

# 2020 ARCTIC FRONTIERS

## POWER OF KNOWLEDGE

TROMSØ NORWAY 26-30 JANUARY

### Arctic Frontiers Science 2020 – Call for Papers

Arctic Frontiers Science 2020 takes place Tuesday 28 January until Thursday 30 January 2020.

Arctic Frontiers Science 2020 will address the following themes:

- Arctic Food Security
- Knowledge-based development in the Arctic
- Disruptive technologies
- Local or Global Arctic? Multi-scaled considerations of connections and remoteness in climate-impacted communities

You can read more about each topic below.

On behalf of the Arctic Frontiers Science Committees, we have great pleasure in inviting you to submit one or more abstracts to any of the four themes.

We kindly ask you to do so in accordance with the instructions provided on the Call for Abstracts page. All abstracts are reviewed by scientific experts for rating of abstract quality and presentation content. Deadline for conference abstract submission is **Monday 23 September 2019**.

In addition, presenters and attendees of Arctic Frontiers 2020 conference are encouraged to contribute to the Springer book volume "BUILDING COMMON INTERESTS IN THE ARCTIC OCEAN WITH GLOBAL INCLUSION" edited by **Paul Arthur Berkman, Oran R. Young, Alexander Vylegzhanin, Ole Øvretveit and David A. Balton**. The book volume is developed as a part of the collaboration between the Arctic Frontiers and the Science Diplomacy Center, Fletcher School of Law and Diplomacy, Tufts University. Further details can be found in this document. We expect that book contributors will give an oral presentation at Arctic Frontiers 2020.

## Theme 1: Arctic Food Security

### Scientific Committee

- Tracey Galloway, University of Toronto, Canada (co-lead)
- Marian Kjellevoll, Institute of Marine Research, Norway (co-lead)
- Narcisa Bandarra, Portuguese Institute of Sea and Atmosphere, Portugal
- Laurie Chan, University of Ottawa, Canada
- Christel Elvestad, Nord University, Norway
- Ida-Johanne Jensen, UiT the Arctic University of Norway
- Shirley Tagalik, Community of Arviat, Nunavut, Canada

Climate changes in the Arctic have complex ecosystem impacts on human food security and health, both locally and globally. It is important to trace these impacts from their sources in Arctic lands and waters throughout the food web, taking both climate-related policy and human-environment interactions into consideration to know how these changes affect food security, nutrition and health.

People living in Arctic regions rely on both wild-caught and cultivated marine and terrestrial resources for their subsistence and livelihoods. This theme brings together scholars from circumpolar regions whose work examines the impacts of marine and other food sources on the food security and health of people living in Arctic communities and across the globe. As many communities face climate- and socially-mediated constraints on their capacity for self-sufficiency, innovative and resourceful approaches - many of them rooted in Indigenous identity and knowledge - are emerging to solve the crisis of food insecurity.

Emerging Arctic aquaculture initiatives are also contributing to global efforts to improve food security. To meet future demand for fish, particularly in developing countries, global production will need to double by 2030. The scale of this challenge requires research innovations across the whole spectrum of fisheries production and its value chain (<http://www.fao.org/3/i3640e/i3640e.pdf>). There is significant potential for empowerment of circumpolar Indigenous communities as Arctic food sources are increasingly recognized as contributors to global food security and improved nutrition, in line with the UN Sustainable Development Goals (SDGs) and the Decade of Action on Nutrition (2016-2025). This empowerment extends to development of the 'precautionary approach' with the Central Arctic Ocean fisheries agreement in the high seas, beyond the sovereign jurisdiction of nations. This is actionable at an international scale now.

Despite these opportunities, access to Arctic foods is at times constrained by policy approaches that restrict development of sustainable harvest and aquaculture initiatives. What changes are needed to policy approaches to have greater impact on food security and nutrition, and how might these changes be achieved? Policies are products delivered by the process of diplomacy, with science diplomacy as an international, interdisciplinary and inclusive (holistic) process. What processes will facilitate holistic integration of priorities in the areas of food security so that decisions about harvest and cultivation foster a sustainable and thriving Arctic food ecosystem?

