

Adaptation in a Changing Arctic: Ecosystem Services, Communities and Policy

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Abstract

This project documents the changing physical, biological and socio-economic conditions that are affecting people in the Arctic and identifies policies and strategies to assist communities in dealing with these changes. The project builds on previous work on the vulnerabilities of Arctic communities, and it is feasible because of established collaborations with northern people and organizations. The project includes case studies in all four of the ArcticNet IRIS regions. One main focus of the project involves integrating scientific and traditional knowledge of ice, permafrost, coastal dynamics and wildlife with information about community use of these ecosystem services. The other main thrust is to identify the opportunities in existing policies and co-management arrangements for adaptation strategies to help communities deal with changing conditions.

Key Messages

- Efforts to support the transmission of Inuit Knowledge (IK) should be included in climate change adaptation programming in northern Canada.
- As a result of sweeping sociocultural transformations in Inuit communities which could undermine the adaptive capacity and resilience of the Inuit socio-ecological system in the long term, climate change may pose more serious risks to the harvesting sector in Inuit communities than previously assumed.
- Key attributes necessary for determining success in linking science to decision-making have not been captured by many International Polar Year projects to date. Integrating these attributes into research design from the outset is essential for creating usable science, and needs to be at the forefront of future research programs, which aim to advance societal outcomes.
- Adaptation in the health sector should focus on doing things we should already be doing but better, tackling pathways that lead to ill-health, building upon traditional knowledge and cultural values, and targeting the social determinants of health which are the root causes of many climate-related health vulnerabilities.
- Adaptive co-management and adaptive governance may be well supported by embedding art and artistic processes into decision-making mechanisms. Artistic processes facilitate adaptation by bridging knowledge systems and contributing to social cohesion.
- A social well-being approach can further help communities and managers account for the trade-offs inherent in making water management decisions and enhance the incorporation of Aboriginal values in water policy processes across the north.
- Rapid expansion of mining in Northern Canada carries huge implications for Aboriginal communities that have limited prior experience with large-scale industrial development. At the community scale, there is little evidence that mining is augmenting adaptive capacity; indeed the institutional arrangements and consultation processes that manage mine development have added to historical processes of disempowerment. At the individual and household scale, however, there is evidence that augmented capacity is determined by strategies to benefit from increased income.
- With recent mineral development, the community of Baker Lake is experiencing changes to Inuit relationships and well-being, but not in a homogenous way. An individual's personal history, family dynamics and socioeconomic status influence their experience with mining and can determine the relative significance of particular mine impacts and benefits. Furthermore, the divergent incorporation of strategies by individuals and households towards adaptation, moderation, cultural continuity and self-determination play a key role in managing these impacts and benefits.

Objectives

1. To integrate natural and social science and indigenous knowledge in vulnerability assessments.
2. To examine the institutional structures and processes which facilitate or constrain adaptation to changing conditions in Arctic communities.
3. To engage northern communities in assessments of adaptation strategies and options.

Introduction

The assessment of vulnerabilities and adaptations in and for northern communities has been identified as a priority area for research by policy-makers, local and indigenous communities, the Arctic Climate Impact Assessment (ACIA), the Arctic Human Development Report (AHDR) and the International Polar Year (IPY) planning committee (ACIA, 2005; AHDR, 2004; Denmark Ministry of the Environment, 2004; Government of Nunavut, 2003; ICARP, 2005; IPY, 2005; McCarthy and Martello, 2005; NRI, 2002; Watt-Cloutier et al., 2005). More specifically, there is a need for research that assesses vulnerabilities, provides insight into adaptation strategies and enhances adaptive capacities based on incorporating multiple sources of knowledge and including multiple scales of analysis from local to global.

This project directly addresses ArcticNet's central objective, "to generate knowledge and assessments needed to formulate adaptation strategies and policies that will help northern societies and industries to prepare for the full impacts of the transformation of the Arctic". The research aims to document and describe the physical, biological and socio-economic conditions that Arctic societies need to adapt to today and will likely be faced with in the future, and it identifies opportunities and institutional processes for effective strategies and policies to deal with changing conditions.

