.

Lunch was welcome—spicy Chicken Gumbo again—and after a short rest we headed back to the aven for another climbing session. I asked the two others whether they would like their turn at climbing, but both demurred and told me I was the one best suited for it. There was nothing to do but start up again.

Shifting the bottom anchors took some time, but I was soon enough on my ledge, with my harness full of hangers. Now came a length of perfect rock, with nothing to interrupt the smooth rhythm. The rock face was so homogenous and hard that I even stopped testing it with my hammer before placing the drill: it was so obviously solid that testing would have been a waste of time. I was back to about six minutes per move, oozing up the wall at about 16 metres per hour. The bottom of the aven was well out of sight in the fog, and nothing disturbed my solitude and concentration.

The smooth rock came to an abrupt end. A series of horizontal bands of slate, or some-

thing like it, stretched around the aven. It looked like the baffles inside a photographic lens, placed there to absorb stray reflections. The plates were crumbling, to the extent that I could pick my way in for several cm using my bare fingers. A thin layer of mud covered the whole thing. This was not a good place for bolting, but it was obviously impossible to avoid. I decided to leave this obstacle for tomorrow. It had been a good day, and tackling something with this level of difficulty required a fresh mind and body.



Figure 129: Perfect, smooth rock (Marek: CC05-04-0025)



Figure 130: The bolting platform; red "rope" is my connection to the Fifi hook (Marek: CC05-04-0027)



Figure 131: Terrible rock for bolting (Marek: CC05-04-0074)

One important part of the morning ritual (or whenever your body rhythm dictates) is a visit to some private place, suitable for practicing the "Human Waste handling procedures" neatly laid down in the Special/Restricted Activity Permit appendix. The theory is simple, but some parts, like "target the centre of the towel", may become messy. In spite of my resolution to practice everything, I had to confess making some exceptions.



Figure 132: Concentrate: Ready, aim,... (Marek: CC05-05-0012)



Figure 133: Target! A miss would have been a mess (Marek: CC05-05-0013)



Figure 134: All packed up for transport out (Marek: CC05-05-0015)

To make the story brief, it worked. The pictures hopefully speak for themselves!

Topping out

The next day would be the third day of climbing, and I was determined to reach the top if at all possible. I started by moving my bottom anchor a considerable distance up the rock face, to ensure that I had enough rope available if things became tricky at the top. At the same time, moving it too high would be bad, since it would increase the shock load in the case—now seeming more likely—of a fall.

Finally, the time had come to start on the rock plates. There was good, solid rock in there, buried inside a layer of mud, on the vertical parts between the plates. The plates stuck out so much that the platform could not be used; the steel wires used to stiffen it stuck against the rock bands and made the platform unstable.

My technique became to stand on the innermost part of plate, with the bolt more or less at harness height. I would then place the next bolt as far up as possible, and move to it partly by using the GriGri and partly by clambering up the rock plates. A corner nearby seemed to provide somewhat better and smoother rock, so I was traversing upwards to the right to get to it.



Figure 135: *There is solid rock somewhere underneath. Not far between bolts here! (Marek: CC05-04-0079)*



Figure 136: *Spot the missing block—the bolt is now on what was behind the loose rock, and the original hole is visible above it (Marek: CC05-04-0081)*

Then I got a surprise. When I hammered the auger to expand a bolt in apparently good rock, the rock split and a piece the size of a cinder block fell out. My poor bolt was left in a hole that ended in thin air, hanging from a small collar of rock! Well, at least the rock *inside* of the fallen block was good, so the next bolt went straight in without delay. Again I was glad to have an ample supply of bolts and drill time.

At the beginning of the days' climb, I had pulled up all the rope that was under me, leaving no slack to hang down. Falling rocks could damage it, and that had to be avoided. The only problem was that I was now completely isolated, as my friends would not be able to get up to me without that rope! Their company 50 metres below me in the darkness, well sheltered against the constant cannonade of rocks and pebbles at the bottom of the shaft, was of psychological value—but anything that happened up here would be my problem to sort out, alone.

In fact, the round trip time to get a rope and climbing gear would be close to a *week*, so this was definitely a time for conservative thinking and good safety margins. The only equipment available was what I had with me right there, the only brain on the job was mine. Only in such circumstances it is possible—and necessary—to achieve the ultimate level of concentration and intensity. These hours were worth all of the training, preparation and expense; and there exists no shortcut.



Figure 137: At the top of the aven. “Rock” you can dig out by breathing on it (Marek: CC05-04-0089)



Figure 138: Why it took so long... ropes spontaneously make tangles (Marek: CC05-04-0090)

The corner was a real step forward, once I got there. I was out of the rain, which improved things considerably. The constant soaking was not dangerous, but it did make it hard to keep warm as well as being irritating. The corner also offered rock that was smoother, to the point where I could use the bolting platform again. Two good, long moves suddenly brought me level with floor of the chamber at the top of the aven!

I spent the next hour or so actually getting on to that floor, past an overhanging rock that I studded with four or five bolts—I was not in the mood to take any chances. I then made sure of my retreat, setting a good anchor at the top, untangling the rope, cleaning up gear: first things first. At last, I could take a quick look at what I had found. The aven continued at least 8 m more above me, but I could just see the roof, so it seemed my climb was over. Going into the chamber, it was up to 5 m wide, meandering with a small brook in the middle. After about 12 m I faced a wall with a vertical crack in it, the continuation of the chamber and source of the water. Both the wall and the crack looked very wet; the crack was squeeze-narrow and required a little climbing to get to it, so I left it for the time being.

Suddenly, the sound of the water seemed to increase? Yes, and by quite a lot, too. Then the water level in the brook started to rise. Within seconds, the flow had quadrupled, and prompted some unpleasant visions of a wall of water coming from the crack, sweeping me over the edge. No thanks... I headed smartly back to the aven, securing myself to the rope at the first possible opportunity. The flow of water stopped rising, remaining at about four times the original flow.



Figure 139: Waiting for Godot—my friends’ patience was impressive, and left them more or less frozen solid (Marek: CC05-04-0094)

This would have ensured a thorough soaking on the way down, so I spent some time shifting rocks and mud around at the edge to try to change the flow. My aim was to make the water flow sideways a little before going over the edge, to move the flow away from the rope. At the same time, I did not want to do any permanent damage, so using the drill to change the solid rock was not an option.

All this took time, and my companions—well out of communication range—would be wondering by now. I was cold, wet, tired and very happy when I slid down to them, able to report a successful conclusion to the climb. We headed back to Camp

One without delay, for a celebratory Sierra Chicken, followed by one of the best drinks in the world: Hot chocolate with a generous dash of rum.

The day got even better: While eating our dinner, we heard strange noises in the distance. They got stronger, and then we had visitors: Greg Horne and his team. They were wet, hungry and happy, after a supposedly⁸ fairly routine trip (as far as Castleguard Cave will ever be routine) from the entrance here to Camp One. They found sleeping spaces for themselves, and except for one of them who fought with his tarpaulin all night, must have slept well. It sounded like the tarp was winning.

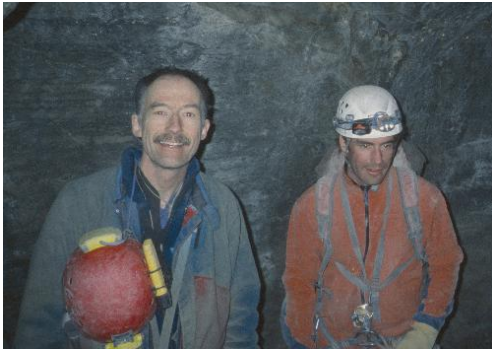


Figure 140: “We must stop meeting like this”—Greg is certainly happy to be here! (Marek: CC05-05-0003)



Figure 141: The tarp is winning... and why doesn't he take his helmet off? (Marek: CC05-05-0009)

Survey work



Figure 142: “Tape tightly round the neck”—never mind the arteries (Marek: CC05-05-0026)



Figure 143: On the cat-walk: Marek demonstrates the latest cave fashion (Marek: CC05-05-0017)

The next morning—day five in the cave—saw us all eager to get up the rope. The only problem was that of water, i.e., getting soaked on the way up. Both I and Christian chose to use the plastic moisture barriers from our sleeping bags under the coveralls, to avoid getting soaked to the skin. Thor Martin said he would survive anyway (which he certainly is good at). We took along our survey gear, kindly lent to us by Greg. He and his team were sketching and surveying underneath Holes in the Floor and in the vicinity.

Going up the rope with just a hand clamp (with a foot sling) and a GriGri was still not very fast and quite tiring—a fair price to pay for saving total pack weight, but still a price to be paid. My plastic bag worked, and I didn't get wet to the skin on the way up. Christian

came next, followed by Thor Martin. First order of the day was to investigate the chamber we were in. The survey data and map are included in the appendix, and show the chamber to be like I had quickly seen the previous day. Meandering walls, a high ceiling and a brook in the middle go on for about 12 metres, ending suddenly in a wall.

I helped Thor Martin up the first part of the wall, so he could get wedged in the crack. Then I sent up the drill... and he slid, made a (correct) snap judgement and dropped the drill on to my head; thus managing to regain his hold at the last instant. “Always wear a helmet” is good advice. We found that nothing had broken on either me or the

⁸A later article in Canadian Caver—see appendix III, p. 113 told the *real* story of that trip

drill, so I sent it up again. He squeezed up the crack to more or less level ground, and set a bolt up there, using some of the spare rope. The crack is now easily accessible.

He and Christian went on to investigate. Christian followed the crack upwards, all the way to the ceiling. He then followed the roof of the main chamber, going back towards the top of the aven, over our heads. From there, he could see no obvious leads, but his time was limited by cold and lack of protection. We did not have sufficient spare rope or heavy-duty bolts to rig anything worthwhile up there.

In the meantime, Thor Martin continued into the crack. This was narrow, wet work with small, very sharp ledges sticking out of the rock every 5 cm or so. After oozing along for several metres, he came to squeeze that may be negotiable by lying down in the water at the bottom, but the cold was taking its toll and he wisely chose not to press it.

We spent more time surveying and sketching the actual main chamber, and not least, finding a good place to rig the main rope. In the end, I set the permanent anchor with two Petzl Cœur Goujon stainless steel bolts/hangers some way southeast of the brook. According to rocks dropped at that point, we had a perfectly clean run on the rope with no rebelayes and no rub points.

We measured the height of the aven up to the chamber floor by pulling up the main rope, where the last man up had set a knot at floor height before starting to climb it. We measured the actual rope length using the tape, pulling it through our hands simultaneously with the rope.

