
THE FREEZE BIGERT & BERGSTRÖM

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INTERVENTION
KEBNEKAISE
JAMES RODGER FLEMING

A Swede likes to stand on the top of Sweden, and no one can get higher than Kebnekaise sydtoppen. In fact, lots of Swedes like to stand there. It can get crowded, as the pilgrimage can attract up to 100 hikers per day. It is an exhilarating, but thoroughly domesticated climb, with a safety rope crossing the small summit where the view is unreal -- a new and alien world of black rock, white snow, swirling mists, and on occasion, blue sky. Since the peak is crowded, be prepared to "make room for others."

Although the mountain and glacier are dangerous, the area is not wild. You can get there by car, train, bus, and recently air, with SAS flying from Stockholm to Kiruna daily. Most climbers start in Nikkaluokta where the trail begins. It is a 6 km hike to the ferry, which crosses lake Laddjujavre, and 7 km further to Kebnekaise mountain station, which offers, among other amenities, dormitory-style overnight accommodations, hiking equipment, trail maps, and guided tours. You can eat breakfast, lunch and dinner there, buy postcards and earplugs (for the dormitory), and yes, they do accept credit cards, even for a helicopter ride to the summit. The Swedish Tourist Association also manages a number of small mountain huts near Kebnekaise.

This is where Bigert and Bergström come in. The artistic duo is known for their engagement with the human obsession over weather and climate. In their 2012 exhibition "The Storm" and film "The Weather War," the duo journeyed into the U.S. heartland with their imaginary machine sculpture, the tornado diverter, in order to enact the human fantasy of controlling severe and life-threatening storms. Now they are off to save the snowpack on the south peak of Mount Kebnekaise, which is currently only one meter higher than its northern, and much-more-dangerous-to-climb rocky neighbour, Kebnekaise nordtoppen. Their intervention – a 22.5 x 22.5 meter rescue blanket intended to protect the snowpack under it.

On the Rhône Glacier in Switzerland, a private landowner is involved in a much larger intervention, deploying hundreds of white blankets each summer to protect his ice tunnel so that visitors can walk through a virtual time machine back into the icy layers deposited thousands of years ago. In Peru workers are using an environmentally friendly whitewash mixture of lime, egg white, and water to paint up to 70 hectares on Chalon Sombrero Peak white in an attempt to "re-grow" a glacier. This intervention is one of the winners of the World Bank's competition, "100 Ideas to Save the Planet and its people from the effects of a changing climate." The project also attempted to change the albedo over a "unit" surface area equated with carbon credits in order to generate a sustainable source of revenue generation for future project applications. In this it was not successful. Glacial retreat is serious business, as historian Mark Carey documents in his book, *In the Shadow of Melting Glaciers: Climate change and Andean society* (Oxford University Press, 2010). Carey details how glacial retreat has resulted in unstable glacial lakes, outburst floods, and glacier avalanches threatening people and infrastructure for over a half-century.

Climate Intervention
Climate Intervention, a two-volume report published in 2015 by the U.S. National Academy of Sciences, concludes that climate change is a global challenge, and addressing it will require a portfolio of responses with varying degrees of risk and efficacy. Climate intervention, the deliberate manipulation of the planetary environment, is no substitute for reductions in carbon dioxide emissions and adaptation of human and natural systems to make them more resilient to changing climate. However, as alarm over climate change has grown, so too has interest in the potential for deliberate intervention in the climate system to counter climate change.

The Academy study assesses the potential impacts, benefits, and costs of two different proposed classes of climate intervention: (1) carbon dioxide removal and (2) albedo modification (reflecting sunlight). Carbon dioxide removal strategies address a key driver of climate change, but research is needed to assess if any of these technologies could be appropriate for large-scale deployment. Albedo modification strategies could rapidly cool the planet's surface but pose environmental and other risks that are not well understood and therefore should not be deployed at climate-altering scales; more research is needed to determine if albedo modification approaches could be viable in the future. If society ultimately decides to intervene in Earth's climate, the Committee most strongly recommends any such actions be informed by a far more substantive body of research—encompassing climate science and economic, political, ethical, and other dimensions—than is available at present. The "other dimensions" include, notably, the historical and the artistic.

Everything is unprecedented if you don't study history
Deliberate manipulation of the planetary environment as a stopgap measure to head off unwanted changes in the climate is currently receiving more popular press coverage than serious scholarly consideration. Advocates are seeking funds for both research and demonstration projects to attenuate incoming solar radiation using space mirrors or by emulating volcanoes, to enhance the reflectivity of marine clouds, and to sequester carbon by stimulating ocean plankton growth—all in an effort to offset anticipated anthropogenic warming. Most ethicists consider such global macro-engineering projects, at least in their current "Rube Goldberg" incarnations, as poorly conceptualized, morally questionable, and probably fraught with unknown consequences. Yet some climate engineers, or more accurately geo-scientific speculators, insist they are the first generation to pose such projects. History says otherwise, as documented in *Fixing the Sky* (Columbia University Press, 2010).

James Pollard Espy (1785-1860), the first US national meteorologist put forward a semi-serious large scale engineering proposal to emulate "artificial volcanoes." Widely known as the "Storm King," Espy was famous in his own right for his convective theory of storms. Espy argued that if a large body of air is made to ascend in a column, a large self-sustaining cloud will be generated and cause more air to rise up into it forming cloud and producing rain. He pointed out that this is certainly the case in volcanic eruptions and should also be the case in the case of great fires. Noting that heavy rainfalls followed volcanic eruptions, he floated a barking mad proposal to alter the entire water budget of the East Coast, stimulate widespread artificial rains, and purify the air as an added benefit by setting huge fires regularly along the crest of the Appalachian Mountains, all the way from Georgia to Maine. Nathaniel Hawthorne immortalized him in literature by placing him in the "Hall of Fantasy… with a tremendous storm in a gum-elastic bag."

In 1901 the Swedish meteorologist Nils Gustaf Ekholm (1848-1923) examined the causes of changes in the Earth's temperature over geological and historical time scales. Ekholm pointed to the accumulation in the atmosphere of CO_2 (carbonic acid) from the burning of pit coal that will, over the course of a millennium, "undoubtedly cause a very obvious rise of the mean temperature of the Earth." He also thought this effect could be enhanced by the "digging of deep fountains pouring out carbonic acid" or perhaps decreased "by protecting the weathering layers of silicates from the influence of the air and by ruling the growth of plants." By such means Ekholm pointed to the grand possibility that it might someday be possible to intervene at a planetary level to regulate the future climate of the Earth and consequently prevent the arrival of a new Ice Age… He wrote in 1901, "It is too early to judge of how far Man might be capable of thus regulating the future climate. But already the view of such a possibility seems to me so grand that I cannot help thinking that it will afford Mankind hitherto unforeseen means of evolution."

A final example stems from the work of Harry Wexler (1911-1962), Chief of Scientific Services at the U.S. Weather Bureau, who lectured in 1962 "On the Possibilities of Climate Control," warning that planetary-scale manipulation of the Earth's short-wave and long-wave radiation budget would result in "rather large-scale effects on general circulation patterns in short or longer periods, even approaching that of climatic change." Barking mad proposals of the time included increasing world temperature by several degrees by detonating up to ten H-bombs in the Arctic Ocean, decreasing world temperature by launching powder into an equatorial orbit to shade the Earth and make it look somewhat like Saturn and its rings, and notably, destroying all stratospheric ozone above the Arctic circle using a relatively small amount of a catalytic agent such as chlorine or bromine. Wexler warned about unknown and unwanted side effects from such climate interventions, whether they be well intentioned or hostile. The cases of Espy, Ekholm, and Wexler show that our current obsession with future climate control are not without precedents.

Bigert and Bergström have made a dramatic statement by attaching a 500 square meter cover to a snow field. We now have a black and white peak with a gold filling. Will this help? Will it hurt? It is a small intervention, but a controversial statement. Perhaps reducing the number of visitors to the top would help more, as human boots and the heat and exhaust from helicopter flights probably damage the snow field as much, if not more than global warming.

ACTION

22 June. 16°, sun, 4.5–9 mph
The summer solstice has just tipped us over to the darker side of the year, and we're at Arlanda airport. After thorough research, we've decided to try to stop the southern peak of Mount Kebnekaise from melting away using a giant sun-reflecting blanket. All the practical details have been arranged, all the permits have been approved and signed, and we've finally managed to check in our big gold package that's going to save Sweden's highest peak. All of the past week has been spent sewing together the pieces that would make up the pyramid shape of the blanket. Then the finished work was divided up again into fewer, more manageable pieces.

We're on our way to Kiruna for further transport towards Nikkaluokta. From there we start climbing towards the peak to carry out our rescue mission. The weather looks unstable, but there's a small chance of sunlight.

We land in Kiruna and are met by Anders from the Arctic Guides, who tells us that the weather conditions are "red alert" and that we need to get to Nikkaluokta right away. A helicopter awaits when we arrive. We load in our equipment and fly to the mountain station and in over Kitteldalen Valley. Leaving springtime behind us, we fly into an increasingly snowy landscape. After a turn in the valley where the Björling Glacier is surrounded by mountains, we finally spy Kebnekaise through the curved acrylic window of the helicopter. The southern and northern peaks are connected by a razor-sharp ridge. We land at the foot of the southern peak and carry all our equipment up to a plateau just before the final climb.

