

## Adam Tremblett: My Winter in Svalbard

If you asked me a year ago where I expected to spend this past Winter, I would never have guessed Svalbard. To be honest, I only had a vague idea of where and what Svalbard even was. But then, after starting my Master's at Memorial University last year, my supervisor Rocky suggested that I spend an exchange semester there through the AOCEC project at UNIS. With no idea what that entailed, I responded "Sure, why not?"

Overall, it ended up being one of the best experiences of my academic career, and I'm extremely grateful to Nataly and Aleksey with the AOCEC project for presenting me with this opportunity.



That's me atop Sarkofagen, with Longyearbyen in the distance.

To provide some background, I'm currently enrolled in the Master of Engineering program at Memorial University of Newfoundland (MUN) and am working on my research at C-CORE, an affiliated R&D institution with a focus on Arctic science and engineering. Memorial University is a Canadian university located in St. John's, Newfoundland, and I was born and raised in the small town of Bonavista which is about a 4-hour drive away. I've been living in St. John's since starting my bachelor's degree in Mechanical Engineering at MUN in 2012 (minus a few work-term semesters spent away and of course, my most recent adventure in Svalbard). During my

undergrad, two of my six four-month work-terms were spent at C-CORE, which encouraged me to further pursue graduate research in ice engineering at C-CORE and ultimately end up in Svalbard. While in Svalbard, I enrolled in the UNIS Arctic Technology courses AT-205 and AT-211, which served to complete my degree's course requirements. With my coursework now behind me, I'm free to spend my next year working on my research in ice mechanics and eventual thesis.

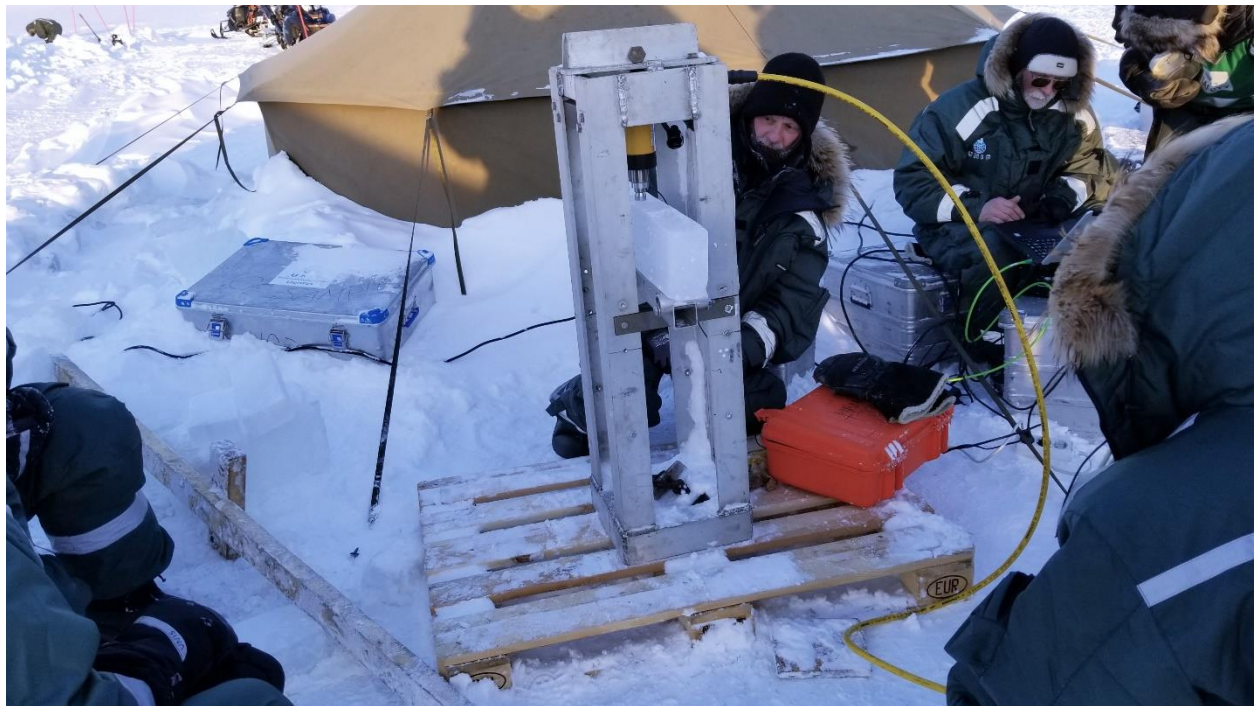
It was uncharacteristically windy when I first arrived in Longyearbyen (although I didn't know that at the time), and as I stepped off the plane and felt the Arctic wind on my face, I wondered what I had gotten myself into. However, my early apprehension proved unfounded, and I found myself quickly adapting to life in the cold and dark Arctic town. Longyearbyen is only a little smaller than Bonavista, and like my hometown, is a bit of a tourist hub during the warmer months. Beyond that, the similarities end. Whereas Newfoundland is cool, Svalbard is COLD. And while both Newfoundland and Spitsbergen are islands, in contrast to my home's wet maritime climate, Longyearbyen is in an Arctic desert as dry as any other place on Earth. Finally, while I grew up surrounded by hills and eroded fjords, Longyearbyen is surrounded by glaciers and mountains approaching a kilometer in height. Both are beautiful in their own rugged ways, and during my five months there, I grew to love Svalbard as much as my home.



