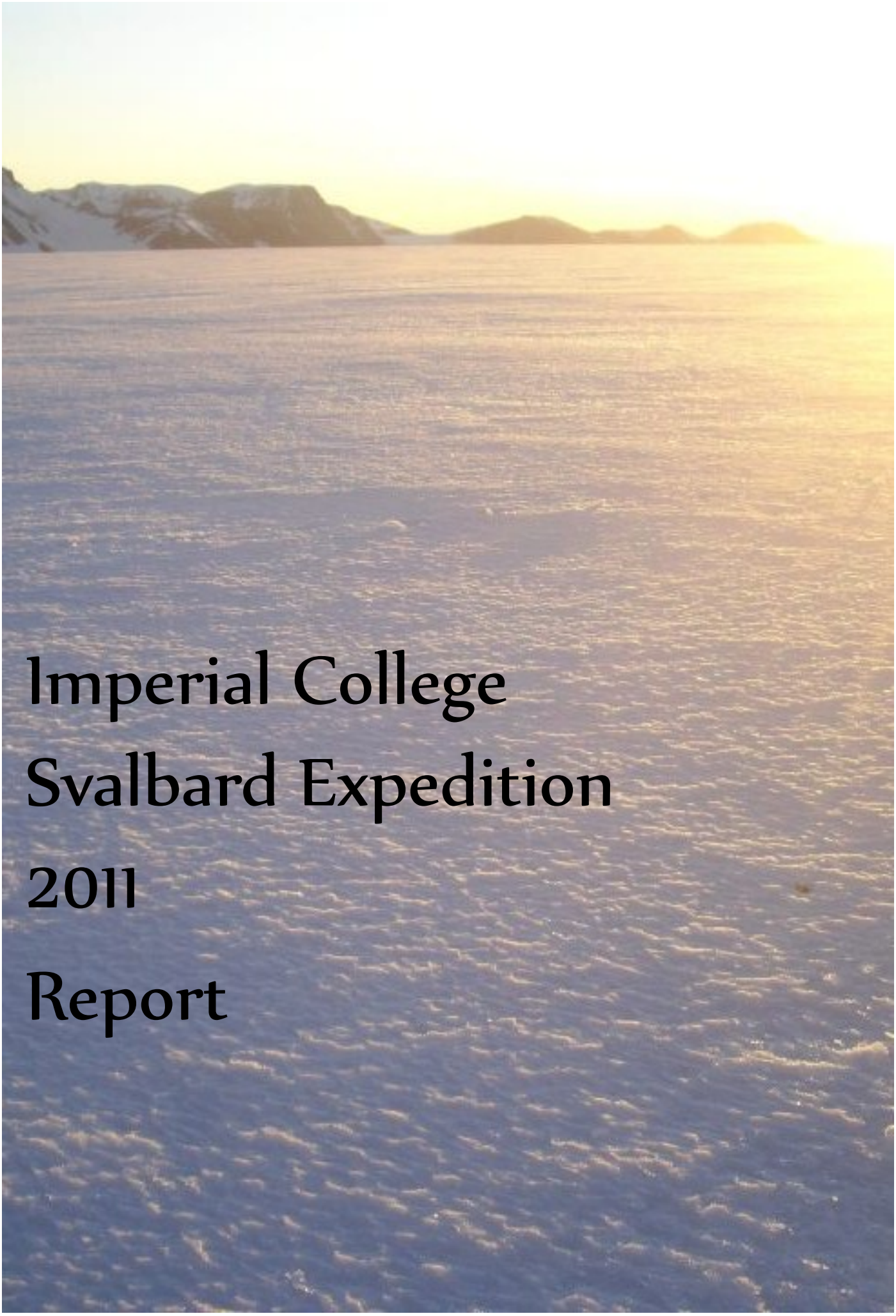
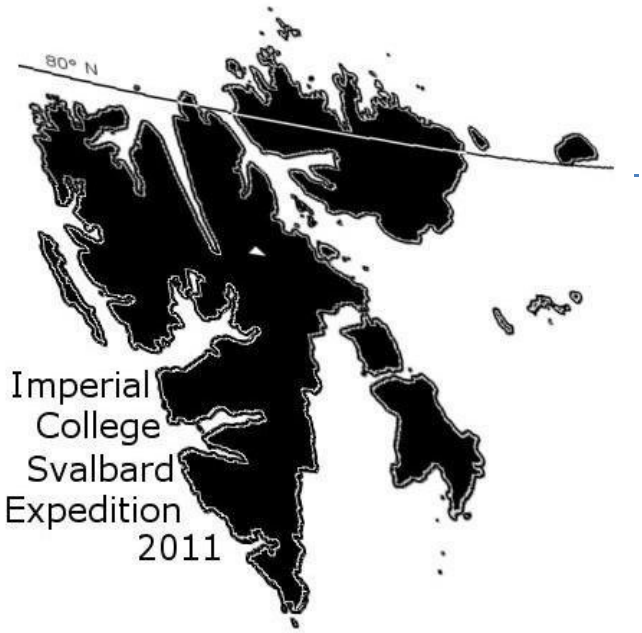


Imperial College Svalbard Expedition 2011 Report

Contents

Introduction



The expedition's overall aim was to live for a month, unsupported, on the ice and rock of Svalbard. None of the six trip members had trekked in the Arctic before and this was an opportunity for all of us to learn how to adapt to the conditions there.

Svalbard is an archipelago of islands, of which only the main island, Spitsbergen, is inhabited. Spitsbergen used to be the site of Norwegian and Russian coal mining but this has now ceased and the majority of inhabitants live in the main town of Longyearbyen.

The main goal of expeditions to Svalbard over the last few decades was to complete a longitudinal traverse of Spitsbergen, a distance of approximately 700km. It was first completed North-South in 1993 by a Norwegian team who made use of the frozen sea ice of April to travel nearly 1/3 of the distance. Two British attempts at the same goal in 1996 and 1998 ended in failure, after achieving most of the route. The first British expedition to complete the traverse, and the first expedition to complete it entirely on land, was the Polestar Expedition of 2001.

Our expedition took place from 7 August -12 September and our aims were to summit the highest mountain in Svalbard, Newtontoppen (1713m), to reach 80°N or as close as possible, and to return to the Nordenskioldbreen glacier where we were dropped off. Supplementary objectives included filming a video diary of the expedition and to use the experience to encourage others to travel to the Arctic.

We were dropped off on the Nordenskioldbreen on 10 August and reached the summit of Newtontoppen on 17 August. On 21 August we found our route along the Veteranen glacier north obstructed by a vast area of standing meltwater which was impossible to cross with pulks and offered nowhere to camp. This point was at 79°08'43 and 785m altitude. We decided at this point to change the expedition objectives to explore some of the mountains around the Veteranen glacier. In all we summated 8 mountains and attempted 1 more before returning to the coast. We were picked up on 3 September.

The expedition succeeded in reaching Newtontoppen and climbing several other mountains around the Veteranen glacier, a rarely visited region of Svalbard. The time of year we attempted the expedition, at the end of summer, was not ideal for snow conditions and we suggest travelling earlier in April to succeed in trekking long distances. However, the long days and the relatively mild temperatures make August a good month for mountaineering in central Svalbard and for trekking without skis. We count this expedition as a success for these reasons, and for the fact that the six of us survived 24 days trekking and mountaineering in the High Arctic with no previous Arctic experience.

Team Members

Alex Kendall, 24, Leader

Alex has been walking and mountaineering in the UK and the rest of Europe since he was small. He first walked on glaciers in the Alps when he was 16 and was President of the Imperial College Fellwanderers in 2009/10, spending the weekends taking students walking all over England, Wales and Scotland. He studies Biology at Imperial College and worked as a Sabbatical in the Students' Union for a year before starting a Masters in Conservation and Forest Protection in 2011. The Arctic has a fascination for Alex as an area of true wilderness and he will definitely be returning, having planned this expedition in Greece having found it too hot. Alex will be going for his Mountain Leader Award in late 2011 and is passionate about getting other people into the outdoors and to appreciate the natural world.

Nathaniel Bottrell, 24, Navigation and Finance

Nathaniel Bottrell is a PhD student studying the protection issues of inverter-interfaced distributed generation. He first caught the bug for mountain walking at the age of 18 when he joined trips organised by the University walking club, the Fellwanderers. Nathaniel has since participated in and led many walks in the national parks of the UK. In Europe, Nathaniel has completed the Tour du Mont Blanc, spent two weeks walking in Jotunheimen National Park and organised a two week trek in the Polish and Slovakian Tatra Mountains. Nathaniel's first experience of the wilderness was an eight day trek through Sequoia National Park, California. As a result of this trip Nathaniel knew he wanted to again experience the feeling of isolation and wonderment of nature that comes from being in the wilderness. Svalbard is one of Europe's greatest wildernesses, and therefore extremely attractive to somebody who wanted to survive a hostile environment that few have the opportunity to encounter.

Sietse Braakman, 24, Training and Medical

Sietse Braakman was four when his parents first took him to the Dolomites and introduced him to the brutality of its landscape during long walks. Since then he has walked all over the French, Italian and Swiss Alps and many of Britain's most beautiful national parks. Besides being a keen walker, Sietse has rowed five years at competition level and enjoys skiing, running and road cycling. The arctic has a magnetic effect on Sietse due to its stillness, emptiness and beauty. When a possibility came up to visit Spitsbergen, in the form of this expedition, he grabbed it with both hands. In normal life he is a first year PhD student in Bioengineering, looking into the causes of glaucoma, an eye disease.

Heather Jones, 22, Food

Heather Jones doesn't remember a family holiday which didn't feature hiking mostly during the UK but also in the Pyrenees, Tatras and Italian Alps. Since going to University Heather has been a keen walker and active member of the hiking club as well as having a brief flirtation with rowing. Heather is currently finishing her undergraduate degree in Physics having taken a Sabbatical year to be Deputy President (Clubs & Societies) at Imperial College Union. Heather wanted to go to the arctic for the amazing experience and personal challenge it offered.

Andrew Elliott, 23, Science

Andrew Elliott finished his undergraduate degree in maths at Imperial and is now studying for a PHD in Systems Biology. He completed his first long distance hiking route at the age of 15 and has never looked back. He has walked all over the United Kingdom and has gone trekking in Poland and Slovakia, Sequoia National Park CA and the Swiss Alps. Andrew loves exploring new places especially natural ones, so the expedition to Svalbard was irresistible.

Ally Cott, 25, Equipment

Alistair Cott is the Systems Coordinator for Imperial College Union. He has been walking either long distance trails around the UK or up and amongst mountains since a young age. He added to his love of the outdoors when he joined the University Canoe club. This has led him to many new exciting countries and mountain ranges. In which he always tries to walk or climb a few as well as travelling down the rivers coming off them. As he is always keen to go out into the outdoors whatever the weather the prospect of going to the Arctic was too great to miss.

Expedition Diary

By Alex Kendall

08/08

Our flights left London Heathrow at 19:30 except for Ande who left at 18:00. Checking in the pulks was easy and we were not charged with extra baggage even though they were definitely oversized. The people who work for SAS (Scandinavian Airlines) are clearly not new to this. At Oslo we had a 10 hour wait and could not check in until 06:00 so we slept in the airport next to a cafe. A security guard advised that someone was always awake to watch out for thieves so we all took turns at this, practice for Polar bear watch. Not being able to check in is actually good as we had sleeping bags etc. with us for the night. By 05:30 the sun had risen, the last time we would see it rise for three weeks. The final two flights from Oslo to Tromsø and Tromsø to Longyearbyen were uneventful and we were looking forward to arriving. Nathaniel and I got a taxi from the airport to the Governor of Svalbard's office in Longyearbyen the moment we landed at 13:55 while the others waited to collect the baggage and the pallet with most of our equipment and food on, which had been stored in a warehouse near the airport and which we had not seen for nearly 3 months.

We got permits from the Governor's office to go out into the wild, beyond 'Management Area 10', and then collected the rifles, flare gun, petrol and ammunition from Paulsen's in town. We took a taxi back to the campsite to find the others unpacking the pallet. Unfortunately Ande's pulk had not arrived. There were also some items missing from the pallet, which looked like it had been unwrapped and then rewrapped. About half the snack food was missing which left us with about an 80,000 calorie deficit. The view from the campsite was incredible, across Isfjorden to the west we could see two glaciers coming down to the sea and there is an abundance of birds, including Arctic Terns, at the man-made lagoon next to us. For dinner we went into town, a 4k walk, and had 'catch of the day', which turned out to be seal. For all of us this will be our first night in the Arctic.