It's time to put our solution to the test. We've sewn a 500 square meter rescue blanket interwoven with a gold foil that's used to reflect away sunlight in some parts of greenhouses. Will it fit? We secure ourselves with climbing harnesses so we don't slip 1,000 meters down to the Rabot Glacier and certain death. We secure ourselves with a safety line stretched over the top of the peak. This lets us move freely so we can start attaching the parts of the blanket. A key element is anchoring the blanket in place. We attach strings to the eyelets in the blanket and tie them around sticks of birch wood, which we then bury and cover with heavy wet snow. We also bury some larger birch trunks vertically along the top of the peak to attach the safety line.

In the middle we leave a free passage so that the nearly 100 people who climb the mountain daily will be able to pass by without having to walk on the blanket. It's six hours until midnight, when the latest weather reports say a storm will hit.

The rapid melting of the southern peak made front page headlines at the end of summer 2014, when it was found that the peaks now only differed by 70 cm in height. If the melting continues at the same rate in the summer of 2015, the southern peak will lose its status as Sweden's highest peak. That in turn will lead to people choosing to climb the bedrock of the north peak, a much more difficult and dangerous

climb that will increase the risk of accidents. Our action to prevent the southern peak from melting is thus not only a symbolic geo-engineering performance, it will also save human lives in the long run. Similar cover-ups have been done on part of the Rhône Glacier in central Switzerland, where a 3-meter layer of ice has been prevented from melting in the summer months.

At 11 in the evening, the midnight sun is still shining, and it's a heady feeling to have established a studio at the nation's highest point. The view is indescribably beautiful. But stress is spreading through the team as an approaching cloud bank becomes the yardstick by which we measure our deadline. We call the helicopter and agree to be picked up at 1 AM. Bit by bit, the fabric is laid out with surprising precision. We film and photograph, sweat and slave, all the while surrounded by an incredible mountain panorama. From the top of Kebnekaise's southern peak, they say you can see 1/10 of Sweden on a clear day.

We finish just in time, and we're about to leave the newly clad mountain when something suddenly moves under the blanket. We think we're seeing things. A trembling little lemming sits peering at us with questioning little black eyes.

When the helicopter lands, we scramble to get everything on board. We throw in all the equipment and jump inside—but the threatening cloud is faster than us and soon it covers the whole peak. We're inside the cloud. Flying under these conditions is out of the question.

The hectic activity of the past few hours now transitions into what you might call frustrating passivity. The temperature in the cabin drops quickly and rain beats against the cockpit. Joakim the pilot is visibly shaken when he realises he's not dressed nearly warm enough and that he only has enough fuel to fly back down the mountain, not to warm up the cockpit. We think of the many explorers in the Arctic who suddenly found themselves snowed in, encased in ice and cut off from the world by the forces of nature.

Time is an elastic lifeline that stretches out through the white night to sometime around four in the morning. We wipe the mist off the inside of the windows and once again see our golden mountaintop. A temporary gap has opened in the compact cloud bank, so we can finally leave the peak and fly down to Nikkaluokta.

23 June. 9°, cloudy, light showers, 6.5–11 mph
When we open our eyes the next morning and peer out the window, we realise how lucky we were. Outside, we see a wet grey blanket gradually wringing itself out over the Sarri holiday village in Nikkaluokta. The weather reports are unanimous—app after app shows rows of raincloud icons. We hibernate for a day. We talk about Linnaeus and his conviction that swallows spent the winter burrowed into muddy lake beds. We discuss temporary truths and scientific delusions formulated by brilliant people.

The highest peak of the mountain is a temporary truth. Or perhaps a truth with a certain fluctuating qualification over time. A striking example is all the photographs that have been taken over the years by mountain climbers who have triumphantly reached the top. There's something melancholy about the fact that their exploit is being diminished every year as the ice melts.

Sixty-eight years ago, Bergström's father stood on the peak of Kebnekaise. He was one of the people who took scientific measurements using the best methods of the day. In 1947, the peak was 2,117 meters high – 19 meters higher than it is today. A few thousand cubic metres of melted ice later, we might ask ourselves, "What happened to the 1970s' threat of a new Ice Age?"

24 June. 10°, cloudy, drizzling, 4.5 mph
New day, same rain. Today's agenda is marked with the Tarfala Valley research station. Professor of geography and manager of the station Gunhild Ninis Rosqvist is going to be there with a group of students who carry out annual measurements on the glaciers in the area. An interesting opportunity to study the movements of the ice both vertically and horizontally. Over the phone, Ninis informs us that there are two meters of snow in the area and that large portions of it are "rotten snow". To reach the station at all, we'll have to use snowshoes. Rotten snow is slushy, like a smoothie, and you risk sinking through it, just like in quicksand, until you reach solid ground. We decide to take the helicopter again.

What would have taken eight hours on foot took 15 minutes by helicopter. Arriving at the Kebnekaise mountain station, we're met by Lisa Lindblom, the site manager, who tells us how tourism has changed in the past decades. Tourists today on Kebnekaise are completely focused on reaching the top —the surroundings, which previously attracted thousands of hikers, fall flat in comparison with the "bucket list" appeal of reaching the peak.

Lisa also explained what the degradation of the peak would mean for the mountain station. Reaching the northern peak, just a few hundred meters away, is a much more dangerous climb. The route to the top goes over a mountain ridge with precipitous drops on either side. This would likely scare the amateurs off, thus reducing tourism in the area. They would also need more guides, new structures with wires and ramps to simplify access and so on. Safety is number one in an alpine area with 7,000 annual peak baggers.

When we visit the station, all 200 beds are full. The guided climbs to the peak have all been pre-booked for the past six months, paradoxical when the weather often makes climbing impossible. There's a certain frustration in the air, mixed with the rank odor of wet hiking boots.

We escape this den of stalled ambitions and head out into the valley instead. We film and photograph the meltwater rushing through crevices in the mountainside. But the herd of reindeer

lazily grazing next to the floods of water seem unperturbed. A pure white albino calf stares at us curiously before running off, leaving a little pile of its shed winter coat in the bright green mountain vegetation. Glaciers calve, as do reindeer cows, but their little ones go on to very different futures. Instead of growing up with impressive antlers, the ice blocks lose shape and gradually dissolve in the Arctic Sea.

25 June. 12°, cloudy, occasional showers, 9 mph
Today's weather looks just the same as yesterday's and tomorrow's. We wonder how long the weather has to remain unchanged before we stop relating to it as weather. Changeability is its nature. We grapple with trying to formulate an original description of the weather's dreary dinginess. "A grey memorial stone under which all previous weather lies bound and chained." Or is the grey weather a reminder of the erratic boulder that researcher Louis Agassiz saw at the foot of a Swiss glacier in the 1830s? The clump of Nordic granite, so far from home, made Agassiz visualise a kilometer-thick blanket of ice stretching from the Arctic to the Mediterranean over a course of millennia. And this block of granite ended up in Switzerland, Agassiz said, a controversial idea that was questioned by the entire scientific community in its day. A few years later, it became the accepted theory of the Ice Ages.

We don't make it to Tarfala today either, because there's a shortage of snowshoes. They're all being used for today's climb to the peak, so we head out to climb a nearby mountain that seems relatively snow-free. We cross Elsa's bridge and Ladtjojokk, a stream rushing down to the unregulated waters of the river Kalix. We set up our panoramic equipment to photograph the dramatic whirlpools around the base of the bridge. An idea is born to make a new molecular globe art-work linking the different parts of the area, from the peak of Kebnekaise and our little rescue blanket, past the Tarfala Valley research station and down to the mining community of Kiruna. Where extractionism guarantees the survival of the city (and a large part of Sweden's GDP), but also affects the climate and the environment in all sorts of ways, from contamination of local watercourses to CO_2 emissions generated by all the iron ore transports.

The mountain we're going to climb also seems to be rich in iron, as the fallen rocks in the valley bear the typical rust-red colour. Like mountain goats, we hop between a sea of lichen-clad shale stepping stones, noting that the mountains remind us of giant black-and-white spotted cows lying there chewing their cud all around us. These silent, majestic mountain cattle provide their life-giving milk of meltwater packed with minerals. We consider whether we could ring-mark a water molecule and follow its journey from melted ice, through rapids and watercourses, to the place where it evaporates and becomes a cloud again. Attempts have been made to DNA-mark water that is poured out in glaciers to see how fast it arrives at the ablation zone, but the experiments have failed as the DNA marking becomes too diluted.

Instead, we study cloud formations around the nearby peak. The mountain is reminiscent of a chimney, producing clouds that dance around briefly before dissipating. After four hours of climbing, we reach the peak. Far in the distance we see Kebnekaise and the southern peak, with a tiny golden point at the top. Or is it? It's barely visible through the camera's zoom. Maybe it's not there anymore? For a moment we doubt the whole escapade, and we decide to make lunch instead: freeze-dried goulash boiled in melted mountain snow.

26 June. 14°, sun, 4.5–9 mph
Today we finally got hold of snowshoes, so now we can take the helicopter up to Tarfala. It's great to leave the mountain station and all of its high-tech tourists in brightly coloured Gore-Tex. We fly up along the snow-filled valley towards the research station, which consists of about 20 cabins peeking out of softly rounded hollows in the thick blanket of snow. The wires attached to all the houses remind us how hard the wind can blow here. Gusts of up to 161 mph have been measured. Before that, the instruments blew to pieces.