Aurora over Longyearbyen.

My first week at UNIS was occupied by the mandatory safety course AS-101, which included (among other topics) a dip in a frozen lake and rifle training for polar bear defense. Fortunately, I didn't end up requiring the use of either during my stay. It was a fairly exciting and busy week, and it introduced me to both Svalbard and many of the friends who would be studying alongside me at UNIS. My academic courses started the following week and ran the entire semester until June.

AT-211: Ice Mechanics, Loads on Structures and Instrumentation was taught by Dr. Aleksey Marchenko of the AOCEC project, and was the more relevant of my two courses to my research. While I was already familiar with much of the course material regarding the material properties and behavior of ice, it went into a greater depth than my previous studies, and comprised heavy field and lab work components to complement the coursework. The most notable fieldwork of the class was performed during two week-long excursions: one a day's snowmobile ride away, and the other onboard an icebreaker.



3-point bending apparatus during field tests.



For our first fieldwork excursion, we spent a week in Sveagruva, an old Swedish mining settlement. We worked on a nearby frozen lagoon, a relatively sheltered body of seawater that enabled the formation of undisturbed sea ice. This location provided an ideal scenario for testing the material properties of sea ice, as it rarely forms without experiencing some form of wind or wave action. At Svea, we obtained ice cores, performed uniaxial, cantilever, and three-point-bending strength tests, and performed other experiments such as determining salinity profiles and porosity, viewing the grain structure of thin ice sections using polarized light, and observing the turbulent effects of water beneath moving ice floes. The week in Svea was an incredibly valuable practical experience and it undoubtedly prepared me for future fieldwork for my own research.



Hard at work in Svea.

The class's second fieldwork excursion involved a week onboard the Svalbard Governor's icebreaker, the M/S Polarsyssel. We travelled to dense sea ice to the South-East of Spitsbergen, between Bear Island and Hopen. From the Polarsyssel, we performed field experiments on a large, consolidated "floeberg," an ice feature that was once part of a ridge, and was comprised of numerous ice floes frozen together. As we did in Svea, we drilled ice cores, performed uniaxial strength tests, and measured salinity and porosity. Additionally, we generated a 3D map of the

ice feature through the use of an underwater ROV and surveying equipment on the vessel. In addition to the further practical experience this excursion provided, being on an icebreaker in the Arctic is itself an unforgettable experience, between the scenery along Svalbard's coast and the wildlife (ie: numerous walruses) that we saw along the way.



In front of the M/V Polarsyssel.

My second class, AT-205: Frozen Ground Engineering for Arctic Infrastructures, while less directly relevant to my field of research, also proved to be a valuable and interesting addition to my studies. This class was taught by Dr. Arne Aalberg, the head of UNIS's Department of Arctic Technology. I had little background in geotechnics or even civil engineering at all prior to taking this class, yet was still able to follow-along and learn much. Unlike AT-211, the fieldwork for this class took place nearby around Longyearbyen, and involved soil sampling (and later laboratory testing), snow-pack profiling for avalanche forecasting, and mountainside hikes with our professor and his dog.

Perhaps the most interesting aspect of this class would be the large number of guest lecturers we had, who each taught us about their various fields of expertise. Such topics included the

design and ongoing work with the Svalbard seed vault, artificial ground-freezing, soil sampling, coastal erosion, avalanche forecasting and protection, heat pumps and geothermal energy storage, and more. This was in addition to the main course material, which primarily focused on the geotechnical properties of frozen ground. As such, this class provided me with a huge array of interesting new topics to learn about over such a short time period.



Snowpack profiling with the best field partner.

In addition to my academic studies, I had no shortage of activities at which to spend my time in Svalbard. My dorm-mates in Sjøskrenten student housing were my second family in Svalbard, and between the nearby cafes, bars, and even a brewery, we always had a place to go out on the evenings we didn't stay in to play board games or watch movies in the kitchen. When we were feeling more adventurous, the mountains and glaciers surrounding the town provided miles of hiking terrain. I even had the opportunity to explore ice caves beneath the glaciers behind Longyearbyen. Other extracurricular activities during my stay involved snowmobile trips to the Russian town of Barentsburg, bonfires and barbeques on the beach, and enrolling in a two-week

Northern Lights class at UNIS, which involved field excursions to the Kjell Henriksen Observatory and the SvalSat satellite ground station, on mountains on opposite sides of Longyearbyen.



Exploring an ice cave beneath the glacier Larsbreen.

I'm finally home now after an exciting, learning and adventure-filled five months. Like I said, this experience has been one of the best I've had throughout my studies, and if whoever reading this finds a chance to go to Svalbard yourself, I can't recommend it enough. Who knows, perhaps I'll be back again someday if the opportunity arises.