The project builds on the accomplishments of ArcticNet 4.2, which documented vulnerabilities in a set of northern communities where researchers have completed baseline vulnerability assessments and have established relationships with stakeholders. This experience affords an opportunity to develop longer-term research collaborations than is normally possible within the constraints of most research programs, to address gaps in existing research such as the need to further integrate natural and social science research on relevant exposure-sensitivities faced by these communities, and to systematically analyze the ways in which community-level adaptations are facilitated or constrained by institutions and policies at higher levels.

Activities

A significant range of research activities were conducted in 2013-2014 including field work for the purposes of data collection and building relationships with collaborators, data analysis and the preparation and submission of manuscripts, as well as knowledge dissemination.

Data collection and building collaborative relationships:

- Rathwell conducted field work in Pangnirtung, and Cape Dorset, Nunavut from June to November 2013, participated in the Pangnirtung summer school offered by the University of Manitoba, and attended the Northern Scene arts festival. To explore how perspectives of climate change are embedded in Inuit artwork and the role of art and artistic expression in northern communities, Rathwell completed two participatory art workshops: 'Painting Change 2013 1 and 2, collaborated with Inuit and western youth, Inuit elders and artists on a community mural, undertook post-process interviews (n = 5) with participants of the participatory art workshops, interviewed 30 professional artists, interviewed two governance practitioners and three scientists. Additional data collection is ongoing.

- Carter travelled to Yellowknife (in January 2013) to attend the NWT Cumulative Impact Monitoring Program's Environmental Monitoring Annual Results Workshop to build relationships with NWT water partners and identify priority water-related issues in the north. Carter subsequently spent six weeks of preparatory fieldwork, attended the Annual Dehcho First Nations Assembly in Fort Providence, and participated in the "A Return to Country Foods" workshop in Kakisa. Based on a strong relationship with the social science consultant for the community of Sambaa K'e, Carter made arrangements to stay in the community, conduct 28 interviews with harvesters and elders to discuss their relationships with and uses of water. Carter also conducted 8 interviews with water policy and government representatives in Yellowknife to gain insight into how some of the water and well-being information from the community interviews may help improve water governance in the NWT.
- Pearce (from January to February 2013) completed field work in Ulukhaktok, NWT to conduct interviews with community members on experiences with changing environmental conditions, worked with community research partners to prepare publications and met with community organizations including, Hamlet and Ulukhaktok Community Corporation (UCC) to identify research needs and priorities.
- Pearce and Jasiuk (from July to October 2013) conducted field work in Ulukhaktok, NWT to conduct interviews with community members on ethical considerations for documenting and disseminating Inuit traditional knowledge using multi-media platforms (the data has been analyzed and a manuscript is being prepared), met with community organizations (Hamlet, UCC and District Education Authority (DEA)) to design three research questions, which are now the focus of three ArcticNet graduate students, and worked with community research partners to prepare a manuscripts.

Data analysis and the preparation and submission of manuscripts:

- Pearce worked with community research partners to prepare the manuscript, "Inuit Traditional Ecological Knowledge (TEK) in adaptation to climate change in the Canadian Arctic," the IRIS 1 chapter, "Part IV Factors of Adaptation: climate change policy responses for Canada's Inuit," and the manuscript, "Vulnerability and adaptation to climate change across the Circumpolar North."
- Frugal and colleagues engaged local collaborators in publication review and editing. Resulting from sub-projects led by Frugal in 2013-2014 one publication was published, one was accepted, one was submitted and three others are in full draft and are scheduled to be submitted before the end of April 2014.
- Other manuscripts completed in 2013-2014 are summarized in the publications list.
- Community well-being indicators were synthesized from this qualitative research conducted in 2011 and 2012, and summarized in a March 2013 report: Developing Community Wellness Indicators in the Hamlet of Baker Lake. This report provided an exhaustive list of community wellness indicators based upon the values, concerns and opportunities for well-being participants described in the context of mineral development. These indicators can be tracked over time through use of a household survey tool and used to inform the implementation of programs and services in Baker Lake so as to mitigate impacts from mining and enhance benefits. During a follow-up visit to Baker Lake, community feedback on these indicators was solicited and the report was subsequently presented to the Baker Lake Hamlet Council, Agnico-Eagle Mines, the Kivalliq Inuit Association and the Baker Lake Interagency Committee.
- With the assistance of Lorraine Niego and Graeme Dargo of Agnico-Eagle Mines, a second

report was produced for the Kivalliq Inuit Association in August 2013: the Agnico-Eagle Mines Ltd. Wellness Report and Implementation Plan, as required by the 2011 Inuit Impact and Benefit Agreement signed for the Meadowbank mine. This report summarizes existing knowledge on mining impacts to community wellness in Baker Lake, highlights key findings from qualitative research conducted in 2011 and 2012, and presents opportunities for ongoing impact mitigation.