We meet Ninis, who tells us about the station's history and its current daily operations. The station was established in 1946 by Valter Schytt in the form of a "research hut," where they planned to gather data about the glaciers. Schytt was a pioneer in Sweden in studying climate change over time through the measurement of glaciers. Today they measure the glacier's movements using radar and satellites, but measuring sticks poking up here and there show that some analogue analyses are still carried out. In addition, Ninis tells us about the more holistic experiments they're focusing on these days, with the goal of collecting data from reindeer herding and changes in the vegetation. They've equipped reindeer with GPS transmitters and small individual weather stations so they can create graphs and maps of the places the animals visit and the weather they're exposed to. We ponder the mental image of a reindeer with a wind gauge and thermometer in its antlers.

The station's own meteorological equipment is placed outside the cabin. It looks like a museum timeline starting with the original white cabinet of measuring equipment from the 1940s and ending up with a modern, fully automated weather station.

That old cabinet has a special nostalgia for Bergström, who tells us that his father worked with Schytt to build the station and even carried that cabinet up the mountain on his back. It's a dazzling connection. Bergström tells us that he was here at age 10 visiting the station with his father. A few years later, on the other side of Kebnekaise, the 10-year-old Bigert rambled on the mountainside with his uncle Sten Yngström, a researcher on the northern lights.

On top of the weather cabinet is a peculiar instrument, an optical reader of solar movement, consisting of a glass globe mounted on a stand in which a paper can be attached: a *pyranometer*. Like a magnifying glass, the spherical lens projects the sun onto the paper, gradually burning a small moving point into it. The sun's movement across the sky is translated into a charcoal line drawing.

We continue on up to the Swedish Tourist Association cabin, where cabin hostess Beatrice is busy digging out the woodshed, which has been buried in snow. Of the privies, only the rooftops are visible with their tiny ventilation shafts sticking up like snorkels.

If the snow doesn't melt away, next season's precipitation will add another layer, and after a few thousand years we'll have another 3,000-meter-thick Ice Age crust above the buildings, which will have been pressed down into a 1,000-meter-deep grave of isostatic subsidence.

The Tourist Association's cabin is primitive, but functional, with sturdy pinewood bunk beds and chunky tables and chairs – but no other guests apart from Bigert and Bergström. The cabin hostess Beatrice comes by with a box of kiosk goods. We polish off the day with marshmallows and beer.

27 June. 15°, sun, 4.5–9 mph
Glorious sunshine, +5° in the morning, later rising to 20°. The meltwater runs and drips, but it seems doubtful that all the snow will disappear when the nights are still around 0°.

With our snowshoes on, we head down to the research station. Inside, we meet a group of students poring over their papers and computers. We sit down by the bookshelves and plough through their collection of glaciology literature. Hungrily, we study the history and current situation of the glaciers to understand how the positioning of ice on all the world's landmasses and how various melting scenarios will affect the earth. One image that seared into our retinas came from Manchuria, a tree standing next to an expanding iceberg — even nature must make way for the growing mass of ice.

The simplest model or future scenario to imagine is how much the sea levels will rise when the ice transforms into a liquid state. If all the glaciers melt, the oceans will rise by an estimated 67.04 metres. Of this, Antarctica will be responsible for 60 metres, Greenland for 7 metres and all the remaining glaciers (including our southern peak) for 4 cm. So if we really want to protect the world's lowland regions from flooding, we should sew a golden blanket for Antarctica instead. Only then will this kind of geo-engineering action generate a significant benefit.

28 June. 18°, partially cloudy, 6.5–11 mph
After two days of freeze-dried food, we start longing for a real meal. This high-tech method of preservation, developed during the Second World War to ship blood serum to wounded soldiers at the front, should have achieved higher gastronomic levels by this point in history. We've heard that there's supposed to be an establishment called LappDonald's down by the boat jetty in Nikkaluokta that serves freshly barbecued reindeer burgers, so we pack our rucksacks and head off through the Tarfala Valley on snowshoes. The meltwater rushes down the stream with a tangible energy that's visible in all the white water rapids we pass on the way down to where the mountain birches have only just begun opening their leaves.

Fortunately the mosquitoes haven't hatched yet, so we only need to struggle against our own 25 kg of kit and the protesting muscles we've never used before.

After five hours and 13 km of hiking, we eventually arrive at the boat station, which will shorten our hike by a whole 5 km. The skipper is Enok Sarri's grandson, who enthusiastically tells us about his grandfather's entrepreneurship, which laid the foundations of the Sarri family's tourism business in Nikkaluokta. Enok was also the Swedish Meteorological Institute's weather observer in the municipality of Gällivare between 1950 and 1970. He used the Sámi technique of weather forecasting through the study of reindeer and fish entrails, called *extispicium* in Latin. We ask the grandson if he's inherited that gift, but apparently the unique skill followed old Enok to the grave. When we moor the boat in the little harbour, the grandson hops lightly out and runs into the tipi-shaped restaurant, which is indeed called LappDonald's, puts on an apron and starts barbecuing reindeer burgers.

29 June. 18°, partially cloudy, 4.5–9 mph
We wake up in the civilised world of Kiruna and look out of our window on the fifth floor of the Hotel Scandium Ferrum. There, on the other side of the valley, is the mine, blackened with iron ore, like a tall, terraced hill. The iron deposit, which was discovered in 1696, is a unique cohesive body of iron ore and today it's one of the world's biggest, most modern underground mines. But now the mining company wants to dig at such a depth that the city of Kiruna itself, built on top of the downward-angling vein of ore, has to be moved. This is a project that will go on for more than 20 years into the future, a Sisyphean task that is as fascinating as it is absurd. The modern hotel where we are now eating our continental breakfast will soon be torn down so that the city and its inhabitants can extract more of the coveted iron ore. We take some panoramic photos at the edge of the mining area to include the final factor in the equation we've been examining for the past week. On the way out to the airport, our driver points to a desolate flat plateau in the distance. "That's where the new city will be."

Bigert & Bergström 2015

REFERENCES

The glacier recession in the Swiss Alps call for an immediate response to a desperate situation.

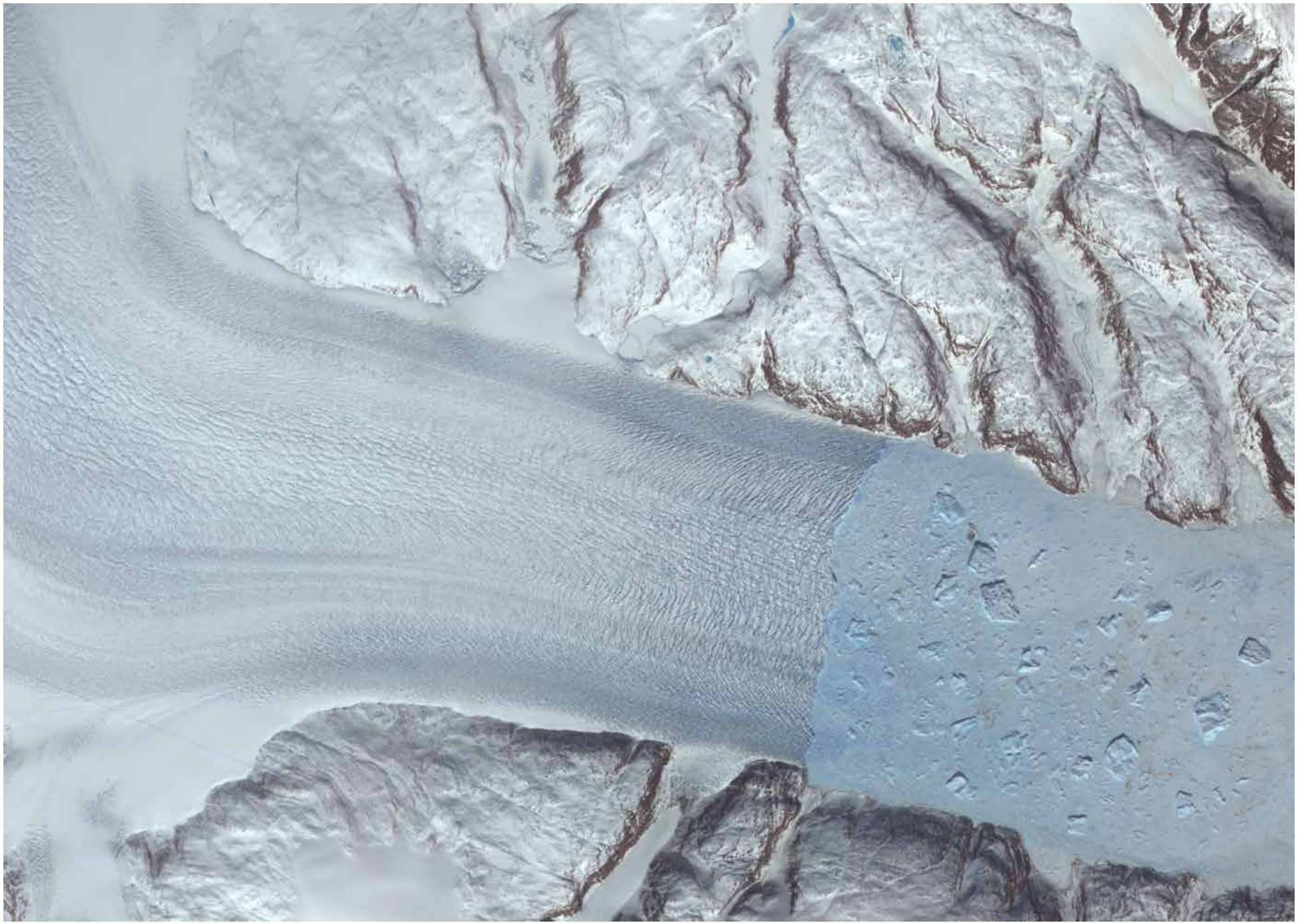
In many places, people use huge blankets to cover up the ice in order to prevent it from melting. On the Rhone glacier (which might lose 10 cm of ice thickness on a hot summer day) the protective blankets save up to three meters of ice thickness every summer.