09/08

First porridge of the trip this morning, including powdered milk which forms lumps rapidly. Headed to Longyearbyen to pay Pole Position for storing our pallet for the last two and a half months and to arrange for them to take our pulks to the harbour tomorrow. Went to visit Spitsbergen Travel and have got us places on the Polargirl, a tourist ship which has agreed to drop us at the Nordenskioldbreen (breen = glacier). We

resupplied on snack food from the town supermarket, a Coop, and visited the Museum and the University. Kristina, who we met in the museum, advised we take a dog with us to scare off Polar bears. We do not have time to get a dog. Returned to campsite and, since it was good weather, asked the owners about the 'Arctic Naked Bathing Certificate' we saw on their website. Two women came to witness, with a thermometer and a gun (a Polar bear had been sighted nearby the week before). Then we all got naked and ran into the sea, which was reasonably cold. We were lucky enough to also see a seal but not sure what species. We went to bed early because of an early start tomorrow, though not before enjoying the last 'indoors' we will see for a while. Saw an Arctic Fox in the lagoon and several Arctic Skuas.

10/08

Woke at 06:00 and had porridge in the camping hut. Packed pulks and five of us left for the harbour at 07:40, leaving Si-

etse to load the pulks into the truck with the driver when it arrived. Scheduled driver didn't arrive so Sietse got another Pole Position driver to help. Delivered pulks to the harbour at 08:22 and we loaded them onto the Polargirl, which left at 08:50. The pulks were left on a large open deck at the back. We had a comfy lounge area with a few dozen other passengers where there was a bar with re-fill coffee and waffles. The boat was taking tourists to see the Nordenskioldbreen and Pyramiden (an abandoned Russian mining town) and makes this trip three times per week. We stood on deck a lot to see the passing scenery and did some filming. The Nordenskioldbreen could be seen almost as soon as we rounded the headland near Longyearbyen but it still took us over three hours to get there. There were plenty of Northern Fulmars flying round the boat and we also saw Puffins. The crew said the southern side of the Nordenskioldbreen was a more difficult place to land so we agreed to be dropped off on the northern side, which meant we would start closer to the glacier. Lunch on the beach after being dropped off by a Zodiac.

Once left on the beach we took the first load of equipment in backpacks up the moraine north of the Nordenskioldbreen, in a valley called Thomsonelva. We walked 2.5k and 230m altitude gain in one and a half hours and decided to set up camp. The moraine is very loose with several ridges and a small stream we cross twice on our route. We went back for a second load and then, after spending a short time making sure everyone could fire the rifles, Ande and Heather stayed to prepare dinner while we went back for the third load. Whilst on the beach we saw an icefall from the Nordenskioldbreen into the sea which made a long wave into the fjord. There is also a hut nearby and some pallets on the beach. We got back to camp with the third load at 20:42 and had dinner. Tested the flare gun. The equipment is quite disorganised as we can't put it in the pulks so it is a good thing that it is not

raining. Went down to the beach for the fourth load and were back at camp at 00:40. Polar bear watch begins tonight with me and Ally. We currently always have two people on at once, but staggered, everyone doing two hours but someone new getting up every hour. Billiefjorden is calm with small ice bergs. The cloud came low during the afternoon but is now lifting and clearing. We have seen quite a few flowers and there are plants in camp. It seems to have snowed within the clouds on the tops of the surrounding mountains.

11/08

It snowed and sleeted throughout the night. Everyone up at 11:30 because of late night. Ally has hurt his neck and so will have some more sleep. Heather is staying to guard and the rest of us went for the final load from the beach. Carrying pulks up

the moraine is very tiring. We had all equipment to the camp at 230m by 15:30. Packing bags again we continued up the moraine and crossed the large ridge to the glacier. Walked up the ice to a relatively flat bit to make the depot. Did another round trip before dinner, a round trip taking an hour and a half. I changed the Polar bear watch routine so that five people do two hours each, the sixth person getting the night off. This way everyone gets eight hours sleep and the shifts are rotated so we each have a night off every sixth night. The staggered system means we have to get up several times each night and I think it will make us too tired. One alert person is better than two sleepy ones. Ally is much better now but Heather does not feel good. Saw a Purple Sandpiper. The weather is improving to high cloud.

12/08

The weather is clearer with high clouds. We ran two loads to the ice depot and then had lunch there. Filled up water bottles in the stream before taking the final load. Now fully off the moraine and on the glacier. Set up the pulk hauling systems including tying the smaller pulks together for Ally, Nathaniel and Heather, who each had two. Started walking up the glacier, which was made extremely hard by the lumpy surface made up of small knolls with snow drift in-between. Headed north but had to contour east round a bowl. Only managed 1k in one hour twenty minutes before camping on some flat ice at

18:20. The clouds are coming in regularly with snow and drizzle. Tents covered with snow during dinner. White out. The new Terra Nova Ultra quasar tents have very annoying tent

sleeves for the poles, which are far too grippy. Cleared for a bit but is now raining. We saw an Ivory Gull during dinner, which Ally has named Bernard. First night on the ice.

13/08

There was a white out for most shifts last night. From 3-5am the clouds lifted and dropped several times. By 07:00 they had lifted and parted slightly and we had some sun and blue sky which lasted until lunch. This was the first full day hauling. The glacier was still covered in the ice humps which we wove around up quite a steep slope. The slope flattened out but then we entered a crevasse field. Myself, Ally and Ande fell in; decided not to rope up as we can see most crevasses and the pulks are heavy enough to hold us if we fall. The crevasses are mostly narrow but we had to weave our way round some big ones. We soon came to the top of the rise and had a view north of our route, most of it flat, for the next few miles. Crossed some melt-water pools and changed into snow shoes from crampons which made it a lot easier. Large rock formations lie on each side of the Nordenskioldbreen. The sets of two pulks are not running in straight lines and we have attempted to fix this by crossing the connecting ropes, which seems to work. Camped between two large ice mounds, heavily crevassed, at 680m, having gained 5.4 miles. Bernard is following us. White out.

14/08

Still a white out. One stove is being troublesome. Ally has migraine so we are staying at camp for the morning. Read in tents until 12:00 when we woke him. He feels much better so we packed up and left by 13:00. Walked in a complete white out for an hour and a half uphill. No difference between sky and snow. Nathaniel navigating with GPS and compass. Stopped for lunch at 14:15 and the sun was visible through thin cloud. Slowly all clouds lifted and we had blue sky and a hot sun. View extended very far to the south-west. Stripped down to thermals and finally could look at the mountains as we walked. Had first snowball fight in show shoes, which are brilliant for going uphill. Clouds kept retreating though some mist to the north. Stopped to camp at 18:00 after only 2.7 miles but 330m height gain. Drying clothes in sunshine but clouds on the way. Sietse and I swapped pulks with Ally and Heather so we could try the two smaller ones and they could try the one larger one. Everyone thinks the others' is easier! Glad we finally have some proper sun.

15/08

Bernard appeared during night watch. Two weather fronts appeared to be meeting above us, one from the north and one from the south west. Everything moving quite slowly. Morning came with clouds and some view west. Soon after we began walking it became a partial white out. Sietse and I split one of Ally's pulks between us as he was very tired. Our aim for the day was 6 miles and by lunch we had done more than 4. Terrain is smooth snow gently uphill. White out again when we reached the high point of the Lomonosovfonna (fonna = ice cap) at 1255m. Descended the other side and could see the rocks of Saturnfjellet through the cloud. Now and again we lose sight of the rocks so enter the coordinates on the GPS. Came to plateau beneath Saturnfjellet which was covered in thick snow, very hard to walk through. Struggled up the ice between Saturnfjellet and Tethysfjellet and pitched tents at 17:00. Heather and Ally slept while we cooked. Clouds then fully lifted in half an hour and we now have spectacular views down to Billiefjorden far south west and north

to new mountains. Made a snowman called Phil. Clear blue sky. Walked 8.48 miles today, a really good effort.

16/08

The last of the clouds vanished last night and we woke to a clear blue sky. Got going by 09:30 but it takes a long time to fill all the water bottles and thermoses. Passed Tethysfjellet and descended round the bowl before Jupiterfjellet. Because of the steep bowl we went up to the western flank of Jupiter-

fjellet and then turned east up to the pass leading over onto the Keplerbreen. Very steep and hard going but at least we could see where we were going. Got to the top of the pass at 12:10 and had lunch. For lunch we use thermos water to eat noodles, cous cous or mashed potato, with soup. The mashed potato needs quite a lot of water, as I found out on this day. We had our first view of Newtontoppen from the pass. We descended down the Keplerbreen, keeping south of Astronomfjellet. The Keplerbreen runs into another glacier, the Kvitbreen, which is much larger. We crossed the Kvitbreen, walking north to a low ridge between Newtontoppen and a rocky outcrop called Eplet (Apple). The low ridge connects with the slope we will ascend up the first stage of Newtontoppen, at 1713 m the highest mountain in Svalbard. Camped at 990m. Looks like a front is coming in from the south west but we may be lucky.

17/08

Today we summited Newtontoppen! Started walking at 09:00 in clear blue sky, just wearing thermals. Started across the plain then up the first slope. Stretched on the ridge then made our way to a rocky outcrop up Ermakbreen at around 1300m. Crossed another snowfield to a ridge where the rocks broke through. Roped up for the steep section, with quite large drops to the south. Wove between rocks near the ridge crest to get to the shallower slope, and then carried on up a wide gentle ridge, keeping on the inside of the rock formations. The ridge ran up to the summit dome. Passed the 79°N line! One long slope then a mini dome and we were on

top at 13:10. Incredible views all around far into the distance. All shook hands and took photos. Wind quite fierce and cold so descended the dome to the nearest rocks for lunch. Unroped for descent and found some small crevasses. Descended back to camp in around two hours. Camp ground is a lot slushier from the hot sun. Gear has dried and the solar panels are working. Read and ate chocolate and assembled for dinner at 18:15. Everyone in very good spirits. We were told it would take a week to get to Newtontoppen. It has taken exactly a week.

18/08

Rest day today. Beautiful weather but a cold wind which keeps us reading in tents. Audited the food and fuel situation after lunch. Plan to trek to Trebrepasset tomorrow and make a food and fuel dump for the seven days it may take us to get back to the Nordenskioldbreen. Read for a few hours in the sun as the wind died down. Bernard is here. Socks and boots are drying.

19/08

Got suddenly colder last night which must have been when the sun went behind the mountains. Saw clouds coming from 03:00-05:00 but by 07:00 they had gone. Packed and left the Newtontoppen base camp – the tents had sunk in the warming snow. Walked west up the Kvitbreen and large clouds began moving in from the south west. Newtontoppen soon became covered and we spent much of the walk in the shade. Clouds were high. We had lunch below the slopes of Didierfjellet and then Nathaniel, Ande, Sietse and I began an ascent of Didierfjellet (1455m). Ally and Heather rested. Steep slopes up to a rocky ridge, some rotten ice and a few crevasses. Roped up all the way. Stayed south of the rocks on the summit ridge as the ridge was broad and the rocks were very broken up. There was a cairn on the summit which we reached at 14:08. Descended the way we had come. Short break then walked to the Veteranen glacier across a snowfield to the south of Didierfjellet. Set up camp on Trebrepasset, the high point of Veteranen, to make the food and fuel dump. The blue sky is back with a few wispy clouds and some wind. Discovered a third tin of hot chocolate powder! Today we walked 5.8 miles and gained 120m. This is our first camp beyond 79°N.

20/08

Walked down Veteranen to the base of Galileotoppen and selected the best looking route up. We had decided to

attempt mountains on good weather days as the maps we had were only 1:100,000 and so it would have been very hard to navigate off a mountain in a white out. Ally's ankles were painful so he rested while the five of us started up the mountain by contouring up a snow bowl to the south, all roped up to the 60m rope. There were a few crevasses and very slushy snow. The sun came out fully when we got to the top of the col. We turned north up an ice dome and zig zagged to the rocks at the top. We were soon on the main ridge leading to the summit which was very narrow with long drops on both sides. Had to change in and out or crampons in very tight spots. The ridge had an overhang to the east and the wind was quite strong. The snow gave way to about 40 metres of narrower ice ridge which was rotten and crumbled away beneath my feet. I could feel myself slipping though there was a beautiful view to the glacier far below. Turned back as it was too dangerous. The rotten section was too long and we would have all been on it at the same time. At this point we were only 150m from the summit but this was all ridge and there may well have been other dangerous sections. Descended down to the pulks to have lunch. Walked further down Veteranen and turned west to camp below Marsfjellet. I didn't feel well and think it is probably dehydration. There are clouds to the west and the wind comes in bursts. We are at 1161m.

