

UNIS | ANNUAL REPORT 2013

THE UNIVERSITY CENTRE IN SVALBARD



MAP OVER SVALBARD



FRONTPAGE

August 2013: AB-201 students sampling tadpole shrimps outside Ny-Ålesund, with the mountain Scheteligfjellet in the background.

Photo: Steve Coulson/UNIS

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MAY 2013

AG-345/845 students going ashore in Hiorthhamn.

Photo: Anne Hormes/UNIS



OCTOBER 2013

Minister of Education and Research, Ms. Kristin Halvorsen presenting her gift to UNIS director Ole Arve Misund at the 20th anniversary seminar at UNIS.

Photo: Eva Therese Jenssen/UNIS

FROM THE DIRECTOR

For the last couple of years we have been developing a new strategy for UNIS which our Board have adopted and made effective for the period 2014 – 2020. The new strategy focuses on consolidation and developing UNIS further as the internationally leading centre in the High Arctic for research-based higher education in close cooperation with the Norwegian universities.

In October 2013 we celebrated our 20th anniversary. A jubilee seminar with an accompanying jubilee dinner were arranged with a prominent delegation from the Ministry of Research and Education led by Minister Kristin Halvorsen, the rectors and delegates from most of the Norwegian universities and a number of invited guests attending.

For the anniversary, a bibliography was produced by NIFU with participation from an editorial committee at UNIS. The purpose of the bibliography was to map the academic “footprint” of UNIS. The result that emerged was that UNIS scientific staff have produced nearly 1000 scientific publications since the start in 1993. The scientific production per scientific employee is slightly higher than at the mainland universities, the articles are cited somewhat above the average than the mainland universities for the respective themes, and 2/3 of the articles were produced in an international scientific cooperation. The collaborating institutions ranked according to number of co-authorships were University of Tromsø, University of Oslo, University of Bergen, the Norwegian Polar Institute, and the Norwegian Technical University (NTNU), followed by a number of foreign universities and research institutions. Generally, the articles had a pronounced High Arctic Svalbard focus.

UNIS had 497 students from 36 countries attending altogether 76 courses in 2013. The Birkeland Centre for Space Physics, awarded status as Centre of Excellence, was opened in March 2013. During the autumn UNIS became partner in the Centre for Arctic Petroleum Exploration (ARCex, led by University of Tromsø) and likewise partner in the BioCEED (led by University of Bergen) Centre for Excellence in Education. For some years already we have been partner in the SAMCOT Centre for Research Based Innovation in Arctic coastal and maritime technology (led by NTNU). These centre partnerships, acquired in public competitions, show that UNIS is recognised as a high quality institution in Arctic science and education.

The development at UNIS imply that a third building step at Svalbard Science Centre starts being planned. The building is now filled up, and new activities and new establishments like SIOS are planned to be housed in the science centre. At the 20th anniversary the Ministry of Education and Research was presented a first concept for a building step III of Svalbard Science Centre.

UNIS is a unique institution within the international family of academic institutions. Our vision, *Research-based education of the next generation of Arctic experts*, proves that we see our work in a holistic context. I appreciate the privilege to take part in realizing the potential of this fine institution, and I see it as my responsibility that UNIS continue developing as a leading centre for arctic science and higher education.

Ole Arve Misund

Ole Arve Misund

EXCERPTS FROM THE BOARD OF DIRECTORS REPORT 2013

In 2013 the flow of students to UNIS increased, there were more externally financed research projects and UNIS became a partner in the Birkeland Centre for Space Science, which was opened at the University of Bergen in March 2013. The collaboration between UNIS and the eight universities in mainland Norway was followed up through the action plan that operationalizes the collaboration agreements, and UNIS has had major focus on efforts involving quality assurance. A new strategic plan for 2014 – 2020 has been adopted in order to further develop UNIS. The Board of Directors notes that the financial situation is in good shape, with strengthened shareholder equity and a good system for managing the company's values. This is accompanied by good research results in several areas. The Ministry of Education and Research allocated UNIS funds for a further increase of student production. There has been significant field activity and considerable media attention about UNIS Co2 Lab AS.

The University Centre in Svalbard AS (UNIS) was established as a state-owned limited corporation on 29 November 2002, replacing the original foundation established in 1994 by the Norwegian University of Science and Technology (NTNU), the University of Bergen (UiB), University of Oslo (UiO) and University of Tromsø (UiT). As of 2011 UNIS AS has an identical collaboration agreement with the eight universities on the Norwegian mainland, and five members of the Board of Directors come from NTNU, UiB, UiO, UiT and the Norwegian University of Life Sciences (UMB).

The company's objective is to provide tuition and engage in research based on Svalbard's geographic location in the High Arctic and the special advantages this offers. The educational provision shall act as a supplement to the tuition offered at the universities and form part of the ordinary programmes of study that culminate in degrees at Bachelor, Master or PhD level. The educational provision shall have an international profile, and all tuition is given in English.

EDUCATION

In 2013, UNIS continued the four fields of study: Arctic Biology, Arctic Geology, Arctic Geophysics and Arctic Technology.

A total of 497 students from 36 countries took courses at UNIS (467 students from 23 countries in 2012), of which 53 % were women and 47 % men. A total of 52 Master's students (36 in 2012) worked on UNIS-related Master's theses during the year (students with contractual agreements). A total of 175.11 student-labour years was produced in 2013. Of this, 22.79 student-labour years constitutes the production from guest Master's students.

The proportion of Norwegian students at UNIS in 2013 was 35 %, which equated to 175 students. The term Norwegian students means Norwegian citizens affiliated with Norwegian universities. These were divided as follows: 74 students from NTNU (42 %), 36 from UiB (20.5 %), 20 from UiO (11.5 %), 26 from UiT – The Arctic University of Norway (14.8 %), 10 from UMB (5.7 %), 7 from UiS (4 %) and one student each from UiN and UiA (both 0.5 %).

As of 2014, UNIS will state the Norwegian proportion based on the student's programme affiliation at the Norwegian universities and not only Norwegian citizenship.

Of the international students, the largest groups were from Germany (11 %), the United Kingdom (7 %), Denmark and the Netherlands (both 6 %) and Russia and (5 %). The Nordic students comprised 49 % of the student mass in 2013. The allocations from the Norwegian Centre for International Cooperation in Education (SIU) have contributed to good scholarship schemes for Russian, Canadian and American students from cooperating universities.

RESEARCH

The research activity at UNIS continues to grow. Examples of central projects from the departments follow below:

In an article in Nature, with UNIS post doc Faezeh Nick as the coordinating author, documented that new insights into how climate change affects the production of ice from the glaciers in Greenland. This is important in order to understand how the glaciers in Greenland will contribute to the sea level rising in the future. A sophisticated data model projects that sea level rise from these glaciers will be 2 - 5 cm in 2200, which is lower than extrapolated from current trends.

Six wells have been drilled at the old auroral station in Adventdalen through the activities of UNIS CO2 Lab. A sandstone deposit from a depth of 700 - 1000 m has been identified as a possible reservoir for CO2. Through water injection testing, it has been estimated that the reservoir can hold at least 1.2 million tonnes of CO2. UNIS CO2 Lab has applied to the local administrative authorities for permission to inject up to 200,000 tonnes of CO2 in the reservoir. The objective is to explore the potential for future CO2 storage in Svalbard's bedrock.

A PhD thesis in geology demonstrated that the ice sheet over Svalbard during the last Ice Age (ca. 30,000 – 11,700 years ago) began to melt much earlier and the melting period lasted much longer than previously thought. The results are based on samples from unexplored high-lying inland areas of Svalbard.

In early July 2013 a field party from UNIS discovered a new plant in Ringhornsdalen near the Widjefjord on Svalbard. It is 40 years since a similar discovery was made in the archipelago. The plant called *Pinguicula alpina* L. (alpine butterwort) is a relatively thermophile species, and discovery at 79°N is the northernmost find of this species ever recorded. Ringhornsdalen appears to represent an Arctic "oasis" with vegetation originating from the warm period after the Ice Age ended about 5000 years ago.



Alpine butterwort (*Pinguicula alpina* L.) in Ringhornsdalen, Wijdefjorden.
Photo: Anna Vaden/UNIS

Ice ridges can be potentially destructive for subsea installations in the Arctic. Ice ridges are the result of compression of the ice cover caused by a combination of currents, wind and thermal expansion forces. The ice ridge keel formed under water can dig deep grooves in the seabed in shallow water and damage subsea installations. The thermodynamic consolidation of ice ridges was studied in a PhD thesis in which a mathematical model for the dynamics of ice ridges was developed and presented.

How climate parameters affect the snow in order to better predict when spontaneous avalanches are triggered near Longyearbyen was described in a PhD thesis. The cold, dry and windy climate on Svalbard produces extremely dense snow drifts that often trigger avalanches. This is concerning for infrastructure and buildings in Longyearbyen, which in many cases are in an exposed position. Measurements of snow temperature profiles were made in an area where three avalanches were later triggered. A triggering scenario was developed for the avalanches on the basis of these measurements. An innovative test device for accurate measurement of the forces that occur in weak snow layers was developed.

Some contaminants are buried in the ground, or in snow and ice, but are still transported to the sea by meltwater. The extent of these contaminants that end up in the sea and how they are taken up in the marine food chain was investigated in a PhD thesis. The study sites were Svalbard and Nuuk in Greenland. Pesticide distribution in the samples from the fjord in Greenland indicated that glaciers and snow cover along the fjord were secondary sources of pollution for the marine environment. Levels of polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), perfluorinated alkylated substances (PFAS) and pesticides were below the tolerable daily intake thresholds in prey organisms. PFAS was measured in marine mammals, but not in the fish samples, in all likelihood due to the industrial processing of the fish.

During 2013 researchers at UNIS published 90 articles in peer reviewed journals, of which 30 were at the highest level. Corresponding figures for 2012 were 94 articles, of which 26 were at the highest level.

DISSEMINATION

UNIS is popular among the delegations which visit Longyearbyen and in 2013 we had many celebrity visits, including Queen Sonja in February, the Chairperson of the Intergovernmental Panel on Climate Change (IPCC), Rajendra Kumar Pachauri, in May and the Minister of Foreign Affairs, Espen Barth Eide, and his Indian counterpart, Salman Khurshid, in June. In total around 100 groups from both Norway and abroad visited UNIS and the science centre.

Around 230 Norwegian and international media reports were logged in 2013. Queen Sonja's visit to the Kjell Henriksen Observatory and the visit by India's Minister of Foreign Affairs were among events to generate interest. The British television network ITV had live broadcasts from UNIS for a full week in May.

The Svalbard Seminars, which are offered to the local population of Longyearbyen during the Polar Night, were well attended. The Svalbard Course and Studietur Nord were run during the summer of 2013 and received positive feedback. As part of the UNIS' 20th anniversary celebrations, we invited all the kindergartens and the school to create their own research projects, which resulted in an exhibition at UNIS. This was officially opened by the Minister of Education and Research, Kristin Halvorsen, on Thursday, October 11, with all the children present. We also organised an open day for the public during the anniversary weekend, and around 400 people visited on Saturday, October 12.



Minister Kristin Halvorsen opens the research project exhibition made by children from the kindergartens and the school as part of the UNIS 20th anniversary.
Photo: Prasad Rao/UNIS

SOCIAL RESPONSIBILITY

UNIS shall be a resource for the local communities in Svalbard. This applies to the staff, students and the knowledge we possess. The staff shall live and work in Longyearbyen and contribute to the development of the institution and the community. All shall engage themselves in the community's social and cultural life rather than starting their own clubs or societies.

