



WATERLOO INSTITUTE
for COMPLEXITY & INNOVATION

2018 ANNUAL REPORT

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*DAWN PARKER, DIRECTOR; PETER DEADMAN, ASSOCIATE DIRECTOR;
2018 STEERING COMMITTEE MEMBERS: STEVE QUILLEY, MARK CROWLEY,
VANESSA SCHWEIZER, MADHUR ANAND, CHRIS BAUCH, CHRYSTOPHER NEHANIV,
SHARON KIRKPATRICK*

CONTENTS

INTRODUCTION	4
WICI ADMINISTRATION	4
PROGRESS TOWARD STRATEGIC GOALS / MOVING FORWARD	5
WICI-RELATED SCHOLARSHIP AND RESEARCH.....	9
2018 PRODUCTIVITY REPORT	9
WICI CORE RESEARCH PROJECTS.....	9
ASSESSMENT OF AGRICULTURAL BEST MANAGEMENT PRACTICES.....	9
AUGMENTING DECISION-MAKING IN COMPLEX AND SAFETY-CRITICAL DOMAINS.....	9
COUPLED HUMAN-ENVIRONMENT SYSTEMS	10
COMPLEXITY IN DIETARY ASSESSMENT AND NUTRITION	10
DiD MIRACLE PROJECT	11
ECONOMICS FOR THE ANTHROPOCENE	11
NAVIGATORS OF THE ANTHROPOCENE RESEARCH GROUP	11
PROTOTYPING LAB PROJECT	11
RAPID IDEOLOGICAL CHANGE (RIC) PROJECT.....	12
RETROSPECTIVE PHOTOGRAMMETRY AND VIRTUAL REALITY	12
THE URBAN GROWTH AND CHANGE RESEARCH GROUP.....	12
NEW RESEARCH FUNDING	13
COMMUNICATION AND COMMUNITY ENGAGEMENT.....	15
MEMBERSHIP	15
DIVERSITY REPORT.....	17
ONLINE ENGAGEMENT	17
STUDENT ENGAGEMENT INITIATIVE	18
FALL 2018 OPEN HOUSE AND WINTER FACULTY NETWORKING EVENT.....	18
WICI SPEAKER SERIES.....	20
2017-2018 SPEAKER SERIES	20
2018–2019 SPEAKER SERIES.....	21

SPONSORED EVENTS/WORKSHOPS	21
2018 FIELDS WORKSHOP ON HUMAN-ENVIRONMENT INTERACTIONS	21
2018 WICI CONFERENCE ON MODELLING COMPLEX URBAN ENVIRONMENTS	22
WICI VISITING STUDENTS 2018	25
WICI SPONSORED STUDENT RESEARCH AND TRAVEL.....	26
UPDATES ON 2017 WICI SPONSORED WORKSHOPS (COMPETITIVELY AWARDED).....	26
COMPLEX INSTITUTIONAL SYSTEMS AND URBAN SUSTAINABILITY OUTCOMES/SOCIAL- ECOLOGICAL NETWORKS IN THE CITY.....	26
ENHANCING CAPACITY TO APPLY SYSTEMS APPROACHES TO IMPROVE HUMAN AND PLANETARY HEALTH.....	27
THE IDEOLOGICAL CONFLICT PROJECT	28
“TOWARDS A SCIENCE OF CITIES” READING AND WRITING GROUP.....	28
WICI 2017 GRADUATE STUDENT FELLOWSHIP AWARDS UPDATES.....	30
WICI 2016 SEED GRANT CHALLENGE UPDATES	31
FINANCIAL REPORT (MAY 1, 2017 - APRIL 30, 2018)	33
WICI BUDGET 2018-19.....	34
APPENDIX A: WICI GOVERNANCE COMMITTEES.....	35
WICI BOARD	35
SCIENTIFIC ADVISORY COUNCIL	35
STEERING COMMITTEE	36
APPENDIX B: 2018 PRODUCTIVITY REPORT - DETAILS OF INDIVIDUAL CORE WICI-RELATED ACTIVITIES.....	37
APPENDIX C: 2018 CONFERENCE ON MODELLING SURVEY REPORT.....	55
APPENDIX D: ENHANCING CAPACITY TO APPLY SYSTEMS APPROACHES TO IMPROVE HUMAN AND PLANETARY HEALTH – WORKSHOP REPORT	69
APPENDIX E: IDEOLOGICAL CONFLICT PROJECT - FLYER.....	79
APPENDIX F: IDEOLOGICAL CONFLICT PROJECT - PROGRAM.....	80

INTRODUCTION

WICI is a member-led and member-driven organization. We strive to build networks of complex-systems researchers, not just at the University of Waterloo, but across Canada. We also strive to strengthen connections with the global complex systems research community. We welcome diverse complex systems research approaches across disciplines in the sciences, arts, and humanities, striving to connect researchers with common methodological and domain interests.

WICI offerings include talks from a range of speakers, from local experts to world-renown complex systems scholars. The majority of our talks are recorded and are available on our website. We also sponsor working groups, workshops, and small grants to support research development. We have hosted three specialist conferences on various themes. WICI membership offers an opportunity to increase the visibility of complex systems scholars and build networks for collaborative research, funding applications, scientific commentary, policy analysis, and educational initiatives.