21/08

Had a semi-sunset on watch and the clouds in the north were red and orange. The cloud base was low when we woke. Walked down Veteranen through snow which got progressively slushier, having breaks every 45 minutes. There was a white out at the start but it got better as the morning wore on and we had a view to the north. The glacier entering Veteranen from the west in the distance looks completely bare of snow. Passed several pools and had to follow a stream west before we could cross it. Water very blue. Stopped for lunch when we came to another stream crossing the glacier. Another glacier close to the west was blue with running water. Shortly after lunch we saw down Veteranen in the direction we were going a vast lake of standing water with multiple streams going into it, as wide as the glacier and extending far into the distance. This then was as far as you could come north on the Veteranen in summer. We walked down to the very edge of the lake, as far as we could go without sinking. It would have been impossible to cross with pulks and there was nowhere to camp for miles. We were still at 785m above sea level and our position was 79°08'43. This then was our furthest north. We had whisky. Heading back south up Veteranen, we crossed the two streams again and camped on the first flat ground. Still very slushy and wore snow shoes in camp. The point on the Veteranen glacier we would have turned west to continue the journey north was up the Trinity Hallbreen, at around 79°16. Since we could not get there the other possibility was up the Edinburghbreen which we could see. The lower edge was completely covered in running water and we saw from the maps that the route north went over several steep cols. Not knowing what the conditions would be like and anticipating very slow progress in the slush we changed the plan and decided to explore the mountains of the upper Veteranen glacier over the next week.

22/08

It rained just before morning but had stopped by the time we got up. High clouds and clearing. Walked diagonally southwest up Veteranen to the nearest point we could get to Malloryfjellet without crossing a stream, though we saw several. Left pulks and walked about 1k to Malloryfjellet. Leaving snow shoes at the bottom, we climbed a rocky ridge, covered in black and grey rocks shattered by freeze-thaw. Soon found a huge variety of plants and lichen growing on the slopes. Sun came out. Mostly scrambled on the rocks for the ascent but there was some snow and ice near the summit. Reached the summit of Malloryfjellet (1319m) at around 12:00. Good views down to Edinburghbreen and Irvinefjellet. Descended back down the way we had come. The streams were wider on the way back to the pulks. Walked for an hour up Veteranen before setting up tents.

23/08

Rest day today. Clouds cleared during the night and we woke to a blue sky. Stayed out of the tent all day, though some clouds came from the sun. Had Irish coffee. There is a fog to the north which keeps expanding and contracting.

24/08

Rained during the final watch and one stove wasn't working. Rained as we walked south. All a white out. Walked for 5 miles to the previous campsite under Marsfjellet to see if the clouds and rain will clear tomorrow to attempt the mountain. In tents for the rest of the day. It has got a lot colder. I went out for the stove at 20:30 and the pulk covers are solid with ice. Cooked in the porch and decided Polar bear watch will be from inside the tents. Now raining again. Weather system seems to be coming from the north, whereas so far systems

have always come from the south west. This at least explains the cold.

25/08

It rained through the night and the rain froze as soon as it hit anything; we have called this the Night of the Freezing Rain. Waited to see it the weather would clear by 12:00. Still a white out. At 12:00 some clouds had lifted but there was still a low mist. Left the tent to take stove to Nathaniel and Sietse who boiled the water for lunch. Had lunch in tents. Phoned the meteorologist at Longyearbyen airport who told us that the rain will ease, the clouds will remain for two days and then we should have sun by the 27th. Now snowing heavily. Decided to stay here for the rest of the day for one more attempt at Marsfjellet tomorrow. The clouds rose throughout the day but there is some wind and it is cold.

26/8

The 'broken' stove now works again – just needed some cleaning. Another sunset to the north with red and orange clouds. Lots of clouds but all high in the morning. Began walk to the base of Marsfjellet. Started up the north side and walked in a spiral loop to approach the summit from the south. Great views west to Austfjorden. Found a cairn on the last rocky section before the summit. The last section up a snow ridge was steep on both sides so we exchanged snow shoes for crampons. Reached summit of Marsfjellet (1429m) at 11:40. Snacked and began rapid descent. Had lunch at

pulks and walked two miles south up Veteranen to the food dump. No wind and a generally warm day. Re-packed the food dump and walked 1.2 miles south before setting up camp. We saw a possible route up Venusfjellet on the north-west side of the mountain. Venusfjellet is very distinctive with steep rocky slopes on all sides and a snow hat on top like a beret. Feet are cold.

27/08

Very cold during last night's shift but good weather. Red pillar of light from the sun in the north at midnight. Woke to find most things frozen and very hard snow. Blue sky and hot sun. Walked south from Stottbreen to the top of Harkerbreen and then up towards Jupiterfjellet. Passed lots of deep crevasses and a pile of white feathers. Stopped at 11:50 high on the col to have half of lunch. Left the pulks and began the walk to Wainfletefjellet over some recently frozen standing water. Reached the col between Jupiterfjellet and Wainfletefjellet and turned north up a very steep rotten ice slope which was steeper than it looked. Quite dangerous. All in crampons. The slope levelled off into the summit dome which had deeper snow Reached summit of Wainfletefjellet (1465m) at 13:30. There is an impressive ridge running east to west and then north, and a cliff to the north. No wind. Descended west down rocks and then a scree slope. Also quite dangerous. Some steep sections to the top and we caused many rock falls. The lower scree section was easy enough. Clouds had come back from the south west by the time we got to the pulks. Walked with them to a flat section between Jupiter-fjellet and Eroshetta to set up camp. Not too cold, and there are sections of blue sky. I think it's fair to say we didn't find the good way up or down Wainfletefjellet.

28/08

Woke to high clouds and no trace of blue. Geared up and began ascent of Jupiterfjellet, leaving the tents standing. Several team members tired and not feeling too good. Approached the mountain from the west and then turned north to summit once past the western rocky ridge. An easy climb to a great view. The rocks seem different to anywhere else and are a

light beige colour. Reached summit of Jupiterfjellet (1425m) at 09:45 and descended south to the col to begin the ascent up Phoebefjellet (1370m) on the other side. Went north up a slope like a large wave of ice to a bowl top. The east side is a cliff with an impressive overhang. Descended back to the col where Ally, Heather and Ande headed back to camp. Sietse, Nathaniel and I set off round the top of the Keplerbreen for Astronomfjellet. It was a long walk and clouds began to gather. Ascended the west side of Astronomfjellet (1487m) which was very monotonous, one large hump-back ice dome. Reached the summit at 13:00. The clouds closed and our view reduced considerably. Descended in a semi white out, following our tracks. Reached camp at 14:20. We saw a dead Northern Fulmar on the lower slopes of Jupiterfjellet, which was partially eaten. Cooked lunch on stoves. Into tents to read until dinner at 18:00.

29/08

Today is a rest day to fully recover before walk back to the coast which we have left a week for as it took a week to get to Newtontoppen. The snow is a lot harder now so it may be easier but we do not know what the Nordenskioldbreen is like considering the melting we saw on Veteranen after several days of sun.

30/08

The clouds rose for us this morning so we had a low layer of mist, a high layer of cloud and mountains in-between. Everything grey. Managed to walk 17k in an almost straight line on very hard snow south. Incredibly different snow conditions to the first week. Amazing that it changed in one night of cold weather from the north. Passed the campsite under Saturnfjellet where we had whisky at 10:20. Carried on over the 1255m high point of Lomonosovfonna. Reached our previous campsite on Lomonosovfonna at around 1000m and set up camp. White out for the evening but will attempt some mountains tomorrow if it clears.

31/08

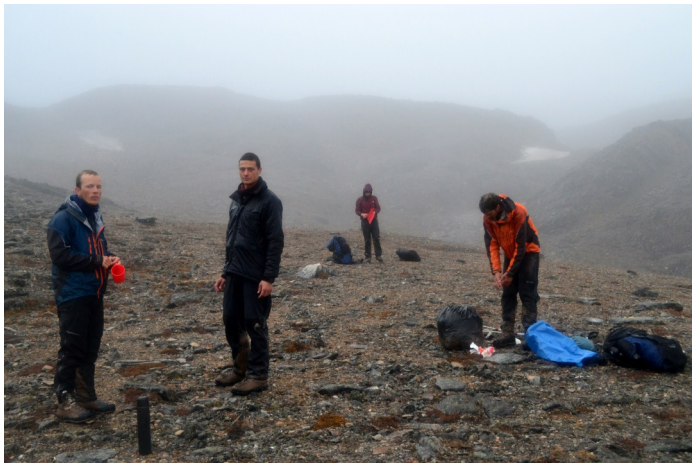
Very cold night. Woke to ice inside the tent. Boots solid. White out and snowing. Phoned the meteorologist who said there would be snow for the rest of the day and then rain tomorrow, then getting better over three days. Decided to head down the glacier and explore nearer the coastline. Passed through a large crevasse field and then we were on the Nordenskioldbreen. Turned south-west down the glacier. Snow hard to start but after lunch we were walking on thin ice over pools of standing water. Slushy snow. The top layer of the glacier has melted and refrozen, leaving strange ice clumps. Very crunchy. The ice is dirty with a layer of black deposit. We have had to cross many streams. Eventually arrived at a large stream which had cut a 2m deep gorge in the ice which was impossible to cross. We left the pulks and walked downstream to try and find a way to cross as Ally had seen it just as deep far up the glacier. Within 20m we found a waterfall straight down a huge hole in the glacier. Couldn't see the bottom. We took the pulks around this waterfall and continued to the Thomsonelva valley and moraine to the north of the Nordenskioldbreen. The glacier has become very dirty in the last few weeks and we have to lift the pulks over small rocky sections. Set up camp surrounded by rock but still on the snow. The snow which was covering the nearby mountains has all gone. Nathaniel found a Reindeer antler amongst the rocks. Incredible patterns in the rocks and really well defined colour bands. Light rain and low cloud approaching. Good to have rocks to cook on so the stoves don't sink.

1/09

It rained for about 16 hours and stopped at 14:00. Had lunch in the tents. If we move everything will get wet. Rain started again at around 16:00 and wind also picked up. Ande had cold mashed potato for dinner.

2/09

Woke to more rain and wind and up for breakfast at 09:00. Got out of tents for porridge and decided to take a load in backpacks down the moraine. Walked downhill for 2.8k to a flat site near our first campsite and made a depot. Came out below the clouds and could see the sea. Back up to the 400m camp for lunch. Decided to camp at the lower (dryer) site so took all sleeping gear and tents down to dry. Set up tents and laid out wet gear. Back to 400m for what was going to be the last load today. Phoned the Polargirl at 17:30 to arrange to be picked up on the 5th or 7th. They said they had cancelled all the boats next week because of a lack of passengers. Their last boat is tomorrow (3rd). Realised we would have to get everything down to the beach by midday tomorrow. Took everything at the 400m camp down to the lower camp in one last load. Very heavy. The route goes through sinking mud. Saw group of Ptarmigan so tame you could almost have picked them up. Also saw two Reindeer. Cooked dinner at the lower camp and ate lots of sugar. Took one load down to the beach with Ally, Sietse and Nathaniel and found a pretty good route. Walked through a low stream. Got back to camp at 23:00 and we will have three Polar bear watches, getting everyone up at 05:00. I was first, followed by Sietse then Nathaniel. The clouds are higher now. It's Ande's birthday!



3/09

It was raining at 05:00 and we couldn't see the sea. Walked down to the sea with a load and the cloud was all the way down to the beach. The sea was covered in thick mist. Everything very wet. Did two more loads and got everything down to the beach by 12:30 which was great as we were told the boat would pick us up at 15:00. Had lunch. Mist began to rise but it rained. Got to 15:00 and no sign of the boat. Phoned but no answer. Phoned the Sysselmanns office who said they'd investigate. Also saw a boat sailing to the Nordenskioldbreen so Sietse and I went to talk to the people on board. Met a couple with children who owned the local hut. They said they had seen the Polargirl at Pyramiden and she would soon be with us. It had apparently left later than we had been told. Helped the couple unload the boat so they could get the sauna started. Polargirl picked us up at 17:00. Saw White Whales in the bay. Given lunch on the boat which we ate pretty quickly and then found out it was Whale. Waffles and coffee on the way back and the sun even came out. Back in Longyearbyen we got a taxi with a trailer to take us back to the campsite with the pulks. Much cheaper and probably more reliable than Pole Position. Set up everything to dry. Hardly anyone in the campsite. Very relieved having

got back safely after an amazing 24 days trekking and mountaineering. Nearly dark outside. Everyone has healthy sunburn.

4/09

Spent the day in the campsite hut reading, playing cards, drying kit. Light rain all day. Worked out some of the trip finances.

5/09

Got a taxi to Longyearbyen and stocked up on food for the next few days. Power cut throughout the whole town. Found out about a symposium on the 7th and 8th at the University which is free. Sat in a cafe. Weather forecast is not great for walking but may clear up in a few days.

6/09

Stayed in the campsite hut reading. Ally went bird watching.