The annual accounts for 2013 show that 51% of goods and services were purchased locally in Longyearbyen.

STAFF

As of December 31, 2013, the scientific staff at UNIS comprised 12 professors, 18 associate professors, nine post docs, 21 PhD candidates, five project positions and 34 with adjunct professor/associate professor attachments. The technical and administrative staff comprised 13.2 and 20.9 labour years respectively. Women accounted for 51.2 % of the technical and administrative positions, 42.2 % of the scientific positions and 46.3 % of the scientific staff including PhD candidates and post docs and 53 % of the students. Four of the nine members of the Board of Directors were women. The Board of Directors is not aware of discrimination of any form taking place at UNIS.

The following positions are externally funded in full or part: two professors (1 Statkraft, 1 Birkeland Centre), one associate professor (SNSK), 10 post docs (four funded by the Research Council of Norway (RCN) and one each by SVALI, Lundin, Conoco-Philips, Samcot, Birkeland Centre and Conoco-Philips/Lundin), 7 PhD candidates (five funded by RCN and one each by the EU and Samcot) and eight adjunct professorships (two funded by NGU and one each by RCN, Svalbard Museum, Lundin, NERSC, ARS/NAROM and NAU). The Board of Directors would like to thank these institutions for their contribution to UNIS.

HEALTH, SAFETY AND ENVIRONMENT

Absence due to illness at UNIS in 2013 was 3.3 %. The institution has an agreement with Longyearbyen Hospital regarding occupational health services and is certified as an IA enterprise. HSE at UNIS is systemised in order to implement all activities for students and staff in a safe manner. We have a special focus on implementing fieldwork and cruise activities in Arctic areas in a manner that is as safe as possible. During 2013 there were no reports of staff members being injured or serious occupational accident or injuries. UNIS is unaware of contamination of the wider environment to any significant degree as a result of the institution's operations. UNIS is working continually to limit the environmental impact of its activities.

ECONOMIC DEVELOPMENT

Funds for operation and investments at UNIS are appropriated in the budget of the Ministry of Education and Research. In 2013 appropriations from the Ministry totalled NOK 112,217,000, of which NOK 87.1 million constituted base funding, NOK 3.6 million was for investments in equipment and NOK 21.5 million rent for the science park and KHO. Of the allocation, a sum of NOK 5 million has been set aside as postponed income; NOK 2.5 million for the purchase of housing and NOK 2.5 million for strategic investments and building upgrades.

Income over and above the appropriations from the Ministry of NOK 62.9 million comprises NOK 9 million from external project income for research and NOK 13.9 million in income from consultancy services and rentals. UNIS has also experienced an increase in external funding for research from 8 % of its gross income in 2001 to 37.8 % in 2013. The Board of Directors is extremely satisfied with the increase in external income.

UNIS has gross operating income of NOK 166.5 million and direct project expenses and other operating expenses constitute NOK 163.5 million. As of the 2012 financial year, group accounts will be kept as UNIS CO2 Lab AS is fully owned by UNIS AS. Operating subsidies to UNIS CO2 Lab AS from sponsors constitute NOK 10.9 million and give the group a gross operating income of NOK 175.5 million. Direct project expenses and other operating expenses constitute NOK 172.7 million for the group.

The annual accounts for UNIS for 2013 show an operating surplus of NOK 2,991,935. After financial items, a figure of NOK 2,840,736 was transferred to other equity. The group's result is identical, as the subsidiary company's unused funds for the operation of the CO2 project are adjusted as postponed income. UNIS' total capital as of 31.12.12 was NOK 106,638,474, of which NOK 40,888,498 comprises institutional buildings. The company's total shareholder equity amounts to NOK 19,466,469. The company's non-distributable equity amounts to NOK 17,412,624. The group's total capital as of 31.12.12 was NOK 111,834,238. The group's shareholder equity amounts to NOK 19,466,649.

In 2013, a salary of NOK 978,586 was paid to the Managing Director. The Chair of the Board of Directors received a fee of NOK 75,000, the Deputy Chairperson NOK 41,500 and the other members of the Board of Directors each received a fee of NOK 37,500.

The accounts were audited by PricewaterhouseCoopers A/S.

INFRASTRUCTURE AND HOUSING

At year-end 2013, UNIS owned a total of 52 housing units. In addition, UNIS rents the UNIS Guest House (52 small studio apartments), for guest lecturers and guest researchers. Cooperation has been established with Leonard Nilsen Spitsbergen AS and Store Norske Boliger AS regarding the rental of smaller apartments for the PhD candidates.

At year-end 2013, UNIS' combined housing loans total NOK 26.1 million. Interest and instalments on the loan as well as inventory for the apartments must be financed from the operational budget.

The Arctic Student Welfare Organisation of Norway (NAS - former SiTø) currently offers a total of 142 studio apartments to students. It is decisive for UNIS that the students have satisfactory living conditions. In 2012 SiTø received funding for 88 new studio apartments for students, which will be completed during the summer of 2014. This will contribute to more easily being able to realise the goal of increased student numbers at UNIS. UNIS is in continual contact with and co-operates with NAS in order to contribute to the new studio apartments for students being able to be realised as quickly as possible.

RISK AND INTERNAL CONTROL IN RELATION TO FIELDWORK, EXCURSIONS AND LABORATORY ACTIVITIES

UNIS' location in the High Arctic provides special challenges in the entire HSE spectrum. In particular it is important to take a proactive approach in our responsibility for the safety of our students and staff when travelling in the Svalbard nature. Safety is the number one priority at UNIS.

All students and staff at UNIS must undergo thorough safety training before they are allowed to embark on fieldwork. Quality assurance of the planning and implementation of field-based projects is implemented in a structured manner with strict requirements for work procedures and methods.

Work at UNIS' laboratories is subject to the same quality assurance as work in the field. Students and staff must undergo necessary training and supervision before they gain access to the laboratory areas, in addition to HSE/risk analyses before the laboratory work commences.

UNIS is reliant on confidence from the management authorities that our activities have as little negative impact on the natural environment as possible. UNIS cooperates closely with the local management at the Office of the Governor of Svalbard and the Longyearbyen Community Council in order to find good solutions, particularly in connection with UNIS' activity in the field. Moreover, it is decisive for the institution that we still manage to implement our activities without serious injury being inflicted on students or staff.

UNIS' internal regulations are based on the formulation of objectives from the Svalbard Environmental Protection Act, which states that in the event of conflict between the activity and the environment priority must be given to environmental considerations.

In a period of strong growth at the institution, it is particularly important that we manage to keep pace with the development as seen from an HSE perspective. UNIS is working in a determined manner to ensure that the particular safety aspects associated with lab and field activities shall be governing for all activities.

THE PATH FORWARD

UNIS has experienced good economic development in 2013. The expenses are under control and the institution is operating in line with the budget. The level of debt is significantly reduced and the shareholder equity ratio is approaching 20 %.

The Ministry expects continued growth in the student production, and has expectations that course provisions are developed that provide 220 student-labour years. The student places are well financed and take into account the additional expenses for field-based activities on Svalbard. The provision of studio apartments for students, which is managed by the Arctic Student Welfare Organisation of Norway no longer meets the requirements during the most intense seasons. The construction of 88 new student apartments near UNIS will be completed in the autumn of 2014.

The collaboration with the universities will be of high priority in the future. This will occur in accordance with the collaboration agreement with the universities in mainland Norway through the appurtenant plans of action. The Board of Directors has high expectations for this process and believes it will be a win-win situation for all the parties.

From the Board of Directors' perspective, UNIS has taken new steps towards achieving its overall goal of being a leading international centre for Arctic studies. The Board of Directors would like to thank all the staff for their good effort in 2013.



AUGUST 2013

AT-209 students jump in the ocean as part of their safety training for the course.

Photo: Nils Roar Sæthun/UNIS

TROMSØ 24.02.2014

Berit Kjeldstad

Berit Kjeldstad
styreleder

Jarle Nygard

Jarle Nygard
nestleder

Morten Hald

Morten Hald

Geir Anton Johansen

Geir Anton Johansen

Anita Johansen

Anita Johansen

Steve Coulson

Steve Coulson

Elise Strømseng

Elise Strømseng

Eva Falleth

Eva Falleth

Gullik Vetvik Kille

Gullik Vetvik Kille

Ole Arve Misund

Ole Arve Misund
direktør



STUDENT PHOTO COMPETITION

This picture won 2nd place in the category "Nature" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Valentin Bickel

QUALITY IN EDUCATION

BY ELISE STRØMSENG, DEPARTMENT OF ACADEMIC AFFAIRS

In 2013 UNIS completed the action plan which was established in accordance with the new cooperation agreement with the Norwegian universities (September 2011). This includes the UNIS admission regulations, exam regulations as well as contracts for guest master- and guest PhD students at UNIS. In accordance with the agreement, the first Dean meeting was held at UNIS in August 2013. The purpose of this yearly meeting is to develop strategic initiatives and discussions on the development of the UNIS course portfolio.

QUALITY ASSURANCE WORK

The purpose of UNIS' quality assurance system is to secure and develop the quality of UNIS' courses at all levels: bachelor, master and PhD. Quality assurance comprises all the processes and activities that affect the quality of courses, from information provided to potential applicants to the completion of their courses. The effort to improve UNIS' courses is a continual process. Course evaluations are being conducted electronically by students and course responsible. From 2013 all the UNIS course descriptions are in line with the National Qualifications Framework.

LEARNING ENVIRONMENT

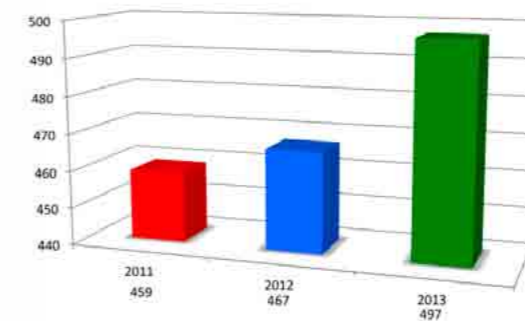
In 2013 students were given improved access to the UNIS library resources due to extended library opening hours. All reading rooms for students were converted into offices for staff, guest master- and PhD students at UNIS.

Students report on the learning environment through the UNIS course evaluation system. UNIS aim to detect shortcomings concerning all the facilities the students use in an academic context, including the services they receive from the UNIS support functions.

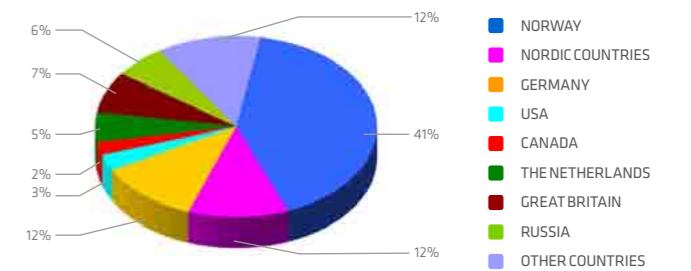
In general UNIS receive positive feedback on the learning environment in the course evaluations. The overall conclusion from the course evaluations is that the UNIS students are highly satisfied with their experiences and outcomes from the field based education at UNIS.