We invite submissions addressing the above mentioned issues, and in particular issues such as:

- Climate-mediated impacts on food security, human nutrition, and ecosystem health
- International and regional comparisons of sustainable harvest and policy approaches
- Harvest and aquaculture safety and sustainability in the context of climate change
- Nutrient composition and contaminant concentrations in Arctic food sources
- Impacts of aquaculture on wild stocks and subsistence fisheries

- Innovative product development, preservation, ecosystem and supply chain management involving Arctic food systems and local and global efforts to improve human food security
- Use of existing and new marine and terrestrial resources to ensure food security including potential use of Arctic algal sources of omega-3 fatty acids as a replacement for fish meal in fish aquaculture
- Potential of seaweed harvesting and seaweed aquaculture in the Arctic

## Theme 2: Knowledge-based development in the Arctic

### Science Committee

- **Gosia Smieszek**, Arctic Centre, University of Lapland, Finland (co-lead)
- **Kim Holmen**, Norwegian Polar Institute, Norway (co-lead)
- **Renuka Badhe**, European Polar Board
- **Kjersti Busch**, SALT AS, Norway
- **John Crump**, Inuit Circumpolar Council, Canada
- **Jill Jäger**, Independent scholar, Austria
- **Kristin Timm**, International Arctic Research Center, UAF, USA
- **Gro Birgit Ween**, University of Oslo, Norway

Scientific knowledge is considered to be a critical component of decision-making in addressing fundamental challenges such as climate change and sustainable development – in the Arctic as well as other parts of the world. Science can provide information and insights into the nature of current and future changes in biophysical and social systems, contribute to the generation of new and innovative policies and technologies, and facilitate the evaluation and assessment of plans and policies. It is important to emphasize that science represents only one form of such organized knowledge and that Indigenous Knowledge and local knowledge can play an important role in decision-making the Arctic. Translating scientific and other types of knowledge into meaningful actions to capitalize on opportunities and counteract problems has proven to be a far more demanding task. These problems and issues span across a "continuum of urgencies": from security time scales (mitigating risks of political, economic and cultural instabilities that are immediate) to sustainability time scales (balancing economic prosperity, environmental protection and societal well-being across generations). There is an ongoing need to bridge the gaps between science, Indigenous Knowledge, policy making and other forms of decision making to enhance trust, communication, collaboration, and to pursue knowledge-based development in the Arctic.

The scholarly field focused on science-policy and science-society interactions has been growing rapidly over the last two decades offering insights into design, development and functioning of more effective knowledge systems for sustainable development. In parallel, we have become more aware of various facets related to advancing the use of scientific information in decision-making and promoting knowledge-based development across all societal groups, sectors and policy levels, from the local, through national to global arenas. Despite these developments, questions still remain over how to effectively bridge the gaps between science, Indigenous knowledge, and policy and decision making.

In order to facilitate discussion on how to close the gaps, we plan an interactive session where good practices, barriers to implementation and potential solutions will receive particular attention. We invite authors to submit abstracts addressing one or several of the following topics or issues, pertaining to knowledge-based development in the Arctic:

- Dealing with uncertainty – bridging science and policy-making perspectives and the integration of Indigenous Knowledge and local knowledge
- Role of communication in linking science, policy, society
- Role of formal and informal education and training (e.g. formal: universities, educational institutions, MOOCs, etc.; informal: oral histories, communities of practice, etc.)
- Role of business in scientific research and knowledge-based development
- Case studies: local, national, and international cases of pursuing knowledge-based development in the Arctic
- Processes of collaboration, teamwork, and knowledge co-production
- Mechanisms and tools at the science-policy interface (e.g. boundary organizations, scenarios etc.)

