KTH ROYAL INSTITUTE
OF TECHNOLOGY

Polar Research at KTH

Dag Avango & Sverker Sörlin
Division of History of Science, Technology and Environment

The Royal Institute of Technology, KTH

Sweden's largest technical research and learning institution:

- 13,000+ full-time students (one-third women).
- Close to 1,800 research students (one-third women).
- Around 3,500 full-time positions (one-third women).
- Four campuses in the Stockholm region
- Educate engineers and architects
  - Bachelors
  - Masters
  - Licentiates (also historians)
  - PhDs (also historians)

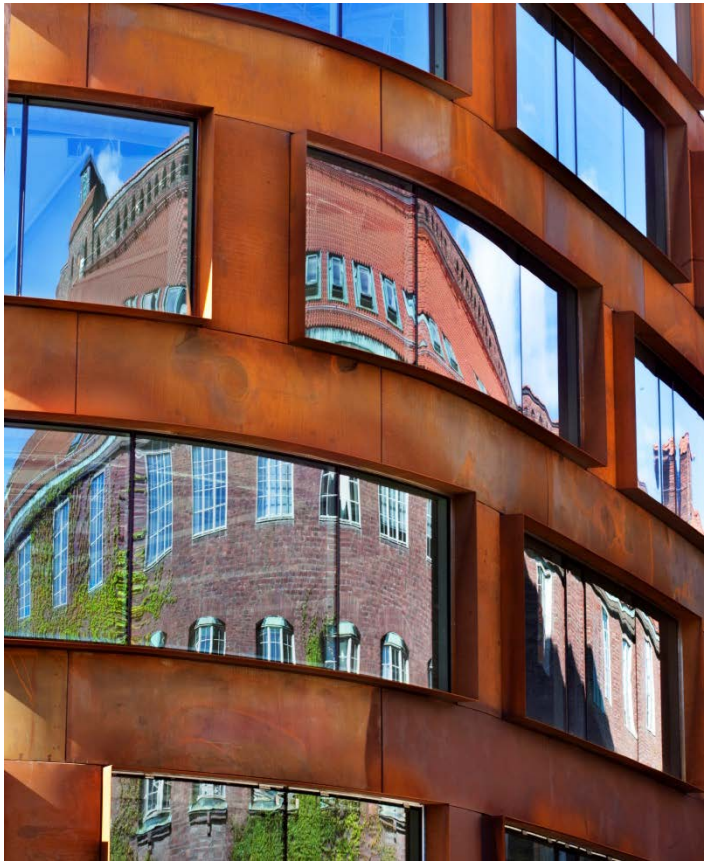
World-class ranking

QS World University Ranking

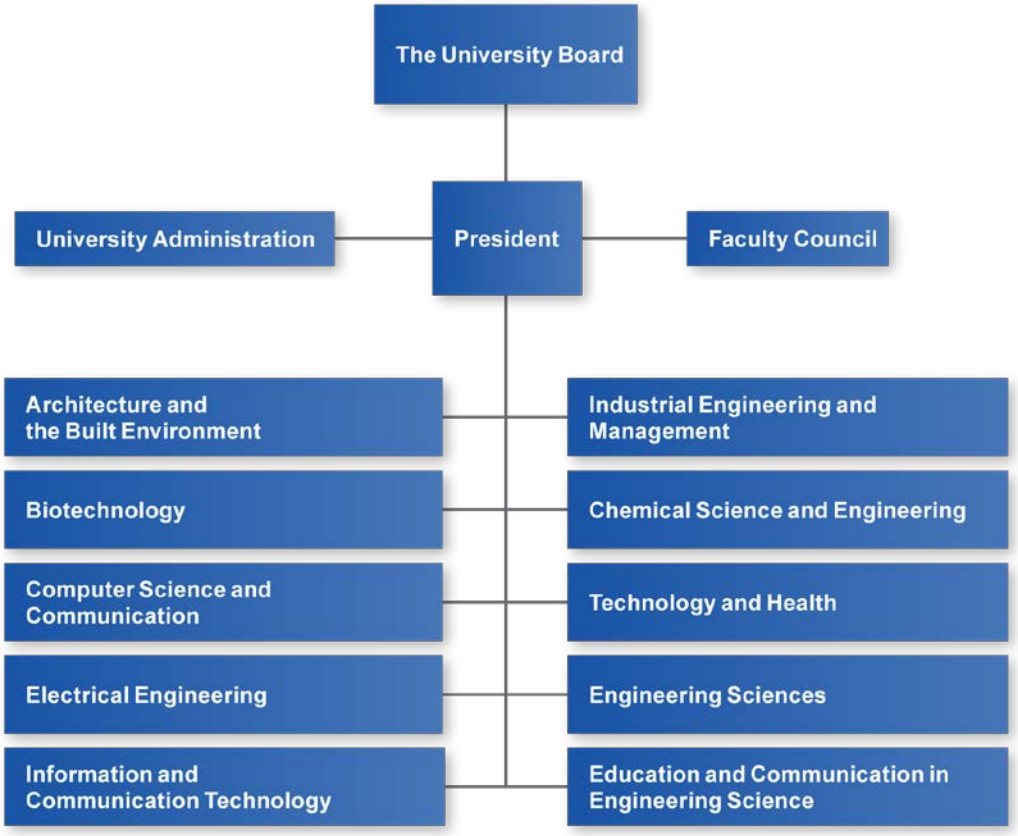
- 98th university in the world
- 23rd in Architecture and Built Environment
- 26th in Electrical Engineering
- 39th in Mechanical Engineering
- 39th in Materials Science