STATISTICS

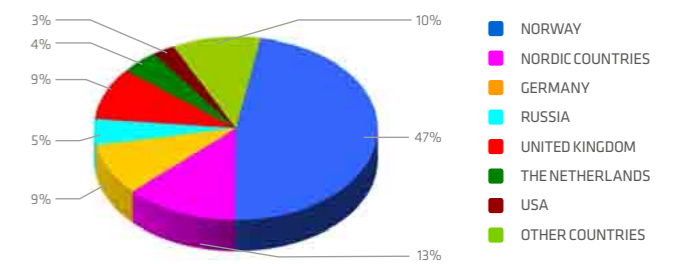
NUMBER OF STUDENTS COMPLETING UNIS COURSES 2011-2013



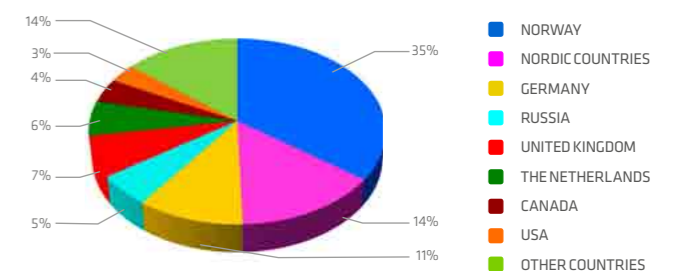
UNIS STUDENTS' NATIONALITY 2011



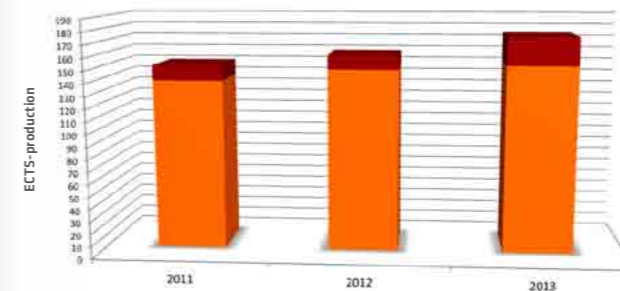
UNIS STUDENTS' NATIONALITY 2012



UNIS STUDENTS' NATIONALITY 2013



PRODUCTION IN STUDENT-LABOUR YEARS (1 YEAR = 60 ECTS CREDITS)



Course ECTS Master ECTS

Note: UNIS registers ECTS by 1) course production and 2) master students attendance

RESULTATREGNSKAP 2013

KONSERN		UNIVERISTETSSENTERET PÅ SVALBARD AS	
2013	2012	2013	2012
DRIFTSINNTEKTER			
107 217 000	100 272 000	107 217 000	100 272 000
-3 617 605	-4 380 860	-3 617 605	-4 380 860
103 599 395	95 891 140	103 599 395	95 891 140
Årets driftstilskudd fra KD			
47 768 001	42 991 203	49 000 337	44 313 247
10 894 927	19 736 988		0
13 385 452	12 126 821	13 862 696	13 111 321
175 647 775	170 746 152	166 462 428	153 315 708
Brutto driftsinntekter			
41 773 197	39 218 865	41 773 197	39 218 865
133 874 578	131 527 287	124 689 231	114 096 843
Netto driftsinntekter			
DRIFTSKOSTNADER			
55 118 067	51 992 188	51 678 690	48 494 103
11 374 661	10 678 162	11 374 661	10 678 162
5 018 131	11 610 152		0
33 088 642	31 625 932	33 088 642	31 625 932
23 890 194	20 508 464	23 074 850	18 116 996
2 480 453	2 437 734	2 480 453	2 437 734
130 970 148	128 852 631	121 697 296	111 352 927
2 904 430	2 674 656	2 991 935	2 743 916
DRIFTSRESULTAT			
FINANSINNTEKTER OG -KOSTNADER			
1 292 268	1 075 606	1 201 206	1 005 889
1 355 962	1 558 871	1 352 405	1 558 414
- 63 694	-483 265	- 151 199	-552 525
2 840 736	2 191 391	2 840 736	2 191 391
Årsresultat			
Opplysninger om avsetninger til:			
		2 840 736	2 191 391
		2 840 736	2 191 391

BALANSE 31.12.2013

KONSERN		UNIVERISTETSSENTERET PÅ SVALBARD AS	
2013	2012	2013	2012
ANLEGGSMIDLER			
VARIGE DRIFTSMIDLER			
40 888 498	39 567 016	40 888 498	39 567 016
40 888 498	39 567 016	40 888 498	39 567 016
Finansielle anleggsmidler			
0	0	100 000	100 000
1	1	1	1
1	1	100 001	100 001
40 888 499	39 567 017	40 988 499	39 667 017
Sum anleggsmidler			
OMLØPSMIDLER			
4 719 939	11 439 322	5 603 643	8 943 393
8 070 519	2 864 341	8 070 519	2 864 341
57 842 152	39 097 311	51 975 813	37 559 479
70 632 610	53 400 974	65 649 975	49 367 213
111 521 109	92 967 991	106 638 474	89 034 230
Sum eiendeler			
EGENKAPITAL			
Innskutt egenkapital			
2 054 025	2 054 025	2 054 025	2 054 025
0	0	0	0
2 054 025	2 054 025	2 054 025	2 054 025
Opptjent egenkapital			
17 412 624	14 571 888	17 412 624	14 571 888
17 412 624	14 571 888	17 412 624	14 571 888
19 466 649	16 625 913	19 466 649	16 625 913
Sum egenkapital			
GJELD			
Avsetning for forpliktelser			
13 108 850	7 194 448	8 463 048	6 089 863
2 605 600		2 605 600	
15 714 450	7 194 448	11 068 648	6 089 863
Annen langsiktig gjeld			
26 140 595	28 621 048	26 140 595	28 621 048
26 140 595	28 621 048	26 140 595	28 621 048
Kortsiktig gjeld			
14 777 515	11 285 761	14 250 857	8 468 017
5 146 473	4 880 169	5 146 473	4 880 169
30 588 556	24 360 652	30 565 252	24 349 220
50 512 544	40 526 582	49 962 582	37 697 406
92 367 589	76 342 078	87 171 825	72 408 317
111 834 238	92 967 991	106 638 474	89 034 230
SUM EGENKAPITAL OG GJELD			



STUDENT PHOTO COMPETITION

This picture won 3rd place in the category "Nature" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Larissa Beumer



STUDENT PHOTO COMPETITION

This picture won 1st place in the category "Fieldwork" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Vegard Bråthen

ARCTIC BIOLOGY

BY OLE J. LØNNE, HEAD OF DEPARTMENT

The department conducts research in arctic ecology and provides a full one-year curriculum of undergraduate studies including and a summer course on identification of arctic terrestrial species as well as nine PhD/Master's level courses. The department was, together with University in Bergen and Institute of Marine Research awarded the status as centre of excellence in education by NOKUT. The new centre (bioCEED) will start up in early 2014 and have a significant influence on our efforts to develop the quality of education we offer. The department has two research groups, one in marine arctic ecology and one in terrestrial arctic ecology.

Based on the new UNIS 2014-2020 strategic plan, released in 2013, and the apparent similarity in many research questions regarding e.g. seasonality, biodiversity, winter ecology, metagenomics and metatranscriptomics and sharing of competence as well as laboratory facilities between the two research groups, there is a strategic move towards focusing on overriding research questions common to the two groups.

THE PEOPLE

At the end of the year the department consists of two professors, four associate professors, one post doc, one researcher, one engineer, four PhD candidates and eight adjunct professors.

Ingibjörg Svala Jónsdóttir accepted a position as professor in our department this year. Maciej Ejsmond started in a two year post doc position in the CLEOPATRA II project, Kirsten Christoffersen was employed as an adjunct professor, Janne Søreide was hired as an associate professor, Ole J. Lønne was hired as head of department and Steve Coulson was promoted to full professor in 2013. Post doc Marie Louise Davey and engineer Courtney D. Nadeau left the department for other opportunities this year.

THE RESEARCH

The focus on the polar night as prioritised research area continued in 2013. Two Research Council of Norway (RCN) funded projects and one funded by ConocoPhillips, all three led by UNIS researchers, focus on processes during the polar night.

Arctic ecosystem processes are direct consequences of the complex behaviours and interactions between organisms, many of which are driven by the physical environment. Accordingly, a classical paradigm in Arctic marine ecology suggests that most biological processes stop during the polar night at high latitudes due to low food availability and the lack of light. Research in the department has challenged this assumption by presenting evidence of both diel vertical migration (DVM) of zooplankton as

well as bioluminescence levels indicative of biotic activity hitherto assumed to be absent during the polar night. Although the polar night at high latitudes is perceived as total darkness, new data indicate that Arctic organisms nevertheless may respond to light levels undetectable by the human eye. Winter ecology of Arctic marine systems is a largely new field of science with the potential for radically altering our fundamental perception of basic Arctic ecosystems processes, current state of the ecosystem and connections between the biosphere, hydrosphere and cryosphere within the Polar Region. Circa, a FriMedBio project fund by the RCN (2012-2015) focuses on the patterns of diel vertical migrating zooplankton in the polar night period, and how this behaviour ultimately affects the exchange of CO₂ between the ocean interior and the atmosphere.

The RCN funded CLEOPATRA II (2012-2015) is a follow-up of one of UNIS' two IPY projects, and focuses on overwintering strategies of one of the most important species in the high Arctic - the small but massively dominant *Calanus glacialis*. Field and laboratory investigations are combined with model development to ultimately arrive at an improved understanding of the physiological and life history adaptations of Arctic zooplankton.

A central element of our approach is to move towards individual-based zooplankton ecology where states, such as lipid reserves, are measured at the level of individuals. Long-term data-series acquired through previous projects are continued in CLEOPATRA II and will allow the inclusion of inter-annual variability and different ice-cover scenarios in the investigations. In 2013 the project continued its intensive field and laboratory activity to complete the one year high-resolution sampling campaign in Billefjorden.

Rijpfjorden (Nordaustlandet) was visited in January with RV Helmer Hansen as work platform and in April-May worked out of the land based field station "Bjørnehiet" in the same area. In August field and experimental work ended and a phase with focus on analyses and writing started. Two spin-off projects from this activity; "Fate of copepod secondary production in a changing Arctic" (COPPY) and "Marine ecological processes during the polar night" (Big Black Box) were funded in 2013.



APRIL 2013
Sampling in Billefjorden.
Photo: Daniela Freese/UNIS

The ConocoPhillips/ Lundin oil funded MicroFun project (2012-2016) is co-lead by both marine and terrestrial researchers in the department and as such enhances the collaboration between the established research groups. The project utilises modern high-throughput sequencing technology to enable a new understanding of the diversity and function of microbial Arctic organisms and the environmental drivers that influence the changes in microbial diversity and processes. Field-campaigns, including a dedicated cruise during the summer, and development of molecular methods in the lab, have dominated the activity during 2013. The project is now entering a phase focusing analysis and publication.

The long term investigations of rocky bottom communities led by professor Gulliksen is in a transition phase as he retired from his position at UNIS in 2012 and from the University in Tromsø in 2013. A new project funded by the Svalbard Environmental Fund aims to smooth this transition as it enabled us to revisit some of the many rocky bottom localities surveyed between 1980 and 2012 in the Isfjord-Kongsfjord area during the summer. Their potential in climate related research is evaluated.

Colonisation of Svalbard by the diverse invertebrate fauna of Svalbard is the focus area of research within the NRC funded AVIFauna project. This Norway-Russia collaboration project investigates whether migrating birds may introduce invertebrates to Arctic islands.

Apart from limited fieldwork in Barentsburg to extend into 2014 this project ended this year. At the moment three papers are published in reviewed journals and several more in the pipeline. The RCN funded project "Predicting effects of climate change on Svalbard reindeer population dynamics: a mechanistic" approach lead from NTNU continued its fieldwork. Bachelor course students

are actively involved in the project. The project; "Effects of climate change and land use on tundra plant communities" continues. This long-term experiment at research sites in Iceland and Svalbard is part of the International Tundra Experiment research network. Linked projects on topics such as; impact of grazing, site fertility and species pool on plant species diversity, the role of mosses in ecosystem structure and functioning, ecological role and diversity of moss-cyanobacteria association and plant life history variation along environmental gradients are also been followed up in 2013.