This is not a very precise way to get the height, but under the circumstances it was the best available. The air in the aven is too foggy to get any kind of sight all the way from top to bottom, and with just one rope it would have been difficult to measure it while hanging on it (plus the extra stretch).



Figure 144: Having a stove to warm our hands on was a good move (Christian: CC05-104)



Figure 145: Surveying in 100% relative humidity (Christian: CC05-105)



Figure 146: Setting the permanent bolts. This has to be just right... (Christian: CC05-107)



Figure 147: Packed for home. Can you find my Leatherman? (Marek: CC05-05-0044)

It was now about seven hours since we had left Camp One, and five since our soaking on the way up. While the plastic helped somewhat, we were all getting cold. I had brought our stove up, so we at least had some warm water (and heat enough to seal the cut ends of the rope, even though they were dripping wet). We decided to call it a day, to get a good rest before the trips out to the entrance and back to the car—scheduled for the next two days.

Therefore, we disassembled the bolting platform, finding that the pieces no longer fit inside each other. My hard use had slightly dented the metal, and the previously snug fit was now a negative tolerance... no matter, into the pack the pieces went. So did the drill and various other items. Our final survey task was to take pictures on the way down. Thor Martin went first, and then I got ready to descend while Christian perched on the edge. Given the loose rock, that meant he had to find a position that would give him good images, while being able to hold it more or less unchanged for upwards of twenty minutes. If he were to dislodge any rocks while I went down, my helmet would take a beating.

I descended, carrying my pack and a large flash. Every so often Christian would call a halt. I would turn off my light, wait for him to call out, and then trigger the flash down under me, thereby illuminating the aven while he had the shutter open. Four or five of these stops were made. From about halfway down the water had spread out enough to hit the rope, so I was pretty cold by the time I got to the floor—no doubt Christian was just as cold in his cramped position up there.



Figure 148: *Looking down the aven (Christian: CC05-108)*

There, with the help of Thor Martin I set an anchor far away from where the rope came down. After Christian had descended, we tied off the lower end of the rope to keep it away from the water and any rock falls. This should insure that it lasts for a long time.

We were not alone! Bjørn and Jørn, our trusty porters, had come in to join us. The

three who were outside had decided to see if we could come out a day early, thus Bjørn and Jørn made the trip in so that they could help us carry all our stuff out. While we would have preferred a good nights' sleep before tackling the journey out, their generous offer of carrying assistance tipped the balance. We would eat, pack and move out tonight, with their help.



Figure 149: *Main rigging done (Marek: CC05-05-0040)*

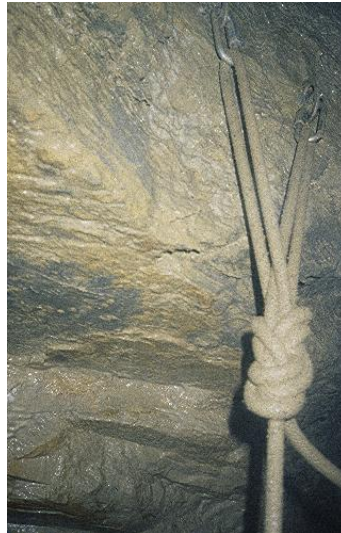


Figure 150: *The main anchors (Marek: CC05-05-0052)*



Figure 151: *Finding a perch for the aven photos (Marek: CC05-05-0057)*

Moving out

Dinner was a time to take stock and consider what we had done. The first ascent of the 200-foot aven itself had been spectacularly successful. A perfectly rigged rope now hangs in the aven, ready for whoever comes next to explore the upper parts. We had rough sketches and survey data of the top, as well as the height and profile of the aven itself.

Our exploration of the “Penthouse” was not as thorough as it could have been, certainly not when seen from the later comfort of my armchair. Maybe if we’d had one more day... and maybe not. I was happy to have done the climb, my companions felt that we had accomplished what we had come for; dry clothes were just a memory and everything was full of mud. Sometimes, turning back is the right decision. The next pairs of eyes up there may well see things we did not, bringing fresh motivation and strength.

Now we were set to move out—or not quite yet. Bjørn told us that he had slid and fallen against a rock on the way out on cave day 2, slamming a battery pack into his ribcage. He suspected one cracked rib. Having cracked a few ribs myself on other occasions, I’m quite sure that going into Camp One in Castleguard Cave is high on the not-with-cracked-ribs list—but his opinion was different. This is what true friendship is about. And the doctor was here! and not outside.

Christian set to work, feeling for and sketching the ribs in blue marker pencil. “I’m going to set a local anaesthetic in the ribs directly above and below, and also straight

into the fracture. This will hurt since I will have to feel for the nerve.” Right. Bjørn clamped his teeth together and Christian brought out the syringe. Every camera in the cave was trained on them while the work went on, and Bjørn held a heroic stone face. “It usually lasts for 24 hours, sometimes more”, Christian said. We lost no time in shouldering the packs and moving out.



Figure 152: First, chart the terrain (Bjørn: bilde-350)



Figure 153: Then, start the injections (Bjørn: bilde-359)



Figure 154: Feel for the nerves (Bjørn: bilde-355)

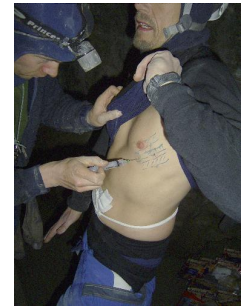


Figure 155: Last shot, right into the fracture (Bjørn: bilde-362)

Going out was far easier than going in. It’s downhill, you’ve seen the scenery before, we only had one pack each, and we were heading towards daylight with “mission accomplished” stamped across our minds. Between the almost perpendicular block walls I didn’t even think of looking for footholds—I simply slammed out knees and elbows and went through with hardly a break, pack and all. Now that was something that felt totally out of reach in 1997—motivation and training are wonderful things. Still, First Fissure is nothing to trifle with... and you do have to watch your step.



Figure 156: Ready to move out: Thor Martin, Bjørn, Jørn, Christian, Marek (Marek: CC05-05-0070)



Figure 157: Test of strength, with pack (Christian: CC05-123)



Figure 158: More strong guys, this one with cracked ribs (Christian: CC05-124)

The nice feeling wore off somewhere around the Pools. We had just become dry, finally getting rid of the water from the aven, when we hit the first Pool. The fresh dunking felt somewhat unnecessary, and made us cold again. After more than eight hours on

the move in the aven, followed by a meal and another six hours travel, we were all getting tired. The jokes were fewer, but no bad vibes. Bjørn's anaesthetic had already worn off (hospital patients don't quite have the same level of activity), but some rather strong pills kept it manageable.



Figure 159: *Patience, wait for the drop to fall* (Marek: CC05-05-0088)



Figure 160: *Stretch test, legs long enough?* (Marek: CC05-06-0002)



Figure 161: *Thor Martin picks up speed* (Marek: CC05-05-0091)

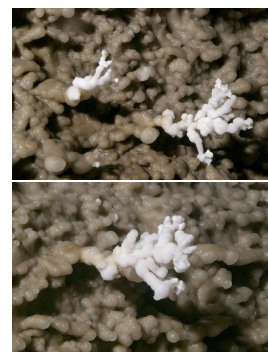


Figure 162: *Hauntingly beautiful "trees"* (Christian: CC05-127)

On the rock crawl between the pools and the ice I lagged behind, changing films in my camera. I went on in darkness and silence, until someone called my name—*behind* me. How could that happen, when I was tail-end Charlie? I had actually lost my bearings during the film change and was going back into the cave. Perhaps I was more tired than I thought, and was glad I had my friends to come back for me. We went on, with less of a spread in the group.



Figure 163: *24 hour anaesthetic, eh? More like 4 under these conditions* (Marek: CC05-06-0008)



Figure 164: *I think all of us pretty much felt the same* (Marek: CC05-06-0015)



Figure 165: *This is not a posed shot; one pack is enough* (Marek: CC05-05-0084)



Figure 166: *The perfect bathing spot* (Marek: CC05-06-0037)



Figure 167: *"Bah"* (Marek: CC05-06-0043)

Crawling over the ice and through the constriction was by now routine. Bjørn took off his helmet and gave me some great shots that show how narrow it really was. After that we almost flew along the ice to the bottom of the 8 metre pit close to the entrance, where we set about collecting enough climbing gear to get up. Since we did not have full sets for everybody, the first people up (myself among them) sent the harnesses down for the next.



Figure 168: *At least the exercise will warm you* (Marek: CC05-06-0054)

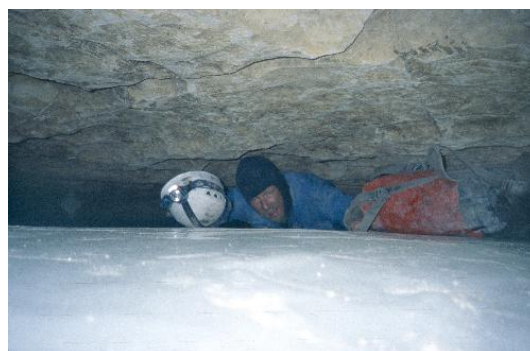


Figure 169: *Aha, the tight spot again* (Marek: CC05-06-0069)



Figure 170: *... and do remember the pack* (Marek: CC05-06-0070)



Figure 171: *Self portrait* (Marek: CC05-06-0071)

Thor Martin decided he would just use two hand clamps to go up. He's a strong guy, but given the past fifteen hours this was a somewhat optimistic decision. He nearly got stuck on the overhang and it took a good while for him to get up to where I was waiting, freezing in my wet boots and clothes. Brrrr. Like my inadvertent turning back, his decision was brought on by a combination of cold and fatigue that can play dangerous tricks on the mind.

The last few metres out were done at a crouched run—the fence gate loomed out of the darkness, and we were out.



Figure 172: *The climber and his companions (Marek: CC05-06-0081)*



Figure 173: *The faithful bearers (Marek: CC05-06-0084)*



Figure 174: *Thor Martin, happy in his bag (Marek: CC05-06-0085)*

Return over the mountains

The ideal ending for a cave trip is a hot shower, a huge steak, a soft bed and a long night—right outside the cave, and with lots of beer close by. Castleguard offered mostly the opposite. We had already had a “refreshing” cold bath on the way out, the menu said Sierra Chicken (or whatever), the bed was definitely on the rocky side, and there was talk of moving out early. Being proper heroes these did not seem to be major problems, so we went to sleep in a good mood.

The next morning did present one problem: how to make everything fit into the sleds? What had been soggy the night before was now frozen solid. My socks were stiff as planks and my suit could have been used as a murder weapon. As for the boots... It took ruthless use of brute force (two people jumping on one suit) to compress and fold everything properly. Since I was the last man to move out I got all the leftovers, giving my sled a pregnant look (and weight).