Buster Keaton exits a subway station submerged in a snowy Alaskan landscape. *Frozen North*, 17-minute silent film from 1922.

The harvesting of hibernating swallows from the bottom of a frozen lake. A common explanation in Scandinavia for the absence of migrating birds during winter was hibernation. *Historia de gentibus septentrionalibus*, Olaus Magnus, 1555.

Helheim Glacier is one of Greenland's largest outlet glaciers. As with many other glaciers on the island, Helheim has melted and retreated substantially the last decades. Its name refers to the world of the dead in Norse mytholgy.

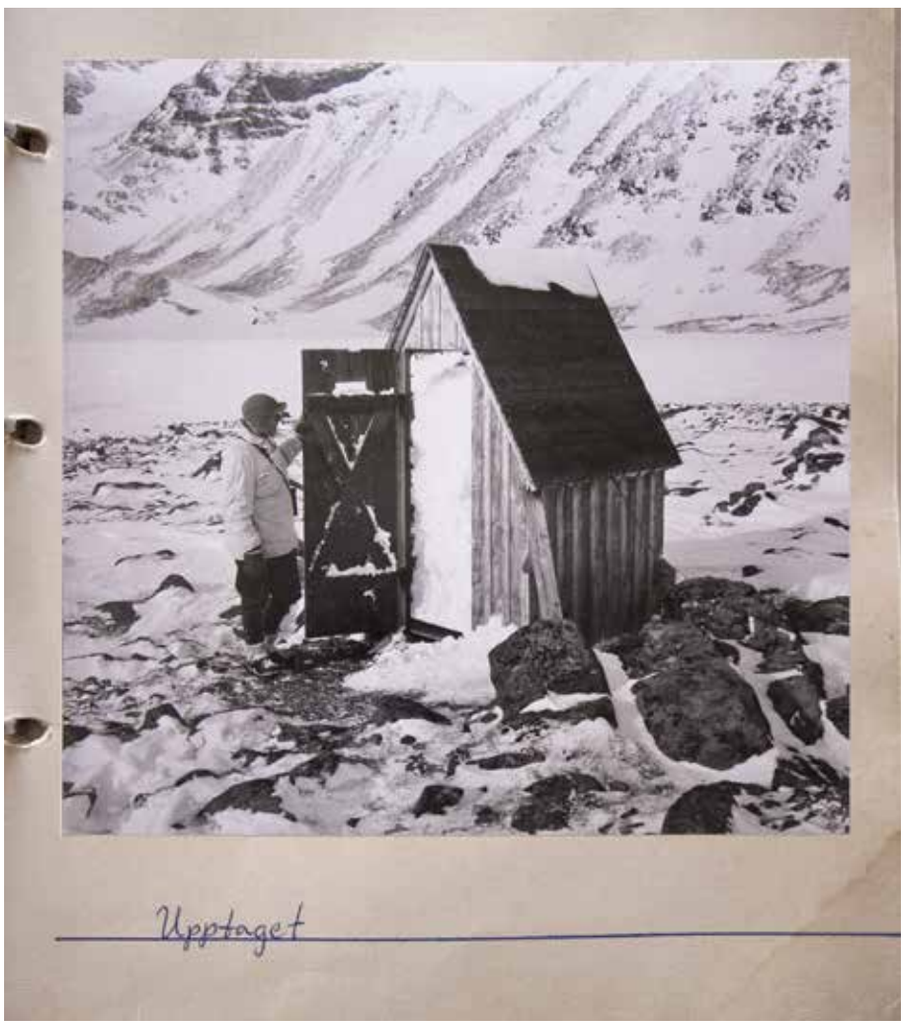
It is a freezing hell watched over by a giant eagle, *Hraesvelg* – the "corpse eater." Positioned at the edge of the world, he flaps his wings to create the icy wind that permeates this barren place.



Glaciologist Erik Bergström on his way up to Tarfala in the Kebnekaise massif. Carrying the weather station on his back for the research hut. 1947
Photo: Valter Schytt

Campbell-Stokes sunshine recorder on top of the Tarfala weather station.
Photo: Bigert & Bergström

Occupied
Tarfala reseach hut, 1947



Albino reindeer spotted at the Ladtjojokk river below Kebnekaise Mountain Station.

Whole Body Cryotherapy originated in Japan in 1978, when Dr. Yamaguchi began treating rheumatoid arthritis by freezing his patients' skin for short periods of time, which provided immediate relief.

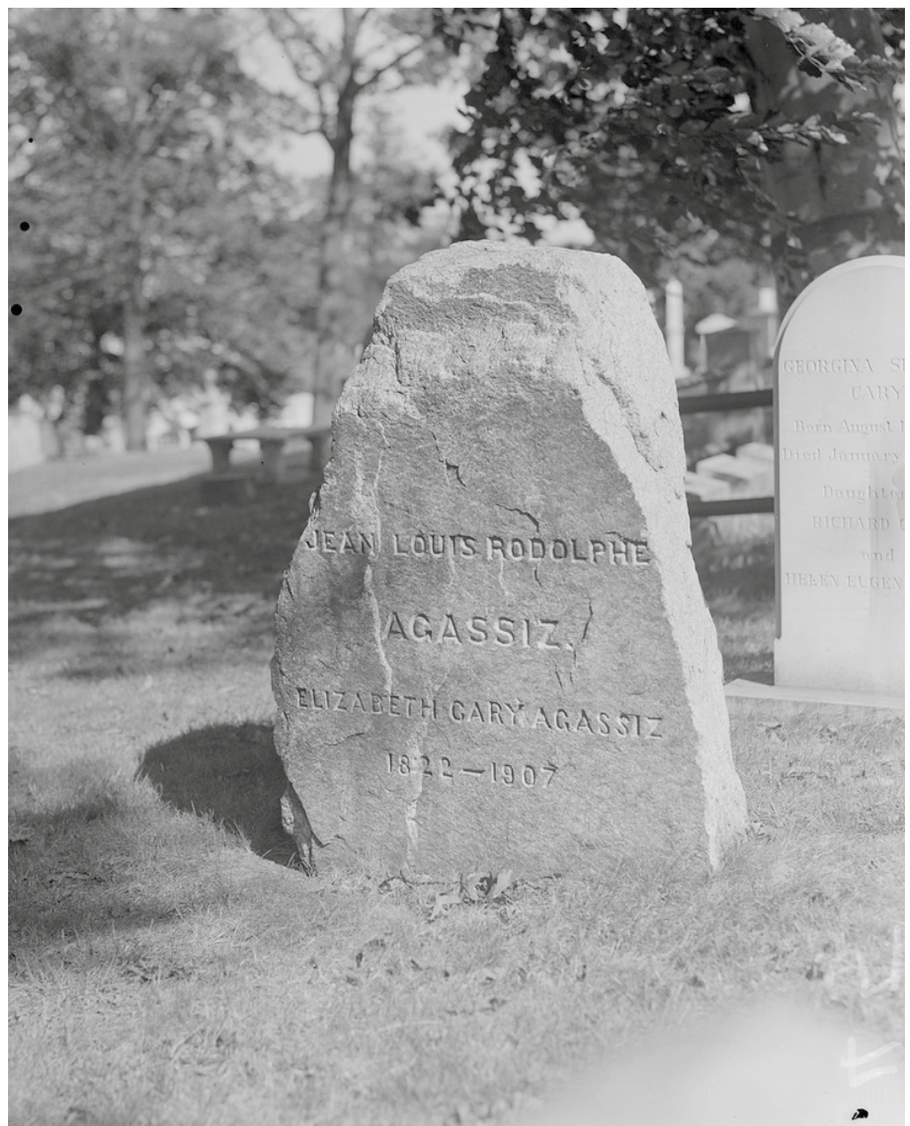
In the 1980s Yamaguchi and his associates concluded that using a cryosauna for rapid short-term freezing of the skin had a more beneficial effect on the human body than compared to gradual cooling in an ice bath. Further study in Europe over the last three decades established WBC as a powerful therapy for, and recovery from, a variety of conditions.

On October 19, 2015, 24-year-old Chelsea Ake-Salvacion stepped into a WBC-tank at the Rejuvenice Spa in Nevada. Something went wrong inside the minus 240-degree Fahrenheit freezechamber. After spending more than 10 hours in the refrigerated coffin she was found dead the next morning.

Life-saving waterproof emergency gold foil heat/cold preservation blanket, 210 x 160 cm, US $1.04/piece.