APPOINTMENTS

Professor Jóhnsdóttir was appointed chair of the Terrestrial Working Group of IASC at the annual meeting during ASSW 2013 in Krakow, Poland. She is also member of the Executive Committee for the International Conference of Arctic Studies III (ICARP III). <http://icarp.arcticportal.org/>.

Professor Coulson has represented Norway in the Terrestrial Working Group of International Arctic Science Committee, and UNIS in Ny-Ålesund Science Managers Committee (NY-SMAC).

Associate professor Ole J. Lønne represents UNIS on the Nansen's legacy project that has developed a national scientific research plan to increase our understanding of the marine bio- and geosphere in the central and northern parts of the Barents Sea.

GRADUATES 2013

PHD DEGREE:

ANNA SOLVANG BÅTNES

Light in the dark – the role of irradiance in the high Arctic marine ecosystem during polar night

MASTER DEGREE:

CARL BALLANTINE

Temporal and spatial variation in a high Arctic bedrock macrobenthic community in Hinlopen, Svalbard

LAURIS BOISSONNOT

Effect of food and light on the development of the Arctic copepod *Calanus glacialis* during the winter-spring transition

SYNNØVE BOTNEN

Low host specificity of arctic ectomycorrhizal fungi

MARTIN TORP DAHL

Spiders in the hills: an investigation into habitat choice for the Araneae of Svalbard

IDA HELENE FUNDERUD KALLEVIK

Alternative prey choice in the pteropod *Clione limacina* (Gastropoda) studied by DNA-based methods

HANNA-KAISA LAKKA

The ecology of freshwater crustacean: *Lepidurus arcticus* (Branchipoda; Notostraca) in a High Arctic region

BENTE SVED SKOTTVOLL

Threat or opportunity? Landscape genetics in a coal mining area



MARCH 2013
The Billefjorden-Adolfbukta project research group on their way to Billefjorden.
Photo: Janne Sævið/UNIS



FEBRUARY 2013
Bjørnehiet in Rijpfjorden lit up by the coast guard ship KV Svalbard, to help out the researchers working on land.
Photo: Malin Daase



ARCTIC GEOLOGY

BY HANNE H. CHRISTIANSEN, HEAD OF DEPARTMENT

In the geology department our research and education is focused on using the unique geology of Svalbard and its present-day cryosphere for geological and physical geography studies. We study the geological evolution of Svalbard as recorded in spectacular geological sequences spanning the Precambrian to the Cenozoic, and overlain by Quaternary glacial and interglacial deposits. Easily accessible outcrops make it possible to do research in the interplay of continental drift with tectonic, glacial, periglacial, coastal, fluvial and marine sedimentary processes. The close proximity of present-day geological, glacial, periglacial, marine and terrestrial processes provides an exciting field laboratory as the basis for our research and education. In the below sections the detailed research outputs from 2013 is presented.

Four bachelor courses, thirteen master courses and eleven PhD courses were held in 2013. For the first time we started running specific PhD courses, most of which were run jointly with the master course with the same title, but with some separate PhD and master activities. On average 15 students attended the master/PhD courses, but with variation from some courses being completely full with 20 students to some only having 5 students. In total 58 full student years have been taught in our department in 2013.

THE PEOPLE

During 2013 the department has consisted of eight full time faculty positions, five professors and three associate professors, and nine adjunct positions. Also five externally funded post docs and 15 primarily externally funded PhD students have been part of our department in 2013. Five PhD students have successfully defended their theses during 2013. In addition we supervised 21 master students. Hanne Christiansen was appointed as new department leader from August 2013.

THE RESEARCH

Glaciology

Doug Benn conducted exciting research on the dynamics of calving glaciers as part of the Conoco-Phillips / Lundin funded project CRIOS (Calving Rates and Impact on Sea Level). The CRIOS team, including UNIS adjunct professors Nick Hulton and Adrian Luckman (Arctic geophysics), UNIS post docs Faezeh Nick and Sue Cook, UNIS PhD student Heidi Sevestre, and other project partners from Norway, Denmark, UK and the Netherlands, made detailed observations of ice motion and calving on Kronebreen, a fast-flowing glacier near Ny-Ålesund. In collaboration with Professor Bryn Hubbard (University of Aberystwyth) and Wim Boot (University of Utrecht), the team drilled 300 m through the glacier and installed wireless water pressure sensors at the glacier

bed. Together with precision GPS measurements of glacier motion and high resolution satellite image analysis, the data are being used to develop and calibrate new numerical models of subglacial hydrology and ice flow. Both Sue and Faezeh published papers on modelling calving, in *The Cryosphere and Nature* respectively. The latter paper calculated future dynamic mass losses from the Greenland Ice Sheet, which were used as input for sea-level rise predictions in the Fifth Assessment Report of the IPCC.

As part of her PhD project Heidi Sevestre compiled the first comprehensive global database of surging glaciers, and carried out statistical analysis of the factors controlling their distribution. She presented preliminary results to the Nordic Branch of the International Glaciological Society in Finland, and the American Geophysical Union in San Francisco. She also conducted systematic ground-penetrating radar surveys of Svalbard surging glaciers, to determine their thickness and thermal structure. Glaciology teaching at UNIS also received a boost in 2013. Applications for the glaciology course AG-325/825 were so high that separate classes for Masters and PhD students had to be created, allowing a total of 40 students to enjoy the unique experience of studying glaciers and glaciation in Svalbard. The 2013 summer was notable for its poor weather. Students attending the AG-340 field camp course endured the worst of it: high winds and rainfall more typical of Bergen than Spitsbergen. The August rainfall totals at Longyearbyen Airport were therefore 2.6 times the average, caused by the transfer of warm, wet air from the southwest. Unsurprisingly, students measuring the melting upon the Foxfonna ice cap recorded the greatest melt losses since records began there in 2007. However, it was not just the summer that contributed to this loss because very low accumulation was observed during the previous winter.

Permafrost and periglacial geomorphology

In 2013 a winter snow mobile based hand drilling campaign was carried out as part of several research project activities in Adventdalen and at Kapp Linné. The campaign was coordinated by PhD student Stefanie Härtel, the EU PAGE21 project and Markus Eckerstorfer, the PermaSAR project coordinator from Norut, but also as part of our DEFROST Nordic Centre of Excellence activities. More than 35 m of permafrost cores were obtained from 20 locations down to 2.8 m depth for detailed cryostratigraphical and basic sedimentological studies.

We ran a UNIS PhD course AG-833 "High Arctic Permafrost landscape dynamics in Svalbard and Greenland" in cooperation with the Center for Permafrost, CENPERM, University of Copenhagen, and as key part of the Nordic permafrost network Perma-Nordnet. 10 Nordic PhD and advanced master students travelled to the research station Zackenberg in NE Greenland. Here they studied the periglacial landscape development based on the extensive

MAY 2013

View of Kronebreen, Kongsfjorden.

Photo: Nick Hulton/UNIS

basis monitoring going on, but also comparing permafrost conditions in NE Greenland to Svalbard. The first full year of permafrost thermal regime data from different landforms in the Zackenberg valley was recovered and first analyses performed during this course.

A detailed analysis of the cryostratigraphical and sedimentological conditions in the top 60 m of Quaternary sediments obtained from a permafrost core from lower Adventdalen is being analysed in a master thesis project by Graham Gilbert. This work is part of the Longyearbyen CO2 Laboratory project activities. An international working group with 12 scientists is studying various topics in this core, and a workshop to coordinate the investigations and plan for combining the results, were held at CENPERM, University of Copenhagen in November.

Snow research in the Longyearbyen area and geomorphological mapping in the Kapp Linné area were the topic of two master theses by Wesley Farnsworth and Sara Cohen successfully defended in 2013. One master student, Stefano Ponti, collected a full growing season CO2 flux measurements at different vegetation and soil types in Adventdalen.



MARCH 2013
The weather station on Knoppbreen has been visited by a polar bear.
Photo: Heidi Sevestre/UNIS

Terrestrial Quaternary geology

The ConocoPhillips/Lundin Arctic Research Program funded Icebound project started with successful fieldwork in Hornsund and on Bjørnøya. The project generated international collaboration with the Bjerknes Centre for Climate Research at University of Bergen, the Lamont-Doherty Earth Observatory, USA, and the New York State University at Buffalo, USA, in order to allow for the highest quality of cosmogenic nuclide dating results. The collaboration with Jostein Bakke and Henriette Linge at Bjerknes Centre for Climate Research at University of Bergen was intensified and Master and PhD students are working on high-resolution lake sediment records from Bjørnøya, Amsterdamøya and in Krossfjorden as well as the chronology of the last deglaciation in Hornsund.



JULY 2013
MSc student Stefano Ponti measures CO2 flux in Adventdalen.
Photo: Eva Therese Jeissen/UNIS

Anne Hormes became co-leader of the PAGES Arctic 2k workgroup together with Jostein Bakke (Bjerknes Centre for Climate Research) in December. PAGES is a core project of the International Geosphere-Biosphere Programme (IGBP) and funded by the U.S. and Swiss National Science Foundations bringing more than 6,000 scientists together in the field of past global changes. The Arctic 2k working group generates and synthesizes high-resolution palaeoclimate data in order to assess the spatiotemporal variations of Arctic climate during the last 2,000 years. The Pages Arctic2k workgroup will focus in the next three years on high-resolution hydroclimate records in addition to adding high-resolution temperature records covering the last 2000 years to the existing database hosted by NOAA.

Ólafur Ingólfsson started as a new professor in Quaternary geology in June 2013. Ingólfsson was a full-time staff member in 2000-2003 and adjunct professor at UNIS until 2013. His research focuses on Quaternary terrestrial geology. In summer he started fieldwork in St Jonsfjorden, Svalbard in collaboration with Riko Noormets, studying the morphological fingerprints of Neoglacial oscillations as expressed by glacial landforms and sediments, both terrestrial and marine. A detailed mapping of the seafloor was undertaken during one week of surveying, and later lateral moraines close to Piriepynten were visited for mapping and sampling. He also studied the foreland of Nordenskiöldbreen, in particular the subglacial sediments and landforms exposed by the retreating glacier. Nordenskiöldbreen is a polythermal glacier, and one of the very interesting features being exposed in its forefield is a small drumlin field. These were studied, with the help of UNIS students. Most of the autumn he devoted his time to writing up final results of the Arctic Paleoclimate and its Extremes (APEX) programme that will be published in a special volume of Quaternary Science Reviews in 2014.

Marine geology

In 2013, Riko Noormets' research on the reconstruction of the Svalbard-Barents Sea Sheet and the natural seabed seeps (one of the major contributors of carbon gases to the atmosphere), focused on the northern and eastern Svalbard margins together with colleagues from the Universities of Cambridge, St. Andrews and Tromsø. PhD students Teena Chauhan and Sri Kumar Roy continued their research on the glacial-interglacial changes along the northern Barents Sea margin and the natural seabed seeps in Svalbard, respectively. Teena participated in the ResClim AMGG (trainee school in Arctic marine geology and geophysics in Tromsø) activities. Sri Kumar's research was closely linked with the ConocoPhillips-Lundin funded "Barents Sea Seeps and Source Rocks" project and the UNIS CO2 Lab.