Times Higher Education (THE)

- 159th university in the world
- 36th in Engineering and Technology globally
- 72nd university in Europe



KTH's organisation



2013

Polar research at KTH
General

Carried out by

- Research teams at different departments across KTH
- Cluster of polar oriented research projects at the School of Architecture and Built Environment
  - Division of history
  - Div of Geodesy and Geoinformatics
  - Department for Industrial Ecology
- Nordic Centre of Excellence: REXSAC

Polar research at Department for Industrial Ecology, KTH

Key researcher

- Prof. Fredrik Gröndahl

Research:

- How to handle wastewater at Antarctic research stations
- Impact of human bacteria (e.g. e-Koli) on eco-systems in Antarctica
- Vertical migration of animal planktons in Arctic waters (based on material from the Ymer expedition)

Polar research at Div of Geodesy and Geoinformatics, KTH

Key researcher

- Prof Anna Jensen

Research:

- Challenges for positioning and navigation in the Arctic
  - Main focus on GPS/GNSS based positioning
  - Effects of the high latitude ionosphere on GPS/GNSS satellite signals

Arctic research at the Division of History of Science, Technology and Environment at KTH

About the Division of History, KTH

42 staff + visitors & affiliated

50% F, 50% M

>50% born outside Sweden

14 nationalities

8 publication languages (2015-2016; Diva)

Approx. 50 research projects

100% teacher/PhD ratio

25 research staff with PhDs, in

17 disciplines (majority in some branch of history), from

17 universities, in 9 countries

Genres: peer reviewed articles, books, essays, op ed pieces, film, podcasts

Polar research at the Division of history of Science, Technology and Environment, KTH

- Research projects with focus on the polar areas from the mid-1990's
- Education with a focus on the Arctic
- Social science and humanities
  - History
  - Archaeology
  - Heritage research
  - Cultural Anthropology
  - Human Geography
  - Literature and art studies

About the Division of History, KTH

Why history at an engineering university?

- Science and technology are part of our culture, shaping and changing environments and conditions for life on earth
- Historical studies are central for understanding contemporary society and for dealing with future changes

Focus: relation technology – environment – society

- Societal drivers behind technological change
- Consequences of technological changes for society and environment

Chairs

- History of technology
- Environmental history
- Industrial heritage (until 2010)

About the division of history, KTH

Fields of research / cores:

- Large technological systems (energy, military, resource extraction)
- History of science/STS (history of climate research, science-geopolitics)
- Media, digital infrastructures, communication
- Environmental Humanities Laboratory (environmental history, literary studies with environment orientation, political ecology)
- Cultural heritage research
- Research policy & higher education
- Polar Regions: science, technology, resources and politics

Polar research at the Division of history – part of a long term trend

- Polar research dominated by the natural sciences from 19th cent establishment phase through 20th cent
  - Reflected in the scientific focus of the International Polar Years (IPY 1882-83, 1932-33 and 1957-58)
- Rapid growth of humanities and social science oriented polar research in 1990's
- Established as siginificant polar research institution during the IPY 2007-2009
- Represented as a science within IASC and SCAR with standing working groups