WICI was founded in 2009 and has experienced healthy growth in membership and scope since its inception. WICI received its second Faculty Senate centre approval in 2015, and as WICI approaches our ten-year anniversary, we will also be preparing for our third renewal. This juncture is an appropriate time to take stock of what we envision for WICI—continue on a path of steady growth under our current mandate and scope, or potentially undergo a regime shift into a new form. As Director, I look forward to engaging with our membership and University administration to explore options for a next-generation vision, identity, and support system for WICI. We look forward to your contributions to this effort. In particular, we are now actively gathering information and feedback in these key areas:

- What networks currently exist among WICI members in terms of trans-disciplinary scope, application areas, and methodological interests?
- To what extent are WICI members engaged in, or have the potential to engage in, external partnership research relationships?
- To what extent does WICI currently contribute towards network and capacity building, vs. support research on specific scientific problems? What should WICI's balance of these two activities be moving forward?
- What is the potential for the development of a Canadian Network for Complex Systems, with the University of Waterloo serving as the leading and founding node?

We welcome your feedback on these points.

This report summarizes key information related to WICI's activities in 2018, with updates on current and planned activities. The 2017-18 Financial Report is included, as well a current update on our 2018-19 fiscal year budget. An up-to-date list of current Board, External Scientific Advisory Committee, and Steering Committee members can be found in [Appendix A](#).

Readers interested in a quick overview of activities, achievements, and plans should review "Progress Toward Strategic Goals / Moving Forward," starting on [Page 5](#).

WICI ADMINISTRATION

Dr. Madhur Anand (Environmental Sciences, University of Guelph) and Dr. Chris Bauch (Applied Mathematics, University of Waterloo) served as [Director](#) and [Associate Director](#) through August 31,

2018. Dr. Dawn Parker (School of Planning, University of Waterloo) and Dr. Peter Deadman (Geography, University of Waterloo) moved into the Director and Associate Director roles on September 1, 2018.

In September 2018, Dr. Mark Crowley (Electrical and Computer Engineering, U. Waterloo) stepped down from the Steering Committee (SC), and Chrystopher Nehaniv (System Design Engineering and ECE) and Sharon Kirkpatrick joined the SC. Dr. Chris Bauch transitioned to the SC, but is on sabbatical leave. Dr. Stephen Quilley (School of Environment, Resources and Sustainability, U. Waterloo) stepped down from the SC in January 2019, after many years of service. Dr. Vanessa Schweizer (Department of Knowledge Integration, U. Waterloo) continues on the SC. In summary, the SC continues with 4 members, 3 active.

Brenda Panasiak was brought on board as the WICI Administrative Coordinator in January 2019, to replace Noelle Valeriote-Hakim, and will continue in that role until May 2020.

Dr. William Sutherland accepted our invitation to join the Board of Directors in February 2019, promoted from an External Affiliate member.

PROGRESS TOWARD STRATEGIC GOALS / MOVING FORWARD

At its 2015 annual meeting, the WICI Board laid out five strategic directions for 2016-2020:

1. Strengthen core networks

- a. Continue to actively support current core projects and members through grant writing assistance and complementary activities such as talks, workshops, and working groups.
- b. Look for existing opportunities on campus to expand core membership in the areas of network science, human-environment interactions, expanding conventional economics, complexity and non-rational drivers of behavioural change, Psychological Dynamics of Catastrophic Dehumanization; Rapid Ideological Change/Ideological Conflict; and Embodied Cognition.
- c. Work with faculty units and deans to identify opportunities for new hires whose research has a complex systems focus.
- d. Seek out particular opportunities to establish core WICI members in under-represented faculties (AHS and Science).

Progress made in 2018-19:

- Goal 1a:
 - Core member support: travel grants (8), matching grant fund for IRPG, two funded and one co-sponsored workshop organized by core members;
 - Other member support: One additional workshop, student travel awards (10), student fellowship awards (3), and funding for one reading group;
 - One member-presented WICI talk;
 - Two WICI student visitors in spring and summer 2018.
- Goal 1b:
 - New Core members (2), new Affiliate members (5), and new Student members (10). Strong collaborations with the Fields Institute continue.
- Goal 1c: While we have not been actively pursuing this goal during 2018, new hires in ENV and Systems have been recruited who have a strong complex systems focus. A key WICI collaborator is also returning to Applied Math.

- Goal 1d: Sharon Kirkpatrick was promoted from Affiliate to a Core WICI member from AHS, and joined the Steering Committee. For science, we are working with the Associate VP of Interdisciplinary Research to better reach out to the faculty. We have also increased poster promotion in science buildings, and we are hosting our student project symposium in the Science Teaching Complex building this term. The Office of Research has facilitated distribution of our funding calls across campus.

Areas for continuing development through 2020: Goals 1a, b, and d will be areas of continual development.

2. Facilitate interdisciplinary research.

- Host talks and workshops, striving to maintain a balance between bringing in global leaders in complex systems and highlighting local complex systems scholarship.
- Support working groups, allowing their focus and scope to evolve with the interests and needs of membership.
- Offer support for grant development.