7/09-8/09

Attended the 15th Russian-Norwegian Symposium on Climate change and effects on the Barents Sea marine living resources. Each day started at around 09:00 and finished at 18:00 and was based in one lecture theatre at UNIS, the University Centre in Svalbard. Luckily it was in English. Over the two days the talks were divided up into three sections: 'What are the changes?', 'What effects can be expected on the ecosystem?' and 'Management implications and challenges'. There was also a good poster display and lots of coffee. Unfortunately nearly everyone at the symposium was a researcher making a presentation and there were no students, which was a shame as we learnt quite a lot.

09/09

Spent the day in town doing touristy things like gift shopping. Paulsen's have agreed that we can return the guns on Monday. Returned to the campsite for dinner and then went back into town to go to the most northerly disco in the world, which happens every Friday and Saturday at 'Huset'.

10/09

Cycled into town to have a look round outdoor shops, drink milkshakes and just to get out of the campsite.

11/09

We were going to go walking today but there was low cloud obscuring everything down to sea level. Cloud started to clear by 11:00. Fully unpacked pulk and left kit to dry. Sietse and I cycled 13k through Longyearbyen and up Adventdalen on a dirt road. After Longyearbyen the fjord ends and the valley is a large freshwater river system covered in tundra. Lots of Arctic Cotton Grass. Started to climb a mountain with a mine on it and after some steep rubble got to the upper section of the mine. No fences so had a look inside the control room and power control areas with the engine controlling the platform and levers controlling the coal conveyor belt. One building at the top had its roof completely off and upside-down 30m away. Climbed some rusty stairs and continued up the mountain to approximately 600m. Had water and chocolate and descended back to the mine to look round the other buildings. Walked down the mountain between the coal conveyor belt and the railway for the platform. Found the old miners track up the mountain. Explored the lower mine buildings including the vast coal storage building and found the mining platform. This mine is the start of the wooden pylon structures taking coal to the sea near the campsite. Cycled back to Longyearbyen. Had milkshake. Rain now heavy. Cycled back and got very wet. Went back to town to the most northerly cinema in the world. Went for one final pint.

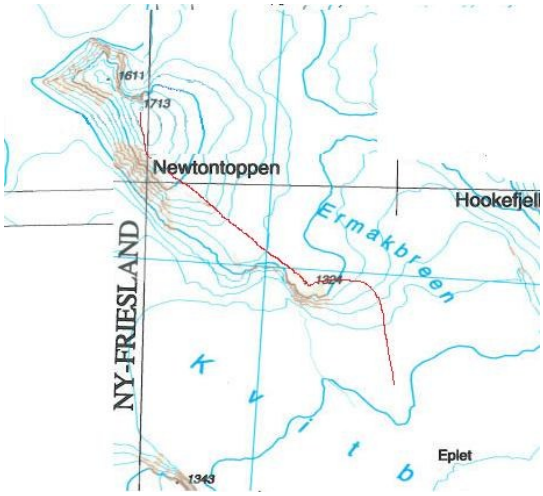
12/09

Up at 07:30 to pack the last of the equipment and food. Ally and I saw an Arctic Fox so went to take photos. It then came very close and ran around up snapping. Leaving for a short time, it returned and attacked the tents, chewing guy ropes and pulling out pegs. Sietse, Nathaniel and Heather escaped to the porch in-between attacks but Ande was stuck in the tent. Nathaniel went outside and it chased him back in. Eventually it ran away after circling the hut a few times and being dive bombed by Skuas. Sietse, Nathaniel and I went to town to return the rifles and the flare gun to Paulsen's and to sell them the last of the fuel. The campsite owner and author of the guide to Spitsbergen, Andreas Umbreit, then came to collect our campsite payment and bought the Alarm Mines from us. Went to check in at the airport and had to pay for our equipment to be transported to England, but at least we don't have to check it out in Oslo. Went to the airport cafe. Uneventful three flights from Longyearbyen to London and we landed with all our equipment still wet at 21:35. It is good to see trees again.

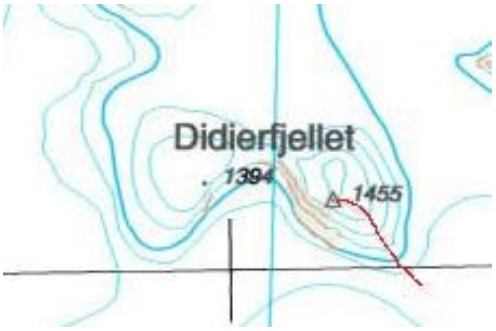
Mountaineering

Newtontoppen - 1713m

Newtontoppen is the highest mountain in Svalbard (though the second highest, Perriertoppen, is just shorter at 1712m). It is a large imposing mountain, its southern cliffs rising high above the Kvitbreen. We climbed Newtontoppen from the east, having camped between its eastern slope and the rock formation Eplet. The eastern slope rises up to exposed rocks at around 1300m. From there you can carry on west up a rocky ridge to the south which was a large exposure on your left, or you can snow shoe up the slope to the north, skirting the sharper ridge. Either route will lead you to the summit ridge which is long and broad and curves from the east to the north. We continued along this ridge keeping north of the exposed rocks. When the ridge finally turns north you climb up onto the summit dome and after a short time the smaller lump of the summit becomes visible. Descent is via the same way.



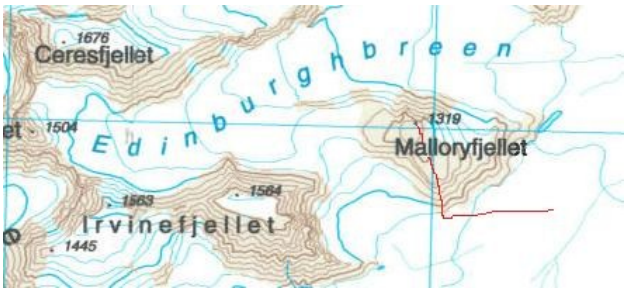
Didierfjellet – 1455m



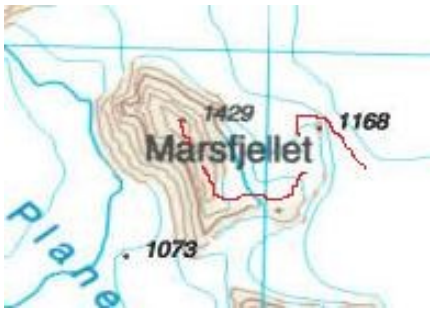
Didierfjellet sits right at the top of the Kvitbreen as it exits from Veteranen. From above it looks like a pair of dumbbells and is probably climbable from either east or west. We approached it from the east as we were walking up the Kvitbreen. The slope directly up from the east is steep but any further north and it becomes even steeper. At this time of year we also saw some exposed rotten ice, which wasn't ideal. At the top of the first slope, there is an outcrop of rocks which is easy to skirt to the south before continuing on up the summit ridge which is broad and mostly covered with a loose rock carpet. We stayed on the ice south of this carpet until reaching the summit, where there is a cairn. Descent is via the same way.

Malloryfjellet – 1319m

Malloryfjellet's most distinctive side is from the south as it is a remarkably different colour from the surrounding mountains. It's southern slopes are mostly snow-free in August and appear black from a distance. The mountains immediately north and east are a much lighter colour. We approached the mountain from the east and went straight up the rocky slopes to the south, which were an easy scramble. There is some snow and rock on top but nothing technical. We did not rope up.



Marsfjellet – 1429m

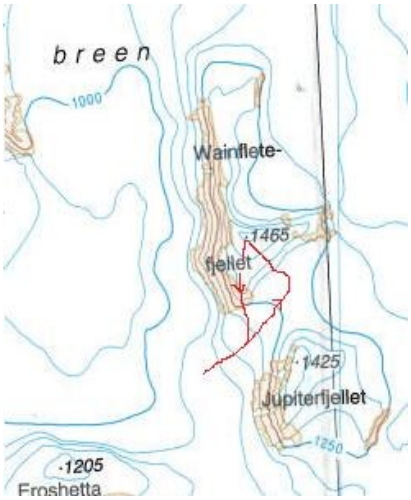


Marsfjellet is easy to identify because of the three humps of ice and snow on top, making it look like a camel. The easiest way to climb this mountain is from the north up a short snow slope and then a much longer snow ridge leading south and then curling round to the north like a spiral. It is unnecessary to walk on the rock until you are near the top and have no choice. There is a cairn on the top of the rocky section but the highest point of the mountain is the summit of the last of the three humps. These are quite narrow (by this point you are walking north) but quite easy in low wind and a lot

of fun, providing some great exposure. Descent was similar to the ascent but straight down a steeper section we had avoided to make the ascent gentler.

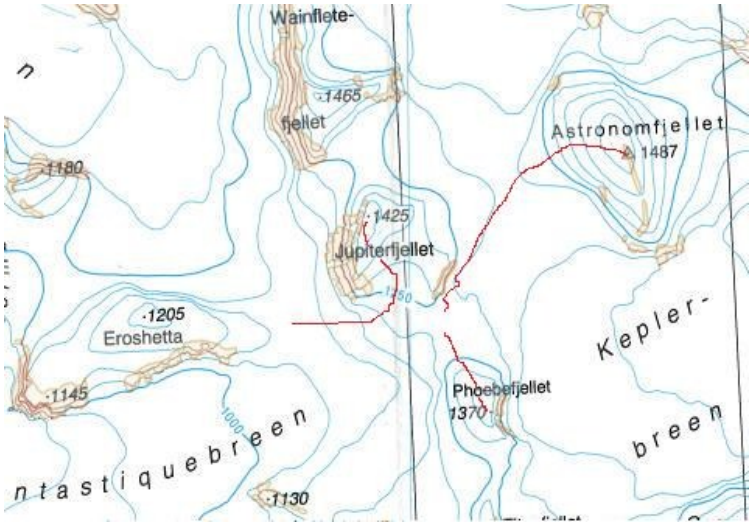
Wainfletefjellet – 1465m

We approached the mountain from the west, near the col between Jupiterfjellet and Eroshetta. It was hard tell from our position between Wainfletefjellet and Jupiterfjellet which was the best way up. The south side had an ice slope which looked firm and not too steep. It turned out to be quite steep but by the time we realised this we were already past the point of no return as descending the ice slope would have been even harder. At the top of the ice slope the gradient flattens out and deeper snow leads up to the summit, which is a short ridge. A long thin ridge descends to the north which looks exciting but not an ideal route. The best route seems to be to the east up a slightly better gradient then our ascent. To descend, we walked west to a rocky outcrop and descended some rocks and then a scree slope which was also very steep. Rocks frequently fell as everything is quite brittle from freeze-thaw. We do not recommend this route for descent, though for ascent the western rock slopes are possible.



Jupiterfjellet – 1425m

We started our ascent up Jupiterfjellet from the col with Eroshetta, walking west until we had rounded the steep rocks to the north and the snow slope to the north looked accessible. From there it was an easy slope north up to the summit. We descended south to the col between Jupiterfjellet and Phoebefjellet.



Phoebefjellet – 1370m

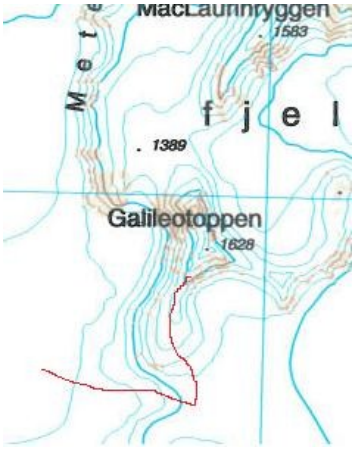
Phoebefjellet is easiest from the north and the col between it and Jupiterfjellet, though it is also doable from the south and the col with Tethysfjellet. To the west the ice is steep and to the west there are high cliffs dropping from the summit. From the north we walked up a wave-like dome which levelled off before the summit. Descent was the same way.

Astronomfjellet – 1487m

We saw a possible route up Astronomfjellet from the north, straight up the ice dome which forms the major part of the mountain. However, we attempted it from the west, from the col with Jupiterfjellet. The slope was steep at times but very simple, there being no rocks or definition other than the dome you are walking up. If your crampon skills are good you can probably attempt Astronomfjellet from any angle. We descended the same way as the weather was closing in at the time.

Galileotoppen

We attempted Galileotoppen from the south, walking up to the col between it and Didierfjellet before turning north up a snow dome to the start of the rocky ridge. From here on, although most of the height has been gained, the ridge makes things very difficult. For the rock and stable snow sections slow going is required and care must be taken of the overhang to the east. After walking along the narrow ridge for half an hour we came to a very thin section, approximately 40m long, of rotten ice, which crumbled away beneath our feet. This was mildly terrifying so we turned back. The mountain from this angle would be doable with a longer rope and fewer people so only one person is on the rotten section at once, or at a colder time of year when the ice is more solid. There may also be better ways up Galileotoppen such as from the north, but we did not have time to investigate further.