Louis Agassiz, a Swiss biologist and geologist, was one of the first to suggest that the large alpine rocks scattered over the slopes and summits of the Jura Mountains known as "erratics," had been moved there by glaciers.

He developed the theory of an ice age, asserting that large parts of the earth had been covered with a thick sheet of ice. When he died in Cambridge Massachusetts 1873, his relatives decided to transport an erratic from a moraine in Switzerland, all the way over the Atlantic, to serve as a gravestone.



Previous page
At the National Ice Core Laboratory in Lakewood, Colorado, over 17,000 meters of meteoric ice cores are preserved in a refrigerated library.

Held at a temperature of -36°C, the ice cores were collected from various locations in Antarctica, Greenland, and North America. NICL allow scientists to study sampled ice in order to learn how the climate as changed and fluctuated over the last 40,000 years.

On 2 August 2007 two Russian bathyscapes went through a 30 meter-wide hole in the ice at the North Pole. During a 12-hour dive, the vessel descended 4,261 meters to the bottom and placed the Russian flag at the magnetic north pole.

Wrong way

1 Normally, when we walk, our legs ability to support our weight is split mid-stride.

2 Walking this way on ice forces each leg to support the weight of the body at an angle that is not perpendicular to the surface of the ice, resulting in a nasty fall.

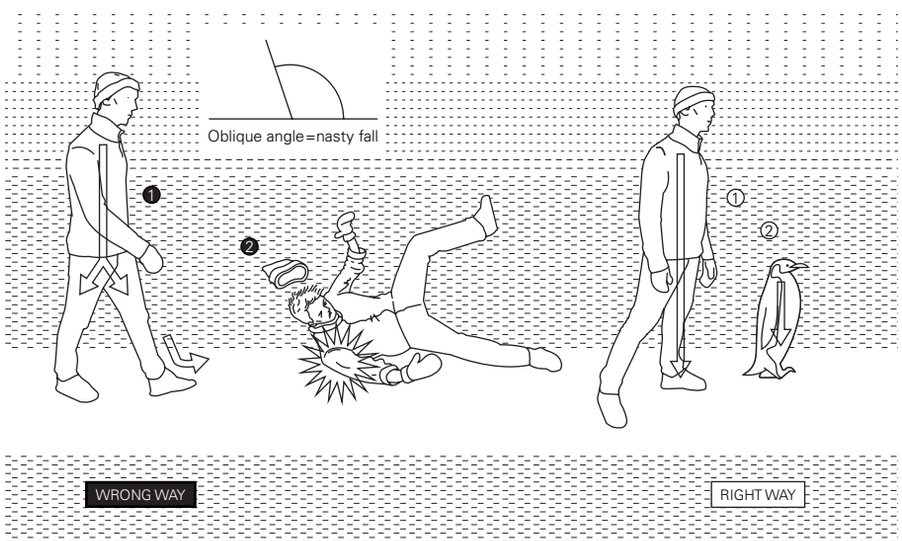
Right way

1 To walk on ice, keep your centre of gravity over your front leg.

2 One animal who has figured this out is a penguin. Think yourself as a penguin and you will be alright.

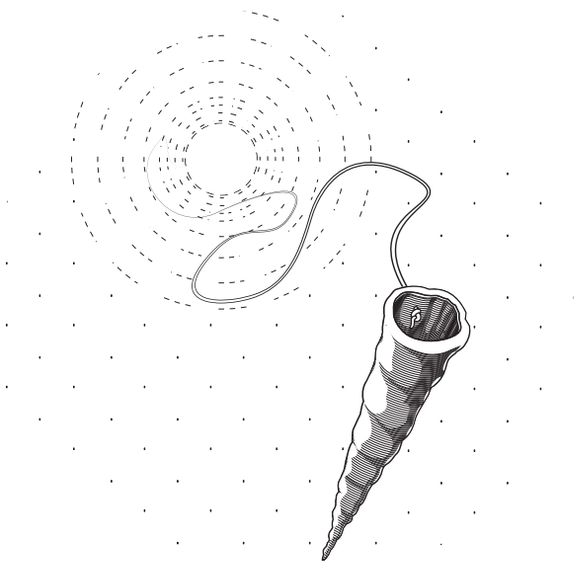
The geological definition of permafrost is soil or earth with a temperature at or under the freezing point for two or more years. As the temperature of the biosphere rises, large areas of permafrost thaws and extreme amounts of methane are released into the atmosphere adding to the greenhouse effect and global warming. Other consequences of melting permafrost is land erosion, collapsing houses, and sink holes, as in the picture shown below, where an unnamed lake in the North part of Alberta, Canada, is about to fall into a sink hole caused by thawing permafrost.

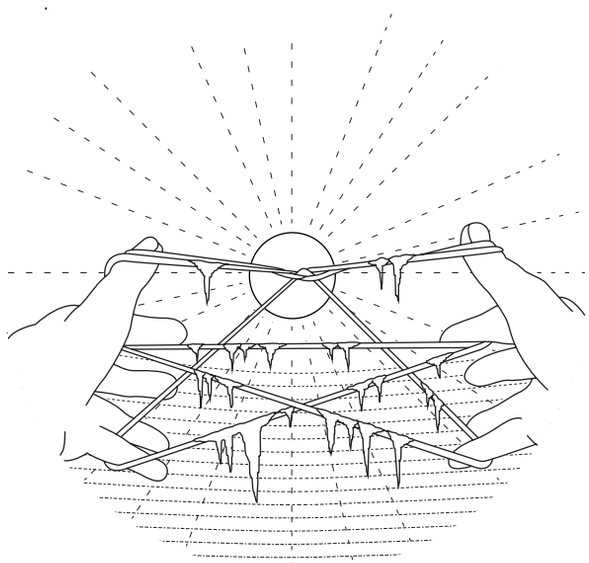
In 2007, while excavating a prehistoric ground squirrel hibernation burrow, a team of Russian scientists recovered frozen seeds from the Silene Stenophylla plant, a flower which grows on the Siberian thundra. Dating from the Pleistocene age some 32,000 years ago, it is the oldest plant ever to have been regenerated into contemporary life, blossoming with snow white petals.



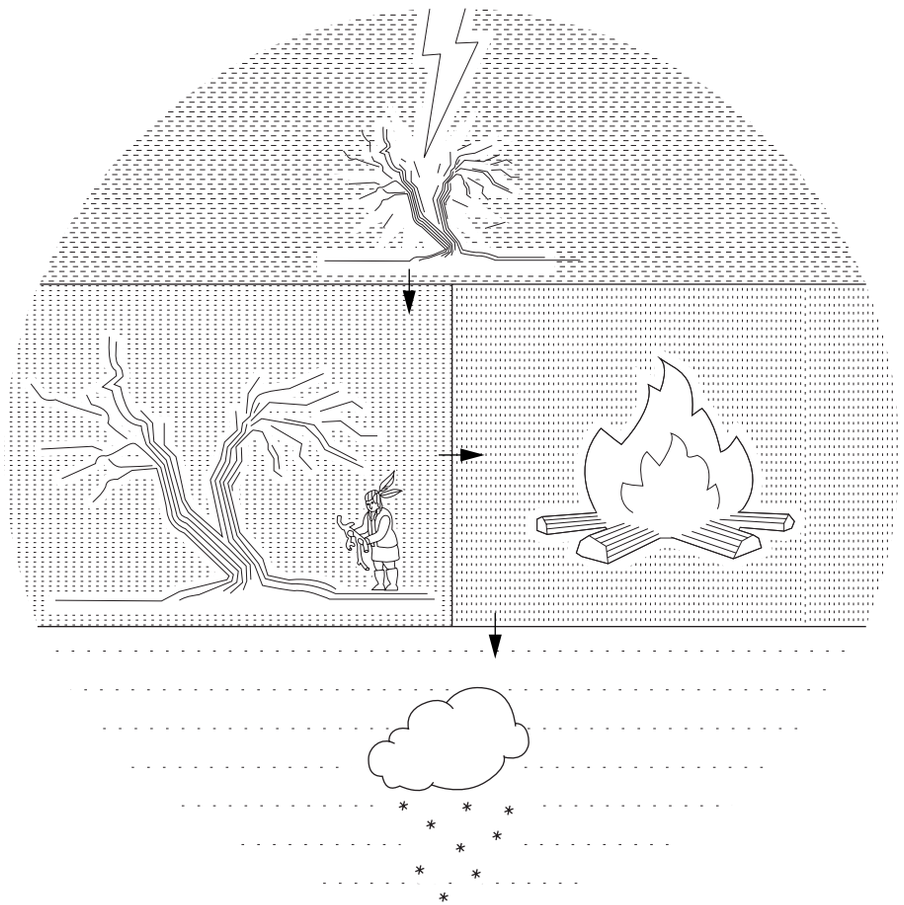
Examples of weather control rituals as described by James George Frazer in Golden Bough: A Study in Magic and Religion, 1890.

When the sun moves south in autumn, sinking lower and lower in the Arctic sky, the Esquimaux of Iglulik play the game of cat's cradle in order to catch it in the meshes of the string and so prevent its disappearance. On the contrary, when the sun is moving north in the spring, they play the game of cup-and-ball to hasten its return.