A new EU 7th Framework Program funded Marie Curie Initial Training Network GLANAM (Glaciated North Atlantic Margins) kicked off in 2013. The multi-partner ITN comprises ten partner institutions, both academic and industrial, from Norway, UK and Denmark, and will train fifteen Early Stage Researchers and Experienced Researchers. A new PhD student in marine geology, Oscar Fransner, started at UNIS as part of this network. Anne Flink, who finished her MSc thesis on the dynamics of a surging glacier margin at Tunabreen (UNIS and Stockholm University), carried on her research on the glacial evolution of Svalbard as a PhD student at UNIS and University of Bergen. She is also affiliated with the GLANAM network. In addition, PhD students Emilia Piasecka (University of Tromsø) and Katharina Streuff (Durham University) are affiliated to UNIS through projects studying the Svalbard and Barents Sea margins.

Peter Hill and Jorina Schütt continued their MSc projects on the iceberg plough marks in the Barents Sea and on the modelling of the Late Weichselian ice sheet dynamics on Svalbard, respectively

at UNIS and Stockholm University. David Burton (SPRI-Scott Polar Research Institute, University of Cambridge) investigated the glacier dynamics in Krossfjorden using submarine landform record in collaboration with Riko Noormets. Undergraduate student Paul Rhodes (UNIS and Scottish Association for Marine Science) studied the depositional environments and Holocene climate shifts in Adventfjorden.

The ConocoPhillips/Lundin funded "Barents Sea Seeps and Source Rocks" project studied seabed seeps in Isfjorden and Storfjorden. The new marine acoustic instrumentation was successfully deployed to study the natural seabed seeps as well as landforms and subsurface sediment structure in several, previously unmapped fjords in eastern and western Spitsbergen as well as on Barentsøya. These data will be used to constrain the distribution and origin of natural seeps in Svalbard as well as to better understand their role in the global climate system. The data will also contribute to several MSc and PhD projects studying the glacial and climate evolution in Svalbard and the northern Barents Sea.

Basin analyses and resources in the Arctic

Snorre Olausen and Alvar Braathen's focus this year has been on further developing major projects such as the UNIS CO2 lab and the "Geological Input to Carbon Storage" together with colleagues from UNIS and other research groups. From the latter project, Kei Ogata finished his post doc in October 2013, moving on to the University of Parma, Italy. At the same time, UNIS/University of Bergen PhD student Kim Senger impressively defended his PhD thesis.

The newly initiated four-year project; "Lower Cretaceous clastic wedges in the Northernmost Atlantic" (LOCRA <http://locra.uis.no/>), which is managed as a joint R&D project between UNIS (Snorre Olausen) and University in Stavanger (Professor Alejandro Escalona) is now supported by 20 oil companies. Three post doc and four PhD positions are hitherto recruited. These positions are currently covering the topics; biostratigraphy (GEUS), sequence stratigraphy (UNIS), geophysical mapping of the greater Barents Sea (UNIS, University of Stavanger and Moscow State University), basin fill in the Barents Sea and the conjugate north Atlantic margins (Univ. Copenhagen, UNIS) and plate reconstruction (University of Stavanger, and Geophysical institute, Austin, Texas). In addition there are five master students linked to the project. Snorre Olausen is responsible for one of the five work pages; WP2 Petroleum Systems, within the new Norwegian Research Council funded Center for Arctic Petroleum Exploration (ARCEX; <http://www.arce.no>) hosted by University of Tromsø. This is a joint R&D project with Norwegian universities, research institutions and international partners, strongly supported by the industry.

The Upper Triassic to Middle Jurassic basin fill; the Fasena project on the Barents Sea, and two projects which aim at improving the knowledge of the Upper Paleozoic carbonate system in the Arctic (led by adjunct professor Lars Stemmerik), have acquired large surveys of LIDAR data. This work was undertaken together with extensive field work on the east coast of Spitsbergen and in the Billefjorden area.



STUDENT PHOTO COMPETITION
This picture won 2nd place in the category "Fieldwork" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Robert Pfau

The Research Council of Norway (RCN) rewarded a Petromaks2 project, the "Triassic North", late in 2013. This project starts in 2014 and finishes in 2017. Partners in the activity is University of Oslo, University of Bergen and UNIS, in collaboration with institutes and international universities, and backed by Norwegian industry.

Maria Jensen continued work on both modern as well as ancient tidally influenced sedimentary systems. The project "Sedimentology of a High Arctic Tidal Flat" focused on understanding depositional patterns and links to forcing mechanisms in the Braganzavågen tidal flat, inner Van Mijenfjorden.

Matt Strzelecki spent a year at UNIS from summer 2012 to summer 2013 as a visiting scientist on the Yggdrasil Mobility Programme funded by the RCN on the project "HACOSE- Multitemporal analysis of High Arctic Coastal Systems Evolution - Braganzavågen and Bjonapynnten, Svalbard".

Ancient tidally influenced systems were studied in the Firkanten Formation, through an MSc project by Anna Stella Gudmundsdottir (UNIS and University of Gothenburg) in collaboration with Store Norske coal company, and in the DeGeerdalen formation and Aspelintoppen Formation by UNIS PhD student Berit Husteli (funded by the "Geological Input to Carbon Storage project"). Her work is focused on providing input data on the complexity of tidal deposits in reservoir models, and has combined field studies from several localities on the DeGeerdalen Formation and some examples from the Aspelintoppen Formation.

GRADUATES 2013

PHD DEGREE:

MARKUS ECKERSTORFER

Snow avalanches in central Svalbard: A field study of meteorological and topographical triggering factors and geomorphological significance

ENDRE FØR GJERMUNDSEN

Quaternary glacial history of northern Spitsbergen, Svalbard; cosmogenic nuclide constraints on configuration, chronology and ice dynamics

JAKUB MAŁECKI

The present-day state of Svenbreen (Svalbard) and changes of its physical properties after the termination of the Little Ice Age

KIM SENGER

Impacts of Geological Heterogeneity on CO₂ sequestration: from outcrop to simulator

TATSUYA WATANABE

Dynamics and Variability of Patterned Ground at a Continuous Permafrost Site, Central Svalbard

MASTER DEGREE:

SARA COHEN

Geomorphological studies of a karst system in a permafrost environment at Linnédalen, western Spitsbergen.

Sarah Eccleshall

Dating the Kapp Ekholm Site: A multi-method luminescence approach to reconstructing the glacial history of Svalbard

THOMAS ERIKSEN

Tidal Flat Sedimentation in an Arctic Environment - A Field Study from Braganzavågen, Spitsbergen

WESLEY R. FARNSWORTH

The Topographical and Meteorological Influence on Snow Distribution in Central Svalbard: How the spatial variability of snow influences slope-scale stability, permafrost landform dynamics and regional distribution trends

ANNE FLINK

Dynamics of surging tidewater glaciers in Tempelfjorden, Spitsbergen

KATHRIN NAEGELI

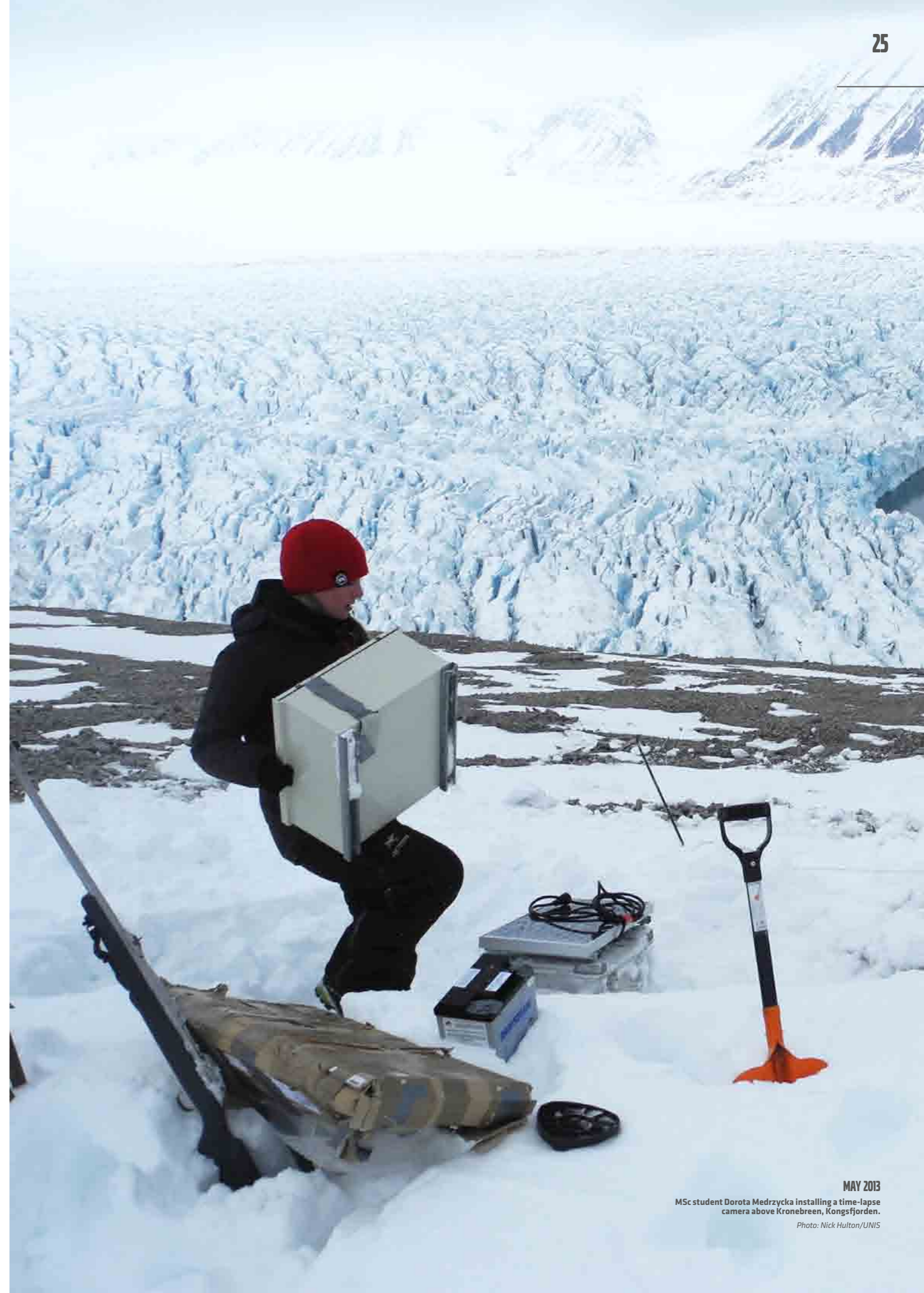
Investigation of state and changes in drainage system, thermal structure and dynamics of Tellbreen, a High Arctic glacier on Svalbard, using glacio-speleology

EVANGELINE SESSFORD

Spatial and temporal analysis of Holocene coastal development: Applications to erosion assessment and cultural heritage mitigation in Svalbard

TORGEIR O. RØTHE

Holocene glacier fluctuations reconstructed from the distal glacier-fed lake Kløsa, at Mitrahavøy, Spitsbergen



MAY 2013
MSc student Dorota Medrzycka installing a time-lapse camera above Kronebreen, Kongsfjorden.

Photo: Nick Hulton/UNIS



APRIL 2013

AGF-211 students measure the permeability of the sea ice in Raudfjorden, northwestern Spitsbergen.