Equipment

Tents and Sleeping

The tents used were one Terra Nova Quasar and two Terra Nova Ultra Quasars. The Ultra Quasar is about a kilo lighter and has different coloured inner and pole sleeves from the normal Quasar. We did find that the pole sleeves were quite fiddly to feed the poles into as they were quite stiff. This was probably due to them being new though. Both tents had adequate space inside and in the porches for all the equipment we needed. We did have one tent pole snap from the normal Quasar but this was fixed using the repair kit we brought with us. Most of us had issues with condensation building up on the inside of the tents and so kept the inner doors open nearly all the time. The outer protected the inner for most weathers but snow valances could be a good investment to reduce draughts and the impact horizontal rain.

We all had bivi bags that we used to try and keep our down sleeping bags dry, with mixed results. The best advice is to not let the bivi come over your face while sleeping as then the interior would get wet. We all had positive experiences with the Marmot Never Summer down sleeping bag and Exped Downmat 7 pump. Another mat beneath the down mat helped keep it from getting wet. The down mats required around 200 pumps to get it fully inflated. We found that the mats sometimes needed extra pumping after having left them inflated for a few days; we put this down to the air inside cooling down and shrinking rather than to leaks. We used varieties of sleeping bag liners to provide extra warmth and to keep the sleeping bags from getting too dirty. We used a variety of different pegs for the tents due to the conditions of camp. Mostly snow pegs were used with ice axes and ice screws helping out as there wasn't enough snow pegs for every guy line.

Pulks

We used two different sorts of pulks, three older Snowsled, and six smaller blue plastic ones. The older ones performed better as they were sturdier than the thinner plastic ones, they also had a better waterproof covering. They also had a fully metal middle support for the poles while the plastic pulks had a metal bar which was attached using plastic T-joints. These small bits of plastic sheared off in two of the three that we had leading to the poles not sitting in the right position all the time. We found that when having the two smaller plastic pulks the back one always tried to overtake the first and run over the connecting rope when going down inclines. Also a persons turning circle when connected to two pulks had to be wider which made lining up and crossing crevasses difficult sometimes.

Walking

We wore a mix of new Scarpa Charmoz and Scarpa Manta with one old La Sportiva boots. They all stood up well with the conditions, either on the snow or when climbing across bare rocks. The Charmoz seemed to get colder than the Mantas but were drier. This helped when the boots froze when left in the tent porches as the Charmoz were then easier to put on than the Mantas. We all used either the MSR Evo Ascent or older variety snow shoes which were very useful for when the snow became more crumbly or deep. The ascenders on the back worked well when climbing inclines, but the shoe extenders didn't seem to make that much difference. We had a mixture or Grivel G12, Grivel G10, and Black Diamond crampons with them all working well. The only issue with both snow shoes and crampons was to be careful not to catch the gaiters or your trouser leg with them as they could create rips. Another time when crampons were not so useful was when the terrain turned into flat solid ice and snow which would jar our leg muscles. We all had inner and outer socks which took turns drying on the guy lines of the tents in good weather. Five pairs of inner and outer socks should be adequate, with another kept back for wearing when sleeping. We all used different types of Leki walking poles with snow baskets which did stop the poles from going too deep into the snow. All of us had various thermals, most made from merino wool, and as long as they stayed dry they worked well. We all had either ski goggles or sunglasses which we wore when walking and around camp when the sun was bright. Buffs, hats, and gloves were worn almost all the time when walking to keep the head and neck dry and warm. A combination of Extremities gloves worked well with an outer Gore-Tex glove protecting a warmer inner glove. We each had a small day bag which was used for when climbing mountains or for keeping smaller items in, and a larger bag which was useful for transporting kit on and off the glacier.

Montane

We all had a collection of Montane equipment differing from person to person. We all had a North Star down jacket which was very nice and warm but not too heavy or bulky. The Atomic DT and Featherlite waterproof trousers worked well but did get ripped when scraping them against rocks. The Terra trousers were not as waterproof but where more resilient to rocks, and had nice side vents for allowing air in. The Extreme Salopettes were also really warm and so were in demand for when doing polar bear watch in camp. However we found that the back doesn't go high enough and so if you didn't have a down jacket over the top you could get cold winds down your back. We also had two Bear Jackets, a Mohawk Jacket, and a Jaguar jacket which all worked well. The only downside for all the Montane equipment was found to be the zips as they were sometimes hard to do up.

Campcraft

We had primus omnifuel stoves which were very reliable once worked out how to use them properly and made sure the right nozzle was connected for the type of fuel we got. The general cooking experience would have been better if we had had hinged heat shields to protect the stove from the weather as the ones that come with the stoves themselves were a bit flimsy. We did have to clean the stoves occasionally, but if we packed away the stove after use then the amount of gunk and water entering the fuel bottle was kept to a minimum. In the end we only used about 30 to 35 litres of fuel. We didn't actually use the alarm mines due to having a polar bear watch around camp at all time during the night. This was probably for the best as the sort we had are made with an open system which could open freeze, so not going off when they should do. We all tried out handling the two rifles and flare gun, and had these out when doing polar bear watch. The only problem with this is that they all got rusty and so had to be cleaned regularly to make sure they would still work when required to. Each person brought different eating implements with people eating out of mugs, bowls, and plates, and mostly using sporks. The idea of bringing a Thermos to hold the water boiled at breakfast for use in lunch worked really well and we would recommend others doing this too.

Other

A few of the group brought mats to sit on which turned out to work well as they would keep you warm when sitting and eating. Something that would have been good to have was a change of footwear to wear around camp. Alex brought Fleece slippers but they were not waterproof, and so Nathaniel and Sietse both suggested that Wellington boots could be more useful. All of us had various large dry bags which all worked well in keeping everything dry. The solar panels that we took worked well attached to the top of the pulks in the direct sunlight. We all had a collection of water bottles, some worked better than others. The water in the Sigg bottles, especially the ones with covers, didn't freeze while the water in other bottles did. We were all glad that between us we had brought a wide collection of books to read. There was also some equipment which we didn't really need, such as torches, spare nail clippers, and too much washing up liquid, and too many batteries for the GPS. The satellite phone worked well and had good signal for the entire time we were out on the glaciers and mountains.

Equipment list

Group Kit

General / Saftey Equipment

First Aid Kit
Rehydration salts
Permit and Search & Rescue Insurance Information
Baby Wipes
Biodegradable Bags
Rubble sacks
Bin Bags
Crevasse Rescue Kit:
2x25 metres of thinnest relevant climbing rope.
3 carabiners each 18x£10.-
Two thin ropes (50cm) each to make self jamming knots
Two ice screws 2x£40.-
Foldaway snow shovel

Nav/comms/tec

Satellite Phone & Solar Charger
Emergency Beacon
GPS and spare batteries
Camera and Filming Equipment
AA Solar Chargers

Bear safety

Rifle, Flare Gun and Air Horn
Rifle ammunition
Rifle Cleaning kit
Alarm mines and cartridges

Shelter & cooking

3xStoves and 2 spare
Fuel
FOOD
Tents - 3
tripod for camera (small)
Nail Clippers
Small adjustable spanner
Spare GPS - 2
Ice screws and pegs for Tents

REPAIR AND SPARES KIT

Tools:

- Leathermans
- Hacksaw (small for iron)
- Pricker/hand drill
- Rubber gloves (a few pair)
- Cleaning kit for gun
- Sewing kit
- Down mat repair kit (was included with down mat)
- Sandpaper
- Lighter

Materials:

- Tent sheet
- Metal sleeves for tent poles
- Superglue
- Duct tape
- Cable ties
- Epoxy
- Glass fiber matt (1 roll)
- Good quality nylon rope
- Metal wire
- 2 pairs of spare boot laces each
- 10m paracord (can be used for boots or other things)

Spares:

- Spare tent poles or metal sleeves
- Spare parts for the stoves
- Spare pair of crampons
- Spare straps (12) for use on bags, pulk straps, gaiters

Personal kit (each member of the team had a variance on

Pulk/trace/rucksack

Pulk
Pulk Hauling Straps
Harness
Small Rucksack

Equipment

Ice axe
Phone
Camera
Camera battery charger + spare
Compass
Walking Poles
Water Bottles – 3L
Thermos - 2L
Watch
Alarm Clock
Lunch box
Leatherman

Shelter

Down Sleeping Bag
Sleeping Bag Liner - 2
Down Sleeping Mat
Bivvy Bag

Clothing

Thermal Leggings (Merino Wool) - 2
Thermal Top (Merino Wool) - 2
Mid-layer Fleece
Waterproof Trousers / Salopettes
Down Jacket
Underwear - 11

Head

Buff - 2
Woollen Hat
Sunglasses

Hands

Gloves - Inner and Outer
Spare gloves

Footwear

Socks
Hiking Boots
Snow Shoes
Crampons
Gaiters

Personal

Personal First Aid Kit
Toothpaste – 200ml
Toothbrush
Floss
Mouthwash
Talc
Moisturiser
Dry Wash Hand Gel
Sun Lotion
Vasolene
Book
Wallet
Diary and pens
Deodorant
Passport

Other

Stuff Sack - Clothes
Stuff Sack - Electronics
Stuff Sack - Wash Kit
Stuff Stack - Other

Food

Planning appetising meals which also contain enough calories to sustain team on the expedition took some time. The factors to consider when planning the team's diet were:

- Calorific content
- Nutritional balance
- Weight
- Food longevity
- Taste, texture and variety

On the training trip to Scotland we tried a possible diet for Svalbard; porridge for breakfast, pre-cooked cold carbohydrate from the previous evening with cheese, cured meat and spices for lunch and a warm version of lunch in evening. Adding lard added calorific content but unfortunately was so unpalatable the team could not consume it. An additional problem was that cold food for lunch was difficult to consume, especially certain carbohydrates which seem to "set" after storage in the cold.

Based on feedback from the Scotland trip an improved food plan was developed for the main trip as follows:

Breakfast: 100g milk powder
100g hot oat powder
50g sugar
75g raisins ~1100 kcal

Lunch: 200g carbohydrate [noodles, mash, couscous]
½ sachet sauce flavouring ~850 kcal

*lunch was made with pre-boiled water kept in thermos' so no water needed to be boiled at lunchtime but the team could have a hot meal.

Dinner: 200g carbohydrate [penne, spaghetti, rice]
½ sachet sauce flavouring
50g dried meat, beanfeast or soya protein
1 Supreme dessert sachet ~1400kcal

Snacks: 1000 Kcal to be selected by individuals to be consumed throughout the day [chocolate, nuts, sweets etc.]
1 sachet soup per day

Tea, coffee and hot chocolate were also available as necessary.

This put the daily calorific intake at close to **4500 kcal per day**, necessary due to the high levels of exertion and cold climate. An attempt had been made to include protein and carbohydrate and the foods taken would not perish during shipping or the expedition. The sauce sachets provided a variety of flavour and beanfeast, soya protein and dried meat provided texture to the meals. The weight of the food was significant however minimised as far as possible. Taking high calorie but unpalatable food proved unworkable following our experiences in Scotland. Individual team members selected the sauces they preferred in attempt to make the meals as palatable as possible.

During the expedition, inevitably, the food plan was not rigidly adhered to. Overall we observed:

- The breakfast quantities were far too large for all members of the group
- Soup was used with lunch to add flavour, leaving plenty of flavouring for dinner

Other recommendations to improve the food plan were:

- A smaller raisin quantity
- Packaging and portion size regulation needed to be improved, bags ripping etc. was a major problem in particular with Sainsbury's basics products
- Couscous, whilst generally good, could have been improved by using pre-mixed sachets and could be hard when the ther-

mos water wasn't hot enough

Smash was almost impossible to eat in 200g quantities, Sainsbury's basics was also of very poor quality. In general, a water hungry meal, often finishing 1 litre of water with only 150g of powder used.

Noodles (Sherwood) were in weak packaging and would also be hard if thermos water wasn't hot enough.

Pasta and beanfeast were favourites and should have featured more prominently

Brown rice took a long time to cook and tasted less good

Dried sausage was very popular and supplementary tuna taken by some team members was also popular

Supreme desserts could have been better replaced with a more palatable and calorific alternative

Tabasco was a useful flavouring to bring

The 1000kcal of snack food per day was chosen by each team member, though during shipping a large quantity of the original selection was lost. More was purchased in Longyearbyen, though not all original foods were available. Many team members bought significant quantities of nuts as they have very high calorie densities however other common foods were chocolate, sweets and Balti mix.

A future expedition may wish to consider that the high calorie density is not the only consideration when selecting snacks. Snacks are particularly useful during energy dips when fast release foods are required – nuts are not particularly useful for this. In addition foods which are not usually eaten by a team member are unlikely to be consumed with enthusiasm. The team should have taken more sweet food for hauling times where nuts and Balti mix are not particularly useful – though savoury snack food to consume at camp was extremely useful.