Figure 175: *Bend this if you can* (Marek: CC05-06-0090)



Figure 176: *Last man out gets whatever remains* (Marek: CC05-06-0092)

After bowing to the mountains and cave, I turned my back to the entrance and moved out, up the hill towards the Meadows.

The actual trip back was fairly routine, but we showed some effects of the strain. At one point we had a slight disagreement as to the route, all previous tracks were snowed over and the light was flat. We split into two subgroups, following similar routes, never more than a few hundred metres apart. I may have saved all of 15 metres of altitude change... but it seemed important at the time.

No-one was eager to go down the ravine we had used on the way up, though the alternative of going blind over the edge of a steep, snow-covered slope did not appeal to me. The snow cover was not very deep and the snow seemed very stable, so we judged the risk of avalanches as low (there were also no avalanches visible on the steep slopes to the sides). We decided on a route close to the cairns of the summer path.



Figure 177: Approaching the glacier (Marek: CC05-07-0015)



Figure 178: This slope is too steep to cross (Marek: CC05-07-0023)



Figure 179: Zoom—the meteoric sled (Marek: CC05-07-0026)

This became an adventure. Iain solved the problem by simply going over the edge and straight down, fast and efficient. The rest of us wanted to find a path where we could see more before committing—but that made us go partly sideways across the slope, never a very good idea. Jørns sled wouldn't take the cross angle and rolled over to hang below him, making further progress close to impossible. At that point I decided visibility was good enough and went straight down. A few minutes later he did the reasonable thing and let go the sled, which blew down the slope like a meteor.



Figure 180: Down on the glacier in good order (Marek: CC05-07-0037)



Figure 181: Goodbye Castleguard Mountain (Marek: CC05-07-0030)



Figure 182: Sled-jumping? (Marek: CC05-07-0042)

Down on the glacier, Iain took charge of pathbreaking. "I know exactly where to go, so I'll go first and you will follow". Fair enough, and we did, all the way to the bottom of the glacier. Across the moraine at the bottom we scraped whatever wax was left on our skis off on the many protruding rocks and pebbles.



Figure 183: Rather sandy snow below the glacier (Marek: CC05-07-0044)



Figure 184: Looking back (Marek: CC05-07-0046)



Figure 185: Along the valley floor (Marek: CC05-07-0048)



Figure 186: Last view of the glacier (Marek: CC05-07-0050)



Figure 187: Up the last hill! (Marek: CC05-07-0056)



Figure 188: Brrr, let's get loaded (Marek: CC05-07-0065)

When we came up to the hill that blocks the exit from the valley, Christian moved in front. He is a great skier and I knew he was going to crack on the pace. "This time, I'll hang on regardless" I thought, and so I did, working up a good sweat in the process. We stopped at the top of the hill, and went down as a close group from there. Our final test of strength was the seemingly ridiculous little river crossing next to the parking lot, easy by the looks of it, but not when hauling a full sled.

Arrival at the car was something of an anticlimax. No welcome committee, no cheerleaders, just a bone-chilling wind and snow everywhere. We cleaned off the cars and loaded the pickup in record time, piled in and went towards The Crossing.

Winding up

The Crossing received us warmly. At last we were within reach of steaks, beer and showers. There was one final duty to be performed, however: weighing. Everyone stripped and stepped on to the scales. I'm sure many expected to have lost a lot of weight, and the table on page 109 shows that some did. However, I had lost not one gram. This did not surprise me, from earlier trips I know that my metabolism seems to switch to high-efficiency mode when needed. The span of weight loss, given the activity levels and identical food intake, is quite interesting.



Figure 189: *At last: Steaks! Beer! Getting a bit out of focus here...* (Christian: CC05-141)



Figure 190: *Happy guy no. 1 (Christian: CC05-138)*



Figure 191: *Happy guy no. 2 (Christian: CC05-139)*



Figure 192: *Happy guy no. 3 (Christian: CC05-140)*

Then, finally, beer & steaks, da capo, da capo.

We spent the night at The Crossing, and in the morning did some repacking. The garbage went into the containers, our excrements were sorted, stacked, photographed and weighed, then disposed of. We got out our “civilian” clothes and left for Banff.



Figure 193: *Weighing the sleds (Bjørn: bilde-412)*



Figure 194: *Your shit is here, mine's over there (Bjørn: bilde-414)*

In Banff we ate a huge lunch at Wild Bill's, then went to the Hot Pools. Recommended pool time is 20 minutes, but we were there for at least an hour. Sightseeing in Banff was followed by a dinner even bigger than lunch and a great party. The Brent Lee Band band could go from Deep Purple to Johnny Cash in ten seconds—you have to be good to dare do that, and succeed.

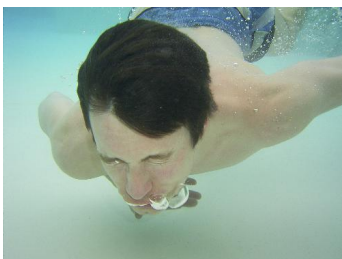


Figure 195: *Blurp, blorp, much better Pools these (Bjørn: bilde-438)*



Figure 196: *Hot guys (Christian: CC05-144)*



Figure 197: *Ditto! (Christian: CC05-145)*



Figure 198: *Finally a Dinner worthy of the name (Christian: CC05-148)*



Figure 199: *The happy climber (Christian: CC05-149)*



Figure 200: *The Brent Lee band (Christian: CC05-150)*

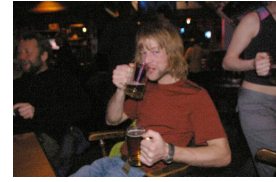


Figure 201: *Mr. Two Beers (Christian: CC05-151)*

The next evening saw us safely back at Marshall's. For the remainder of our days in Calgary, we went sightseeing, made a trip to the Tyrrell Museum and drove along some very straight roads, shopped with abandon at MEC and generally had a good time. Diligent searching even turned up a place to get rid of the empty beer bottles (bottle return is nowhere near the industry it is in Norway). Our 7 hour stop in London was long enough to take a trip into the City, adding something of a cultural diversion towards the end. We were back home on schedule, happy after a great Easter.



Figure 202: *The aftermath of a good trip (Marek: CC05-08-0018)*



Figure 203: *Before... (Marek: CC05-08-0020)*



Figure 204: *... and after cleaning (Marek: CC05-08-0024)*



Figure 205: *How the Netherwood garden became waterlogged (Marek: CC05-08-0030)*



Figure 206: *What a lunch! (Marek: CC05-07-0099)*



Figure 207: Charge! (Christian: CC05-157)



Figure 208: Black gold coming up (Christian: CC05-161)



Figure 209: Homewards bound! (Marek: CC05-08-0033)

Appendices

Illustrated Survey

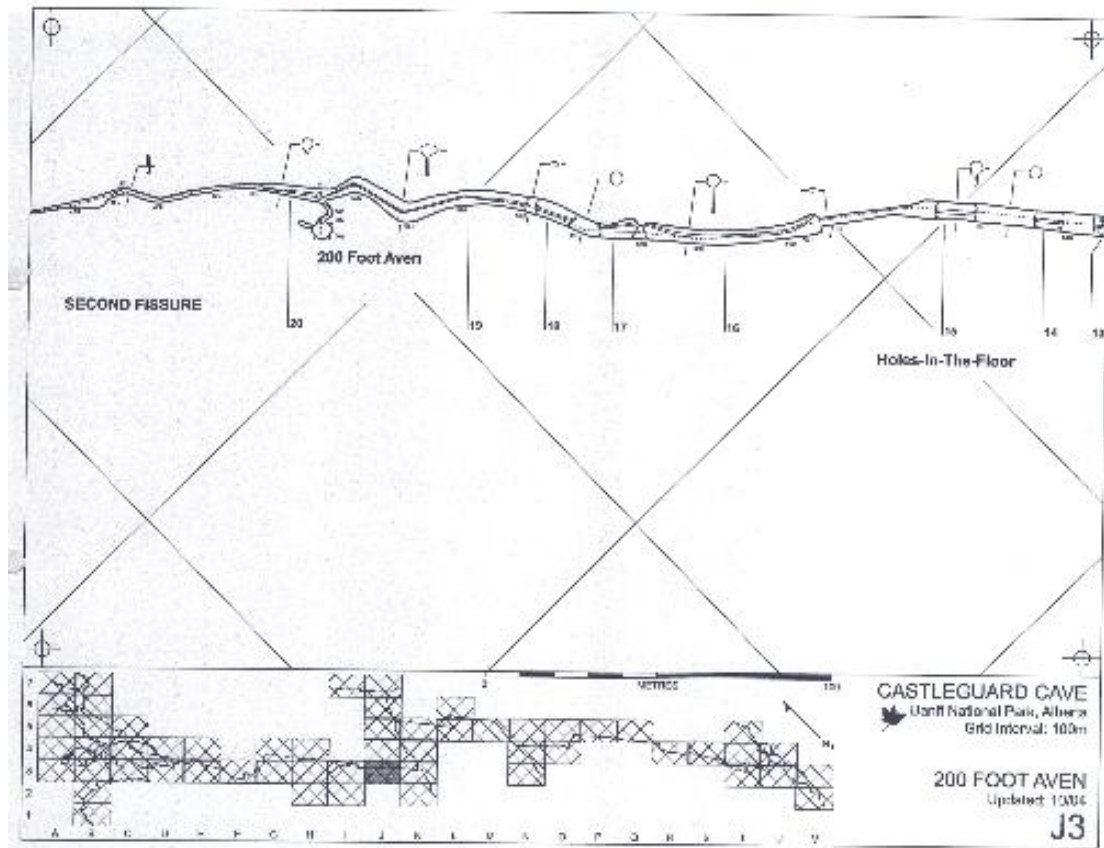


Figure 210: Sheet J3 of the Castleguard map—Camp One is on K4 (Marek-misc: Map-J3)

The starting point for our survey is the station marked “001” close to the south wall of the aven, on sheet J3. The climb proceeded more or less straight up the middle of the south wall. Our first station, termed ‘A1’ is at the bottom of the climb. The forward sight from ‘001’ is 256 degrees, -43 degrees (down angle), 7.00 metres. All direction angles are relative to magnetic north as of March 2005.

Our second station, termed ‘A2’ is at the top of the climb (main bolts). Distance was measured using the rope, and the value of 68 metres must be taken with a grain of salt. The fog precluded any angle measurement, which in any case is very close to the vertical. A longer survey tape, or a multi-stage measurement (not pleasant in the constant drip) would be required for higher precision.