Knowledge dissemination:

- Research related to adaptations to sea ice changes in Nain, Nunatsiavut has led to ongoing discussions with representatives from the Nain Ground Search and Rescue (NGSAR) Committee (collaborators on this project) for the planning, development, and implementation of safety shelters in the Nain area. Data from this project is now being used in collaboration with Furgal – Sheldon’s project on Inuit Knowledge and Geospatial Ontologies in the coming year to look at changes in land use patterns and relationship to land in association with the Voisey’s Bay development in Nunatsiavut.

Results

Detailed results have been reported in more than a dozen journal articles and book chapters, in addition to numerous reports and conference presentations. We present here some representative examples of the many results obtained and/or published in 2013-14.

Inuit artwork, climate change and the importance of knowledge co-production

- Inuit artists note and express perspectives on Arctic climate and environmental change through direct commentary, materials chosen for artworks, an indirect reflection.

- Artistic development in Nunavut, sustained by a global demand for Inuit art offers opportunities for social innovation, sustainable development and the expansion of the Inuit voice in a global environmental change discourse.
- Collaborative artistic processes brought lessons in youth engagement and empowerment, including the importance of establishing trust; importance of games in Inuit culture; importance of youth leaders in projects; importance of positive reinforcement for sharing of stories and ideas, building on each other ideas and realizing these ideas in the mural; artistic process can connect traditional and contemporary art techniques to help youth with a mosaic modern identity.
- Artworks can act as boundary objects for bridging scientific and Inuit knowledge about Arctic sea ice change. Collaborative artistic processes bridge knowledge and skill of Inuit youth, artists and elders increasing community resilience. As a result, artistic processes may help tighten the adaptive co-management feedback loop stimulating open reflection, social learning and bridging of knowledge systems.
- Sea ice scenarios may not be suitable in a cross-cultural context as not everyone is comfortable hypothesizing a potential future for Arctic sea ice.

The role of social well-being in supporting better water governance and policy

- Existing decision-making processes for water-related issues in the NWT do offer an opportunity for Aboriginal community’s to engage in consultation processes, however there are a number of challenges preventing these processes from being used as effectively as they could be (i.e., community capacity issues, communication conflict between water policy and government representatives and communities, lack of community trust in government consultation system).

- There is widespread recognition among water government and policy initiatives in the NWT that the process of translating Aboriginal water values in a way that they can be understood and accounted for in water-related decisions in the NWT is a very challenging task.
- There is a general agreement among water government and policy initiatives in the NWT that there is a need for improved water valuation tools in the NWT that rely on a mix of both economic and non-economic methods.

Inuit traditional ecological knowledge (TEK) in adaptation to climate change

- The success of Inuit in the Arctic has long been associated with their ability to be flexible and innovative in their use of the environment and resources.
- Inuit work with unpredictability, adapt their seasonal cycles to hunt what is available and when it is available and rely on learned experiences, oral traditions and group memory of past situations to respond to fluctuations in the environment and extreme events.
- Food sharing and intercommunity trade continue to be important strategies for addressing differences in food availability and in nourishing a culture of self-worth, independence, and reciprocity.
- Albeit under different circumstances (e.g. living in permanent settlements), IK continues to be important in enabling flexibility and innovation in hunting especially under changing climatic conditions.

Climate change and Inuit health

Key considerations for health adaptation:

1. Adaptation is about enhancing current management of climate-related health risks
2. Adaptation is about tackling the root causes of vulnerability
3. Adaptation is about leveraging and building on socio-cultural strengths
4. Adaptation is about integrating a culturally-appropriate climate change lens into strategies, policy and programming

The usability of climate change research as part of the International Polar Year for decision-making

- While the creation of usable science was promoted by funded projects in the International Polar Year, this was not generally reflected in research design: fewer than half determined objectives with input of decision makers, decision context was not widely considered, and knowledge users were not widely reported to be engaged in assessing the quality of data or in resolving conflict in evidence.
- The importance of science communication was widely emphasized, although only 8/23 projects discussed tailoring specific results for end user needs.