Progress made in 2018:

- Goal 2a: The 2018 WICI speakers included a UW faculty member, an open house and four high-profile external scholars. There was substantive overlap between the subjects of the talks and WICI's core research activities. WICI also co-sponsored and co-organized a highly international Field's Workshop in March 2018 on human-environment systems and subsidized student attendance. The WICI 2018 conference on Modelling Complex Urban Environments included a balance of UW, local, and international speakers and participants.
- Goal 2b: Last year WICI awarded three workshop grants, which are supporting the development of the research programs of core and affiliate faculty members. A WICI student member (Perin Ruttonsha) led an [interdisciplinary reading group](#) and co-authored a paper with other WICI Student members. A GRA has been hired to increase the cohesiveness and identity of WICI Student members. We are also actively engaging WICI members to identify existing and potential networks.
- Goal 2c: Based on conversations with the Office of Research, WICI has made targeting external partnerships funding a priority for this year. WICI issued the challenge grant (see below) in fall 2018. Results are pending, but the program has already provided one match.

Areas for continuing development through 2020: At least one further seed grant competition will be held before 2020 (goal 2c). WICI is offering support (mentoring, grant reviewing, and editing) to assist junior/tenure-track members with grant development (goal 2c). Workshops, the speaker series, and conferences will continue (goals 2a-c). We will also continue to solicit speaker suggestions to bring in speakers of interest to the WICI community. Active engagement through hosted networking activities will continue to be pursued to further facilitate interdisciplinary research (goals 2a-c) and examine potential for more collaboration between WICI members and members from related institutes.

3. Enhance public engagement.

- Improve WICI's web and social media presence, including the development of web pages for WICI core research projects and a set of introductory "What are complex systems?" materials.

- b. Highlight WICI work through press releases and actively engage the media when opportunities arise.
- c. Offer more public talks in the community.
- d. Continue informal receptions before talks with speakers and attendees.

Progress made in 2018:

- Goal 3a:
 - Since last year's report, the WICI website (<https://uwaterloo.ca/complexity-innovation/>) has been averaging over **1,075** visits per month, which is more than double the monthly average of 533 per month at this time last year;
 - Videos from core members on "What are complex systems?" have been posted and viewed a total of 555 times in 2018;
 - WICI's Twitter feed and Facebook page are being actively maintained. Facebook events are now being created to reflect our talks and workshops, so they may be shared more easily via social media networks.
- Goal 3b: WICI core members contributed 12 radio and print interviews in 2018.
- Goal 3c: The keynotes for the 2018 Modelling Complex Urban Environments conference were open to the public. We have not hosted talks off-campus in 2018.
- Goal 3d: Receptions before WICI seminars continue and have been well attended. The fall open house continues and has been a well-attended, effective networking event.

Areas for continuing development through 2020: WICI will continue maintaining its Twitter feed, Facebook page, and website (goal 3a). The website will be updated to reflect new members, new projects, evolving core research projects and emerging working groups (goal 3a). WICI will continue to encourage members to mention the role of WICI in any research that may garner media attention when notifying faculty and university press officers (goal 3b). We will also continue to highlight outstanding achievements of WICI members through our communication channels.

While the goal of more community-based public lectures had merit, considering the new climate of fiscal restraint, WICI is prioritizing allocation of resources to activities that will directly support research.

4. Enhance WICI's resource base and long-term viability.

- a. Prioritize efforts to obtain higher-level, external support to establish and support initiatives such as a staffed resource lab; funding for a graduate fellowship program; a competitive post-doctoral scholar program; and funding for short-term (sabbatical or study leave) positions for more senior complex systems scholars.

Progress made in 2018: The WICI administrative team had extensive discussions with the new personnel in the Office of Research regarding alternative models for WICI support in its next phase. It is clear that WICI's current budget model, based on direct operating support from the Office of Research, is no longer viable moving forward. It is also still not feasible to channel grant overhead directly to WICI to generate operating funds, as envisioned at our 2015 renewal. Alternatives are to stay small, recruiting basic operating support from several deans, or 'go big', striving to obtain University Centre status. The "go big" option would require, at a minimum, strong evidence of external partner funding relationships, and ideally, a secure external funding source such as a foundation or large tri-council operation grant. The 'go big' option was not seen as viable as of fall 2018, especially given

the hold on university centers. However, it may soon be an option, following a bit more strategic assessment and planning. WICI has until April 2020 to explore these various options to identify its next strategic goals and a path forward.

Areas for continuing development through 2020: WICI is actively engaging its members around strategic discussions, and a member survey will be initiated in summer 2019. Discussions have been launched around the formation of a new Canadian Network for Complex Systems as WICI's next incarnation, with the University of Waterloo as the founding and central node. The idea has been positively received by the steering committee and the Associate VP for Interdisciplinary Research. The February 2019 faculty network event, discussed under the Communication and Community Engagement section on [page 18](#), offered ideas regarding the mission, goals, and activities of such as network. We welcome the board's feedback on the idea.

5. Raise our profile.

- a. Focus on academic and media outreach to highlight WICI's unique contributions on a national and global scale.

Progress made in 2018: Our core members made 12 media appearances in 2018, notably Paul Thagard's CBC Interview '[The psychology of climate change: Why people deny the evidence](#)' (December 2018), and Chris Bauch's CBC interview on '[Land use implications of dietary trends](#)' which aired on 9 CBC stations across Canada. The 2018 Conference on Modelling Complex Urban Environments attracted an international scope of participants.