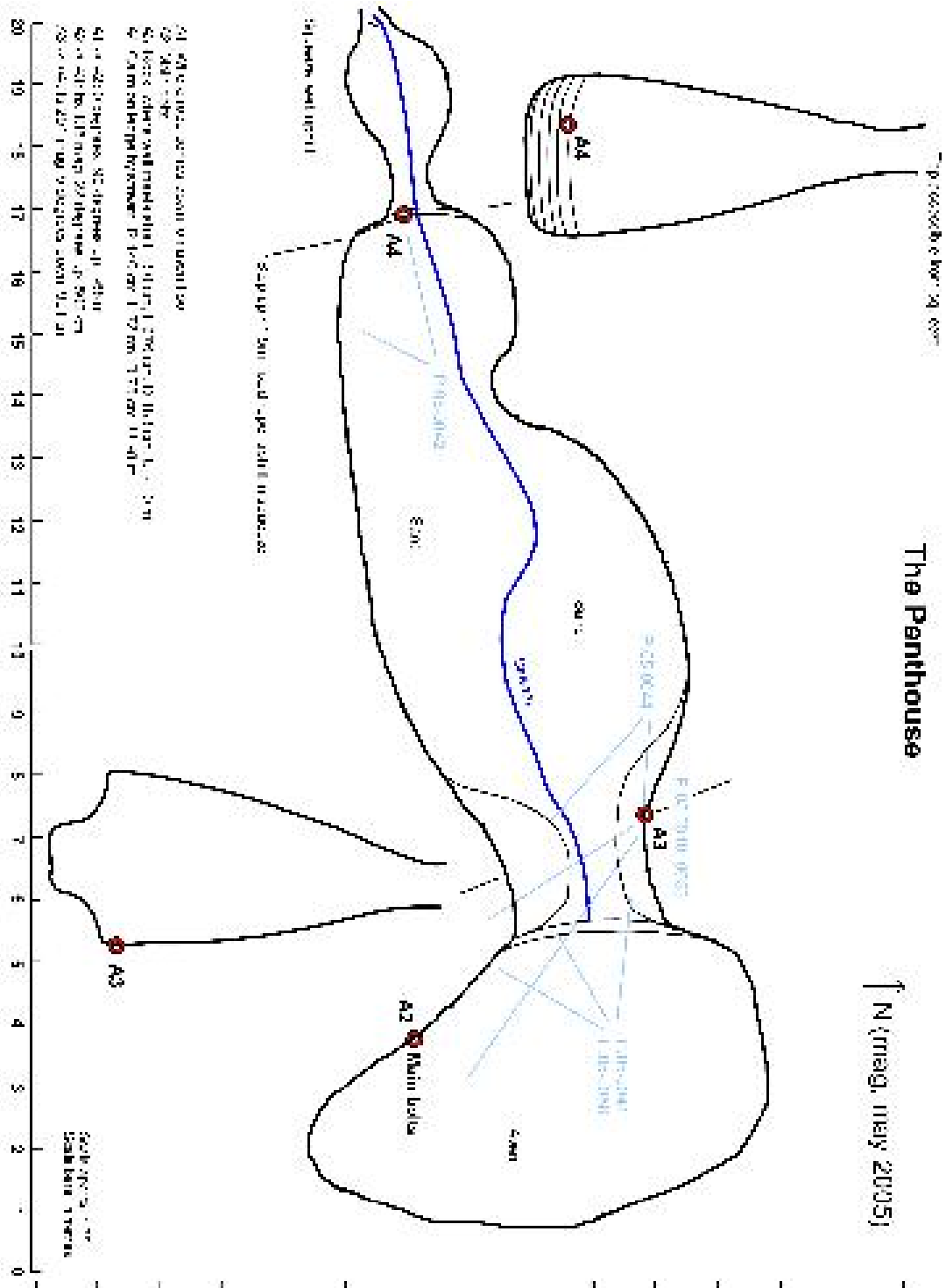


Figure 211: Survey sketch, plan view + cross-sections (Marek-misc: Survey-revised)

This is the survey map, drawn from sketches, images and descriptions. Survey stations are marked in bold text, while camera angles for selected pictures are marked in blue. The chamber ceiling is approximately 8 metres above the floor, and forms the ceiling of the aven as well. The whole chamber lies in the approximate same direction as the entryway to the aven, at the bottom. The ceiling passage is accessible from the squeeze at the inner (southwest) end.

Would-be climbers are advised to bring bolting equipment to rig anchors up there. Our supply of rope was insufficient, and we also did not have more high-strength bolts available. Rigging fall protection using only the 30 mm anchors was not considered advisable; neither was carrying the heavy drill up to pre-drill holes without any protection while working.

The following pages contain a number of images from the chamber, as well as from the aven itself. Some of the images have been manipulated (brightness/contrast/lighting) to compensate for under-exposure and therefore colours should be taken as indicative only; however, great care has been taken not to introduce any gross or outline artefacts.



Figure 212: *View from top chamber towards main rope leading down (Marek: CC05-05-0040)*



Figure 213: Looking up towards the top chamber floor from the aven. Safety ropes and topmost slate-like ledges visible. Opposite angle from photo 05-0040 (Marek: CC05-05-0041)



Figure 214: Inner end of top chamber, just below start of squeeze (fixed hand-rope coming down at centre of picture). Survey station A4 is roughly where the rope enters the picture at the top (Marek: CC05-05-0042)



Figure 215: Climbing gear, with view out towards aven. P.05-0040 was taken from a point to the right of the drill handle. (Marek: CC05-05-0044)



Figure 216: Rigging at the top of the aven; down rope furthest from camera (Marek: CC05-05-0047)



Figure 217: Ready to descend (Marek: CC05-05-0050)



Figure 218: Preparing for the remote flash photos during descent (Marek: CC05-05-0057)

Aven profile

The following series of photos was taken by Christian Rushfeldt, using his Pentax digital SLR. While he was sitting at the top of the aven (see P. 05-0057), I took the big flash and descended along the rope. These pictures show the complete profile of the aven from the top chamber level down to the ledge I reached on the first climbing day.

All the pictures have been enhanced. Orientation: Up is approximately to the north, west is to the left. The top chamber entrance is diagonally to the left and down in the first image, and all the top-down images have the same orientation.



Figure 219: From chamber floor level down. The “baffles” lining the upper part of the aven are clearly visible, with a sudden change to very smooth, black rock below them (Christian: CC05-108)



Figure 220: Next stop on the rope (Christian: CC05-109)



Figure 221: Image 109 and 110 are from the same height, about where the “baffles” end. Note the spurious shadow caused by my pack, slung below me and in the way of the flash (Christian: CC05-110)



Figure 222: Bottom ledge is barely visible (light rock on ledge surface); the aven narrows and changes profile there (Christian: CC05-111)



Figure 223: *In this photo, I'm holding the flash only a few metres above the ledge. Below that, the aven profile changes into a more elongated shape. The rope just avoids touching the edge (Christian: CC05-112)*

The following pictures were taken from below during the climb, and connect with the previous series. The orientation is up = north, west = right (mirror relative to the top-down series).



Figure 224: *The ledge is clearly visible at the edge of vision. Note the rock outcrop on the left (Christian: CC05-064)*



Figure 225: The ledge and outcrop are again visible, and I have passed the horizontal notch (one bolt below, one above). Note the change in the rock texture right above me; this was the calcite layer that forced a traverse to the right and onto the ledge. The opposite wall (upper part of picture) is obviously not suited to bolting, while I'm (so far) on smooth, perfect rock (Christian: CC05-068)



Figure 226: Telephoto image, slightly blurred, with the camera set to 3200 ASA sensitivity. Here I'm off the platform, hanging from the rope on my way up to the next bolt. Changed texture and calcite veins are visible (Christian: CC05-069)

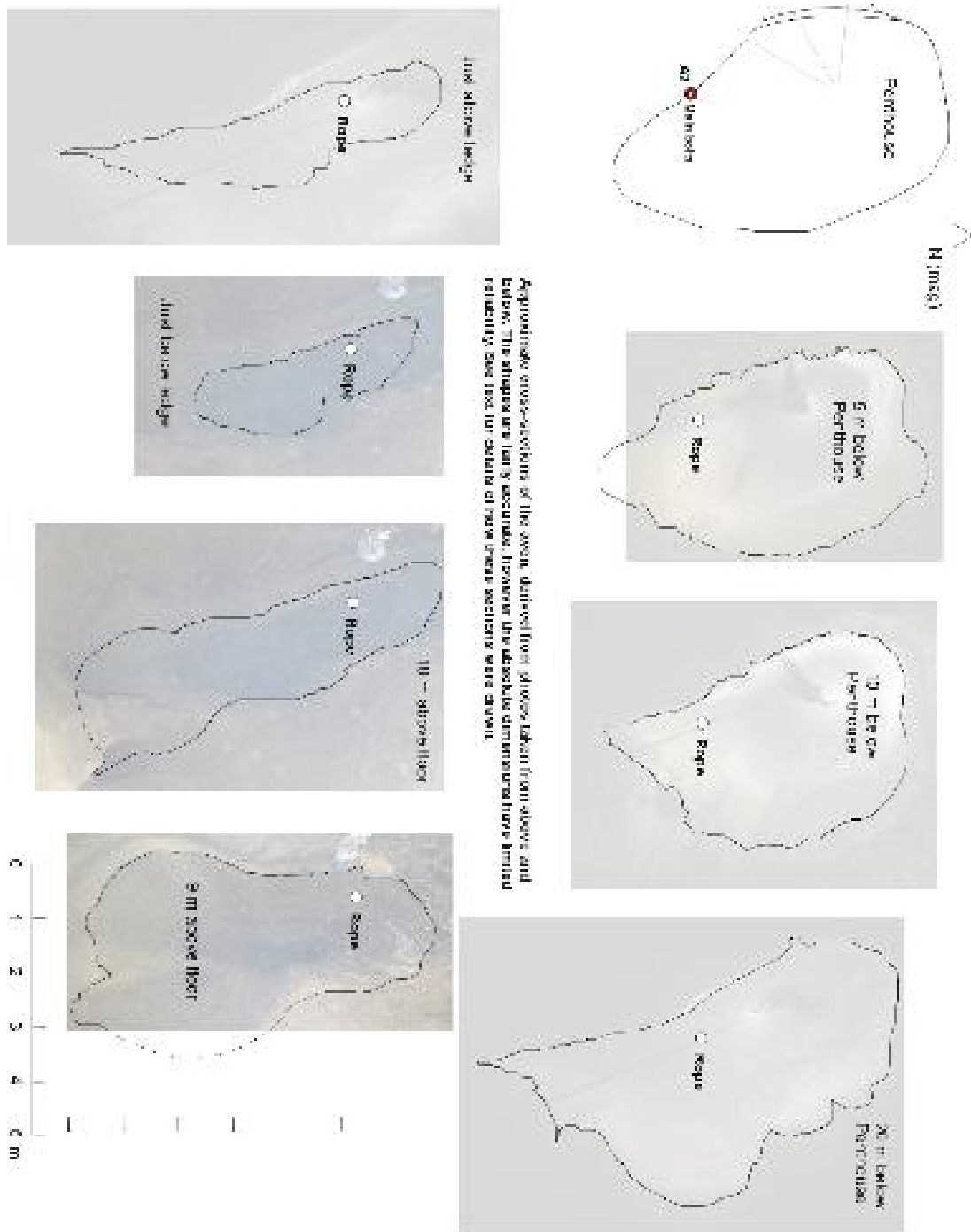


Figure 227: Composite cross-section drawing of the aven and the pictures used (Marek-Misc: Aven-cross-flat)