Overall the food plan sustained all members of the expedition well. Vitamin pills were consumed to ensure no deficiencies arose and in general the diet was enjoyed by all team members. No team members reported significant hunger after meals and in some cases meals were routinely too large. The greatest success was the use of hot water boiled at breakfast to ensure a hot meal at lunchtime without having to set-up stoves and this should be strongly considered for further expeditions.

Training

An arctic expedition is physically demanding. The arctic conditions and heavy pulks demand a high level of aerobic fitness and a quick recovery of the body, the duration of the expedition asks for a rugged musculoskeletal system: injuries may not jeopardise the expedition. During the expedition the members will be facing harsh conditions and will have to put up with each other. This calls for a good perseverance and team spirit. Besides these general physical and psychological prerequisites, the team members must also have specific skills that allow them to survive in this remote area: skills in first aid, marksmanship and crevasse rescue. In preparation of the expedition we therefore set up a schedule covering all of these areas.

Fitness training:

Aims:

To develop

- a physical fitness that allows for 6 to 7 hours of aerobic exercise every day.
- a body that recovers quickly from intensive and repeated exercise.

a rugged musculoskeletal system capable of enduring exercise.

Training Schedule:

As our progress will be determined by the slowest team member, the proposed schedule was designed to improve baseline fitness of the team as much as possible. We have been training 3 times a week from September 2010 until we left for our expedition.

Tuesday: circuit training

The IC Union gymnasium was an excellent venue for this training. The training comprised of three laps around 14-16 exercises with each exercise performed for 45 seconds. Between each lap we had 1-2 minutes rest. The exercises were aimed at improving core stability, leg and arm strength as well as endurance. After the training we did extensive stretching to minimise chances of injuries. Some of the exercises we did were:

- Squat jumps on a crash mat. Make sure that your heels are in contact with the mat when you push out. Keep going and try not to stop in between jumps. Go deep!
- Sit ups combined with bouncing a medicine ball against the wall (http://en.wikipedia.org/wiki/Medicine_ball). Lie down on a mat, pull up you legs with your knees at 90 degrees with your feet towards a wall. Do a sit up, throw the ball at wall, catch it, lie down and touch the ground over your head with the ball. Repeat.
- Boxing with light weights. Take a 1-2kg weight in each hand and box.
- Triceps dips.
- One-arm dumbbell rows. Make sure to keep your back flat and move your hand towards your shoulder. Each side is one exercise.
- Single legged squat. Make a controlled, deep, slow single legged squat while maintaining balance.
- Jump rope. Keep the pace high!
- Back strengthening. Lay face down on a mat, keep your head of the ground at all times such that you tense you back muscles, lift your one arm and leg on opposite side and alternate sides.
- Alt straddle.
- Oblique plank. 20 seconds static, 20 seconds lifting your upper leg. Each side is one exercise.
- Jumping lunges. Keep your balance and make sure both your knees are at 90-degree angles at the deepest point. Looking in the mirror can help.
- Burpees.
- Swiss ball dumbbell press. Keep your feet as close together as possible, maintain a stable core and keep your bum up high.

Swiss ball dumbbell fly. Keep your feet as close together as possible, maintain a stable core and keep your bum up high.

The above exercises are just a small pick out of the many different circuit exercises that exist. In designing a circuit space out the exercises that target the same muscle group: don't do the single legged squats and the jumping squats directly after each other.

Thursday: Cardio fitness at Ethos. 60 minutes of non-stop cardio fitness. We usually did 4x15' on the treadmill, cross trainer, rowing machine and stepper.

Friday: 45' run with the team around Hyde Park (while pulling a tyre). Don't forget a good warm up and cool down with stretching are important parts of the training!

Evaluation

Looking back on the expedition, the training schedule met its aims: everyone was in a reasonable shape at the beginning of the expedition and we have been able to avoid injuries by stretching on a daily basis.

The attendance of the trainings was very irregular at the beginning but improved when the expedition approached. Especially Alistair seemed to have some trouble getting into the regime. It was very hard to keep track of Andrew's training regime, given that he lives in Oxford and could not train with us. In order to confirm everyone's fitness we decided to do a fitness test a month before departure. Anyone who clearly didn't meet the requirements (>44 push-ups in 2 minutes, >50 sit-ups in 2 minutes, 1.5 mile run in <10½ minutes for the guys, >21 push-ups in 2 minutes, >50 sit-ups in 2 minutes, 1.5 mile run in <13 minutes for Heather) would not be allowed to come on the expedition. This test was a clear cut off point and luckily everyone made the requirements.

In retrospect we could probably more fit if we had done such a test every month. This would also have made our progress also more measureable.

Team weekends

Every month we organised a training weekend to get to know each other better during demanding conditions and to practice longer walks with heavy back packs.

22-24 October: Ridgeway walk from Goring to Tring

During our first team weekend we walked along the Ridgeway from Goring to Tring. We left Friday night and managed to get a few miles in before we set up our tents. On Saturday we walked about 40km to Princes Risborough. This was a tough day! On Sunday we did the remaining 20k to Tring. All in all a good experience and training.

20 November: Roller Skiing

This was, for most of us, the first experience with cross-country skiing. We organised this through the London Region Nordic Ski Club. They gave us an introductory training on the Hillingdon circuit for about £20. - a day including hire of the material.

27 November: Mountain biking around Westcott

We hired bikes at Nirvana Cycles in Westcott. It was a nice and cold day and we spent most of it in the saddle exploring the Surrey Hills.

27 December-3 January: Scotland winter camping

We used this week of hiking, skiing and camping in Scotland to test our food plan, tents, sledge, sleeping bags and mats and our general cold weather camping routine. We also got to know each other better and improved our teamwork. Unfortunately it wasn't very cold and the snow that was still present at the start quickly melted away. We therefore only tried out our cross-country skis for a day.

After this trip concluded that the little training on roller and cross-country skis had not prepared us well for the trip and we decided not to bring skis on the expedition. It would have taken a lot of time and money in practicing to become confident on our skis. Instead we decided to use snowshoes. In retrospect this would prove to be a very good decision: the snow conditions during our trip were not very suitable for skies (too slushy or ice).

NB: If we had planned the trip to take place in April, skies would be preferred due to deeper snow and snow covered crevasses.

21-23 January: Hiking around Snowdon

The Fellwanderers happened to have six places left on their trip to Snowdon and we decided to join the trip at the last moment. We brought tyres with us, which we pulled during the walks.

Additional Skills

29-30 January & 19-20 March: Fieldwork First Aid

All members of the expedition attended this two-day first aid course at Imperial College. The training was given by Stuart Marshall from Marlin Training. Besides teaching us what action to take in what situation it also provided us with the rationale for doing so. The fact that all team members had at least followed one first aid course meant that everyone was more aware of risks and solutions and thereby created a comfortable redundancy in knowledge.

4-5 June: Expedition First Aid

All members but one attended the second first aid course, focused on expeditions. The training was given by Stuart Marshall and Dr Simon Green from Marlin Training. During the course of the training we refreshed our knowledge and practical skills from the previous first aid training and supplemented this with more insight into human physiology, pathology and advanced practical skills such as giving injections and suturing.

27 March: Shooting

Ed Poore from the IC Rifle and Pistol club took us out to the shooting range at Bisley. Ed and his companion Nick taught us how to safely handle, aim and shoot Second World War bolt action rifles (Lee-Enfield). Some of us proved to be better marksmen than others but the general level didn't give us any cause to worry. The guns we used during this training were very similar in functioning to the German Mauser M 98a's we hired at Paulsen's in Longyearbyen.

20-22 May: Crevasse rescue

Nathaniel organised this weekend in Snowdon through llanberisguides.co.uk. A weekend in a place with actual crevasses would've been more obvious but given the extra costs involved in following such a training abroad, we decided to do it in Wales. We had two guides who each taught us one day of the weekend. Prior to the training we had bought our own crevasse rescue kit with the help and expertise of Dominic Southgate. For each person the crevasse rescue kit consisted of:

3 screwgates (pear shaped)

1 screwgate (oval)

1 Petzl TiBloc

1 Petzl pulley wheel

1 ice screw

1 harness

2 prussik loops (1m x 5mm thick rope needed for each prussik loop)

1 sling

1 50m x 10mm rope between 3 people

Our guides found this suitable kit but advised us to use a 'Wild Country Ropeman' instead of the TiBloc to minimise damage to the ropes. They also preferred using a ball-bearing pulley over the Petzl pulley wheel in order to minimise drag.

The guides taught us three different techniques to rescue someone from a crevasse:

- Assisted hoist: this techique is used when the person who has fallen down a crevasse can help hoisting him-/herself up. The rope is loped back from the anchor to the victim, who loops the rope through a screwgate and helps with the hoist.
- Unassisted hoist: this technique is used when the person who has fallen down the crevasse is unconscious or otherwise unable to help with the hoist. Instead of loping the rope through the harness to create a better pulling ratio, A TiBloc and pulley are used.

Prussikking: this technique is used when the rope the victim is suspended on is fixed but the victim can't get help for hoist. Using a prussik knot around the rope a loop is created that can be used to climb up the rope using your feet in the loop. The prussik knot has to be moved up the rope as progress is made.

We also learned different ways of constructing an anchor with slings and we practised with different ways of creating a better pulling ratio. We rehearsed all these techniques in the weekend before our departure to make sure we were well prepared.

The training and rehearsal were very useful and gave us the confidence needed to perform a successful crevasse rescue.

Navigation

Svalbard's landscape is vast, consisting mainly of glaciers, ice caps and mountains. In poor weather conditions the landscape has the potential to become featureless and extremely difficult to navigate. It is important to know ones past, present and future locations. In order to achieve this, three types of navigational item were taken to Svalbard; GPS, maps and compasses. The two figures below show examples of the conditions.

Difference in visibility between whiteout and good weather conditions

GPS

In total, three GPS units were required. Two were used to save waypoints, one of which was also used to navigate by. The final unit was a spare in case of failure of one of the other two. The GPS used for navigation was a Garmin eTrex borrowed from the Imperial College Fellwanderers. The eTrex was found to be reliable and simple to use. It has five buttons that are sufficiently spaced so that it can be operated with one hand even when clothed in thick gloves. The eTrex has a waterproof rating of IPX7 and it operated well in the harshest of conditions that were experienced. The eTrex took about two minutes to lock onto the satellites with a maximum accuracy of 5m and during the trek it never lost the satellite signal.

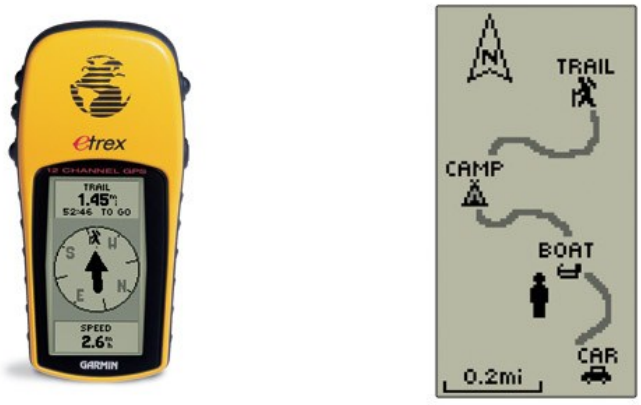


Image of the GPS and screen shot showing navigational page

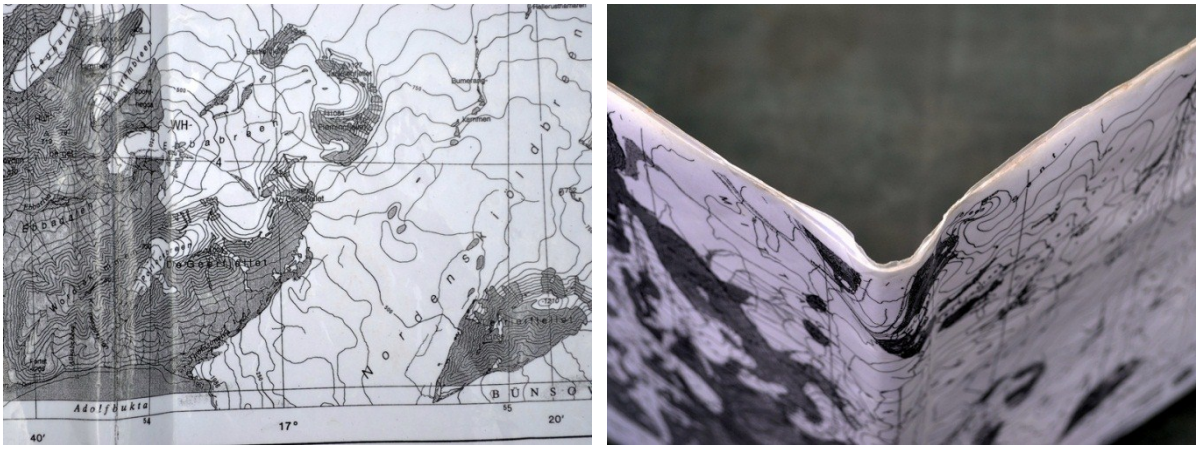
GPS units have the functionality to allow the user to record the current location or enter a set of coordinates. Both the recorded and manually entered positions can be used to fix a bearing. When the GPS is being used to obtain a bearing to a particular point, it will take it from the current location to the desired location via the shortest route and display this on the screen. The GPS used had no information about the undulations in the land and care was needed when following the bearing. At any point the GPS will display its location relative to all the saved locations.