Focus for 2019-20: WICI will continue maintaining its Twitter feed, Facebook page, and website, monitoring traffic and engagements, and optimizing outreach where possible. The website will be updated to reflect new members, new projects, evolving core research projects and emerging working groups. WICI faculty members will be encouraged to write for The Conversation (media-outlet, <https://theconversation.com/ca>). Assistance will be sought from the Office of Research to identify further opportunities for WICI members to deliver public talks on topics of interest to the community.

WICI-RELATED SCHOLARSHIP AND RESEARCH

2018 PRODUCTIVITY REPORT

The following table summarizes the scholarly contributions made by WICI core members from January 1, 2018 to December 31, 2018. The full list of individual contributions can be found in [Appendix B](#).

OUTPUT TYPE	
PUBLICATIONS	62
PUBLICATIONS IN PRESS	20
KEYNOTE PRESENTATIONS	11
OTHER PRESENTATIONS	40
WORKSHOPS/CONFERENCES ORGANIZED	10
OP-EDS/MAGAZINE ARTICLES	2
MEDIA OUTREACH: RADIO/PRINT INTERVIEWS	19
HONOURS, DISTINCTIONS AND AWARDS	5

WICI CORE RESEARCH PROJECTS

ASSESSMENT OF AGRICULTURAL BEST MANAGEMENT PRACTICES Peter Deadman's research group continues work on the assessment of the impact of agricultural best management practices (BMPs) on water quality, with a focus on watersheds in southwestern Ontario. The research group is using hydrological models (SWAT) to simulate the impact of the frequency and spatial distribution of BMPs on key water quality parameters (nitrogen and phosphorus) in agricultural watersheds. The work includes the use of agent-based models to simulate farmer decision making around the selection and implementation of BMPs.

AUGMENTING DECISION-MAKING IN COMPLEX AND SAFETY-CRITICAL DOMAINS This project, led by Assistant Professor Mark Crowley, focusses on problems of prediction and control in the areas of forest fire management, medical imaging and autonomous driving. The work on forest fires includes two main approaches. The first uses deep neural networks to learn compact models of forest fire spread directly from data such as satellite images or computationally expensive, physics based simulations. Another, more holistic approach taken uses reinforcement learning and game theory to learn a policy for wildfire spread across a landscape based on local conditions, as if the wildfire were an agent making decisions about where to move next. This approach utilizes multi-modal satellite, weather and other data to build more robust and generalizable models for prediction and decision making. These simulations are currently being applied to forest fire management but could apply to flood management, disease modelling and urban sprawl as well. This project involves collaborations

with researchers in applied fields such as sustainable forest management, ecology, automotive technology and medical imaging.

COUPLED HUMAN-ENVIRONMENT SYSTEMS This core project explores the dynamics of coupled human-environment systems and the implications of these dynamics for environmental health and sustainability. A coupled human-environment system involves a two-way interaction between human systems and our environment: what humans do influences the environment, but the resulting changes in the environment in turn influence our perceptions and behaviour. Humans and their environment together thus form a single, coupled nonlinear system.

Professors Chris Bauch and Madhur Anand have been moving this core project forward in 2018-19 through the initiation of new projects as well as the fruition of existing projects. This work has been spearheaded by their co-supervised graduate students, some of which just started in 2018, and some of which are finishing up their PhDs in 2018. The core project was also supported by seed funding from the WICI Grant Challenges, the activities of which carried over into 2018-19.

New projects with co-supervised students were started concerning developing new types of early warning signals for tipping points in complex systems, spatial ecosystem mosaic dynamics, and human-environment dynamics of forest pest outbreaks, among others. Existing projects were continued concerning human feedbacks on invasive versus native grasslands, mining social media data for clues about dynamics of climate change; the effects of globalization and interconnectedness on socio-ecological population collapse; and further development of their long-standing collaboration on forest-grassland mosaics. Papers were accepted or published concerning dynamics of coupled forest-harvester populations and early warning signals in complex coupled networks, among other topics.

COMPLEX SYSTEMS SCENARIO ANALYSIS Vanessa Schweizer researches complex systems methods for scenario analysis in the context of the human dimensions of climate change (HDCC). In 2018, she began new research projects that interface her methods with other complex systems approaches, namely agent-based modelling (through hosting a WICI visiting scholar, Mr. Tristan de Wildt) and network analysis. With Mr. de Wildt, she is working on the social justice dimensions of low-carbon energy transitions. With her students, she is working on using scientometrics to perform scientific assessment of HDCC scenario studies. The latter may become increasingly important for Assessment Reports published by the Intergovernmental Panel on Climate Change.

COMPLEXITY IN DIETARY ASSESSMENT AND NUTRITION This research is led by Sharon Kirkpatrick and supported by a team of WICI graduate student members. Understanding people's eating patterns—including what they eat and drink and the contextual factors that influence diet—is essential to better elucidating how diet influences health, as well as how to support eating patterns consistent with disease prevention. The main focus of Dr. Kirkpatrick's work is on improving and disseminating strategies for appropriately collecting, analyzing, and interpreting dietary data. This work is supported by a Capacity Development Award from the Canadian Cancer Society Research Institute, among other funding sources.

Dr. Kirkpatrick's work also explores the utility of systems thinking and methods to better understand the array of factors that influence major nutrition challenges and the effectiveness of interventions to address these challenges. In addition, she has long-standing interests in food access among marginalized populations, as well as food policy.