These cross-sections of the aven were drawn using the pictures taken by Christian from below and above. The pictures were first rotated to a common plane, then scaled to make my silhouette approximately the same size in all of them, thereby bringing them into more-or-less dimensional agreement. Images taken from below were mirrored to and rotated give the same view plane as those taken from above. The cross-section was then traced in each image, keeping as close as possible to one contour height; finally, the images were made semi-transparent so that the reader may see the source of the cross-section directly. As stated in the drawing, the shapes are reasonably

accurate, while the absolute dimensions should be taken as approximations.

This method could be improved by the person in the image carrying a measuring rod (say, 2 m long) with *small* pieces of reflective tape at regular, known intervals. Alternatively, a powerful (the walls are very dark) laser range finder could be used at each level to accurately measure key dimensions. Direct access to the wall would require significant additional bolting.

Directly below the ledge are overhangs that may conceal a passage to another level. We only noted the presence of these overhangs in the images, as our lights were not powerful enough to reveal them while we were there—the fog made long-distance observation hard, and the images have been amplified in contrast to bring out these features. Until the next expedition can bring back better images or measurements this must remain somewhat speculative.

Aven walls and climb



Figure 228: Example of smooth rock with a few veins in it. (Marek: CC05-05-0027)

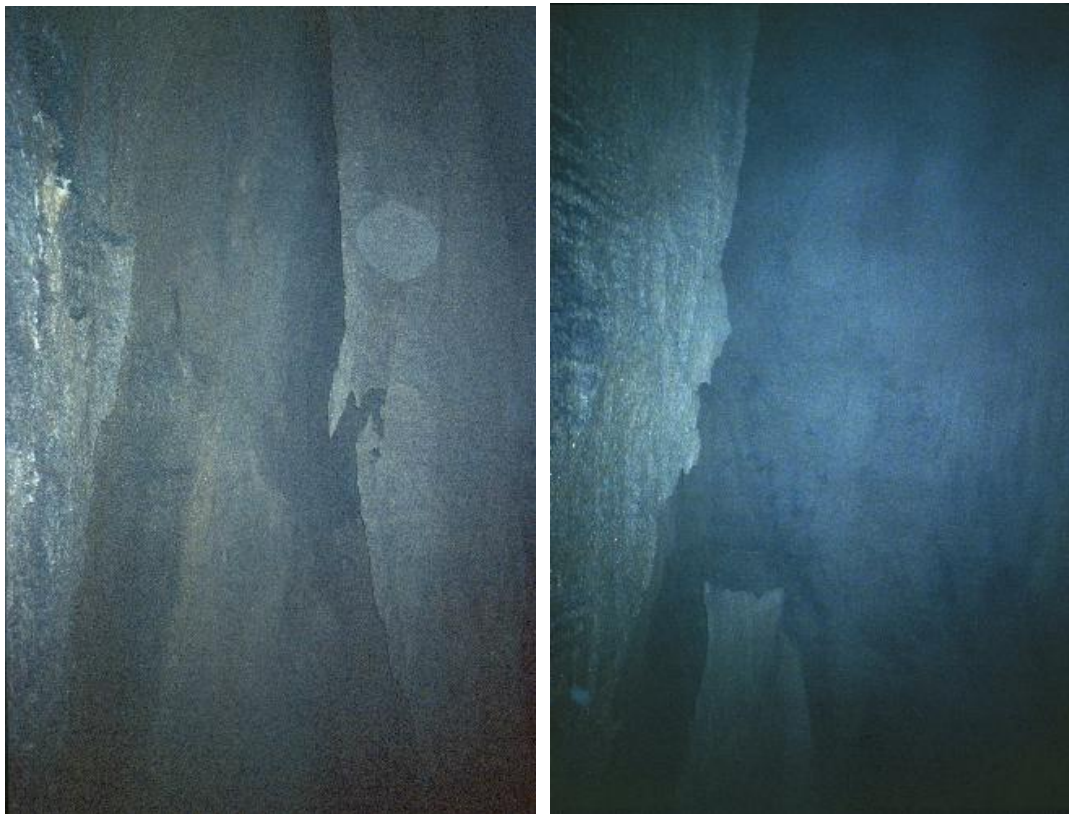


Figure 229: Taken on the way up, to the right (westwards) relative to the top and bottom profiles. This is where Lars Tore Ludvigsen would have ended up, had his 1994 free-climbing attempt got this far—not a pleasant place to be with only nuts and friends for anchors (Marek: CC05-05-0028 & CC05-05-0029)



Figure 230: *Change in rock surface from smooth to something more muddy, around somewhere above the first ledge (Marek: CC05-05-0033)*



Figure 231: *Ditto, note undercut rock at the left of the image (Marek: CC05-05-0034)*

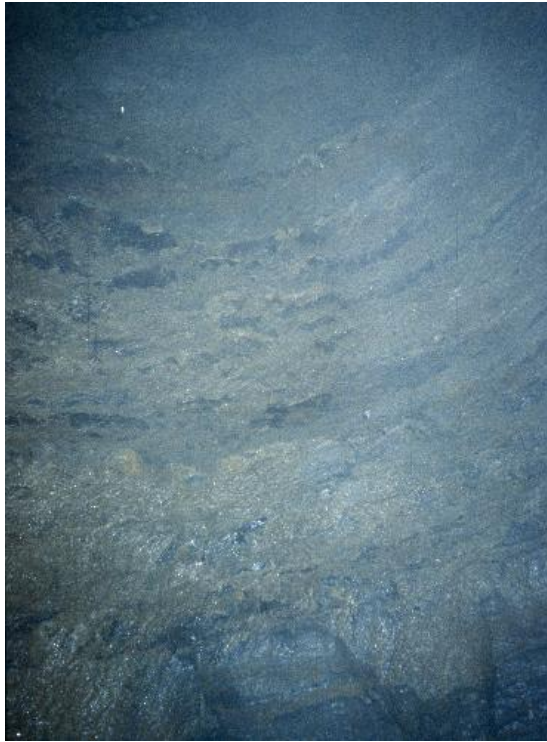


Figure 232: The "baffles" from below (Marek: CC05-05-0035)



Figure 233: Close to the top chamber floor level (Marek: CC05-05-0038)



Figure 234: In the middle of this image is the place where the brick-sized rock fell out while I hammered home a bolt; the new bolt can be seen in the middle of the smooth face left behind. In the left third of the picture can be seen the drops of water on their way down towards the next climber (Marek: CC05-05-0036)



Figure 235: Rock structure right below the top chamber floor, and one of the reasons why the rope has no rebelay—no-one would want to climb 30 metres below this while the first caver clambers left to right over this. The rope comes up to the left of the picture; the stream can just be perceived in the right-hand third. (Marek: CC05adj-05-0037)

Timeline

March 1984	Iain Schröder is on his first trip to Castleguard	He is part of a mixed expedition, including Stein Erik Lauritzen, Norway's leading professional cave geologist.
March 1994	My own first trip to Castleguard	My first view of the aven. Climbing attempt by Lars Tore Ludvigsen and Kjetil Karlsen; this place is <i>not</i> suited for free climbing. Ice Crawl got 2-3 cm of new ice while we were inside.
March 1997	My second trip to Castleguard	Half a metre of fresh snow, two day ski trips. Trip cancelled about six hours from Camp One due to one member being overcome by claustrophobia, specifically expectation of Ice Crawl freezing up behind us.
Every week		Thinking about the aven. I will return some day
2003	Iain Schröder proposes 2004 trip (1984-1994-2004). Postponed to 2005 by my request	I was in the middle of my PhD in Software Engineering at the time, and wanted to concentrate on my work. In 1994, I postponed my wedding to accommodate the trip; this time Castleguard came second.
Early winter 2004	2005 expedition set up; initial meetings and team self-selection	I also started to think seriously about the details of the bolting technique. Thor Martin got a platform to tinker with. Collected all known and spare hardware. Contacted Greg.
June 2004	First training weekend	Forced march, strength tests, and exploration of some really old mines. Good atmosphere
Summer 2004	Family vacation trip to Canada	My wife has friends in Vancouver, I knew Greg in Jasper and Marshall in Calgary. One-way car rental Vancouver to Calgary. Three fantastic weeks. Also bought sample food, and took pictures of Saskatchewan Glacier from Parker Ridge.

December 2004	Team selection complete	...with one involuntary loss, as one member broke his leg. We're down to six.
January 2005	Formal permit issued by Parks Canada	...leading to money being spent: trip food, batteries ordered via mail for pickup by Marshall in Calgary
February 2005	Last few training trips; final equipment modifications.	Also - air tickets issued, meaning that changes will be expensive from now on.
March 13th	Flight from Oslo via Frankfurt to Calgary; joined up with Christian in Frankfurt.	Picked up by Marshall, invaded his house and back porch
March 14th	Packing of gear and supplies, visit to Mec	Marshall's pickup truck was perfect for carrying all our stuff.
March 15th	By car to The Crossing	Stop in Banff for Wilderness Pass and cave key; stop at wardens house before The Crossing to pick up spare drill and cave maps.
March 16th	Ski in	Steak sandwich for breakfast, skis on at 10 am. Arrived cave entrance about 8 pm, camped.
March 17th	Entrance to Camp One	Up at 7 am, ready for departure 1 pm: lots of repacking, and a certain affinity to light.
		Team reorganized on the Ice Crawl due to loss of three members. Arrived at Camp One at 3 am, 14 hrs total travel time.
March 18th	Climbing	Up at 4 pm. Visitors at 4 30, with the rest of our supplies. Started climbing at 8 pm, gained 20 m. In bed at midnight. Time "unaccounted for" spent on travel, rigging, supper etc.
March 19th	Climbing	Up at 9 am, climbing from 11 am. Break between 3 pm and 6 pm, used for lunch plus photo safari in Holes-in-the-floor. Climbing 6 pm to 8 30 pm, hit bad rock. In bed around midnight.
March 20th	Climbing	Up at 9 am, climbing from 11 30. Floor of aven chamber reached around 2 30 pm. At 4 07 pm the water flow in the stream quadrupled. Back down at 5 15 pm, climb complete!