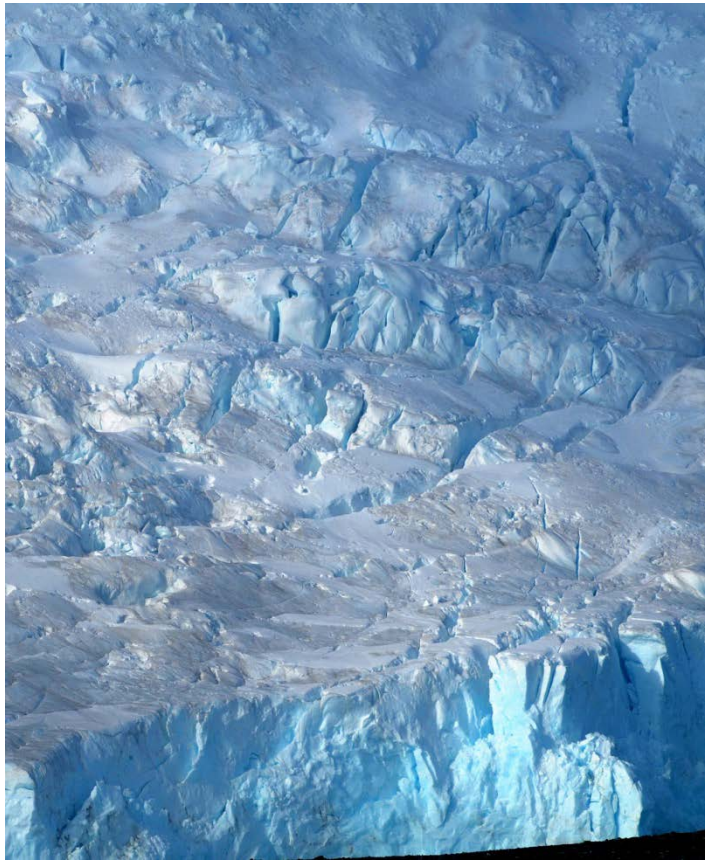
Polar research at the Division of History, KTH

- Main fields of research in the Polar Areas
  - Science, resource extraction and geopolitics
  - Social and environmental of such activities
- Interdisciplinary approach
- International collaborations
- A leading research environment in Sweden within these fields of academic inquiry

Polar research at the Division of History, KTH

Models, media and climate change in the Arctic

- Objectives, understand:
  - Historical development of climate modelling
  - Relation between models for climate- and ecosystem change and sustainable development policies
- Period: 2009-2012
- Funding: Formas
- Participants: S. Sörlin (PI), N. Wormbs, A. Nilsson, M. Christensen, D. Avango and P. Högselius
- Partners: SEI, SMHI



Polar research at the Division of History, KTH

The history of climate modelling, 1950–1972

- Objectives: explain the history of climate models in relation to computerization of geophysical research, funding policies and the politicization of geo-science
- Funding: through Stockholm Resilience Center and internal funds
- Participants: Sverker Sörlin (PI), M. Bohn
- Partners: Stockholm University

Polar research at the Division of History, KTH

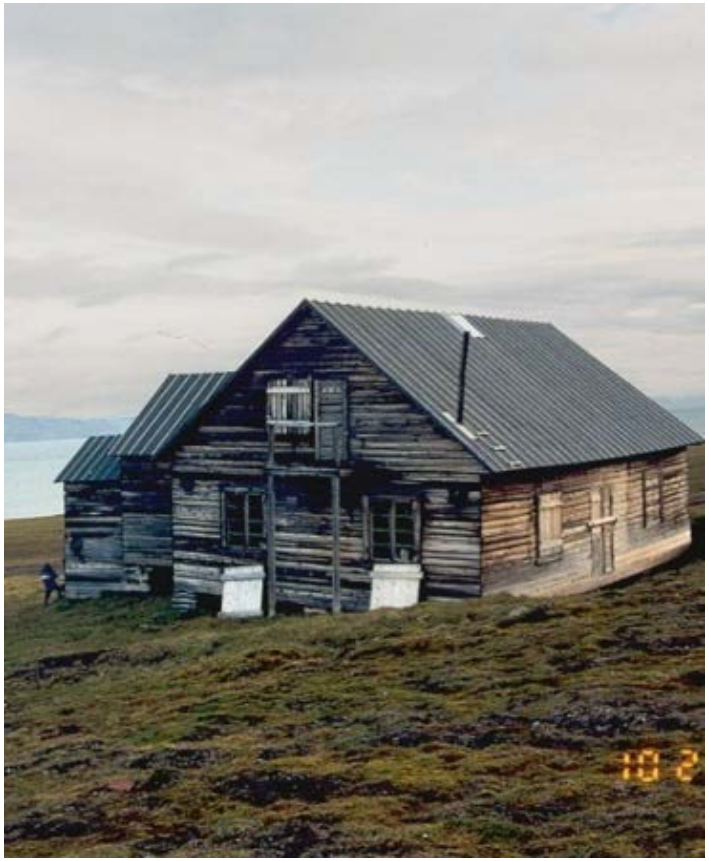
Arctic Norden: Science, Diplomacy and the Formation of a Post-War European North