DiD MIRACLE PROJECT Dawn Parker received funding from the Social Sciences and Humanities Research Council (SSHRC) via the Digging into Data Challenge (DiD) from 2013-2016. The international DiD program was established to advance the use of computational methods to explore, analyze and visualize the rapidly expanding pool of crowd-sourced and remotely sensed “big data” from real-world systems. Unique among her year’s awards, Parker’s research team developed tools to analyze output from computerized simulation models and compare that output to real-world “big data.”

MIRACLE created a prototype community platform to support complex systems research across research communities, providing creates access to sample output from computational models, as well as the algorithms used for analysis. Built-in tools allow users to explore these output data and share results with local or global communities. Supporting publications reviewed analysis methods currently in use to analyze outputs from agent-based models of human-environment, outlined metadata standards for computational model output, and described the prototype model architecture and functionality. Work continues on the next-generation version of MIRACLE, supported by the US NSF BD Spokes: Spoke: West: Accelerating and Catalyzing Reproducibility in Scientific Computation and Data Synthesis (Michael Barton, ASU, PI) and Compute Canada resources. Lessons learned from the MIRACLE project are outlined in a new final white paper, available at <https://diggingintodata.org/awards/2013/project/mining-relationships-among-variables-large-datasets-complex-systems-miracle>

ECONOMICS FOR THE ANTHROPOCENE Through WICI, Stephen Quilley has been a partner on the *Economics for the Anthropocene* project – an international partnership between McGill, Vermont and York. Working closely with Prof. Peter Brown at McGill (including being on the committee for one of his students), Quilley has helped to create an opening for Katie Kish, who is now playing a leading role in the Canadian Society for Ecological Economics (CANSEE). In consequence, Quilley is now on the scientific committee of the CANSEE 2019 conference that will be held in Waterloo where he will be giving a keynote presentation with Paul Gregory, Director of Outreach for the Green Party.

NAVIGATORS OF THE ANTHROPOCENE RESEARCH GROUP Since 2015 Stephen Quilley has worked with Dan McCarthy to develop a broad cluster of doctoral projects under the WISIR Umbrella, working with Barb Davy, Katherine Zywert (with Jennifer Lynes) and most recently Anna Beresford. In different ways these students are developing projects that share a theoretical framework that combines a complex systems approach to social and economic change, radical political economy and an emphasis on the significance of ontology and non-rational drivers of behaviour in process of cross-scale systems change. Specific foci include: neo-paganism and ritual, ecological conscience formation and environmental politics (Barb Davy); communitarian experiments in health care and post-capitalist, post-growth health/welfare systems (Zywert); peer-to-peer production and the reMaker society (Kish); and social capital formation and sustainable community in traditional music culture (Beresford).

Continuing over the last two years, students Perin Ruttonsha, Katie Kish, Barb Davy, Anna Beresford and Katherine Zywert have all been dealing with very theoretical problems which draw upon literatures far removed from the centre of gravity of an albeit interdisciplinary department. This work is highly intensive, often rewarding for both parties and absolutely critical, though it takes a great deal of time. This is a necessary transaction cost of interdisciplinarity.

PROTOTYPING LAB PROJECT (Stephen Quilley with Marcel O’Gorman): This CFI-JELF grant supports the work of students and researchers who are investigating the social, psychological, and environmental impacts of contemporary technologies. The equipment purchased through this grant has been used to train HQP in the creation of digital interfaces, apps, and small electronics that serve as "objects-to-think-with." More specifically, in the past year 15 graduate students have been trained in 3D

modelling and printing, physical computing, Internet of Things design, big data analysis, and visualization. The training has paid off in the form of research papers presented, hardware projects showcased in design exhibitions, and Mitacs funded positions for students at Deloitte and North (formerly Thalmic Labs). This project builds on the ongoing work in relation to Stephen Quilley's (Metcalf Funded) reMaker Society and represents quite a unique interdisciplinary collaboration.

RAPID IDEOLOGICAL CHANGE (RIC) PROJECT Tad Homer-Dixon was awarded a SSHRC Insight Grant for *Ideological Conflict Project (ICP), Methods field testing* in the spring of 2018. The ICP is a component of the *Rapid Ideological Change (RIC) Project*. This project, of which Homer-Dixon is the Principal Investigator, involves an international research group of ten scholars in Canada, Germany, the United Kingdom, and the United States. It applies complex-systems methods to integrate cognitive science with research in history and political science on the structure and dynamics of ideology. Planning for methods field testing started this past summer and continued through a two-day workshop at the University of Victoria in late-September.

RETROSPECTIVE PHOTOGRAMMETRY AND VIRTUAL REALITY Peter Deadman is beginning work on the use of historical photographs and survey data to construct 3D models of archeological sites for visualization using virtual reality technologies.

THE URBAN GROWTH AND CHANGE RESEARCH GROUP Dawn Parker's research group is conducting long-term, highly empirical research to explore interactions between residential location and transportation decisions, using Kitchener-Waterloo and the natural experiment of its light rail implementation as a living laboratory case study.