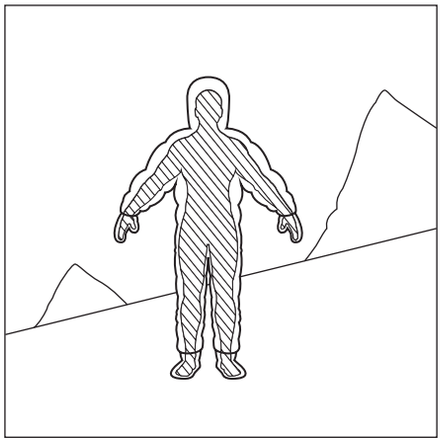
The Shuswap Indians believe that they can bring on cold weather by burning the wood of a tree that has been struck by lightning. The belief may be based on the observation that in their country cold follows a thunderstorm. In spring, when the Shuswap are travelling over the snow on high ground, they burn splinters of this wood in the fire in order to prevent the crust of the snow from melting.



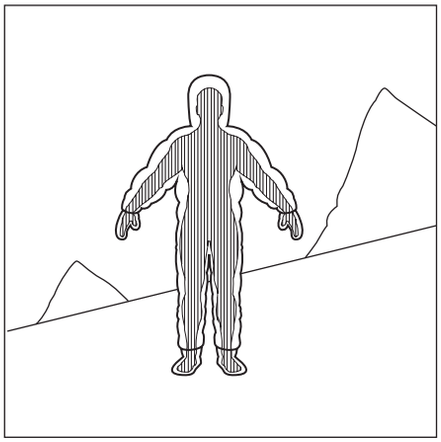
Hypothermia classification
Mild: Awake and shivering,
body temperature 32–35 °C
Moderate: Drowsy and not shivering,
body temperature 28–32 °C
Severe: Unconscious, not shivering,
body temperature 20–28 °C

Between 20% and 50% of all hypothermia deaths result in "paradoxical undressing," a phenomenon which occurs between moderate and severe hypothermia and makes a person take off his or her clothes. When naked, the victim often tries to squeeze into tight, low spaces. This is known as "terminal burrowing." One woman, who had overdosed on an anti-anxiety medication on a cold night, was found partially under her own car. Other people have been found in positions that suggest they were digging into the ground or the snow—under logs, or under rock ledges. People who freeze to death indoors can be found in-between shelves, or under tables or desks.

REALSTATE



DELUSION

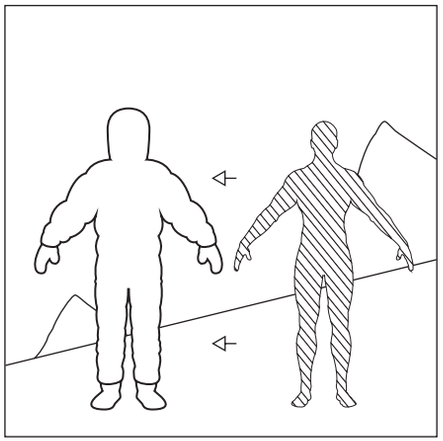


BODY TEMPERATURE

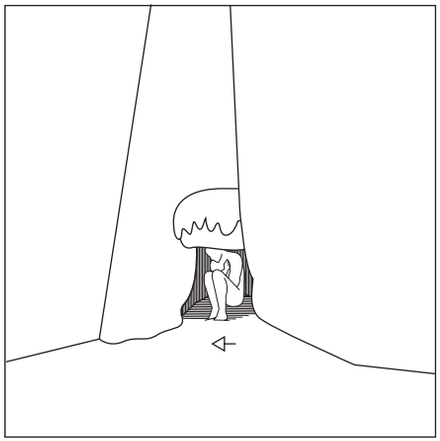
LOW NORMAL HIGH

HIGH

PARADOXICAL UNDRESSING



TERMINAL BURROWING

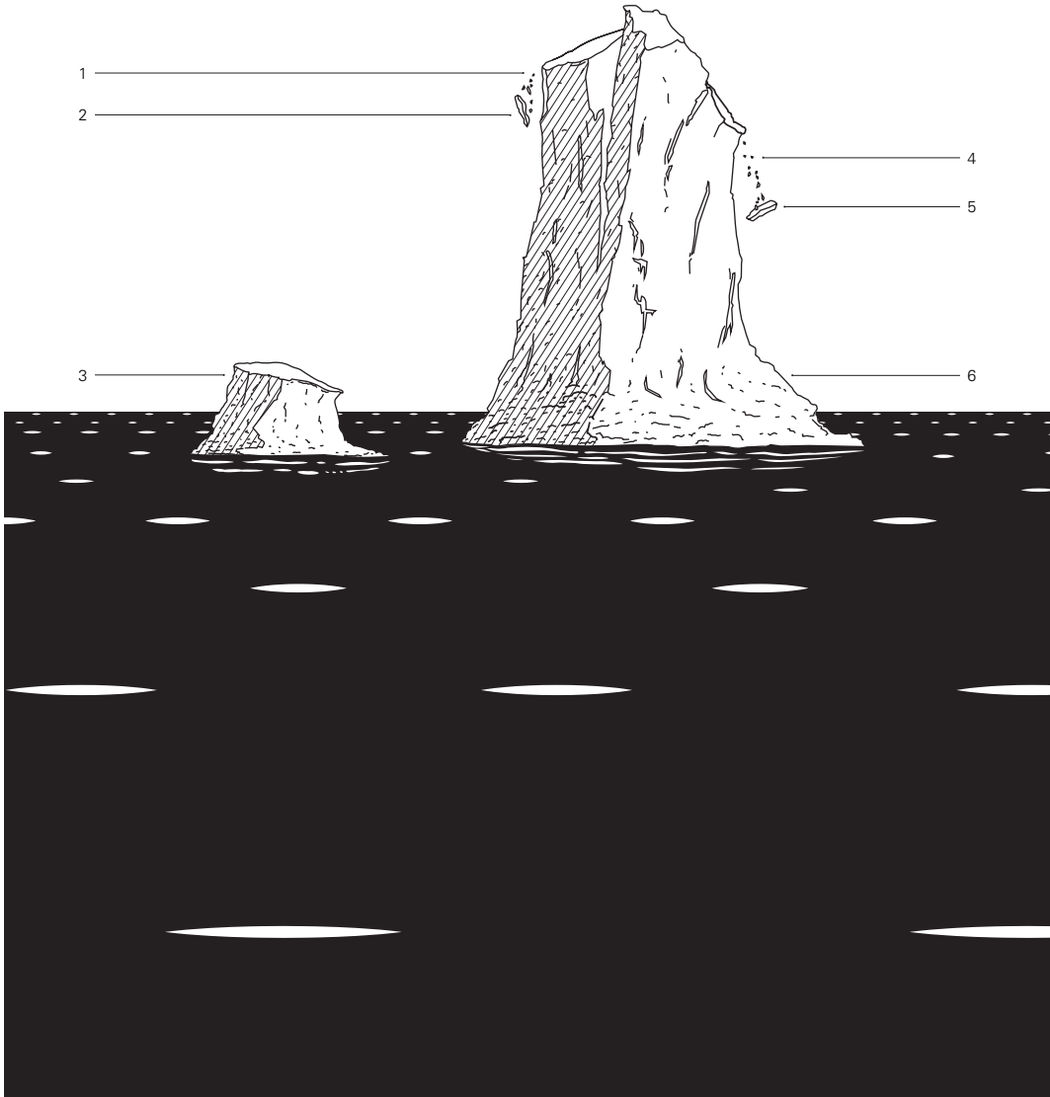


LOW

NONE

Disposition of earths glacial ice:

1 Rabot glacier, Kebnekaise – 0,000015%
2 Vatnajökull, Iceland – 0,015%
3 Greenland – 8%
4 Jostedalsbreen, Norway – 0.003%
5 South Patagonian icefield – 0,015%
6 Antarctica – 91,8%