Capturing the dynamic multi-scale nature of climate change vulnerability: an Inuit harvesting example

- Sea-ice conditions are changing rapidly and affecting trail conditions, safety, and access to harvesting grounds. GPS data and bi-weekly interviews document real-time adaptations, with traditional knowledge and land-based skills, resource use flexibility, and mobility underpinning significant adaptability, including utilizing new areas, modifying trail routes, and taking advantage of an extended open water season.
- Socio-spatial reorganization following resettlement in the 1950s/60s, has created dependency on external conditions, has reduced the flexibility of harvesting activities, and has affected knowledge systems.

Adaptation to multiple forces: the transition to mining in Baker Lake

- The Hamlet of Baker Lake has experienced unprecedented development with the construction and opening of Agnico-Eagle's Meadowbank gold mine.
- While the town appears to be benefiting economically from the development of the mine and local exploration camps, neither benefits nor impacts are evenly distributed. Impacts from mining upon community well-being are diversely experienced within the context of relationships to the land, family and community and the value practices that sustain these relationships. Strain upon Inuit relationships and value practices affects well-being through the compartmentalization of time and space with rapid transition to an industrial economy. Further, a perceived lack of community experience, program and service capacity, and control over mine development has negative implications for individual and community well-being.
- In order to make a successful shift from a nomadic lifestyle to a prosperous, mixed economy, participants stressed that a shift in thinking and priorities should be made. In the face of rapid change and development, participants of all ages discussed the importance of adaptation, moderation, cultural continuity and individual and community self-determination as strategies to cope with these transitions.
- In general, those who were in a position of relative economic advantage before the mine continue in that position since the mine began construction. While over 150 Inuit from Baker Lake are working at the mine, there are still people living on social assistance or working minimum wage jobs in town, meaning that there may be a widening economic gap with the increase in the number of high wage employees in town.
- In order to take advantage of existing and future mine employment opportunities, as well as opportunities in town, education and training is critical.
- The two weeks of downtime without structure, combined with a lack of money management skills, was also identified as a concern, and a cause of reckless spending, including gambling and drug and alcohol consumption. Furthermore, changes to family and community dynamics were widely discussed with reference to the disruption of spousal relationships, inadequate childcare, increased crime, and decreased perceptions of community safety and closeness.
- Participants described the maintenance of a strong Inuit identity and cultural practices which adapting to the needs of the future as integral to Baker Lake's well-being, and combatting social issues attributable to mine employment.
- Some residents are using mine employment as a resource towards their personal empowerment and to enhance their family's well-being. However, the community continues to experience frustration with its inability to manage impacts and capture benefits from local mine development. This frustration is attributable to a deficit in community services, programs and infrastructure to manage impacts, along with complicated institutional arrangements that empower the Kivalliq Inuit Association and disempower the Hamlet. Participants expressed a desire for more information regarding mine development and associated changes to the local environment. There is also a great deal of uncertainty and concern regarding participation in mine consultation processes and what will happen when the Meadowbank mine closes, or if AREVA's Kiggavik mine is approved. These findings are consistent with mining and community health scholarship that highlights social determinants of health, and perceptions of local control in particular, as a dominant vehicle through which mining impacts local communities.

Discussion

Inuit artwork, climate change and the importance of knowledge co-production

Findings are showing that art and artistic processes are playing an important role in several ways: 1) by bridging knowledge systems as they stimulate a new way of seeing the world, open space for multiple languages of expression, facilitate the creation of artistic boundary objects (objects that allow people from multiple perspectives to engage in dialogue about specific issues); 2) Providing a visual basis to keep people connected during periods of rapid change as art and artistic processes can help maintain emotional and social cohesion by guiding collective vision; 3) facilitating adaptive management and adaptive governance by bridging knowledge systems and social cohesion which are processes that are sought after in adaptive co-management and adaptive governance mechanisms - adaptive co-management and adaptive governance may be well supported by embedding art and artistic processes into decision making mechanisms. Key preliminary findings of the research point to artistic processes, extended to the context of governance, can have a particularly rich resonance in the Canadian Arctic. Inuit capacity for the arts and imagery and forms of expression, such as oral history, sculpture and song, are significant. Many of these art forms have been shown to reflect changes (environmental, social) and in a language that resonates with people. The implications for adaptation are significant but largely unaddressed. For example, the use of artistic processes to understand and navigate sea ice change in the Canadian Arctic provides new insights on how sea ice is changing and adaptation issues for a future Arctic.