The outward growth of cities after the Second World War and associated urban sprawl has created extensively documented negative impacts. As a result, contemporary planning policy and investments promote intensification—concentration of activities in vibrant urban cores and nodes and corridors that support accessibility and more efficient municipal expenditures. Rapid transit (RT) has potential to catalyze intensification, assuming that it causes intensification and economic vitality. However, while numerous studies have demonstrated correlation between these factors, due to data and methodological limitations, causality has not been established. Establishing causality is challenging, as some relationships may be direct—new RT investments may make adjacent lands more desirable—producing direct changes in property values. Yet, some impacts may be indirect, as RT investment might increase the density of complementary land uses, creating positive agglomerative feedbacks. Confounding the identification challenge, such feedbacks can occur independent of, and may themselves induce, RT investments. Further, RT investments often occur with complementary physical investments, higher land values, or policy changes to achieve planning goals.

Our research responds to a natural experiment to explore the causal dynamics between the pending development of light rail transit (LRT), core-area intensification and socio-economic change in Kitchener-Waterloo, Ontario, working with local government and industry partners. Research in the UGC research group has two streams: data gathering/analysis and modeling. Working in partnership with the Region of Waterloo, we are gathering and analyzing qualitative and quantitative information from the pre-build stage through completion of the LRT construction. We are using these data to build a series of agent-based models that model the joint evolution of residential land-use change and transportation behaviour. To date we have surveyed residential land owners, renters, and developers, buyers, sellers, and real estate agents, with results reported in four completed and one ongoing student theses. We have also assisted the Region to design a long-term data gathering and monitoring strategy, and we annually contribute additional “special topics” analysis briefs to this report. (See “Monitoring Change in the CTC <https://www.regionofwaterloo.ca/en/regional-government/land-use-planning.aspx>)

Recently, the K-W real estate market experienced an unprecedented rise into a “hot market,” and then a cool-off and return to historical trends. We were able to gather data during the bubble on price setting, bidding, and market perceptions from key actors, which is allowing us to build cutting-edge models to better understand the dynamics of market bubbles. In particular, our somewhat unique combination of qualitative and quantitative data has allowed us to characterize the key influences of shifting demographics, cultural norms, and the impact of buyers from the Greater Toronto Area on the local real estate market. From a complex systems perspective, the lessons learned from the project to date highlight the importance of understanding both spatial heterogeneity (i.e. LRT access, open-space amenities, and neighbourhood quality) and actor heterogeneity (i.e., the varied preferences and beliefs of key demographic groups) and how these factors interact. Project outputs and further information are available at <http://research.wici.ca/ugc/>

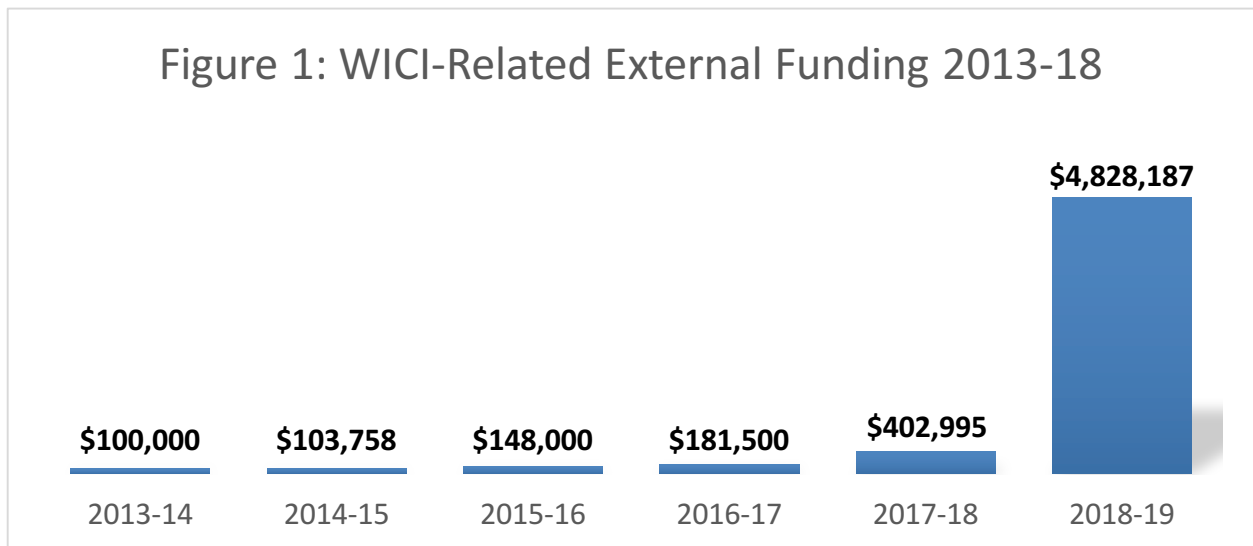
NEW RESEARCH FUNDING

Researcher	Project	Awarded By	Amount
C. Bauch	Infrastructure Operating Grant (2017-2022)	Canada Foundation for Innovation	\$39,484
M. Crowley (Co-Investigator, 15%)	“Computational Peer Review through Identification and Captioning of Gigapixel Digital Pathology Scans” (2018-2024)	Ontario Research Funds – Research Excellence (ORF-RE)	\$ 465,000
M. Crowley (Co-PI, 50%)	“Driver Behaviour Learning” (2018-2021)	NSERC Collaborative Research and Development (CRD) matched with funds from industry partner Magna International	\$265,000
M. Crowley	“End-of-line Testing for Safety and Quality with Machine Learning” (2018-2021)	Mitacs Accelerate Cluster Fund with Industry partner Accerta Analytics Solutions	\$240,000
M. Crowley	“Towards Fully Integrated Deep Learning and Reinforcement Learning for General Spatial Domains” (2018-2023)	NSERC Discovery Grant	\$140,000
P. Deadman	“Integrated Assessment of Agricultural Best Management Practices and Phosphorus Runoff”	University of Waterloo Water Institute Seed Grant	\$18,500
P. Deadman	“Agricultural Water Futures in Canada: Stressors and Solutions”	Global Water Futures Program	\$2,761,700