Photo: Juni Vaardal-Lunde/UNIS

ARCTIC GEOPHYSICS

BY FRANK NILSEN, HEAD OF DEPARTMENT

Teaching was conducted at both the undergraduate and graduate level, with six courses in each level. An important part of all courses is the fieldwork, which allows the students to actively carry out research in the field. During 2013 the department has carried out several courses with teaching of field method on glacier, in the surface boundary layer over land and sea ice, at the Kjell Henriksen Observatory (KHO) and on two scientific cruises around Svalbard. The data collected are then typically used in course reports, giving the students valuable experience in analysing and presenting scientific data in a coherent manner.

THE PEOPLE

The department has in total seven full time faculty positions, and conduct research within physical oceanography, chemical oceanography, cryosphere, meteorology, middle- and upper polar atmosphere. The department also consists of eight adjunct professors, as well as one researcher (oceanography), one post doc (middle polar atmosphere) and four PhD students (upper polar atmosphere, middle polar atmosphere, cryosphere and physical oceanography). In order to offer relevant full term combinations of courses within the department, and to strengthen the research strategies, we have two dedicated research groups within the department: The Space Physics Group and the Air-Cryosphere-Sea Interaction Group.

THE RESEARCH

The Space Physics (SP) Group

In March 2013 the Birkeland Centre for Space Science was officially opened. The SP group at UNIS is a part of this Centre of Excellence – the first centre in space physics in Norway. The centre has a ten-year life span, and provides the SP group a secure foundation within research collaboration and funding as well as increasing its international profile. The centre's main research focus is how Earth is connected to Space. The SP group's key strength with regards to the centre is our vast experimental background and our state of the art research facilities.

During 2013 the SP group has signed contracts with the University of Leicester and the University of Saskatchewan for constructing a new SuperDARN radar facility in the vicinity of Longyearbyen. The project is funded by ConocoPhillips and Lundin and is currently funded until 2017. The radar will make continuous measurements of the plasma flow patterns in the upper atmosphere that are controlled by the interaction of the Sun's magnetic field with that of the Earth. It will form part of a global network of 32 radar systems operated by institutions from nine countries and will make Norway part of this international radar community. Members of the SP group attended the annual SuperDARN workshop held

by University of Saskatchewan in Canada. Whilst at this meeting the group was successful in its bid to hold the 2014 SuperDARN workshop at UNIS.

SPEAR is a research facility owned and operated by the SP group. It artificially perturbs the ionosphere so that scientists can measure on the effects of these perturbations. In essence, it mimics the energy input of the sun into the ionosphere, but on a much smaller scale. In 2013, a large multi-instrument campaign was carried out in collaboration with University of Tromsø, the Polar Geophysical Institute (Russia), the Arctic and Antarctic Research Institute (Russia), the Institute of Radio Astronomy (Ukraine) and the Inter-American University (Puerto Rico). The science focus of the campaign was the generation of artificial plasma turbulence where a large base of core space physics instrumentation such as the EISCAT radars, SuperDARN radars, ground magnetometers and HF interferometers, in addition to satellite instrumentation were employed.

Activity at the Kjell Henriksen Observatory ([HYPERLINK "kho.unis.no" kho.unis.no](http://kho.unis.no)) has been high in 2013. The campaign season has been good with many clear nights and intense aurora activity. Her Royal Majesty Queen Sonja of Norway visited KHO with friends in February. Together with the Governor of Svalbard she inspected key scientific instruments and learned about the dayside aurora and airglow.

A complete status report of the observatory has been delivered to the Norwegian Office of the Auditor General as part of their investigation and exploitation of arctic research infrastructure in the period 2006-2012. The publication rate was found to be close to 1.5 peer review paper per month and 14 PhD students have graduated in the period using data from KHO. KHO is now more or less fully automated. In addition, all the 77 rooms of KHO are now secured by an automatic fire extinction system. In August, the Space Physics group launched its first Quadrocopter including own sensors. The group's mobile phone Auroral forecast has reached over 10 000+ downloads at Goggle Play, while the numbers for the iPhone and Windows platforms are not known. and the UNIS contribution was research on the impact of aerosols on glacier ice melt.

The Air-Cryosphere-Sea Interaction (ACSI) Group

During autumn 2013, the ACSI group acquired two remotely piloted aircraft systems (RPAS) called "Small Unmanned Meteorological Observer" (SUMO). The SUMOs will be used for research within boundary layer meteorology and for fieldwork in courses such as AGF-350/850, AGF-211, AGF-212 and AGF-213. The SUMO system is developed by the German company Lindenberg und Müller GmbH & Co. KG and has already been used during several

international field campaigns by other institutions. An extensive operation manual for the SUMO system has been submitted to the Norwegian civil aviation authorities for operation permission. The SUMO system is currently being upgraded to include a fast temperature sensor that together with a flow sensor will allow for the determination of turbulent sensible heat fluxes. The system is thereby able to contribute with for example measurements of heat fluxes over polynyas and leads, which is an important research topic within the ACSI group. The group also has a portable weather station equipped with the same hardware and sensors as the SUMO aircraft. This will be mounted on a snowmobile or a car to make transect measurements. Like the SUMO, the scientific equipment is intended for both research and education purposes.

In the field of snow- and ice processes, methods and tools to investigate the transport of any kind of passive tracer inside polythermal ice sheets are being developed. This is an important step to model the whole $\delta^{18}O$ cycle. Observations and measurements of stable water isotopes in climate archives can help to decipher and reconstruct climate change and its regional variations. For the cryosphere, the $\delta^{18}O$ cycle in the current generation of Earth-System-Models is missing and an efficient and accurate tracer transport scheme is required. A submitted paper from the ACSI group describe ISOPOLIS 1.0 a modular semi-Lagrangian transport scheme of second order accuracy which is coupled to the polythermal and thermomechanical ice sheet model SICOPOLIS (version 2.9). Model skill is demonstrated by experiments with simplified ice sheet geometry and by comparisons of simulated ice cores with data from Greenland (GRIP) and Antarctica (Vostok). Collaboration between the ACSI group and Alfred Wegener Institute is established in order to further develop passive tracer method for the Greenland ice sheet margins. The method will be used to investigate how old the ice is at the Greenland margin and where it is coming from.

The ACSI group is involved in research projects related to physical and chemical oceanographic- and sea ice data collection in fjord and shelf areas around Svalbard, in the Greenland Sea, Eurasian basin and the Barents Sea (REOCIRC, UNDER-ICE, and GrønnBille - Research Council of Norway), AWAKE-2, Polish-Norwegian Research Fund. Oceanographic data have been used to study the dynamic of the West Spitsbergen Current and its effect on the water mass and sea ice distribution in Fram Strait and the Arctic Ocean. Based on the long-time hydrographic monitoring program conducted in selected Arctic fjords in Svalbard by UNIS, new knowledge on shelf-fjord exchange processes in Arctic fjords was presented at conferences and workshops. The second stage of the Polish-Norwegian collaboration (AWAKE-2) is initiated with a dedicated ocean monitoring program along the western Spitsbergen shelf and fjords. Hornsund is used as an earth system science laboratory and the ACSI group is responsible for the air-sea-ice interaction- and chemical oceanography program. Hydrographic measurements were taken in Hornsund during the student cruise in September and will be used to calculate the freshwater content in the fjord. Moreover, water samples were collected at each station and analysed for $\delta^{18}O$. The $\delta^{18}O$ values will be used to distinguish between the different fresh water sources (glacier melt, runoff from land or sea ice melt).

The ACSI group is leading the Research Council of Norway project Remote Sensing of Ocean Circulation and Environmental Mass Changes (REOCIRC), and a kick-off meeting with the project partners (Nansen Environmental and Remote Sensing Center and Polar Science Center, University of Washington, USA) started the project in May 2013. We have recruited a PhD candidate and in September 2013, the REOCIRC team started the monitoring program of the West Spitsbergen Current crossing the Yermak Plateau on the north-western corner of Spitsbergen. Analysing existing oceanographic data from the eastern Fram strait, purchasing scientific equipment, and constructing mooring equipment for the moorings that will be deployed in 2014, have been the main project task during autumn 2013. The main objective in REOCIRC is to study the Absolute Dynamic Topography (ADT) of the West Spitsbergen Current by taking advantage of satellite gravimetry (GOCE) and altimetry, and provide ground truth observations for satellite gravity solutions (GRACE) from in situ ocean bottom pressure measurements.

GRADUATES 2013

MASTER DEGREE:

STEFAN MUCKENHUBER

A quantitative description of the West Spitsbergen Current by using altimetry

INGRID HUSØY ONARHEIM

Interaction of Atlantic Water and Sea Ice West and North of Svalbard



FEBRUARY 2013

H.M. Queen Sonja visits the Kjell Henriksen Observatory. From left: Master student Henrik Bjørklund, post doc Margit Dyrland, adjunct assoc. professor Pål Brekke, H.M. Queen Sonja, director Ole Arve Misund, assoc. professor Lisa Baddeley, professor Dag Lorentzen, PhD candidate Silje Eriksen Holmen, professor Fred Sigernes and PhD candidate Xiangcai Chen.

Photo: Pål Brekke/UNIS



APRIL 2013

AGF-211 students take a break from science and try their luck fishing in Palanderbukta, Nordaustlandet.

Photo: Juni Vaardal-Lunde/UNIS



SEPTEMBER 2013

PhD candidate Pernilla Carlsson at the regional "Forsker Grand Prix" in Tromsø, where she won 2nd place for her talk about toxins in food. She also participated in the national finale in Oslo.

Photo: Eva Therese Jenssen/UNIS

ARCTIC TECHNOLOGY

BY JAN OTTO LARSEN, HEAD OF DEPARTMENT

The Department of Arctic Technology conducts research in:

- The mechanics of ice and its influence on offshore structures related to oil and gas exploitation
- Environmental chemistry related to current and potential pollution problems and impact on the environment
- Geotechnical engineering related to foundation of infrastructures in frozen ground and the expected effects of climate change. Coastal erosion processes concerning infrastructures as harbours, pipelines and buildings located at shoreline. Natural hazards protection for Arctic infrastructures
- Arctic Hydrology in studying water discharge in rivers connected to retreating glaciers
- Rock Mechanics and Engineering Geology
These research activities generate material for courses offered in all five areas given at the Bachelor, Master's and PhD levels, giving students a good opportunity to study both the theoretical and practical aspects of Arctic technology.

THE PEOPLE

In 2013 the department consisted of one professor, two associate professors, one research associate, two post docs, four PhD candidates, six adjunct professors, and one adjunct technician. Jessica Lorraine Bosch was employed as full time technician in July 2013.

THE RESEARCH

Ice mechanics

The ice mechanics section had five full-time researchers during 2013: Professor Aleksey Marchenko, Post Doc Anatoly Sinitsyn, PhD candidates Aleksey Shestov, David Wrangborg and Renat Yulmetov. Professor Sveinung Løset at NTNU has an adjunct position. Aleksey Marchenko is leader of work package 1 in the "Sustainable Arctic Marine and Coastal Technology" (SAMCoT) project, entitled "Data collection and process modelling" (2011-2019), and Jan Otto Larsen has been the co-leader of WP 1.

In 2013, in-situ tests on compressive and bending strength of sea ice in Van Mijenfjorden, in the Barents Sea and on lake ice in Longyearbyen area. Experiments of thermal expansion of saline and fresh ice in cold laboratory and investigation of internal stresses in sea ice in coastal zone of Van Mijenfjorden were performed. The project also made measurement of ice

pressure on coal quay in Kapp Amsterdam (Svea), oceanographic measurements (sea currents profiling, CTD, turbulence in ice adjacent water layer, tracking of surface currents and drifting ice) in Isfjorden, Van Mijenfjorden and in the Barents Sea. Part of the project was also numerical simulations of thermodynamic consolidation of sea ice ridges and icebergs drift. In the project SMIDA, investigations of tidal currents and spectral characteristics of natural oscillations in fjords of Western Spitsbergen were performed. Nataly Marchenko prepared the report "SAMCoT GIS development of Oceanographic data" as overview of the work for the SMIDA project. She took care of the Russian students coming to UNIS, guest researchers and expeditions for students, workshops and organized and participated in field work.