- Topics specifically covered in a Springer book volume "Building Common Interests in the Arctic Ocean with Global Inclusion" to be published in conjunction with the Arctic Frontiers 2020 conference (please see details in a separate [Call for book contributions](#))

## Theme 3: Disruptive technologies

### Science committee

- **Morten Dalsmo**, SINTEF Digital, Norway (co-lead)
- **Harry Kolar**, IBM, USA (co-lead)
- **Kjell A Høgda**, NORCE, Norway
- **Tor Arne Johansen**, Norwegian University of Science and Technology, Norway
- **Oddvar Vermedal**, COO Digital Center of Excellence, Equinor, Norway

New technologies have the power to change the way we think, the way we live and perform, and have proven to path the way for new concepts and businesses. Since the first digital products were developed, digitalization has leapt forward and we are now facing a step-change in performance and utilization of digital products in research, businesses and society.

Arctic Frontiers 2020 invites speakers addressing "disruptive technologies" developed and/or applied for the Arctic. We are looking forward to contributions focusing on one or several of the following topics:

#### *Digitalization*

Arctic Frontiers invite speakers that address digital transformations that support the transition towards more fully digitalized industries based on integrating technologies such as Internet of Things, Big Data and Cloud computing. We would like to welcome presentations addressing digital twins, simulations and modelling that directly or in-directly support the sustainable development of Arctic societies and industrial developments.

#### *Telecommunication in Arctic*

Arctic frontiers invite speakers addressing telecommunication challenges and solutions for the arctic region. Geostationary communication satellites do not cover the Arctic region well. They are difficult to use between 70 to 80 degrees latitude and become unusable above 80 degrees latitude. Both dedicated Arctic communication solutions as the proposed Norwegian satellites in high elliptical orbits and new communication satellite constellations with thousands of satellites also covering the Arctic are planned. This will revolutionize telecommunications solutions for the Arctic, how we operate and the communication equipment we use.

#### *Autonomy (mobile platforms)*

Autonomy is an emerging trend in the marine domain in the time to come and is believed to be essential for an oil and gas industry as well as ocean science requiring cost reduction by more efficient concepts. Arctic Frontiers welcomes presentations addressing research performed for the area of control, guidance algorithms and mission management for unmanned vehicles and methodologies and research enabling the development of smarter vehicles capable of reaching higher levels of decision autonomy while maintaining operational robustness. This includes technology for dealing with the harsh Arctic environment, such as low temperature, high winds, icing conditions, and lack of supporting infrastructure.

Arctic Frontiers also welcomes speakers addressing relevant research that includes focus on mesh network architectures for communication between heterogeneous vehicle systems and sensor networks, capable of handling degraded and time-varying radio and hydroacoustic communication channels in the context of delay tolerant networking. We would like invited speakers to address new methods for multi-vehicle distributed mission and path planning, using optimization and heuristic search methods in combination with sensory and estimation information, terrain models, and simulations of vehicles and communication channel losses accompanied by new architectures and algorithms for fault-tolerant and intelligent command execution in autonomous unmanned vehicles, including obstacle avoidance and re-configurable control.

Navigation remains a major limitation and challenge for most underwater operation and autonomous operation specifically. Due to the attenuation of electromagnetic waves in seawater, terrestrial systems like GNSS does not penetrate the ocean. Acoustic means like range measurements, phase derived bearing measurements, and dead reckoning derived from inertial and Doppler measurements and lately visual based close-range position estimation are the most important tools for navigation. This is a rich field of research and Arctic Frontiers welcomes speakers addressing novel research and development in this area.

### *Sensors*

Sensors are of fundamental importance in all aspects of marine and maritime observations and operation. Norway has world-class research and industry on a wide range of marine sensors, with applications ranging from oceanography and the natural sciences to important industries like aquaculture and offshore oil-and-gas. We would like to welcome presentations addressing novel concepts on underwater acoustic mapping and measurements (sonar, navigation, identification etc), optical measurements (fluorescence, spectroscopy, hyperspectral imaging, range-gated imaging, etc) and applications of chemical sensors and sensor fusions, together with newer concepts like biosensors in the Arctic.