- Objectives: Study formation of a Nordic Arctic, constructed by science, diplomacy and politics during the post-war period
- Funding: Tercentenary fund of the Swedish National Bank
- Participants: S Sörlin (PI), A. Houltz, P. Roberts, D. Avango
- Period: 2007–2010

Polar research at the Division of History, KTH

Polar Field Stations and IPY History: Culture, Heritage, Governance (1882–Present)

- Objective, understand:
  - Relation between polar science and geopolitics in polar areas
  - Role of field stations as nodes in this interaction
- Participants: Sverker Sörlin (PI), Michael Bravo
- Funding: IPY project
- Collaborations: Project within the framework of IPY 2007-2008



Polar research at the Division of History, KTH

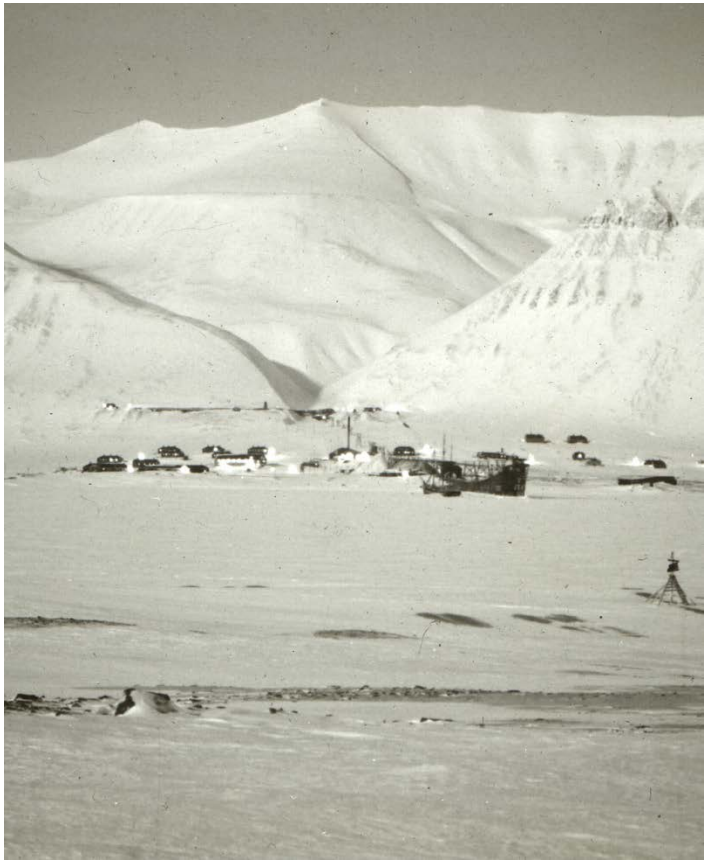
LASHIPA (Large Scale Industrial Exploitation of Polar Areas)

- Objectives, explain:
  - Development of resource exploitation in polar areas (1600-present)
  - Consequences for political situation & environment
- Funding: Science councils in Sweden, Netherlands, USA and Russia
- Participants (PI): L. Hacquebord (D Avango, V Starkov, P Martin)
- Period: 2007-2012 (IPY 2007-08)
- Multidisciplinary approach