The role of social well-being in supporting better water governance and policy

The social well-being approach can provide an effective means to better understand the deeply-rooted cultural and spiritual values of water that conventional economic water valuation techniques often struggle

to account for. The social well-being lens provides important insights into each of the three well-being dimensions (material, relational, subjective), and that it also helps to unravel the complex relations between the valued dimensions of people's lives as they relate to water. By providing a broader and deeper understanding of Aboriginal water values and the interactions between them, the social well-being lens helps to provide insight into how and why people use and think about water. A social well-being approach can further help communities and managers account for the trade-offs inherent in making water management decisions and enhance the incorporation of Aboriginal values in water policy processes across the north.

Inuit traditional ecological knowledge (TEK) in adaptation to climate change

The research shows that efforts to support the transmission of Inuit Knowledge (IK) should be included in climate change adaptation programming in northern Canada. Supporting efforts to improve the transmission of IK will inadvertently enhance adaptive capacity to deal with current and expected future climate change risks, which affect subsistence. Inuit are not just victims of climate change, they are active players in adaptation, and IK is a key component of adaptation.

Climate change and Inuit health

Adaptation encompasses a variety of strategies and actions that make households and societies more resilient to climatic risks. These can be broadly categorized as focusing on better management of existing climatic risks, identifying opportunities to enhance cultural and institutional capacity to respond to changes in existing risks, or transformational change. Our findings focus on the first two categories, in which adaptation is about doing things we should already be doing but better, tackling pathways that lead to ill-health, building upon traditional knowledge and cultural values, and targeting the social determinants of health which are the root causes of many climate-related health vulnerabilities. These characteristics of

decision-making are pertinent where there are many pressing issues besides climate change, and can help demystify adaptation bringing it to familiar territory for policy makers. Such actions will require leadership by actors within the public health sector, but will also need concerted collaborative action with other sectors and across jurisdictions at local to national scales.

The usability of climate change research as part of the International Polar Year for decision-making

While International Polar Year research has made significant advances in understanding the human dimensions of Arctic climate change, key attributes necessary for determining success in linking science to decision-making (pertinence, quality, timeliness) were not captured by many projects. Integrating these attributes into research design from the outset is essential for creating usable science, and needs to be at the forefront of future research programs, which aim to advance societal outcomes. The framework for assessing usability here, while developed and tested in an Arctic climate change context, has broader applicability in the general environmental change field.

Capturing the dynamic multi-scale nature of climate change vulnerability: an Inuit harvesting example

Within the context of ‘slow’ variables (i.e. sweeping sociocultural transformations in the second half of the twentieth century such as the resettlement of former seminomadic hunting groups into centralized communities), current responses which are effective in moderating vulnerability could undermine adaptive capacity in the long-term, representing overspecialized adaptations, creating the potential for further loss of response diversity and flexibility, and engendering potential downstream effects, creating trajectories of maladaptation. These findings challenge previous research, which has argued that current resilience of the Inuit socio-ecological system is indicative of high adaptive capacity to future change, and indicates that climate change may pose more serious risks to the harvesting sector than previously assumed.

Adapting to Multiple Transitions: Mining and Baker Lake

With recent mineral development, the community of Baker Lake is experiencing changes to Inuit relationships and well-being, but not in a homogenous way. It is evident that an individual’s personal history, family dynamics and socioeconomic status influence their experience with mining and can determine the relative significance of particular mine impacts and benefits. Furthermore, the divergent incorporation of strategies of adaptation, moderation, cultural continuity and self-determination play a role in managing mining impacts and benefits.