		Greg and party arrive around 7 pm (? time uncertain) after supposedly routine trip.
March 21st	Survey	Up around 9 am. Marek and Christian dressed in plastic under the suits to ward off the drip. Thor Martin suffered quietly. Survey of aven chamber, main anchor for rope, aven profile photos. Back at the bottom at 5 pm, met Jørn and Bjørn.
March 21st	Pack up and walk out	The outside group had decided to see if we could come out a day early, so Jørn and Bjørn came in to help us carry baggage. Bjørn had a cracked rib (before he started in!) and got anesthetic injections from Christian. Departed Camp One at 7 pm, out at cave entrance at 2 am. A very long day.
March 22nd	Ski out	Skis on at 11 am. Straightforward ski trip, at car at 6 pm after 7 hours of travel.
March 23rd	Hot pools!	Mountains of food replaced the mountains of rock and ice; hot pools replaced The Pools. Altogether an improvement!
March 24th...	Sightseeing and home	Marshall had most kindly left us the house keys, and we became tourists for a few days.
Autumn 2005	Writing	Writing this report has taken a staggering amount of time. The project isn't done until the documentation is complete.

Equipment

What do six people need in order to climb the 200 foot aven? The following list comes from our equipment database, and shows both what we brought, and the level of detail put into the planning. The list is only approximate when it comes to personal details of clothing, skis and other more private gear. As an indication, I have included the most significant parts of my own personal gear, and left out those of others—for instance, Christian’s camera box, Jørn’s extra-large sleeping bag, etc. Every expedition needs to find its own appropriate way of doing things.

All personal items that “everyone” was supposed to bring for himself have been multiplied by 6 in the list below, to get a correct aggregate weight. Similarly, since our intention was to have a three-member climbing team and a three-member mapping team, those teams’ equipment is grouped as such and in case of personal items, multiplied by three within each team. Other items have quantities more individually determined.

In principle, this is what a pile of all our equipment should have contained. For completeness’ sake, a stipulated insurance value has also been included—but this doesn’t imply we bought all these items specifically for the trip. However, if we had started absolutely from scratch then this would have been the approximate cost. There are lots of unneeded decimals in the numbers, since they are calculated via a currency conversion.

The total weight is quite close to the measured average sled weight of around 40 kg, so the list must have been reasonably complete. . .

Climbing team, personal

Climbing gear

Ascension ascender	3	each	645 g total	€ 131,25
Petzl GriGri	3	each	675 g total	€ 225,00
Screwgate carabiner	9	each	675 g total	€ 135,00
Super Avanti harness	3	set	960 g total	€ 562,50

Climbing team, shared

Cave gear

Repair kit for MSR	1	set	15 g total	€ 18,75
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Climbing gear

"Spirit" carabiner	20	each	1000 g total	€ 250,00
13mm wrench	1	each	70 g total	€ 2,50
Bolt 10x60mm with hanger	3	each	360 g total	€ 15,00
Bolt bag	1	each	50 g total	€ 25,00
Bolt plug	1	each	40 g total	€ 3,13
Bolting platform with ladder	1	each	2100 g total	€ 187,50
Chuck oil for drill	1	bottle	15 g total	€ 0,63
Drill bit	15	each	705 g total	€ 90,00
Gasoline in 1/2l bottle	3	bottle	1200 g total	€ 3,75
Hammer	1	each	365 g total	€ 31,25
Hammer drill	1	each	6000 g total	€ 812,50
Petzl hanger	17	each	544 g total	€ 21,25
Repair kit for drill	1	each	300 g total	€ 12,50
Rope 10 mm static	100	m	7200 g total	€ 250,00
Wallplug	100	each	1200 g total	€ 150,00

General

1/2 ltr bottle for White Gas	4	bottle	300 g total	€ 10,00
First-aid kit	1	each	775 g total	€ 12,50
MSR fuel bottle	1	each	200 g total	€ 18,75
MSR Stove	1	each	335 g total	€ 126,88
Pot	1	each	360 g total	€ 18,75
Pot holder	1	each	20 g total	€ 6,25
Tape	1	roll	355 g total	€ 6,25
Toilet paper	2	roll	40 g total	€ 1,25

Skiing and outside gear

4-man Gore-tex tent	1	each	3700 g total	€ 625,00
Ski wax	1	set	170 g total	€ 6,25
Snow shovel	1	each	675 g total	€ 18,75

Individual, all

Cave gear

Batteries, 7 days + 7 days	6	set	1500 g total	€ 262,50
Cave boots	6	pair	9000 g total	€ 562,50
Caving backpack	6	each	7200 g total	€ 825,00
Caving coverall	6	each	6000 g total	€ 487,50
Crampons	6	pair	2460 g total	€ 187,50
Drinking hose	6	each	300 g total	€ 7,50
Headgear under helmet	6	each	600 g total	€ 150,00
Helmet with light	6	each	4200 g total	€ 1 500,00
Spare light source incl. 7 days	6	set	1020 g total	€ 225,00

General

Breakfast	54	packet	12420 g total	€ 236,25
Lunch	54	set	12420 g total	€ 236,25
Dinner	54	packet	12420 g total	€ 236,25
Knife / multitool	6	each	2100 g total	€ 750,00
Sleeping bag	6	each	12600 g total	€ 900,00
Thermarest mattress	6	each	2100 g total	€ 487,50
Ullfrotté underwear	6	set	3900 g total	€ 300,00
Fleece sweater	6	each	3600 g total	€ 712,50
Woolen socks	12	pair	3600 g total	€ 300,00

Personal gear

Personal hygiene set	6	set	900 g total	€ 37,50
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Skiing and outside gear

"Pulk" sled	6	each	60000 g total	€ 2 625,00
Cap / toque	6	each	900 g total	€ 150,00
Compass	6	each	180 g total	€ 150,00
Gaiters	6	pair	3420 g total	€ 675,00
Gore-tex gloves	6	pair	1800 g total	€ 450,00
Jacket/pants outside	6	set	12000 g total	€ 3 000,00
Foul weather face mask	6	each	360 g total	€ 450,00
Ski skins	6	pair	2580 g total	€ 375,00
Skis	6	pair	15600 g total	€ 1 125,00
Sleeping bag outer cover	6	each	2610 g total	€ 375,00
Sunglasses	6	each	600 g total	€ 337,50
Telescopic ski poles	6	pair	3600 g total	€ 375,00

Physiological data

Christian conducted a study of how our weight changed during the trip. Physiologically we form a fairly diverse group, with body weights ranging from 66 to 102.6 kg. We had quite similar sled weights on the ski in, and roughly the same pack weights while inside the cave. The two non-climbers spent much of the climbing time sitting still, but my activity level while climbing was usually no more than what was required to keep warm—the bolting technique is more ballet than brute force. The three who were mostly outside went on skip trips with light pack loads.



Figure 236: Christian on the scale before departure from the Crossing (Marek: CC05-01-0043-cut)

All defecations were recorded with time and date, and the bags were sorted and weighed after we returned to The Crossing. As can be seen in the following two diagrams, both the number and total weight of defecations varied widely.

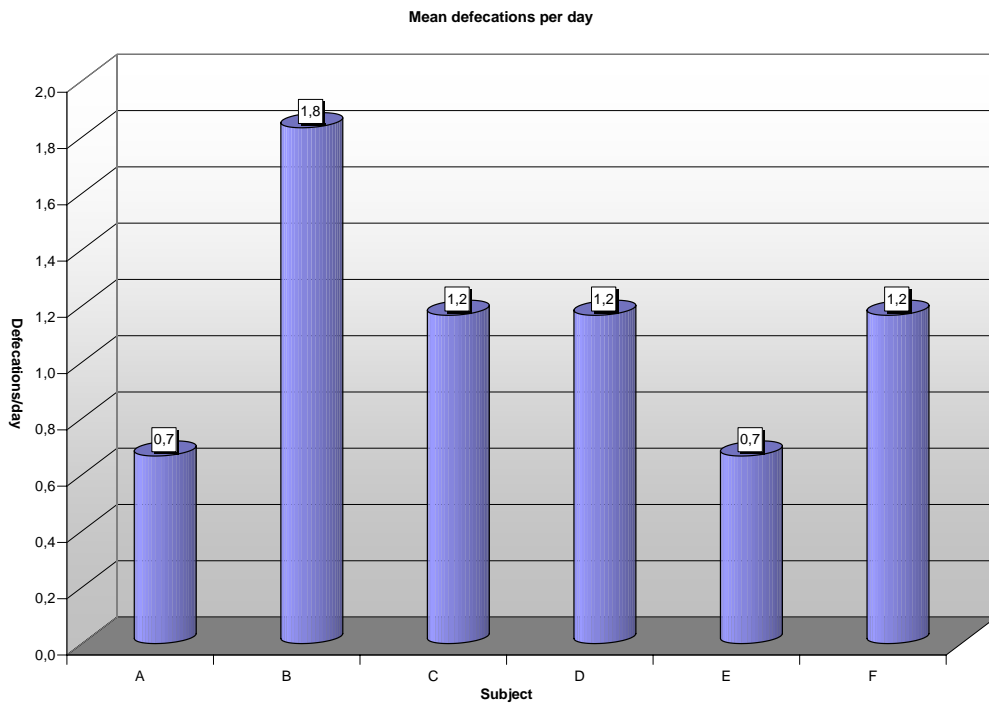


Figure 237: Mean number of defecations per day for each member of the team (Christian: DefecationsPerDay)