Polar research at the Division of History, KTH

Sweden and the Origins of Global Resource Colonialism

- Objective: explore role of Swedish actors in global resource oriented colonialism, 1870-1990
- Focus on three arenas:
  - Arctic
  - Africa
  - Central and eastern Asia
- How did Swedish actors behave and why?
- Funding: Swedish Science council (VR) and Tercentenary fund of Swedish national bank (RJ)
- Participants: P. Högselius (PI), D. Avango, D. Nilsson, H. Vikström



Polar research at the Division of History, KTH

Arctic Futures in a Global Context

Funding: Mistra (Foundation for strategic environmental research)

Five projects

- Arctic Futures: Managing Competition and Promoting Cooperation (SIPRI)
- Arctic Games (Enveco)
- From Resource Hinterland to Global Pleasure Periphery (Umeå Univ)
- Preparing for and Responding to Disturbance: Arctic Lessons for Sweden (Umeå Univ)
- Assessing Arctic Futures: Voices, Resources and Governance

Period: 2011-2014

Polar research at the Division of History, KTH

Assessing Arctic Futures: Voices, Resources & Governance

- Objective: explain production of future visions about the Arctic from a historical perspective
- Questions:
  - How do actors construct future visions about the Arctic and why?
  - Which future visions are realized and why?
- Participants: Sverker Sörlin (PI), D Avango, P Roberts, N Wormbs, S Höhler, E Paglia, L M van der Watt. SEI: Annika Nilsson. EUSP: J. Lajus
- Period: 2011-2013

Polar research at the Division of History, KTH

Mistra Arctic Sustainable Development

- Funding: Mistra (Foundation for strategic environmental research), 30 MSEK + 10 MSEK
- Participants: UmU & KTH (SEI, SIPRI & EUSP)

Objectives:

- Provide new understanding of conditions for sustainable development in the European Arctic with focus on:
  - The construction of resources (historical perspective)
  - The role of governance
  - The local and regional impacts of global trends
- Increase capacity of local and regional decision makers to make informed decisions related to sustainable development