### *Integrated monitoring and decision support*

Research and technology development reflect a shift from retro-perspective to pro-active monitoring as observation techniques and numerical modelling mature. The potential of integrating observation systems (i.e. autonomous sensor platforms such as unmanned aerial, surface and underwater vehicles in combination with satellite remote sensing, buoys and seabed infrastructure) in a marine industrial infrastructure opens for real time or near real time observations, providing high-resolution temporal and spatial information, required for informed decision-making process in the Arctic. Arctic Frontiers welcomes speakers addressing development and applications that combine such observations with numerical models enabling extrapolation and forecasting of environmental impact in a relevant influence area that could open for significant improvements in environmental management.

## Theme 4: Local or Global Arctic? Multi-scaled considerations of connections and remoteness in climate-impacted communities

### Scientific committee

- **Mia Bennett**, The University of Hong Kong (co-lead)
- **Jostein Bakke**, University of Bergen, Norway (co-lead)
- **Jessica Graybill**, Colgate University, USA
- **Ketil Isaksen**, Norwegian Meteorological Institute, Norway
- **Ingrid Medby**, Oxford Brookes University, UK
- **Andrey Petrov**, University of Northern Iowa, USA
- **Peter Schweitzer**, University of Vienna, Austria

Societal, political, and scientific challenges are converging in the Arctic as temperatures rise, sea ice and glaciers retreat, and permafrost thaws. There remains an urgent need to document, understand and to respond to the causes of changes to the Arctic environment. Given the inability of the world's carbon-intensive societies to significantly reduce their emissions in the near future, there is an urgent need for Arctic communities to consider how they may need to adapt to a warming planet while at the same time looking for whether there might be synergies for social or economic transformation within these ongoing shifts in the international community.

In this session, we will address this urgency and seek to bring together experts concerned with understanding Arctic climate change and its impacts on communities alongside individuals focused on questions of adaptation and political, sociocultural, environmental, and economic transformations related to a changing Arctic. We are interested in both issues that are relevant at a pan-Arctic scale, local case studies, especially those from which lessons can be scaled up or down and cross disciplinary solutions for a sustainable development. One key case study for which we are eager to see examples highlighted is Svalbard – for instance, whether local climate change and adaptation strategies pursued there can be applied in other Arctic communities.

Key questions driving this session are: What are the key climatic and environmental impacts currently facing Arctic communities? What are their causes? How do these impacts manifest across a range of scales, from the local to the pan-Arctic, and how do they also interact with global processes? What strategies can be realistically implemented in the short term to encourage relatively immediate societal and infrastructure adaptation? Over the longer-term, as societies transform, are there adaptation strategies or technological solutions that could lead to new economic opportunities or job creation?

From this point of departure, we invite submissions addressing the above topics and other questions such as:

- Coupled human-society interactions, especially between issues such as climate change and infrastructure or climate change and economic activities
- Modeling and predicting environmental and societal changes relating to climate change, with attention to spatial and temporal scale
- Translating scientific predictions into practical solutions for stakeholders
- Identifying "prototypical" aspects of climate, societal, or infrastructural change in the Arctic (for instance in places such as Svalbard)
- Considering linkages between climate change and society, such as with:
  - Risks that coastal erosion presents to infrastructure and cultural heritage
  - A warming ocean and its impact on fishing and coastal communities
  - Whether climate change will diminish the value of the Arctic as a tourist destination

- How reductions in ice (i.e. sea ice or frozen rivers) will impact transportation
  - How permafrost thaw may affect the built environment
- Imagining how new and improved communication systems, foreseen in the near future, may impact those living in the Arctic
- In which way remote-controlled and autonomous systems will affect further Arctic development