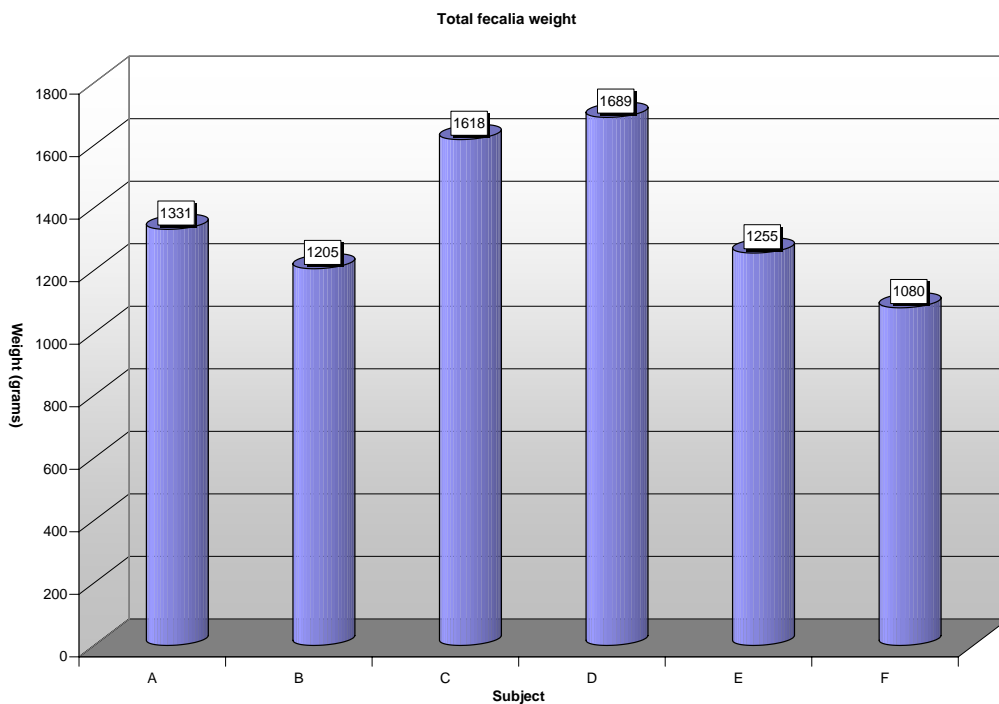


Figure 238: Total weight of fecal matter for each member of the team (Christian: TotalWeight)

The loss of body also varied, but there is no clear correlation between the loss and either body weight or weight of fecal matter.

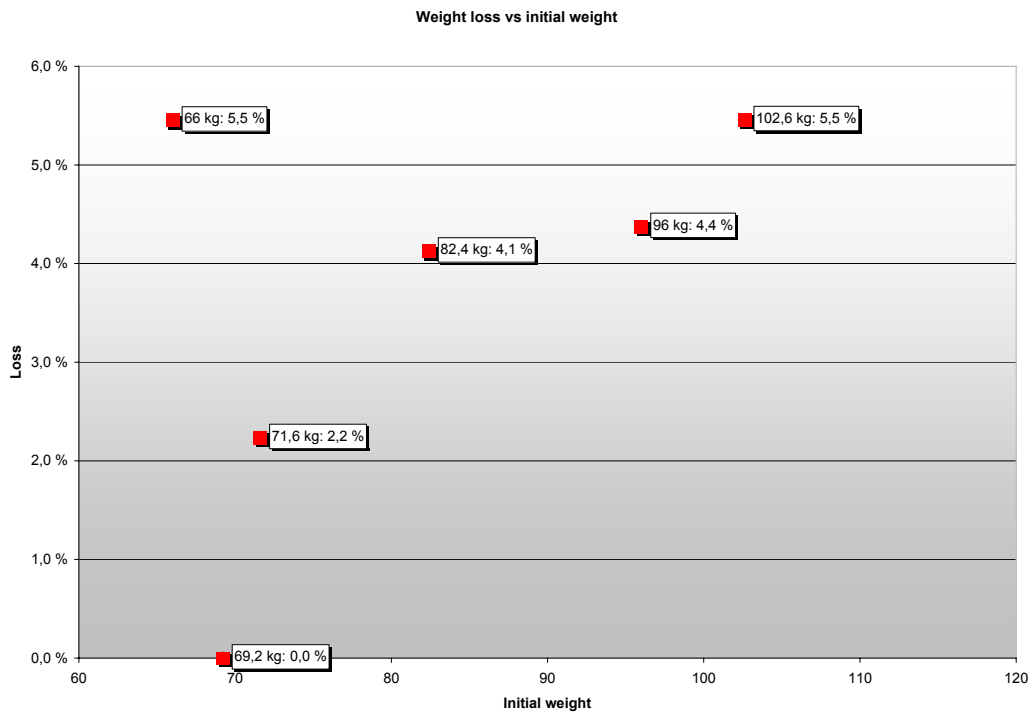


Figure 239: Weight loss vs. initial body weight (Christian: WeightLossVsWeight)

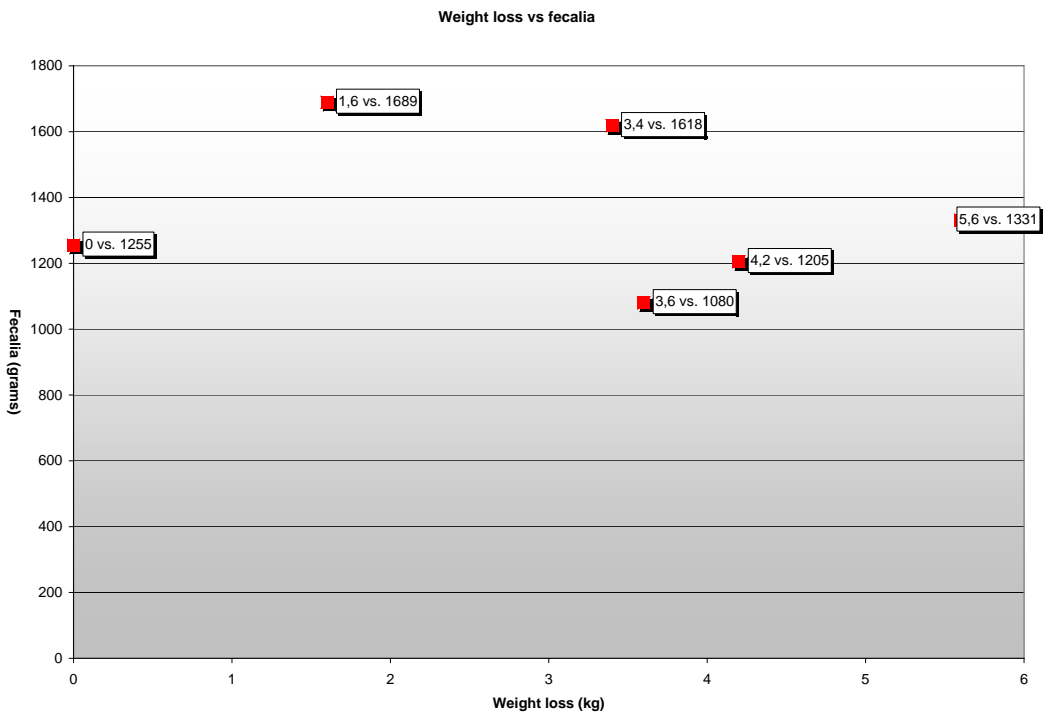


Figure 240: Weight loss vs. total weight of fecal matter (Christian: WeightLossVsFecalia)

Greg's trip

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101 HOURS UNDER THE MOUNTAIN

Kirk Safford (R), Greg Horne, Dan Green, Barry Lewis, Troy Arnold

"You don't know about the pools?" Greg asks in astonishment, and then begins to laugh. Dave, standing beside the truck window, is still offering the wetsocks I had just turned down. Outside a cold wind blew up dust underneath slate grey skies, as winter storms tried to force their way from the east into the mountains.

"There are five pools waist deep we have to pass through" Greg says. I gratefully grab Dave's socks, and wonder why he even thought to offer them. Was it that obvious I had no idea what I was getting into?

The fact of the matter was, I wasn't really supposed to be here. Trying to negotiate time off, borrow gear, organize another trip (leaving the day after this one ended) all on short notice. And coercing a 30 year old vehicle, which hadn't been started in eight months, through winter squalls, icy roads and snow blind conditions to Greg's house. As I passed car after car in the ditch all day Friday, I awaited my turn to drift off the road. But it wasn't until Greg's driveway that the van met its match, as wet snowpack turned to grease, and the van slid sideways back down the driveway. But here I was, going to Castleguard on a trip to collect more detailed passage information as part of Dan's Castleguard mapping project.

Dave had a to bail due high fever and delirium, so it was Greg and I who drove south to our rendezvous with Troy, Barry and Dan in the park. Greg's eyes widened again as I told him the skins I had borrowed hadn't been separated, or re-glued for that matter, in ten years. Dan and Troy had their gear dialed down to bare bones, all excess grams vented. Dan had the usual array of lightweight custom made gear. His space age sled, which I nicknamed 'The Doodlebug', looked like something evolved through millions of years of natural selection.

The morning broke with clear skies, and we raced to the trailhead for an 8AM departure, eyeing the spindrift boiling off the mountaintops with suspicion. Once on the trail all the planning and fretting were left behind. It was time to just move and enjoy where we were.

The day remained glorious, and, perhaps conspiring with the stunning scenery, kept me distracted from what was going on with my feet. During a break on the Castle-

guard glacier I duct taped hot spots on my heels and toes, but in the end it helped little. We made good time, and it was only at the first moraine climb that the first sign of gear problems arose. Barry's sled was a little top heavy, and rolled unmercilessly on any side slope and always stopped upside down. Barry spat every vindictive curse he could come up with at the thing, and it continued to torture him in response.

In the distance we could see three skiers on top of a moraine. They were part of the Norwegian team who was camped out at the entrance. From them we learn that the ice crawls are an ice squeeze this year, requiring helmet removal. They are the portion of the team who were unable to get through. With this sombre thought in mind, we push on to the entrance, only now wishing to get the day over with as grey clouds begin to churn over the mountaintops around us.

Despite the advantage of a trail broken in by the Norwegians, I was shuffling along with short glide strokes. I was concerned about my feet, but since I couldn't feel them, I had no idea what to expect. One last uncontrolled rocket slide on teetering legs down a steep slope, and I'm at the entrance, greeted magnanimously by the Norwegians. Removal of my boots and socks is met with a round of hisses and grunts of disgust. The boots had simply chosen flesh that did not have duct tape, placing one 3 inch blister on my right heel perfectly along the edge of the duct tape, as if to flaunt the futility of my efforts.

The large Norwegian tent took up most of the good space, so we scattered ourselves in the remaining flatish nooks. One expects peaceful nights while out in the great outdoors. No traffic, blaring horns, shouting drunks, but that night at the entrance achieved similar decibels. The cacophony of various snorers, burpers, and farters was substantial enough to keep even the rats at bay. Fortunately fatigue is a strong force, and sleep was finally achieved.

The Parallel Passage

There was a certain seriousness about this trip. There are plans, objectives and measures of success. This wasn't a tourist trip; a race to the ice plug and back to check off on our Famous Canadian Caves to do list. We were above all that 'bagging mountains' type stuff. This was official business.