Polar research at the Division of History, KTH

GREENPOL – Greening the Poles

- Funding: European Research Council, 15 MSEK + 4 MSEK
- Participants: KTH

2016-2021

PI: Doc. Peder Roberts, KTH

REXSAC – Resource Extraction and Sustainable Arctic Communities

CORE PARTNERS

PARTNERS

A multi-disciplinary centre of excellence with 15 partners

Point of departure: global processes of change

Climate change

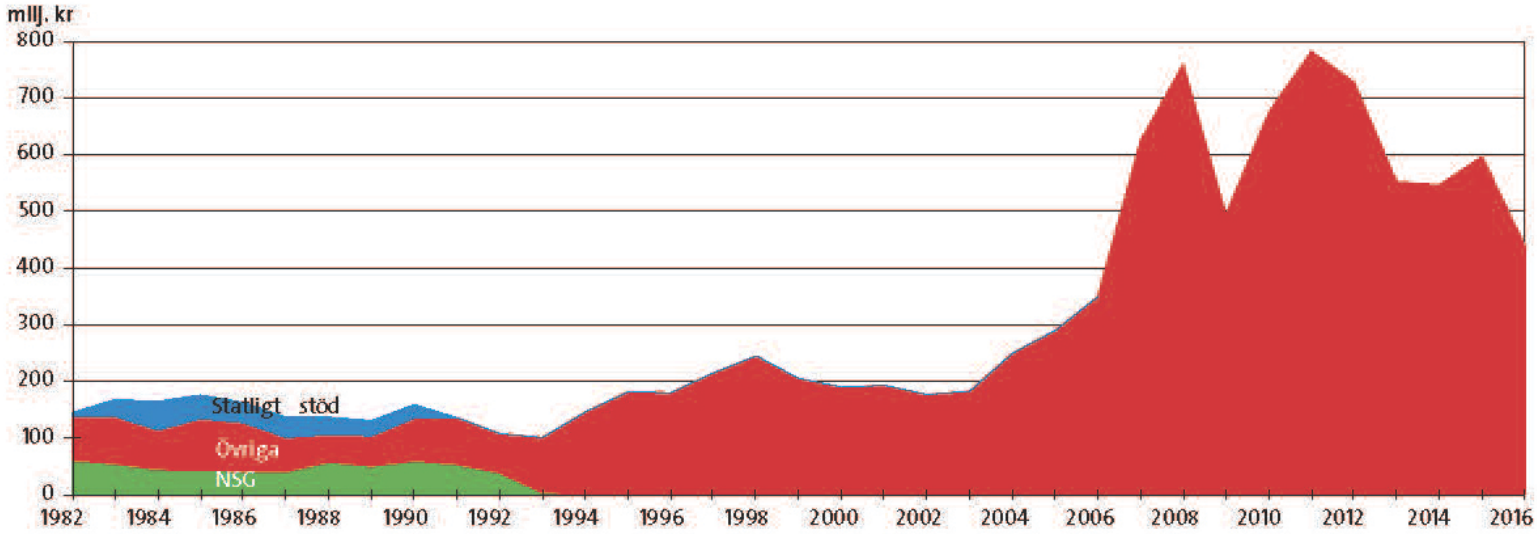
Ilulissat, Greenland

Point of departure: global processes of change

The mining boom 2003-2013

Diagram 25. Prospekteringskostnader i Sverige 1982–2016 (löpande priser).

Value of exploration in Sweden 1982–2016 (million SEK, current price).



Investments in prospecting 1982-2017. Source: SGU

REXSAC – Resource Extraction and Sustainable Arctic Communities

- Objectives: study extractive industries in the Arctic as cultural, social, economic, and ecological phenomena in long term perspective
  - Why resource extraction commences,
  - What consequences it has for communities in the Arctic and beyond
  - What opportunities exist for transitioning toward post-extractive futures

Long term outcome: a set of best practices for sustainable development in Arctic mining regions

Best practices and processes to ensure sustainability in a rapidly changing social, political, cultural and ecological environment

What opportunities exist for transitions to post-extractive futures?

What consequences does resource extraction have for communities and environments in the Arctic and beyond?

How and why does resource extraction commence?

Research task	2017	2018	2019	2020-2021
RT1: Indicators and assessments	2 articles 1 outreach publication	2 articles 1 outreach publication	2 articles 1 outreach publication 1 report	2 articles 1 book 1 outreach publication, 1 report
RT2: Multiple pressures	1 outreach publication 1 report	1 flagship article (draft) 2 articles 1 outreach publication 1 report	1 flagship article (publ): **Effects of multiple pressures on Arctic environments and societies** 1 flagship article (draft) 3 articles, 1 report	1 flagship article (publ): **title TBD** 3 articles 1 outreach publication 4 PhD theses, 1 report
RT3: Governance structures – EIA		1 article	1 article	2 articles
RT4: Transnational companies	1 article	1 article	1 article	1 PhD thesis
RT5: Affective economies	1 article 1 PhD thesis Workshop: Uchronotopia (Oslo)	1 flagship article (draft) 1 article	1 flagship article (publ): **What is Arctic sustainability?** 1 article	2 articles
RT6: Rewilding				1 article
RT7: Mining legacies	1 report	1 flagship article (draft) 1 report	1 flagship article (publ): **Extraction legacies as heritage** 1 flagship article (draft) 1 report	1 flagship article (publ): **After extraction – tourism in post-industrial mining communities** 1 report 1 PhD thesis
RT 8: Co-existences		1 article 1 outreach	1 book	1 article
RT9: Scenarios		1 flagship article (draft)	1 flagship article (publ): **Beyond the extraction site: towards an integrated systems approach for interdisciplinary analyses of extractive industries** 1 article, 1 outreach publ	1 article 1 book
RT10: Comparative global learning		1 flagship article (draft)	1 flagship article (publ): **Best practices – or, better practices? What is it?** 1 flagship article (draft) 1 article 1 outreach publication	1 flagship article (publ): **title TBD** 1 article 1 book
REXSAC wide activities	PhD course 1 (Copenhagen, March) Progr. wide conf. (Copenhagen, March) Field workshop Gällivare (September) PhD course 2 (Akureyri, September)	PhD course 3 (Alta, October) Program wide conf. (Alta, Oct.) Field worksh. :Greenland (June) Annual Outreach Synthesis (AOS); Atlas project	PhD course 4 (Finland) Field workshop: Fermont, Canada Annual Outreach Synthesis (AOS); Atlas project	REXSAC program wide meeting Extractive industries conference Annual Outreach Synthesis (AOS); Atlas project

What opportunities exist for transitions to post-extractive futures?

What consequences does resource extraction have for communities and environments in the Arctic and beyond?

How and why does resource extraction commence?