Maps

Research showed that the only maps of Svalbard are those printed by the Norwegian Polar Institute. The most topographically detailed of these are at a scale of 1:100,000 with 50 meter contours. These maps proved to be adequate when crossing glaciers or the ice cap, but were not accurate enough for mountain summits in poor weather conditions. Whereas the ice cap could be crossed during a whiteout, mountain could only be summited when the weather was good or the cloud high.

The maps required are not available in standard high street shops in London and had to be ordered specially. Orders were placed with both Stanfords and the Norwegian Polar Institute. Ordering maps from Stanfords took many phone calls and a month's wait, whereas ordering maps from the Norwegian Polar Institute required only a couple of emails and the maps arrived within two weeks. There was not a significant price difference between the two suppliers. For ease, it is recommended to order Svalbard maps direct from the Norwegian Polar Institute.

Four copies of each map were taken on the expedition. The first being the original paper copies, which were kept in dry bags. The other three copies were black and white A3 double sided photocopies. These were of a desirable size, large enough to see the route and surrounding mountains but small enough to be manageable, and provided enough details and distinction between ice and rock to allow for safe navigation. The photocopies were laminated and kept away from excessive amounts of water; whilst the photocopied maps withstood the elements well, the laminate began to separate with frequent use. However, no maps became unusable.



Map photocopies and damage to the laminate

Compass

Silva compasses were purchased from Cotswolds for use during the expedition. Although they did work, they did not prove to be a useful as was hoped. The compass could only be used in good weather conditions as this was when features on the horizon could be seen and a bearing taken.

When walking, the compass needle would oscillate by around 15 degrees and required time to settle to provide an accurate bearing. The combination of needle oscillations and lack of visible geographical landmarks meant the compass was redundant in a whiteout. Although the compass was not used, it is still an essential back-up item. If all three GPS unit had failed the compass could have been used to navigate back to the boat pick-up point.

Navigation Techniques

General Navigation

When the horizon was visible and features could be identified, navigation was possible with the compass and map. By observing the mountains the location of the group could be obtained and a bearing taken to the next point. The bearing would be matched to a feature on the horizon and the group would walk towards that feature.

The GPS was used to record all the camp sites on the ice and any point where we had taken a turn. This allowed us to know how far we had come and provided us with a safe and pulk-friendly route back to the boat drop point.

Whiteout Conditions

Using the compass in a whiteout provided no information on the distance to the next destination or if the group had veered off the bearing and was running parallel to, instead of on, the intended path Instead navigation by the GPS was required and a coordinate of the intended destination would be read from the map and entered into the GPS for navigation.

In these conditions there was no way to differentiate the white land from the cloud and walking in a straight line was impossible. It is well know that a person without a focal point on the horizon will follow an arc in the direction opposite to their strongest leg. To stop this effect dominating, the group would walk single file so that the rearmost person could clearly see when the lead person was turning. When the GPS was used the straight line became a meandering line and the wobble could clearly be seen once the weather had improved.

Difference between straight route in whiteout and good weather

Crevasse Fields

Crevasse fields posed different navigational challenges and it was not always possible to travel in a straight line. To cross a crevasse field the group would travel in-between the snow bridges and follow the crevasse until a snow bridge could be found. This would result in the path deviating from the intended bearing and if the horizon could not be seen the GPS would need to be set to find a new bearing.

Group crossing crevasses and traveling over snow bridges

Medical

First Aid Kit

Stuart Marshall, our trainer for the first aid courses, sold us a full first aid kit. We supplemented this first aid kit with a tourniquet, cellox (blood coagulant) and airway openers. In addition to our first aid kit we brought a variety of medicine to be prepared to counteract illnesses we were most likely to face.

Antibiotics

Amoxicillin 250mg Capsules (40) – 4 courses, very versatile.

Augmentin 2 x 5 day course good for chest, abdominal infection, urine

Fluconazole 1 x 7 day course anti-fungal, good for thrush etc

Flucloxacillin 2 x 7 day course anti-bacterial infections

Metronidazole (200mg) 3 x 4 day course for abdominal abscess or anaerobic gum infections

Trimethroprim 2 x 3 day – Urine infection

Erythromycin 1 x 7 day – Versatile second line antibiotics, in case the other antibiotics are not working.

None of us were allergic to penicillin

Creams and Ointments

After sun 200ml

Canesten Cream 1% w/w – Anti-fungal cream used by some

Anusol – Haemorrhoid cream, not used but name alone is enough to buy it!

Savlon Cream 60g – Effective on ice grazes and more serious blisters.

Chloramphenicol 1% w/w – Against snow blindness. Not used

First Aid Kit

Airway openers (Medium, Large) – Can be used to open the airway in case victim is unconscious

Antiseptic Cleansing Wipe (20)

Blister plasters – Need to be warmed before application!

Cellox – Strong blood coagulant.

Cotton Wool

Crepe Bandage 7.5cm (4)

Dental kit – We can't do more than treat inflamed gum and chronic toothache with antibiotics. A broken tooth or lost filling can be treated with temporary filling materials.

Eye Dressing No.16 (2)

Gaffer tape

Gauze Swabs 5x5cm (8)

Melolin Dressing, Adhesive (10) – Great for putting on sore heels to prevent blisters. Melolin Dressing, Non-Adhesive (5) – Adhesive ones used in preference for blistered heels

Plasters, Adhesive, Assorted (50)

Paperclip – can be used to pierce through nails to treat a blood blister under the nail.

Scissors, Medical

SAM-Splints (4)

Steri-strip Large (3)

Steri-strip Medium (10)

Suture kit – 2 small vials of local anaesthetic (Lidocaine 1%, a few sutures, forceps to grab the needles, and syringes and syringe needles to administer the anaesthetic.

Safety Pins (20) – Can be used in many situations

Survival Blanket – Multitude of uses

Tourniquet – To be used in case of severe blood loss in the upper leg e.g. due to an open fracture of the femur.

Triangular Bandage (4) –A couple amongst the group are essential.

Painkillers

Aspirin 300mg Caplets (64) – For small pains. Not used

Aspirin 75mg Caplets (100) – To prevent frostbite. We took one daily at breakfast.

Paracetamol 500mg Caplets (100) – For moments where Ibuprofen is inappropriate.

Ibuprofen 400mg Tablets (80) – For sore muscles, tendons and joints, also anti-inflammatory.

Solpadol (100) – Codeine(30mg)/Paracetamol(500mg) none used

Other Medication

Duclolax 5mg (20) – To cure constipation. Drinking enough should also help. Not used.

Lopramide – To cure diarrhoea. Not used

Otrivine nasal spray – Not used

Loratadine – Hay fever tablets can be used in general against allergic swelling. Not used

Personal First Aid Kit

Adhesive plasters – Used frequently

Antiseptic fluid

Aspirin (16) – Used seldom

Ibuprofen (20) – Used frequently but no couple used more than 20 between the two during the trip

Strepsils (16)– Used by some

Personal medication (inhalers etc)

Dioralyte – Useful addition

Sun cream – Used a lot when sunny. Bring something that can withstand sweat.

UV block lip balm – We actually forgot to buy this: a big mistake!

Nivea Cream 100ml – Used by some but you can bring less.

Vaseline 150mL – Used very frequent but 20 mL would probably have sufficed

For all prescriptions, we have had good experiences with the pharmacy in Sainsbury's at Cromwell road. They had all medicine we needed in stock and have been very helpful.

Evaluation

Looking back on the expedition, we are glad to say that none of us suffered serious injuries. Here I will list the minor physical problems we faced:

- Alistair suffered of migraine in his neck, usually after having had a tough day. He told us this happens to him every now and then in normal circumstances as well. Some more rest and an ibuprofen usually allowed him to recover in 4-6 hours.
- Heather dislocated her kneecap while relaying our gear down to the beach on the penultimate day. We knew of Heather's knee problems and a good night's rest and lighter and fewer loads the next day didn't cause her kneecap to dislocate again.
- Sietse had a tiny case of frostnip on the side of his index finger due to insufficient use of gloves. This did return to normal during the trip.
- Alex and Andrew both had a day where they felt weak. This might have been due to insufficient hydration. Both took Dioralyte solution and seemed to feel better afterwards.
- Most (at least Alex, Alistair, Nathaniel and Sietse) of us suffered of numb big toes once we had returned to Longyearbyen. We first thought this might have had something to do with the cold combined with our occasionally wet shoes. Another option might be that it was a case of neural amyotrophy due to the battering that our feet got during the last two days of relaying gear down to the beach. The terrain was very rough and we've had little rest during these 24 hours. This might have caused the nerve in running centrally under our foot to be pinched for a prolonged time thereby cutting of the blood supply. Since then, the feeling in our big toes has slowly started to return.
- Some of us got sun burned, especially on the nose. A hat with a long visor would have helped. Due to the reflection of the sunlight on the ice, the underside of the nose is very exposed to the sun.
- Some of us had blisters but none of these got infected and most healed well and did not return.
- Some of us had cracks in their toes but these were kept in check by moisturising them well.

Scientific Observations

Research Groups

As part of the expedition planning we contacted 2 groups of scientists to ask if we could assist them by collecting samples while trekking in Svalbard. The first group we contacted was Dr Gail Preston of Oxford university and Andrew Elliott's supervisor. Dr Preston was interested in the cold adaptation of bacteria on Svalbard. Several methods of bacterial or plant collection were considered, however they all either were not suitable for the experiments or expedition. Thus instead of this photographs and locations of plants were taken on the island in order to identify areas for a possible future Oxford plant sciences collection. The Fauna section of this report along with the GPS data has been submitted to Dr Preston in order to aid in preparation.

The second group was from the University of Tromso and interested in polar bear research. We offered to collect polar bear faeces samples as well as any other data that would be helpful for their research. We discovered the group through an Imperial alumnus Matthew Kaplan who writes for the science section of the economist and had discovered the group while writing a story. Unfortunately the group did not require additional samples this year, however as no polar bears were seen it is unlikely that we could have helped their research.

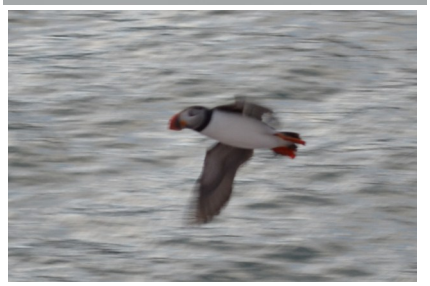
Flora and Fauna of Svalbard

During the expedition we encountered many plants and animals that have been adapted to survive on Svalbard. We have kept a record of the dates and sites of our sightings on the ice cap. We hope that this will be useful in tracking the distribution of these organisms. All photographs in this section were taken by members of the expedition unless stated otherwise.

Birds

Fulmar *G. Glacidis*, we spotted the Fulmars on the boat on the way to and from Billiefjorden on the 10th August and the 3rd of September. They are found on many of the islands of Svalbard and breed on the coastal cliffs. It is estimated that there are over 500,000 breeding pairs on the island.

Atlantic Puffin *Fratercula arctica* we spotted these on the boat from Billiefjorden. They arrive on the island in Mid May and live in burrows on offshore islands, there are 50 known colonies on Spitsbergen and making an estimated <10,000 pairs on the island.



Ivory Gull. *Pagophila eburnea* We saw ivory gulls throughout most of our trip. From the 12th of August to the 1st of September we saw them at least once a day. They have a patchy circumpolar distribution, and are very rarely found south of Bering Sea. The gulls seemed to be following the group in order to consume its urine. It demonstrated to us how rare resources are in the arctic and the length animals must go to in order to survive in such a harsh environment.

Svalbard Rock ptarmigan *Lagopus muta.* We spotted the ptarmigan on the moraine near Billiefjorden and Noldenskioldbreen on September 2nd. They stay on the island all year round and are the only land dwelling bird to do so. In limited surveys it is estimated that there are 3 to 5 territorial males per km^2. They were very unafraid of humans, and allowed us to get very close before they started slowly moving away.