T. Homer-Dixon	“Ideological Conflict Project (ICP)” as a component of the “Rapid Ideological Change (RIC) Project”	SSHRC Insight Grant	\$232,000
S. Kirkpatrick	“Embracing complexity: Advancing our understanding of dietary patterns to inform chronic disease prevention”	University of Waterloo Research Incentive Fund	\$10,000
S. Kirkpatrick (Co-PI)	“Impact of numeric and traffic light calorie labels on label use, purchasing, and intake among young adults”	Canadian Foundation for Diabetic Research Grant	\$20,000
S. Kirkpatrick	“Building capacity in dietary assessment”	Ontario Early Research Award	\$150,000
D. Parker	“Interpreting housing market dynamics in Kitchener-Waterloo, and investigating relationships between housing demand and demographics from housing survey”	Municipal Property Assessment Corporation	In-kind (valued at ~\$300,000)
D. Parker	“Interpreting housing market dynamics in Kitchener-Waterloo, and investigating relationships between housing demand and demographics from housing survey”	Teranet	In-kind reduced-price purchase – valued at \$74,700
D. Parker	“Residential Property Values and Active Transportation Infrastructure”	Cities of Kitchener, Waterloo, Cambridge and the Region of Waterloo	\$7,051
S. Quilley	“Hedgelaying in the Ontario Landscape [UNIT 4 50658 10006]”	SSHRC Partnership GRF Extension Plan fund	\$41,000
S. Quilley	“A Pattern Language for Traditional Music and Sustainable Communities”	SSHRC IDG fund	\$62,753

Not reporting: Core members Paul Thagard, and Keith Hipel.

Figure 1: WICI-Related External Funding 2013-18

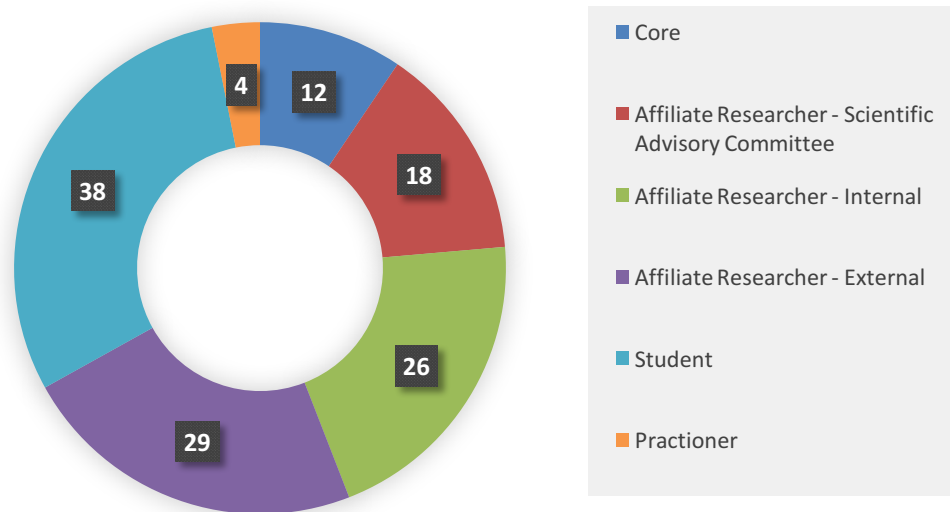


COMMUNICATION AND COMMUNITY ENGAGEMENT

MEMBERSHIP

As of February 2019, WICI had a total of 126 members, which represents a 16.6% growth in membership over the past year. Figure 2 provides a breakdown of the number of members in each membership category.

Figure 2: WICI Membership By Category



In 2017 WICI expanded its Student Membership description to include undergraduate students working on a complexity science related degree in addition to graduate students. Our hope moving forward is to engage Student Members even more through specific initiatives for them such as the WICI Student Project Symposium to be held in April this year. Student Membership saw the largest growth this year, with a 31 % increase from 2017.

In 2018-19 WICI welcomed the following members:

NAME	POSITION	MEMBERSHIP CATEGORY
Chrystopher Nehaniv	Professor, Systems Design Engineering	Core Member
Kerstin Dautenhahn	Professor and Canada 150 Research Chair in Intelligent Robotics, University of Waterloo	Affiliate Researcher
Kumaraswamy Ponnambalam	Professor, Systems Design Engineering, University of Waterloo	Affiliate Researcher
Jeremy Pittman	Assistant Professor, School of Planning, University of Waterloo	Affiliate Researcher
Reza Yousefi-Nooraie	Post Doctoral Fellow, Institute of Health Policy, Management & Evaluation, University of Toronto	Affiliate Researcher
Hazem Ahmed	PhD candidate, School of Planning, University of Waterloo	Student Member
Joe Battikh	PhD candidate, Sustainability Management, University of Waterloo	Student Member
Ileana Diaz	PhD candidate in Geography and Environment Management, University of Waterloo	Student Member
Julia Goyal	PhD candidate, SPHHS & MME, University of Waterloo	Student Member
Peter Jentsch	PhD candidate, Applied Mathematics, University of Waterloo	Student Member
Christopher Luederitz	PhD candidate, Geography and Environment Management, University of Waterloo	Student Member
Sam Petrie	MSc Candidate, Health Sciences, Carleton University	Student Member
Ajar Sharma	PhD candidate, Systems Design Engineering, University of Waterloo	Student Member