Arctic sea ice, Beaufort Sea,
11 August 2009
Photo: U.S. Geological Survey

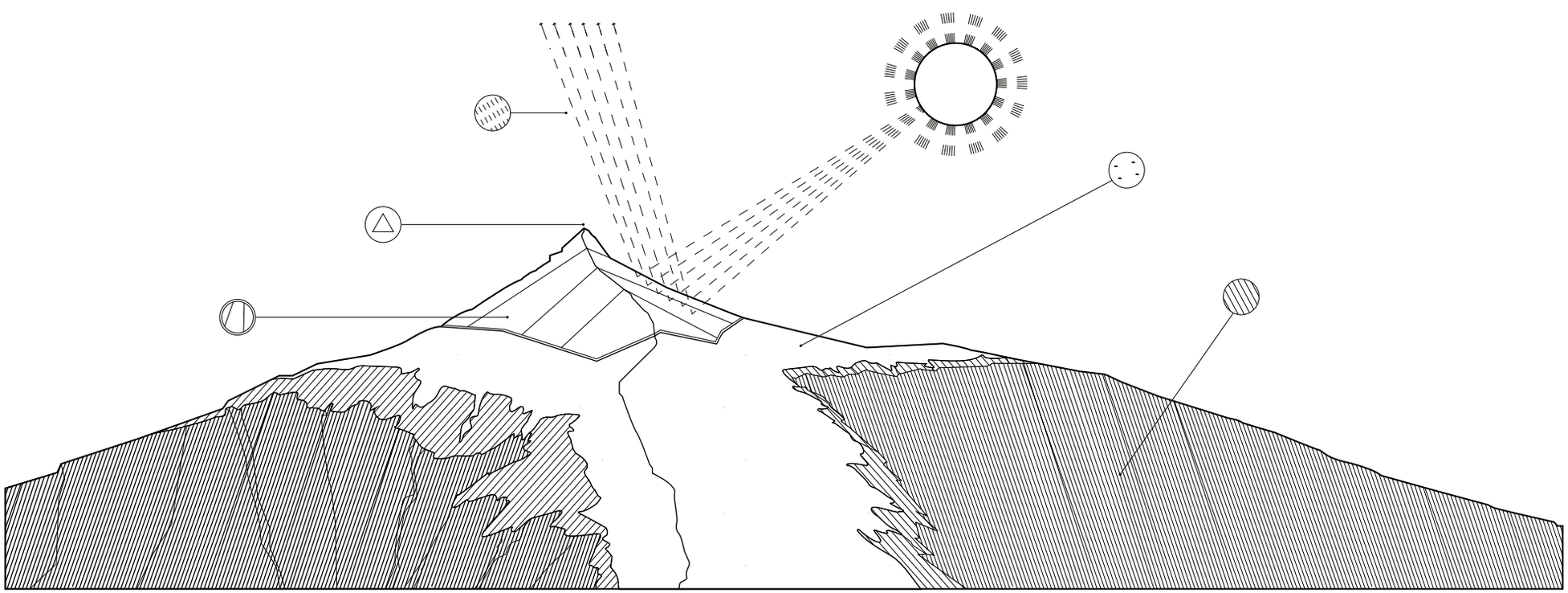
Rescue Blanket for Kebnekaise

Top 2097,5 meters

Sunbeams

Melting Glacier

Granite



Rescue Blanket for Kebnekaise
Climate screen shade cloth, styrofoam, jesmonite, steel frame, paraffin, nylon strings, birch wood sticks
670 x 330 x 180 cm
Photo: Jean-Baptiste Beranger
Bigert & Bergström 2016

Rescue Blanket for Kebnekaise
Climate screen shade cloth, styrofoam, jesmonite, steel frame, paraffin, nylon strings, birch wood sticks
670 x 330 x 180 cm
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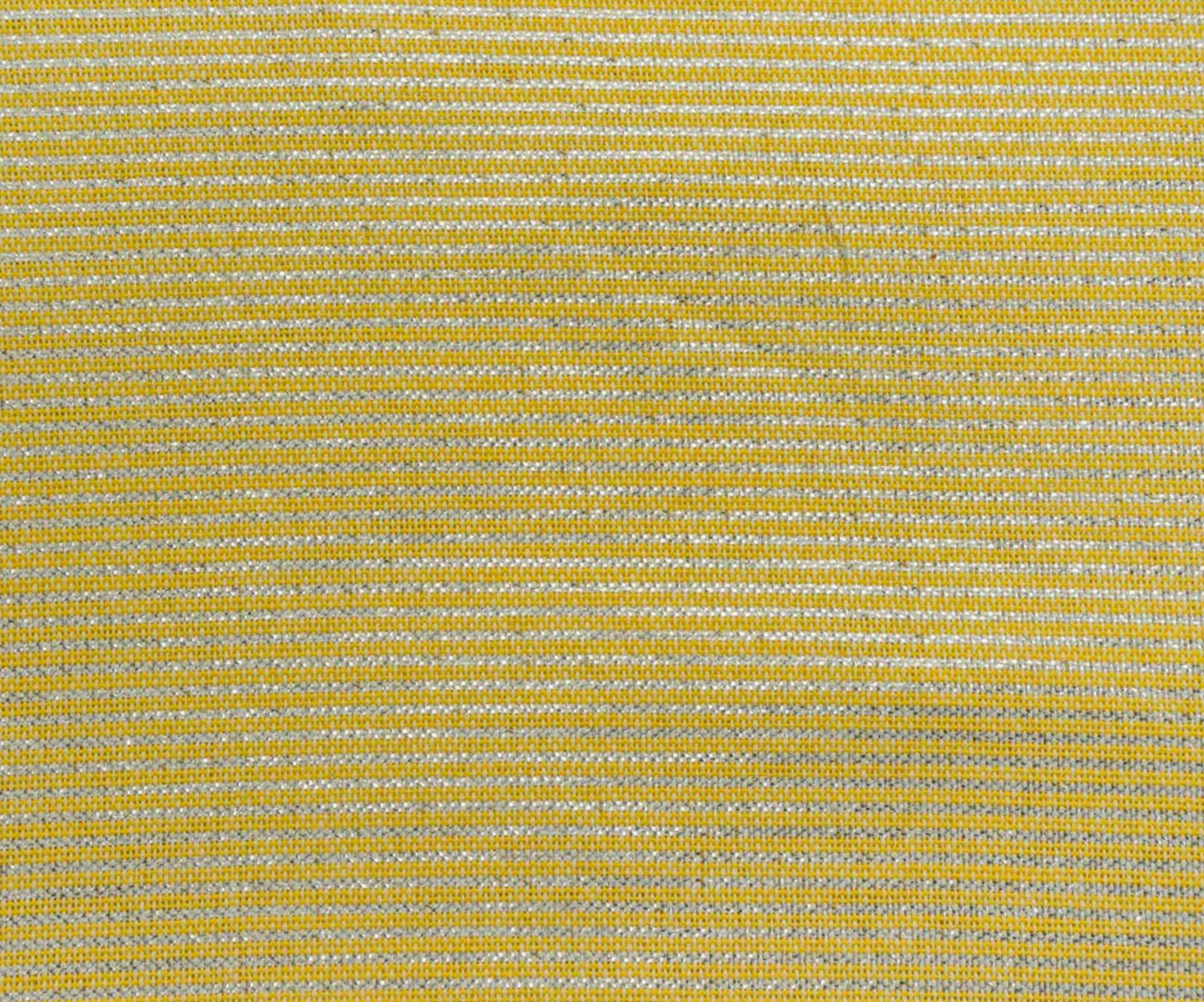
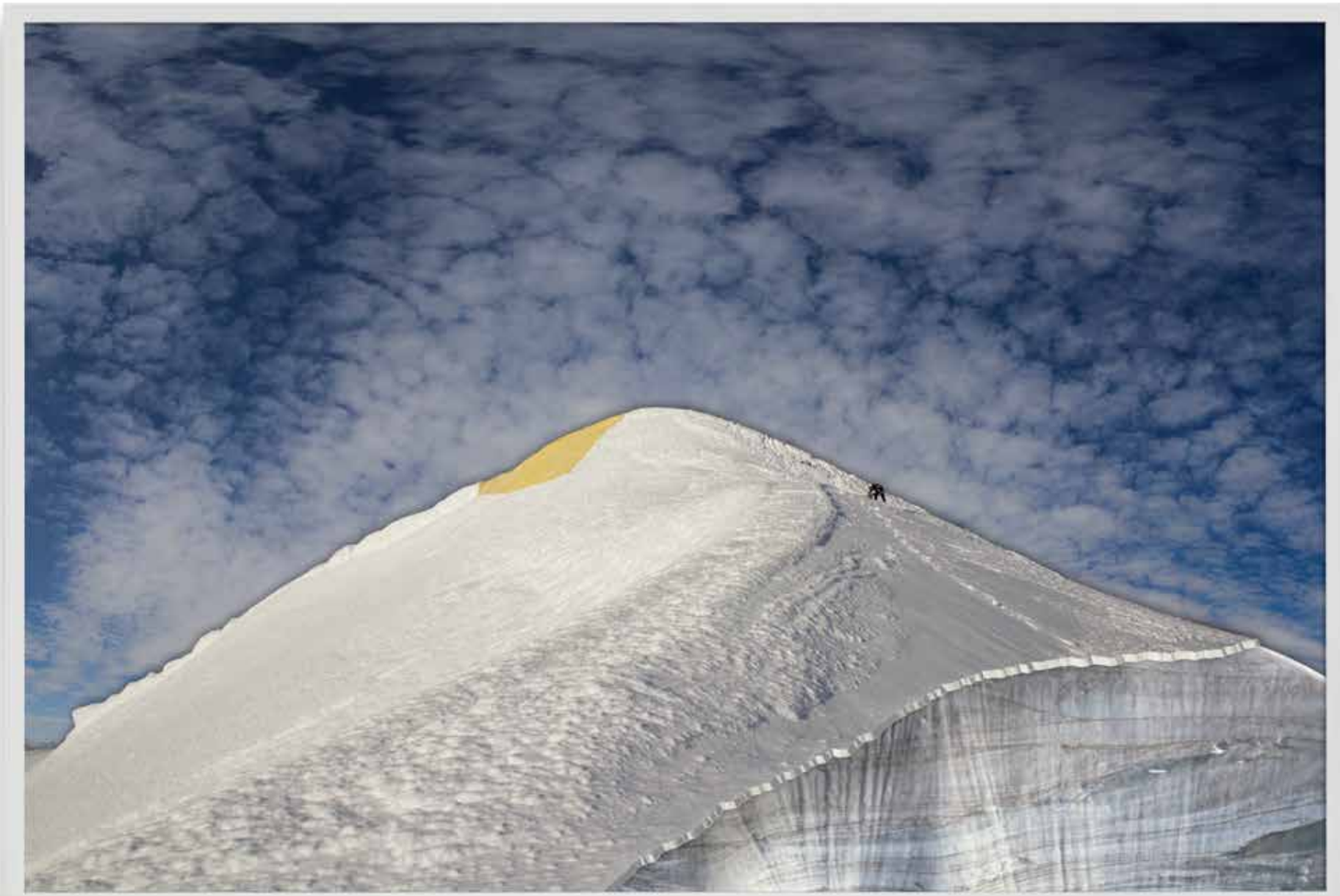
Bigert & Bergström 2016