It is necessary to situate Baker Lake experiences with mining within broader ongoing social, cultural, political and economic transitions in the region. With the timing of these developments, it is clear how the people of Baker Lake have been, and continue to be, affected by the ongoing transition from a nomadic subsistence economy to a sedentary mixed economy. Processes of colonization, settlement and modernity have created gaps between generations and existing time and space structures, causing some cultural values to become either strained or displaced with implications for identity and well-being. The most recent transition to a mineral economy has presented challenges for cultural continuity and sociocultural value practices that connote well-being. Historical transitions and their lasting impacts upon Inuit relationships to land, family and community must be considered in the context of impacts mining has upon these relationships and hence Inuit well-being.

The findings of this research in Baker Lake fill an identified knowledge gap in terms of how Aboriginal peoples in Canada perceive changes in their health and well-being through natural resource development on their traditional lands. These findings contribute to research on mining impacts and adaptation in Inuit communities by employing local conceptualizations – values, practices and strategies. Examining impacts through local constructions of well-being, these findings bridge a gap between two separate areas of

research: Aboriginal perceptions of well-being and Aboriginal community experiences with mining. This research demonstrates that self-determination plays an integral role in the ways mining impacts conceptualizations of well-being through the ability of Inuit to determine land, family and community relationships. Further, in exploring changes to family, community and land-based relationships this research demonstrates dynamic interconnections between various types of mine impact and Inuit strategies in response to these impacts. Quantitative measures of change are incapable of capturing these complexities, and the ways in which historical and ongoing transitions shape them.

Conclusion

Overall, the components of this project have made significant progress in documenting and explaining the changing physical, biological and socio-economic conditions that are affecting people in the Arctic and in identifying the policies and strategies to assist communities in dealing with these changes. The researchers have undertaken their analyses of the dynamic forces affecting Arctic communities via collaborations and partnerships with northern people and organizations. Case studies provide a wealth of information on the importance of knowledge co-production and traditional ecological knowledge in adaptation to climate change, the ways in which multiple stressors on multiple scales influence vulnerability to climate change, and the usability of climate change research for decision-making.

This project has provided insights beyond physical and biological impacts of climate change by assessing the sensitivities of northern peoples' lives and livelihoods to rapid changes, and by integrating local and traditional knowledge with scientific knowledge for a comprehensive and locally-relevant understanding of socio-economic and natural processes and interactions in the north. It has demonstrated that communities are susceptible to-and adjusting to-a variety of dynamic conditions, with social, political and economic forces

interacting with physical and biological forces. It has also demonstrated that "adaptation" encompasses a variety of strategies and actions and should be about doing things we should already be doing but better, tackling the root causes of vulnerability, and building upon traditional knowledge and cultural values.

This project has generated research results that are significant for the future of Arctic communities across the Canadian north. Future research that captures pertinence, quality and timeliness will ensure the practical relevance of the research across the north in the face of an increasingly changing northern environment.

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- Carter, B., 2014, How do you do Qualitative Research Analysis?, Seminar Presentation, for a fourth year Environment and Resource Studies undergraduate research course at the University of Waterloo (Environmental Research Project Course - ERS 411/412),
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- Pearce, T., Stephenson, E., Kaodlak, S., Akhiatak, D., Kudlak, A., Nakoneczny, L., and Ford, J., 2013, Nunamin Illihakvia: Learning from the land., Poster presentation to the ArcticNet Annual Scientific Meeting, Halifax NS.,
- Rathwell, K., 2013, Exploring Inuit artistic voice about arctic sea ice change: How does art and artistic process contribute to bridging knowledge systems?, ArcticNet Scientific Meeting 2013, Halifax, Canada.,
- Rathwell, K., 2014, Art and Climate Change: Integrating knowledge for a sustainable future, Invited Guest Seminar, Knowledge Integration Seminar Series, University of Waterloo, Canada.,
- Rathwell, K., 2014, Making case for embedding art and artistic process in environmental governance, Invited Guest Seminar, INDEV 101: Introduction to International Development: Issues, Challenges and Approaches, University of Waterloo, Canada.,
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- Smit, B., 2013, Hot air and unmitigated disasters: the fractured science and politics of climate change, Public Address, McMaster Centre for Climate Change, Hamilton.,
- Smit, B., 2013, Science and Indigenous Knowledge in the Canadian Arctic, Keynote address, Annual Environmental Sciences Symposium, Guelph,
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