King Eider *Somateria spectabilis.* We spotted the King Eider on the beach on Billiefjorden on the 3rd of September. They have a circumpolar distribution but breed in North America Greenland and Svalbard. The population on Svalbard is estimated to be around 2500-5000.

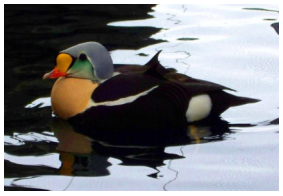


Image Caption: The image is credited to Zaskoda from flickr and is under the Creative Commons License.

Purple Sandpiper *Calidris maritime* We spotted the Sandpiper on the beaches both at the campsite and at Billiefjordan. It is estimated that there are 2000 to 4000 on the island. The Sandpiper breeds in most of the arctic, in winter it is found around the coast of Scotland.

Image Caption: Image credited to Andrew Easton and wiki commons.

Black Legged Kittiwake *Rissa tridactyla.* We spotted the Kittiwake from the boat in Billiefjordan on the 3rd of September. They are present in most coastal regions on Svalbard although they tend to avoid to eastern facing coasts. They are the most numerous gull species in the world. They arrive on the island between March and April and leave in September. The population on Svalbard is estimated to be around 270,000 pairs, however this has been in an unexplained decline since 1995.

Image Caption: Image credited to Hanno and is distributed under the GNU Free Documentation License

Mammals

We also encountered a small number of larger animals while trekking. On Thomsonelva we saw a small number of reindeer on the moraine reasonably close to the beach on the 2nd of September (see image below). Unlike the ptarmigans they were apprehensive around humans and we could only get within 50m of them. The Svalbard reindeer is a independent sub species of reindeer and they have several adaption to help them survive the harsh climate. For example they are very efficient at consuming resources reserves including fat and muscle to help them survive the winters.

We also encountered seals and beluga whales at the beach on Billiefjordan on the 3rd of September. The whales were swimming in a pod with 3 individuals. Belugas are the most numerous of the whales on Svalbard and have a tight coastal distribution.

Plants

We discovered 2 sites while trekking that were able to support plant life. The first was at Thomsonelva a slope of moraine at Billiefjordan the second was more surprising, the south facing slope of Malloryfjellet contained several species of plants. Malloryfjellet is a mountain named after the British mountaineer on the Veteranen glacier, it is 20km from the nearest fjord and many of the surrounding mountains are covered in snow. In this section we will give a overview of the species we found at each site which we hope will be of some use.

Thomsonelva

Polar Campion *Silene uralensis.* Grows in moist heath and meadows, and in moderate snow beds. It is found over most of Svalbard although avoids the acidic areas in the northwest.

Pale Withlowgrass *Draba oxycarpa.* Solitary herb with clustered rosettes. Common in heaths, and bird cliff meadow and less common in the polar desert zone. Found on all major islands on Svalbard.

Tundra Grass, *Dupontia fisheri.* Found around the arctic circle and in subarctic Canada including Ontario and Quebec

.

Purple Saxifrage *Saxifraga oppositifolia*. A perennial plant which is possibly the most widely distributed vascular plant on the island occurring on multiple sites on all islands of Svalbard.

Mountain Avens *Dryas octopetala* It is found in the artic sub arctic of the world. It is also present on mountains in Britain. While there has been examples of them on all island with the exception of Bear Island most of the population is in the western growing regions of Svalbard.

Moss Campion *Silene acaulis*, Very common on Bear Island and well established in Spitsbergen. It has a very long lifespan, an example was found in Canadian Rockies that was 252 years old. Interestingly it is not closely related to any other species on Svalbard.

Malloryfjellet

Purple Saxifrage *Saxifraga oppositifolia*. One of the most common species on Svalbard. It has been found growing in northern Greenland and it has been postulated that it is the most northerly growing plant in the world.

Svalbard Poppy. *Papaver dahlianum*. The poppy is the national flower of Svalbard. It is found both white and yellow flowers. It is widespread throughout the island.

Unidentified Plants

There was also several species of lichen, moss and fungus that I was unable to identify. The photos are included below. The moss and lichen were found on Malloryfjellet and the fungus on Thomsonelva.

References

Birds

http://www.allaboutbirds.org/guide/Ivory_Gull/lifehistory (Cornell)

http://www.allaboutbirds.org/guide/King_Eider/id (Cornell)

http://www.npolar.no/en/the-arctic/birds-and-mammals/king-eider.html

http://www.npolar.no/en/the-arctic/birds-and-mammals/purple-sandpiper.html

http://www.rspb.org.uk/wildlife/birdguide/name/p/purplesandpiper/index.aspx

http://www.npolar.no/en/the-arctic/birds-and-mammals/black-legged-kittiwake.html

Flora

http://svalbardflora.net/index.php?id=1

http://svalbardflora.net/index.php?id=249

http://wwwars-grin.gov/cgi-bin/npgs/html/taxon.pl?412699 Tundra Grass

http://www.sysselmannen.no/hovedEnkel.aspx?m=45297

Logistics

Flights

We took six flights in total, three each way. The route was London to Oslo, Oslo to Tromsø and Tromsø to Longyearbyen and the same on return. We flew with Scandinavian Airlines (SAS). On the way there and back there was around two flights per day which was sufficient for what we were doing. By the time we returned there was only one flight per day as the early morning flights has stopped for the year. SAS dealt very well with the transport of our pulks, which they must be used to taking to the far north. On the way back we had to pay extra for them but there were no other difficulties to overcome. Sleeping overnight at Oslo airport on the way there was easy as it is a huge airport although there are not a lot of seats before check-in so we slept on the floor. The time given between each flight was easily enough to make the connection.

Shipping

The transport of our pallet, loaded with all the food and most of our equipment, was organised alongside the British Schools Exploring Society. They were very eager to help and the timing worked well as they were also shipping several pallets that were due to reach Longyearbyen before we were. We packed our pallet at their warehouse in Wandsworth on the 23rd May. The pallets left the UK by ship on the 20th June and arrived in Longyearbyen on 10th July after a brief stop in Bergen. We sent all our equipment except for the items that would be damaged by long-term compression (sleeping bags and down jackets). The pallet was wrapped up using industrial pallet-wrap. When our pallet arrived in Longyearbyen it was held by Pole Position, who charged 100NOK per day for this until we collected it on 8th August. Unfortunately, when we received the pallet and unpacked it there were a few items missing, mostly including at least two boxes of snacks. This led us to have to re-buy these snacks from Longyearbyen. We assume that the pallet was checked at customs and the boxes may have fallen out or else got mixed up with BSES equipment.

We did not ship anything back to the UK, instead we took all equipment on the plane.

Moving equipment within Longyearbyen

Pole Position, who held our pallet for us, also transported it to the campsite when we arrived. This was extremely overpriced for a journey of around 100m. We also booked them to take our pulks to the Polargirl on the day we left for the ice but the scheduled driver never showed up. This journey was also extremely expensive. On the way back we got a taxi with a trailer to take our equipment back to the campsite from the Polargirl. It was cheap and easy.

Permits

We required two permits to run our expedition. One was a permit to leave 'Management Area 10' which is a roughly oval loop around the main settlements on Svalbard and to leave which you need permission from the Governor of Svalbard. This is mainly to show that you have Search and Rescue insurance. Approximately six months before we submitted the forms and then we are instructed to what value the Search and Rescue insurance must cover. This is calculated using the location we are going to and the number of persons on the trip. For our expedition we needed insurance covering £13,500 which was well under the £20,000 cover for Search and Rescue provided by Imperial College insurance. The permit to leave Management Area 10 is free.

The second permit was to be able to hire rifles on Svalbard. This permit is also given out by the Governor or Svalbard's office and to receive it someone must have a 'certificate of good conduct' from your home country. Since we needed two rifles we needed two people to have these certificates, which we decided would be Nathaniel and I. Since the UK police do not produce 'certificates of good conduct' we were advised that the nearest thing is an ACPO Certificate, which is used for immigration purposes to show you do not have a criminal record. Luckily neither Nathaniel nor I have a criminal record so although this process was expensive (£37) it was easy. Upon sending our ACPO Certificates to the Governor's office with the rifle permit application form we were able to rent rifles. Rifles were rented along with the flare gun from Paulsen's, based in Longyearbyen.

Further information on permits for travel in Svalbard can be found on the Governor's website: http://www.sysselmannen.no/hovedEnkel.aspx?m=45609

Travel to Nordenskioldbreen

Most travel on Svalbard is organised through 'Spitsbergen Travel'. I had told them the number in our group and how much equipment we had and we booked a RIB to take us to the ice. However, upon arriving in Longyearbyen they said our equipment was too heavy and that we should go with the Polargirl, a tour boat. Luckily the Polargirl owners and crew were very helpful and it was easy to book ourselves and our pulks onto the boat. They did not charge extra for the pulks but we paid 990NOK per person. They even changed their timetable to drop us off first before carrying on with the tour route. The Polargirl has a Zodiac on board which was used to drop us off.

Travel back from Nordenskioldbreen

We were informed when we were dropped off that the last boat of the season (10th September) was likely to be fully booked so we should try and make the boats on the 5th or 7th September. I phoned the Polargirl on the 2nd September to remind them of our wish to board the boat on the 5th or 7th but the owner (based in Tromsø) said that all the boats that week had been cancelled because there were no passengers so the last boat would be the next day, on the 3rd. Despite the rush, and the wrong times given to us by the owner (we were told we would be picked up at 15:00 but as the boat leaves later on Saturdays we were picked up at 17:00) the crew were equally as friendly as on the way out and saved us some lunch.

Polar bear watch

Because of the danger of Polar bears we developed a system where there was always someone awake. Five people did two hours watch each night, leaving the sixth person to have a night off. This meant everyone had eight hours sleep. This system was rotated so a different person had a night off each night. Everyone practised using the rifle and the flare gun. We had alarm mines with us which use a trip wire tied to a detonating mechanism to cause a large bang. However, these have been said to fail in the past and we had enough people in the group to do watches.

Accounts

Income

GRANTS		
Imperial College Exploration Board	£	4,500.00
Gino Watkins Memorial Fund	£	2,500.00
Andrew Croft Memorial Fund	£	1,200.00
Cortauld Trust	£	1,000.00
Geelman Trust	£	260.00
AC Irvine Travel Fund	£	600.00
RCS Trust	£	300.00
Old Centralians Trust Fund	£	1,500.00
	£	**11,860.00**

Expenditure

TRAVEL AND LOGISTICS		
Flights from London to Longyearbyen	£	2,228.90
Extra Baggage	£	471.60
Shipping from London to Longyearbyen	£	550.00
Boat Return	£	1,381.30
Pole position van and storage	£	372.71
Longyearbyen Campsite	£	603.10
Taxis in Longyearbyen	£	200.00
	£	**5,807.61**

GENERAL EQUIPMENT		
Rifle, flare gun and bullets	£	1,102.52
Maps	£	178.54
Crevasse Rescue Kit	£	740.29
Small items spares kit	£	149.05
First aid supplies and medication	£	344.42
Solar panel	£	94.61
Satellite phone (hired from Earth Science Dept.)	£	-
Fuel for stoves	£	294.00
406Mhz EPIRB radio beacon hire for 5 weeks (hired from Exploration Board)	£	-
Pulk sledges, twin bar hauling system and full harness hire for 42 days	£	2,278.20
Alarm mines with trip wires	£	55.65
Alarm mine blanks	£	37.08
	£	**5,274.36**

PERSONAL SPECIALIST EQUIPMENT		
Montane North Star Down Jacket	£	634.50
Down sleeping bag	£	1,020.00
Exped down mat	£	386.04
Bivibag	£	313.04
Scarpa B2 Boots	£	800.00
MSR Evo Ascent 22 Snow Shoes	£	1,050.00
Snow Shoes Repair Kits	£	62.97
Grivel Airtech Newmatic AB C2 Crampons	£	434.78
	£	**4,701.33**

SPECALIST TRAINING		
First Aid Training	£	330.00
Crevasse Rescue and Glacier Walking	£	520.00
	£	**850.00**

SUBSISTENCE		
Food for expedition	£	899.09
Extra spent on food due to shipment failure	£	357.87
	£	**1,256.96**

INSURANCE		
Imperial College Insurance	£	-
Search and Rescue Cover (covered by Imperial)	£	-
	£	**-**

TOTAL EXPEDITION COST	**£**	**17,890.26**

Personal Contributions

Personal contributions were calculated on an individual basis, depending on equipment purchased. The difference between income and expenditure is £6,030.26 or not less than £1,005.04 each.

Acknowledgements

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- The Andrew Croft Memorial Trust
- The Courtauld Trust
- The Royal College of Science Association Trust
- The Old Centralians Trust
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