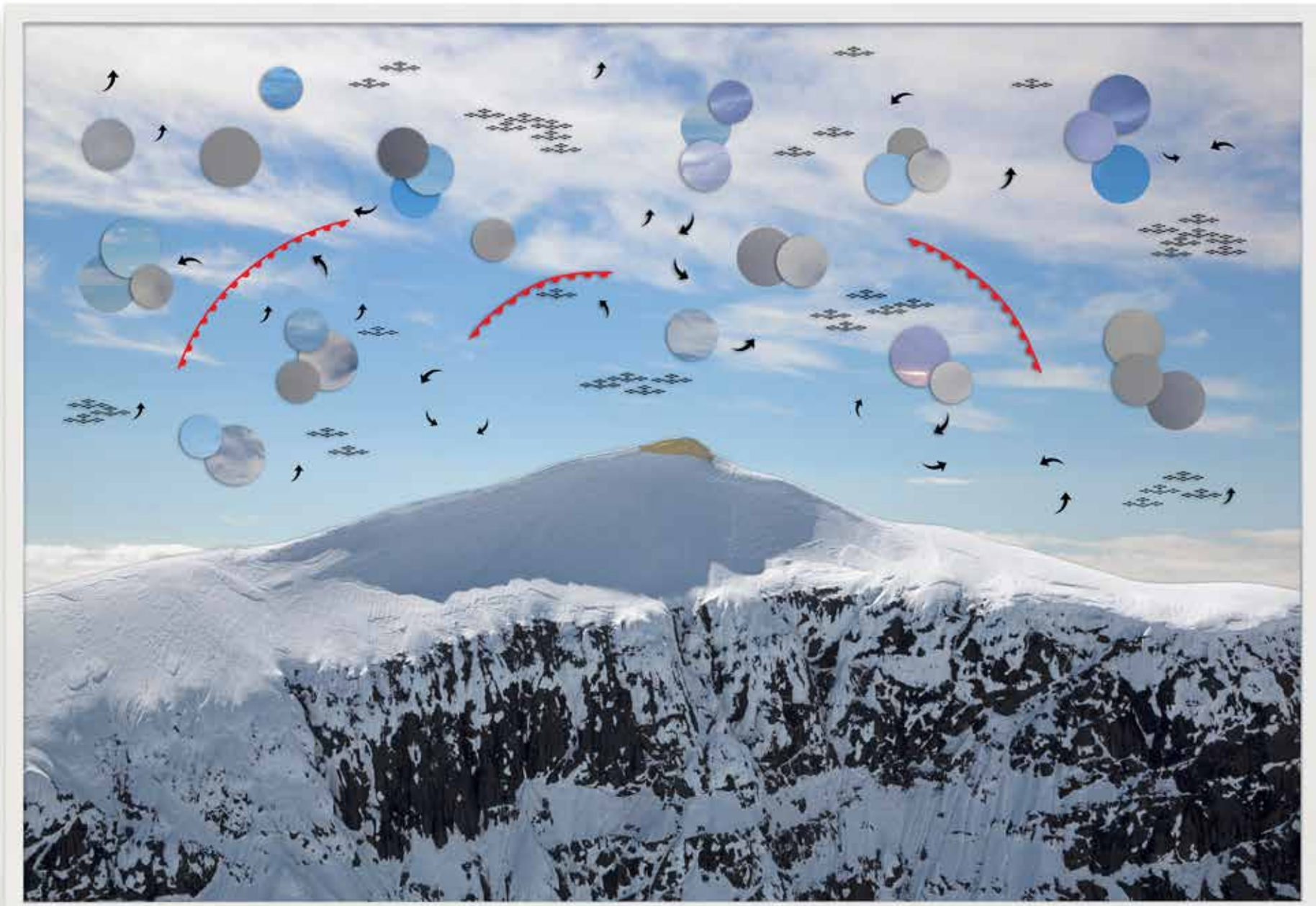
70 cm from not being the highest point in Sweden
Mirror polished stainless steel
210 x 110 x 70 cm
Photo: Jean-Baptiste Beranger
Bigert & Bergström 2016

Rescue Party
UV-printed photo on three-layer glass
and aluminum
75 x 50 x 6 cm
Bigert & Bergström 2016

Kebnekaise South Peak Exploded View
UV-printed photo on three-layer glass
and aluminum
75 x 50 x 6 cm
Bigert & Bergström 2016

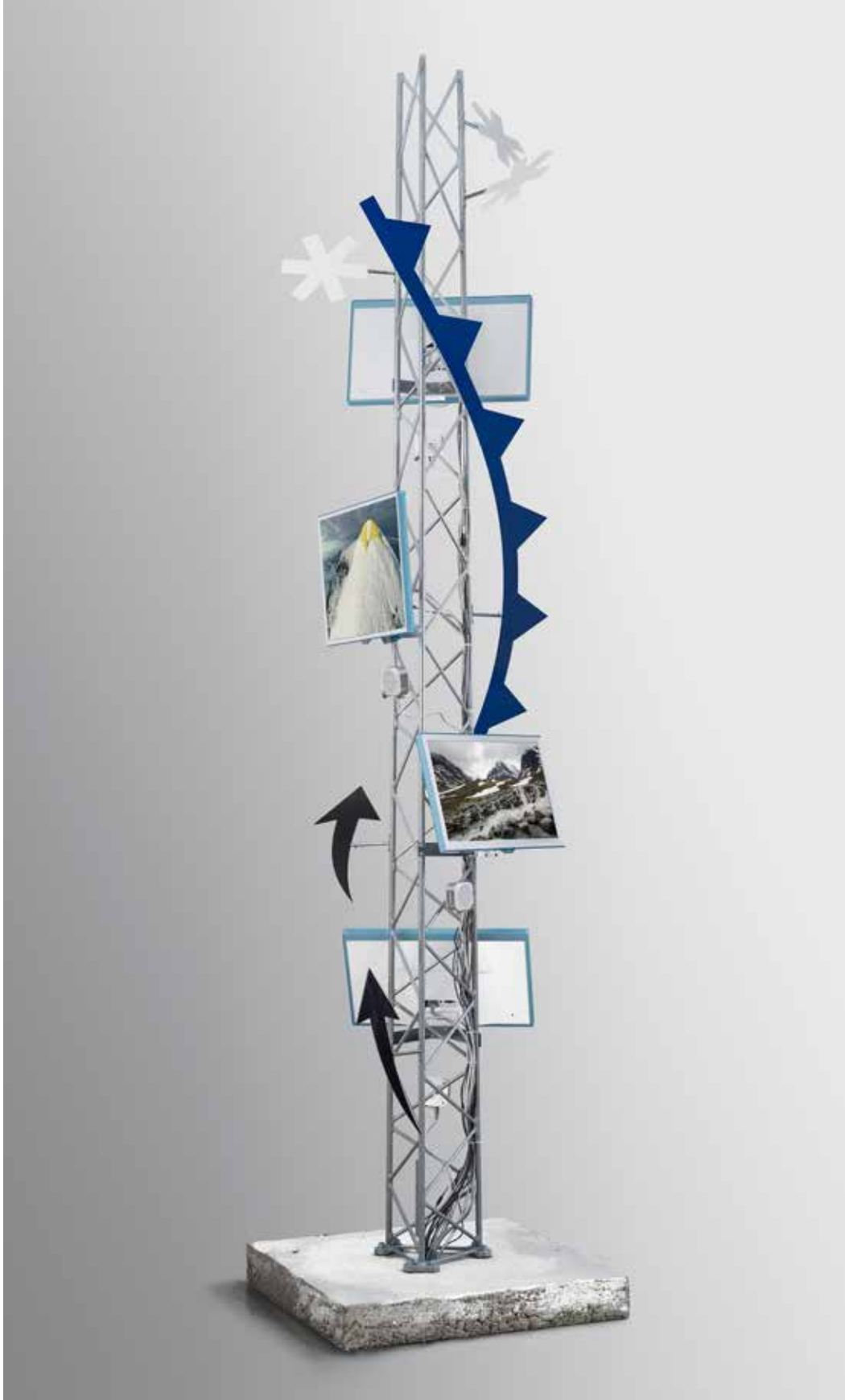


Rescue Blanket for Kebnekaise
UV-printed photo on three-layer glass
and aluminum
160 x 110 x 6 cm
Bigert & Bergström 2016



Rescue Blanket for Kebnekaise
UV-printed photo on vinyl foil,
acrylic spheres, low energy lights
110 x 135 x 35 cm
Bigert & Bergström 2016

Rescue Blanket for Kebnekaise –
Video/Weather Station
4 channel video, HD, 3-17 min.
LED-screens, HD video players, cord,
cable, steel, concrete.
80 x 320 x 80 cm
Photo: Jean-Baptiste Beranger
Bigert & Bergström 2016



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