So there's mild tension in the air as we pack up to go underground. . No one, particularly Barry and I (Castleguard newbies), wants to slow the team down. It's 11:00AM, and I'm still packing my remaining gear when Barry, Troy and Dan head underground. Greg waits for me. The gear bags must be narrow to make it through the squeeze, and I suspect mine is too thick.

As we head in, Greg points out various features of the cave and some history. I relish in the idea of having a guide and only having to follow; to be the dumb grunt as it were. We descend the first pitch (there are only two drops in the main passage of the cave) and continue along an ice-covered floor. At the ice squeeze we meet Barry, panting hard, on a return trip to pick up his second load.

The Norwegians had chiseled a narrow trough in the ice to allow bodies and gear through the tightest section. With some coercion, Greg and I are able to get our bags and bodies through the tight bit. The passage is wide, and it's difficult to route find with helmet and bag sliding ahead of you. We make slow progress, and the cold,

howling draft begins to work on the fingers.

After 30 metres or so, the ice ends in stooping passage with a cobble floor. Dan and Troy are waiting here for us and had once again lightened their load, leaving a gear bag behind. They continue to the pools, where they plan to wait for us again. Soon Barry arrives, panting hard, with his remaining gear. While Barry repacks, breathing hard, Greg lists off the various hurdles to expect, and techniques to use: role the bag through the crawls, stay to the left of Boone's Blunder. Finally we're off, passing a couple ice columns before descending into a wide crawling passage with a cobble floor.

We roll our bags along for a while till we come to a pool with a thin veneer of ice. Greg stops and stares at the pool. It's not familiar. He recesses to the right. "This way", he says, and we begin to roll our bags along, seemingly in a wide arc. We crawl under a low bit, and up a short cobble slope, and then we're in stooping passage. We pass a couple of ice columns. Soon we reach an ice covered floor. "There's a lot more ice than I remember" Greg says. "Hey, there's another axe left by the Norwegians" Barry says. The axe had been used to chop trenches in the ice.

We continue unquestioning; complete trust in our fearless leader.

The ceiling lowers, and soon we're crawling over ice. Up ahead Greg announces it gets tight. "But not as tight as the other squeeze, I still have my helmet on!" Barry starts to force his bag through. It snags. He curses and begins to kick and fight with it. It wins and Barry unpacks. "Oh, it gets tighter up here!" Greg announces. "Helmets off!" I forge ahead to catch up with Greg, leaving Barry with his war campaign. Greg hasn't moved much, and there's a continual barrage of grunts. "Oh!", he says finally, "There's a spot here where they've chiseled out a trench. You can just make it through!"

Behind me I can hear the grunts, gasps and curses of Barry as he struggles with his bag. I follow Greg and gratefully slide down into open passage. I've had my fill of tight passage. Greg and I rest and wait for Barry, the sounds of struggle and battle drifting up the passage.

"I just don't recall this much ice" Greg states in consternation. He then mentions the draft, which is now in our face, opposite of the first ice crawls. I hadn't noticed. "Maybe it's reversed," I said, "It's warm out today". Draft in twenty kilometers of passage reversing on one warm day. Hmm. "Maybe we should look at the map" Greg says. "Nah!" I say. 'Waste of time' I think. After all there's only one way on as far as I know (which, of course, is nothing because I've never been in this cave). But there are strange forces at work here, and Greg and I ponder them all. We soon discover that the possibilities are endless; an infinite array of rationale explanations is available to us. The best thing we can do is to continue on. So as Barry's struggling and gasping noises get closer, Greg and I continue with Greg in the lead.

Greg stops dead, his posture exudes surprise "We're back at the entrance!" Greg says in shock. "No way!" I respond. I scramble past and look up to find a vaguely familiar rope dangling before my eyes. It can't be! "Are you sure there isn't a rope ascent on the route?" I ask desperately. After all no one mentioned the pools to me, perhaps there were an infinite number of rope drops that have been forgotten or misplaced. It's a long cave after all. Greg sees the desperation in my eyes, and slowly shakes his head. "We haven't made it past Boon's Blunder," he says. We slide back down to the

ice floor and sit across from each other and discuss. There is a rational explanation for this. It's not possible for three fully grown, and apparently competent adults with plenty of caving experience to go 400 metres into a cave, get turned around in passage ten metres wide; and then spend the next 45 minutes returning through unforgettably uncomfortable passage and not clue into the fact they are going the wrong way.

We cover all the bases. "Parallel passage!" Greg says finally, "There's parallel passage all over the place in the entrance section!" That's it. We have it! We had simply taken a parallel passage through another ice crawl that the Norwegians had also chipped a trench through remarkably like the first one. It was the best thing our overtired sub-conscious brains could come up with to save our face without us knowing it.

Barry arrives, panting and weary after his drawn out war with his gear. He describes his ordeal: Unpacking what was meticulously packed, and herding a thousand distracted ziploc bags across the ice. Collecting the wayward individuals and returning to the main herd, only to find others had strayed. But in his fatigue is also relief, knowing that he is now through the last of the ice crawls.

Then we tell him the news, and the spirit leaves his face. He is disbelieving, then distraught, then finally resigned as we lay out the facts. We explain the parallel passage theory, but he is not cheered.

By the time I jam myself through the chipped out helmetless squeeze I realize the 'parallel passage' theory is completely bunk. We're at the beginning of the cave, ... still. The recognition of what we've been doing for the last hour finally sinks in. This fact, I believe, dawns on all of us at the same time as we make our way back through the ice crawls, but remains unspoken. "Ok!" Greg says when we're finally on the right route, rolling our bags along, "We make a pact. We don't tell them a thing until tonight. If they pester us, we delay telling a day!" It is agreed.

Troy and Dan have to wait until the second night underground to hear Greg tell our tale of woe. Barry and I hide behind the fact that we were merely following our fearless leader who had been in the cave many times. But in the end, being a sheep is no better than what Greg suffers through. It is only then that we realize Barry has been through the ice squeeze five times. His gear, and worry at slowing everyone down, being such a distraction that he did not recognize he was going through the same passage time and again.

The Norwegians

We arrive at camp1 about 9 hours after entering the cave, and are greeted by four Norwegians. They share stories, fuel and hot water as we set up in the remaining camp spots, which are few and less desirable. Up to this point my impression of the Norwegians hadn't been great, since several of them could not make it through the ice squeeze, which we had had little difficulty with, other than going through more times than we intended to. I would soon find out my impression was wrong.

The Norwegians are in a celebratory mood. They had achieved their objective: the bolt ascent of the 200ft aven. A gas powered drill, and a custom made ledge allowing 1.5-2 metres of distance between bolts, had allowed completion of the 70 metre high aven in about 14 hours of work. The leader of the group had made several trips over the past ten years (when he first saw the aven and decided he would climb it). All

of which had ended in some disastrous event or team melt-down that prevented even an attempt at the climb. Now he had succeeded. There was one ten metre climb that needed to be completed, then they could find out if there was continuing passage.

The following morning the Norwegians slink past our beds early, the beginning of a very long day for them. Our day is slow to evolve, fatigue from the last two days having built up. We split up into two teams, one to sketch the Next Scene, and the other to sketch the Holes in the Floor to the 200 Foot Aven. I ignore Troy's advice to rest my feet and head out with Dan and Barry to the Next Scene. An hour and half later I'm forced to return, my feet giving me no end of grief.

Troy and I are playing cards when the Norwegians finally make their way into camp. It takes a few minutes before we realize there's something odd is going on. One Norwegian is standing with his shirt lifted up, wincing, while another appears to be drawing on the exposed flesh. Troy asks.

"Broken ribs!" the wincing one states. It turns out one of the Norwegians slipped in the First Fissures, and another Norwegian is a surgeon. Troy and I crowd around and gawk as the surgeon buries a thick horse needle, with no-slip-thumb-grip, between the man's ribs and proceeds to poke a prod about. He moves the needle back and forth and sideways as if there's no flesh in the way. There's no noise from the patient until the surgeon jabs sharply to the left and a loud hiss escapes. He found the broken rib. With his side frozen, the patient can now carry his share of gear out of the cave. I am humbled. Somehow cards are less interesting after the surgery show.

Camp

Black mornings were defined, not by a sunrise, but by an insistent bladder that could no longer be ignored. One by one we struggle out of sleeping attire and make the long walk down stooping passage to the pee spot, doing our best not to crack our skulls on the ceiling. After the Norwegians leave we spread ourselves liberally over the camp. At night we played poker, discussed gear, tell lies, and pretended the dinner we ate was really what we wanted. The Elixir of Truth is brought out for the telling of the 'Parallel Passage' debacle, and we are in stitches as each of us tell our version of events for the first time.

Much of my time in camp is spent in protracted negotiations with my feet. I try various tricks, like dry socks, soft gauze, and massage, but there was no bargaining with them. 'Try shoes that fit!', they seem to say. A truce is finally made: they won't heal, but I'm allowed to move around gingerly for the rest of the time underground.

Over three days we work on the passages around camp. We resurvey sections of F7 until it sumps out, sketch the Grottos and Holes in the Floor, and survey stream level passage beneath the Holes in the Floor. We count isopods in transects upstream from camp 1; and search for isopods in the 200ft aven pool and stream (present), Holes in Floor passage pools (absent), Grottos (absent), Corridors (absent), Corridor sump (absent), Next Scene stream junction with Corridors (absent), and First Fissures to just downstream of the third handline (absent).

It's day five underground and its time to return to the surface. We are heading down-slope (4-5 degrees all the way), and the going is noticeably easier. Greg and I scour the pools for isopods and amphipods. Isopods are found at the Tyrolean, Waterfall Room,

Easy Street, and the Pools. Notably they are not found in the Subway, and seem to be quite rare in the Pools section. The amphipods were nowhere to be found, not even the pools in the upper Subway with the signs that say "No stepping the Pools" and are full of boot prints. There are no mysterious acts of God in the ice crawls, aside from wet feet beginning to freeze in the colder temperatures. We all make it straight through, which is not too surprising since it's Barry's sixth time through and the fourth for Greg and I.

It's still light out when we exit the cave around 4pm, 101 hours after we entered. Colours take new meaning as the mountains glow in a clear sunset hues. After a cold clear night in the entrance, we ski out in blazing sun and strong wind. We make good time despite some of us making large yard sales on the steeper slopes onto and off the glacier. At the trucks we share a beer, then scatter to points across the western provinces. And as for my feet, despite tremendous volumes of duct tape, the boots found a way through and my feet have yet to forgive me.

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