Best practices and processes to ensure sustainability in a rapidly changing social, political, cultural and ecological environment

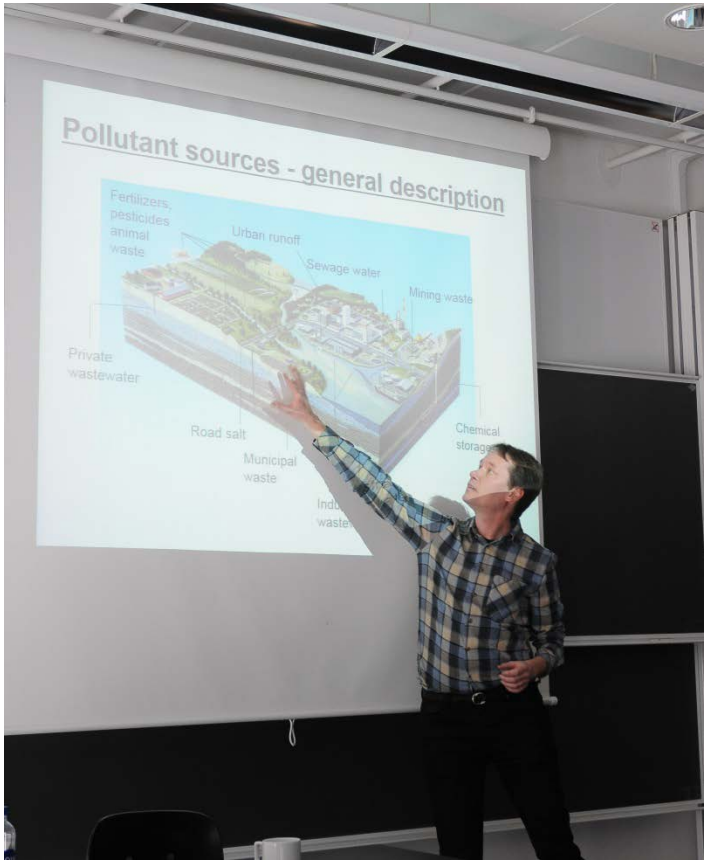
REXSAC PhD training

1) Four PhD courses (core)

2) Courses within PhD schools of REXSAC partners

3) Mobility

4) Field based learning



REXSAC PhD school

Interdisciplinary introduction to Arctic studies (March 2017)

Broad introduction to fields of research in REXSAC

Humanities, social sciences and natural sciences

Learning goals:

- General knowledge about the Arctic: environments, communities, cultures, economies, institutions, history
- Social science (economy, international relations)
- Natural sciences (climate change, cryosphere, hydrology)
- Humanities (history, representations, heritage)
- Ways of integrating disciplines in research on Arctic sustainability

REXSAC PhD school

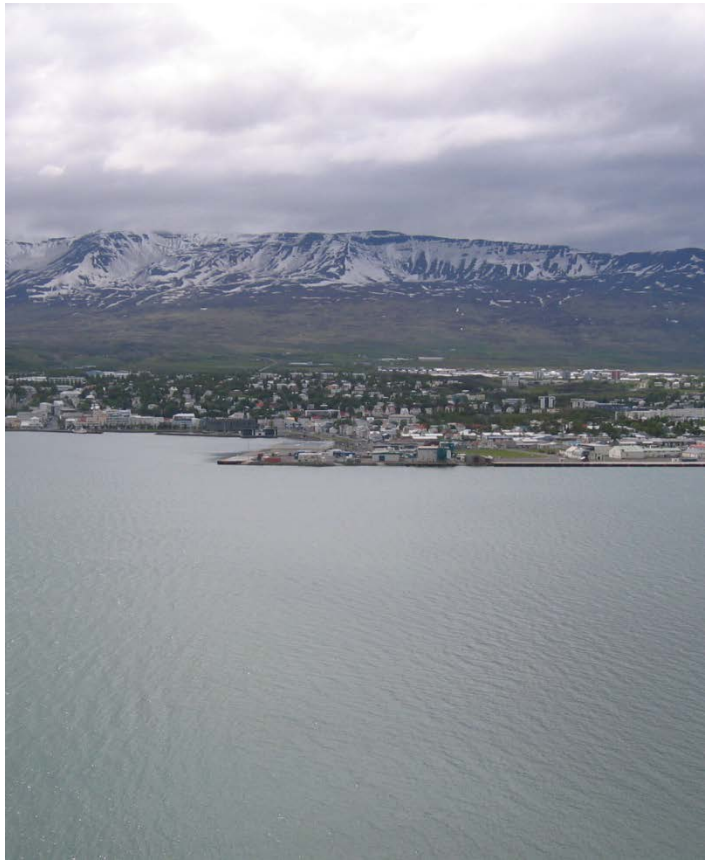
Methods and ethics in Arctic interdisciplinary research (Sept. 2017)