Renat Yulmetov developed a model of iceberg drift in broken ice based on contact dynamics method. The model is able to calculate trajectories, velocities and forces acting on an iceberg during free drift or towing. First half of 2013 he developed the model itself and built theoretical background behind. His last half year was dedicated to the development of the method of generation of initial conditions for the model. The numerical generator of ice field was implemented. The main principle is generation of random polygons and distribution them in space. Control over the size distribution is performed using scaling parameter for each floe which is random number itself. He developed a theory making it possible to control all the parameters at once automatically. The description of the algorithm is going to be a conference paper on IAHR 14.

David Wrangborg has focused on laser scanning of different coastal erosion processes and stress-strain deformation processes in ice flows.

Dr. Anatoly Sinitsyn participated in organizing the expedition with the ice breaker "Oden" for ice studies in Fram Strait between Spitsbergen and Greenland in August 2013 (OATREC 2013), and contributed in the course AT-307F "Arctic Offshore Engineering-Fieldwork" as co-supervisor.

Aleksey Shestov successfully defended his thesis in October. He has continued to work within SAMCoT project as a post doc and started the research work on loads against the floating quay in the Longyearbyen harbour. He has also contributed to the course work in AT-211 and AT-332/832.

Environmental technology

The environmental technology section was staffed by two full-time researchers during 2013, associate professor Mark Hermanson and PhD candidate Pernilla Carlsson. Professor Roland Kallenborn at NMBU, professor Bjørn Munro Jenssen at NTNU and Geir Wing Gabrielsen at Norwegian Polar Institute were adjunct professors in the section.

Mark Hermanson collected particle samples on the roof of UNIS building both as an instructional tool for students and as a research effort to identify temporal changes related to seasonal effects of air mass movements from urban-industrial areas to Svalbard. In cooperation with the Norwegian Polar Institute he has published results from contaminations in ice cores from Lomonosov glacier in Svalbard. Mark Hermanson is course responsible for AT-210 and AT-331/AT-831.

Professor Bjørn Munro Jenssen conducted the course AT-330 in March-April with 13 participating MSc students. In the course a field study was conducted where nest boxes for snow buntings (*Plectrophenax nivalis*) on the mining ropeway trestle along the Advent valley were utilized. The purpose of the field study was to collect feather samples from the nests to investigate the concentrations of heavy metals in the nest material, and apply this as a proxy for pollutant exposure along the ropeway. The samples were subsequently analysed for heavy metals and other elements at NTNU, and the results will be discussed by the students in the AT-330 course in 2014. Initially, the results could provide information on the geographic differences in environmental pollutant exposure in snow buntings in Adventdalen from Mine 7 and towards Longyearbyen. In turn, it will be possible to examine the relationships between pollutant loads in the nests and the nesting success in each nest.

In collaboration with Geir Wing Gabrielsen an MSc project was started. Two students examine levels of persistent organic

pollutants on the stress hormone corticosterone, the sex hormone progesterone and thyroid hormones in glaucous gulls (*Larus hyperboreus*) in Svalbard. Fieldwork was conducted in Ny-Ålesund during the summer of 2013.

Pernilla Carlsson successfully defended her PhD in environmental chemistry in November. Pernilla and Roland Kallenborn's outreach project "POP hunt in school", where pupils in the local school participated, was also finished this year. The pupils learnt about environmental chemistry and what scientists can work with. Pernilla participated in "Forsker Grand Prix" – a national competition for PhD candidates where they present their research in 4 minutes. She made it through the regional final in Tromsø and participated in the national final in Oslo.

The European Union funded ArcRisk project (Arctic Health Risks: Impacts on health in the Arctic and Europe owing to climate-induced changes in contaminant cycling) has also come to an end. Several of the research results were presented at Arctic Frontiers in January 2014, where Pernilla Carlsson was invited speaker.

Geotechnical Engineering and Natural hazard prevention

The section had one full time researcher: Associate professor Jan Otto Larsen. Professor Lars Grande at NTNU was as adjunct professor until July 2013 and then replaced by professor Arne Instanes.

Jomar Finseth was employed as adjunct technician and Anatoly Sinitsyn in a post doc position working on coastal erosion processes connected to SAMCoT.

Jan Otto Larsen continued the consulting work for Store Norske Coal Company in the Lunckefjellet mining project to protect tunnel entrances and rigs on both sides of the Martha glacier. He has also been involved in new guidelines for avalanche and slush flow protection of infrastructures



MARCH 2013
Researchers in the Centre for Research-based Innovation "Sustainable Arctic Marine and Coastal Technology" (SAMCoT) performing fieldwork in Svea.
Photo: Anatoly Sinitsyn/UNIS

MARCH 2013

AT-330/830 students have lunch break in Adventdalen.

Photo: Bjørn Munro Jenssen/UNIS



edited by SINTEF Byggeforsk in Oslo, and given input to the cooperation project NIFS (Natural hazards, infrastructures, floods and slides) in Norway. A one week seminar on slide- and avalanche protection was organized in September with 91 participants and lecturers from Switzerland, Austria, Canada and national organizations as NVE, JBV and NPRA. The seminar was organized as a part of the courses AT-301/AT- 801.

As member of the Engineering Geology Committee in the Transportation Research Board in USA he has also contributed to international cooperation in natural hazard prevention work. Locally, Larsen has given advice in different aspects of natural hazard prevention as safe planning in arctic environment and rebuilding of the Museum-road bridge.

Anatoly Sinitsyn has continued the research work on coastal erosion processes at Vestpynten (Svalbard) and Varandey (Russia) as part of the SAMCoT project work packages 1 and 6. He has also contributed to the course work in AT-205 and AT-301 and in laboratory work in AT-329.

Arctic hydrology

Professor Nils Roar Sælthun has had an adjunct position in 2013 to run the course AT-209. His education and research work has been performed at Kapp Linné investigating discharge in the Linné river from the Linné glacier.

Rock Mechanics

The Rock Mechanic section started in 2013 with one researcher, associate professor Zongxian Zhang. Zongxian Zhang started to cooperate with the mining company Store Norske. The research topics under discussion are (i) rock support, (ii) deformation and data treatment, (iii) cuttability in Lunckefjellet, (iv) capability. He continued his research in rock fracture and blasting. The contact with LKAB in Sweden and another mining company in Norway is going on. He is involved in the EU KIC team led by DTU in Denmark investigating mining in Greenland.

GRADUATES 2013

PHD DEGREE:

PERNILLA CARLSSON

Selective processes for bioaccumulative up-take of persistent organic pollutants (POPs) in Arctic food webs

LOUIS DELMAS

Spontaneous Avalanches released in Svalbard. Influence of Climate parameters on Snow Mechanical Properties

ALEKSEY SHESTOV

The Role of the Thermodynamic Consolidation of Ice Ridge Keels in the Seabed Gouging Process

SERGIY SUKHORUKOV

Ice-ice and ice-steel Friction in field and in laboratory

MASTER DEGREE:

ÅSE ERVIK

Experimental and numerical investigations of cantilever beam tests in floating ice covers

MAREN GARSJØ

Perfluorinated alkylated substances (PFASs) in Arctic char (*Salvelinus alpinus*) from freshwaters in northern environments: A case study from Svalbard, Norway

DAVID HORNER

Ice blasting technics

ANTONIA MARIA LINZBACH

Coastal erosion on Vestpynten, Svalbard - Engineering measures for Offshore Protection

**STUDENT PHOTO COMPETITION**

This picture won 1st place in the category "Nature" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Pieter-Jan D'Hondt



STUDENT PHOTO COMPETITION

This picture won 1st place in the category "Social life" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Robert Pfau



OCTOBER 2013

Minister Kristin Halvorsen (right) stopped by the student barracks in Nybyen and had coffee with the Student Council.

Photo: Eva Therese Jensen/UNIS



STUDENT PHOTO COMPETITION

This picture won 3rd place in the category "Social life" in the competition arranged in connection with the UNIS 20th anniversary in 2013.

Photo: Pieter-Jan D'Hondt



SELFIE OF THE YEAR?

AG-325/825 students in front of Tunabreen, Tempelfjorden, March 2013.

Photo: Heidi Sevestre/UNIS

STUDENT COUNCIL

BY VINCENT CARRIER, SC LEADER

Students from all over the world come to Svalbard to experience the high Arctic. The small community makes everybody know everybody and there is a close bond between students, staff and the local community. This relationship along with the astounding surroundings, the magic light and the unforgettable excursions make students come back year after year.

The Students Council (SC) members are elected in the beginning of each semester. The number of people with specific responsibilities within the SC is:

President (1); Vice-President (1); Board members (3); Treasurer (1); Vice-Treasurer (1); Kitchen Equipment Group (3); Student Equipment Group (10); Yearbook Group (1); Friday Gathering Group (6); Party Group (8) and Environmental Group (3). One representative from each group is present at the SC meetings.

In autumn 2013, the SC asked the students to evaluate the level of safety in the Arctic on private excursions. It has been revealed that students do not feel completely safe. Therefore, a new group (The Safety Group) will start in spring 2014 semester aiming to develop safety skills of students and be a complementary to UNIS' safety information. The SC also took the initiative to organize academic meetings including students representatives and staff leaders from all scientific departments. The purpose of these meeting is to upgrade different UNIS courses.

Social activities are arranged throughout the year, with Friday Gathering every week, dinners and so on. The ice-breaker parties are arranged at each start of the semesters to let new and old students get to know each other. Despite they are unusable at the moment; students have access usually to two cabins and a multitude of outdoor equipment, free of charge.

The SC is the main funding source for new outdoor gears, kitchen supplies and more. The students are able to get involved with the local community on numerous different levels. At Svalbardhallen many students participate in sports teams with the locals.

UNIS has also paid for student memberships to the snow scooter club "To-Taktern", so that the students have a garage to do repairs to scooters and sledges.

The Environment group students run the community thrift store known as "Bruktikken". Here you can donate your unnecessary stuff and take something home with you. In autumn 2013, this group also arranged the annual Longyearbyen charity flea market at UNIS with the Longyearbyen Local Council.

During both the light and dark period students are involved with the organization of the Dark Season Blues festival in October, the Polarjazz festival in February and the Sun festival in March. They are also involved in different organizations such the Longyearbyen choir and Svalbard Turn coaches.

The Students Council exists to support the UNIS students and to ensure that the student welfare is maintained. The students have representatives on the UNIS board (board representative and observer) and in the UNIS Leader Group. These representatives discuss topics that affect the students most and topics concerning the student view of UNIS as an institution. Student surveys are undertaken to get a more clear picture of the opinions about different aspects of the student life and a chance to contribute to the further growth and development of UNIS.

As a student representative you get an inside view of how UNIS is run and get to participate on most levels. Because of the interaction of past students representatives UNIS has become what it is today, from a student point of view.

UNIS remains a unique experience and a large majority of students would desperately like to come back.