Learning goals, how to:

- Conduct research in Arctic communities
- Allow stakeholders to influence and make use of research
- Design research methods aimed at this
- Implement ethic principles in methodology
- Understand strength & weaknesses of methods
- Discuss & defend approach/es and research question(s)

Increase student understanding of:

- Role of stakeholder involvement and policy engagement
- How to identify outreach and co-production activities allowing for such engagement



REXSAC PhD school

Global comparisons and post-extractive futures: resources and communities in change (2018)

Focus on extraction based regions and communities in transition

Research problems:

- What opportunities exist for communities to transition to post-extractive futures?
- How can Arctic communities deal with legacies of the past?

Themes

- New economies / re-economization, affective economies
- Environmental damage and remediation
- Heritage processes, politics of memory
- Tourism

REXSAC PhD school

Mining, communities, and sustainable development (2019)

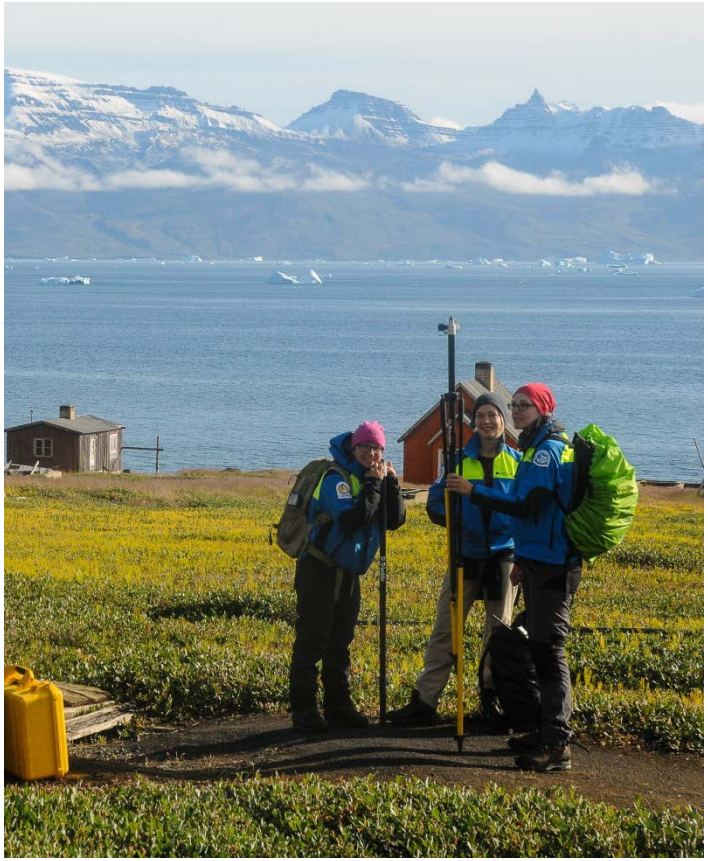
Focus on multiple pressures – social and environmental impacts from:

- Climate change
- Extractive industries

Local encounters with multiple pressures in long term perspective

Classroom and field based education at Kiruna and Gällivare, building on research under way in REXSAC

- Climate science, physical geography, hydrology
- Social- and cultural anthropology
- Human geography
- Historical archaeology
- Heritage studies



REXSAC PhD school

PhD student mobility

PhD students spend semester at 2 other REXSAC partner universities, to stimulate

- Broadened intellectual horizon
- Interdisciplinarity
- Increased knowledge for comparative case studies

Exchanges start in 2018

REXSAC PhD school

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REXSAC PhD school

Field based learning

Our method for achieving interdisciplinarity:

- Case study areas
- Field research
- Deal with common research problems by integrating different disciplinary approaches in joint field work
- Done through PhD courses and separate field work campaigns

Nautanen, September 2-8, 2017

- PhD students
- Researchers from all disciplines represented in REXSAC

Combined undergrad and PhD courses