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GUEST LECTURERS 2013

ARCTIC BIOLOGY

LAST NAME	FIRST NAME	INSTITUTION
Aars	Jon	Norwegian Polar Institute
Andresen	Steinar	University of Oslo, Norway
Berntsen	Roland	University of Tromsø, Norway
Blight	Clinton John	University of St. Andrews, UK
Brekke	Harald	Norwegian Petroleum Directorate
Bråthen	Kari Anne	University of Tromsø, Norway
Bårdsen	Bård-Jørgen	Norwegian Institute for Nature Research
Convey	Peter	British Antarctic Survey, UK
Cooper	Elisabeth	University of Tromsø, Norway
Cottier	Finlo	Scottish Association for Marine Science, UK
Coyer	James Allan	Cornell University, USA
Davidson	Jan Grimsrud	Norwegian University of Science and Technology
Descamps	Sébastien	Norwegian Polar Institute
Ehrich	Dorothee	University of Tromsø, Norway
Eikemo	Aksel	Directorate of Fisheries, Norway
Fedak	Michael Andre	University of St. Andrews, UK
Gjøsæter	Harald	Institute for Marine Research, Norway
Gulliksen	Bjørn	University of Tromsø, Norway
Hansen	Brage Bremset	Norwegian University of Science and Technology
Herstad	Bente	University of Oslo, Norway
Hop	Haakon	Norwegian Polar Institute
Janik	Vincent	University of St. Andrews, UK
Korsbrekke	Knut	Institute of Marine Research, Norway
Lindstrøm	Ulf	Institute of Marine Research, Norway
Lowther	Andrew	Norwegian Polar Institute
Lydersen	Christian	Norwegian Polar Institute
Maråk	Audun	The Norwegian Fishing Vessel Owners Association
Morata	Nathalie	National Center for Scientific Research, France
Pedersen	Åshild	University of Tromsø, Norway
Potts	Tavi	Scottish Association for Marine Science, UK
Primicerio	Raul	University of Tromsø, Norway
Reiersen	Lars-Otto	Arctic Monitoring and Assessment Programme, Norway
Reigstad	Marit	University of Tromsø, Norway
Sander	Gunnar	Norwegian Polar Institute
Shunatov	Natalia	St. Petersburg State University, Russia
Skartveit	John	NLA University College, Bergen
Sundet	Jan	Norwegian University of Science and Technology
Sunnanå	Knut	Institute of Marine Research, Norway
Svenning	Martin	Norwegian Institute for Nature Research
Søvik	Guldborg	Institute for Marine Research, Norway
Tandberg	Anne Helene	Institute for Marine Research, Norway
Tomkiewicz	Stanley	Telonic Inc., USA
Ulfstein	Geir	University of Oslo, Norway
Varpe	Øystein	Akvaplan-Niva, Norway
von Quillfeldt	Cecilie	Norwegian Polar Institute
Wenneck	Tomas de Lange	Institute for Marine Research, Norway
Weslawski	Jan Marcin	Institute of Oceanology, Poland
Wiig	Øystein	University of Oslo, Norway

ARCTIC GEOLOGY

LAST NAME	FIRST NAME	INSTITUTION
Alexanderson	Helena	Lund University, Sweden
Appleby	Peter Graeme	University of Liverpool, UK
Austin	William	University of St. Andrews, UK
Ballantyne	Colin	University of St. Andrews, UK
Burn	Chris	University of Ottawa, Canada
Brynjolfsson	Skafti	Norwegian University of Science and Technology
Burton	David James	University of Cambridge, UK
Cook	Susan	University of Edinburgh, UK
De Koeijer	Gelein Mainza	Statoil, Norway
Dowdeswell	Julian	University of Cambridge, UK
Eiken	Ola	Statoil, Norway
Eiken	Trond	University of Oslo, Norway
Goertz-Allmann	Bettina	NORSAR, Norway
Grette	Juile	University of Massachusetts Amherst, USA
Hald	Morten	University of Tromsø, Norway
Hansen	Louise	Norway's Geological Survey
Henriksen	Mona	Norwegian University of Life Sciences
Hock	Regine	University of Alaska Fairbanks
Hogan	Kelly Anne	University of Cambridge, UK
Hubberten	Hans	The Alfred Wegener Institute
Hulton	Nick	University of Edinburgh, UK
Husum	Katrine	University of Tromsø, Norway
Johansen	Tor Arne	University of Bergen, Norway
Johnsen	Helge	University of Bergen, Norway
Jonsson	Sverrir Adalstein	University of Iceland
Kaufman	Darrell	Northern Arizona University
Kirchner	Nina	Stockholm University, Sweden
Landvik	Jon	Norwegian University of Life Sciences
Laberg	Jan Sverre	University of Tromsø, Norway
Landro	Martin	Norwegian University of Science and Technology
Larsen	Eiliv	Geological Survey of Norway
Lehn-Nilsen	Espen	University of Bergen, Norway
Lind	Eva	Stockholm University, Sweden
Lovell	Harold	Queen Mary University of London, UK
Moorman	Brian	University of Calgary, Canada
Nakren	Hans Arvid	University of Oslo, Norway
Nicholson	Lidsey	University of Innsbruck
Nilsen	Alf	University of Bergen, Norway
Nilsson	Johan	Stockholm University, Sweden
Nowak-Zwierz	Agnieszka	Sheffield University, UK
Nøttvedt	Arvid	Christian Michelsen Research, Norway
O'Regan	Aaron Matt	Stockholm University, Sweden
Pfeffer	Tad	INSTAAR, USA
Powell	Ross	Northern Illinois University, USA
Preusser	Frank	University of Stockholm, Sweden
Retelle	Mike	Bates College, USA
Riis	Fridtjof	Norwegian Petroleum Directorate
Rubensdotter	Lena	Geological Survey of Norway
Rutt	Ian	University of Bristol, UK
Ruud	Bent Ole	University of Bergen, Norway
Schomacker	Anders	Norwegian University of Science and Technology
Spielhagen	Robert	GEOMAR, Germany
Tessier	Bernadette	Directory of Research and Technology, France
Tveranger	Jan	Centre for Integrated Petroleum Research, Norway
Vega	Carmen Paulina	University of Uppsala, SW
Werner	Al	Mount Holyoke College, USA

ARCTIC GEOPHYSICS

LAST NAME	FIRST NAME	INSTITUTION
Abermann	Jakob	Centre for Advanced Studies in Arid Zones, Chile
Asplin	Lars	Institute of Marine Research, Norway
Behlke	Riko	SvalSat, Norway
Berntsen	Terje	Department of Geosciences, University of Oslo, Norway
Bossert	Katarina Elizabeth	University of Colorado Boulder, USA
Bøggild	Carl Egede	Technical University of Denmark
Dagestad	Knut-Frode	Norwegian Meteorological Institute
de Lange	Tor	Geophysical Institute, University of Bergen, Norway
Finch	Ivan	Rutherford Appleton Laboratory, UK
Fortelius	Carl Gustav Emil	Finnish Meteorological Institute, Finland
Gjevik	Bjørn	University of Oslo, Norway
Greve	Ralf	Institute of Low Temperature Science, Hokkaido University, Japan
Haaland	Stein	Max-Planck Institute, Germany
Havnes	Ove	University of Tromsø, Norway
Hoppe	Ulf-Peter	Norwegian Defence Research Establishment
Howells	Victoria St.Clair	University of Bath, UK
Kosch	Mike	Lancaster University, UK
Kramer	Daniel	Finnish Meteorological Institute, Finland
LaCasce	Joe	University of Oslo, Norway
LaHoz	Cesar	University of Tromsø, Norway
Leppäranta	Matti	Division of Geophysics, University of Helsinki, Finland
Løvhaug	Pia	University of Tromsø, Norway
Mattila	Olli-Pekka	Finnish Environment Institute
Myking	Steinar	University of Bergen, Norway
Nilsen	Jan Even	Nansen Environmental and Remote Sensing Center, Norway
Olafsson	Kjartan Johannes	University of Bergen, Norway
Partamies	Noora	Finnish Meteorological Institute
Randelhoff	Achim	Norwegian Polar Institute
Sinisalo	Anna katarina	University of Oslo, Norway
Stober	Gunter	Leibniz-Institute of Atmospheric Physics, Germany
Strømme	Anja	National Science Foundation, USA
Taskanen	Eija Irene	Finnish Meteorological Institute, Finland
Tverberg	Vigdis	University of Nordland, Norway
Tyssøy	Hilde nesse	University of Bergen, Norway
Vaardal-Lunde	Juni	Multiconsult, Norway
Vaivads	Andris	Swedish Institute of Space Physics
Wiese	Mareike	University of Bergen, Norway

ARCTIC TECHNOLOGY

LAST NAME	FIRST NAME	INSTITUTION
Bartlett	Paul Wood	Saint Peter's University, New Jersey, USA
Beldring	Stein	The Norwegian Water Resources and Energy Directorate
Berggren	Anne-Lise	Geofrost AS, Norway
Bogen	Jim	Norwegian Water Resources and Energy Directorate
Bühler	Yves	WSL Institute for Snow and Avalanche Research SLF, Switzerland
Bøggild	Carl Egede	Technical University of Denmark
Chistiakov	Petr Vladimirovich	Institute of Mechanics of the Lomonosov Moscow State University, Russia
Ciesielski	Tomasz	Norwegian University of Science and Technology
Dierssen	Heidi	University of Connecticut, USA
Dowdall	Mark	Norwegian Radiation Protection Authority
Førland	Eirik	Norwegian Meteorological Institute
Goksøy	Anders	University of Bergen, Norway
Hellevang	Helge	University of Oslo, Norway
Hung	Hayley Hing Ning	Environment Canada, Science & Technology Branch
Hylland	Ketil	University of Oslo, Norway
Høyland	Knut Vilhelm	Norwegian University of Science and Technology
Instanes	Arne	Opticonsult, Norway
Issler	Dieter	Norwegian Geotechnical Institute
Jerkø	Jostein	Troms Kraft Produksjon AS, Norway
Karulin	Evgeny Borisovich	Krylov State Research Centre, Russia
Khan	Alia	University of Colorado, USA
Knutsson	Sven	Luleå Technical University, Sweden
Kühnel	Rafael	Meteorological Institute, Norway
Liferov	Pavel	Statoil, Norway
McClung	Dave	University of British Columbia, Canada
Muir	Derek C. G.	Environment Canada, Science & Technology Branch
Nord	Torodd Skjerve	Norwegian University of Science and Technology
Norem	Harald	Directorate of Public Roads, Norway
Onishchenko	Dmitry Arsenievich	Gazprom VNIIGAZ LLC, Russia
Outridge	Peter Macdonald	University of Manitoba, Canada
Radovanovic	Marija	University of Oslo, Norway
Rønning	Jan Steinar	Norway's Geological Survey
Sauermoser	Siegfried	University of Natural Resources and Life Sciences, Austria
Schuler	Thomas Vikhamar	University of Oslo, Norway
Skogseth	Terje	Norwegian University of Science and Technology
Sodhi	Devinder Singh	Cold Regions Research and Engineering Laboratory, USA
Stoffell	Lukas	WSL Institute for Snow and Avalanche Research SLF, Switzerland
Wendeler	Corrinna	Geobrugg AB, Switzerland
Wergeland	Sjur	Norwegian Meteorological Institute
Wold	Magne	SINTEF, Norway
Zolotukhin	Anatoly	Gubkin Russian State University of Oil and Gas

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THE UNIVERSITY CENTRE IN SVALBARD

CONTACT INFORMATION

The University Centre in Svalbard (UNIS)
P.O. Box 156 | N-9171 Longyearbyen
Norway

Phone: (+47) 79 02 33 00

E-mail: post@unis.no

Web: www.unis.no



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