Figure 3: WICI Membership by Faculty - 2018

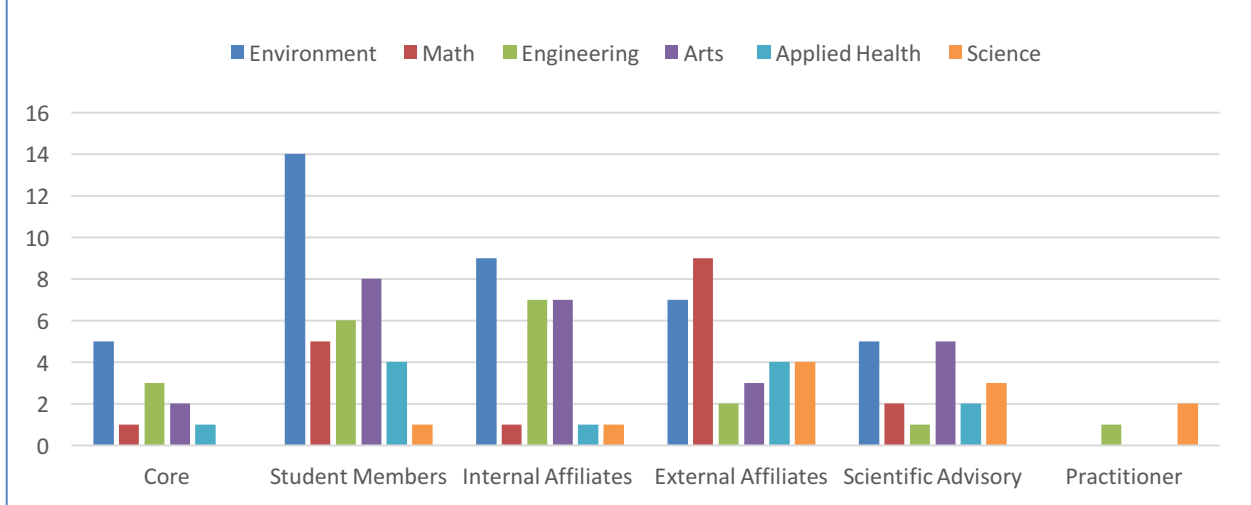
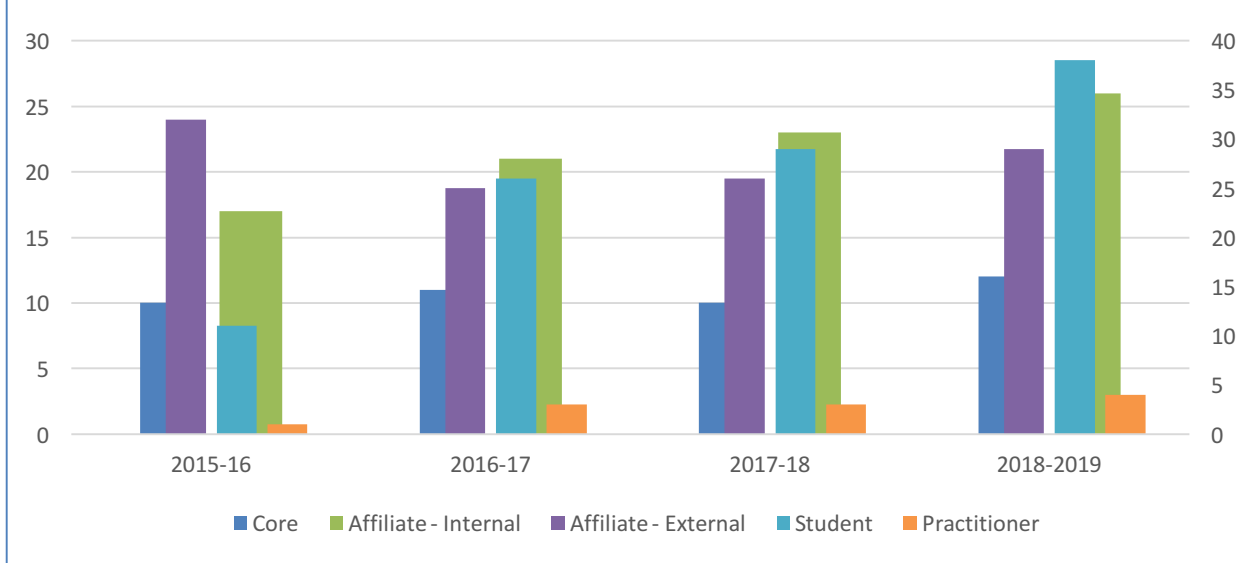


Figure 4: WICI Membership Category Comparison 2015-2018



DIVERSITY REPORT

Approximately twenty percent of WICI’s membership is visible minorities, and thirty percent are women. (These current numbers are not based on self-reporting. We will update all diversity statistics for our renewal document following the university standard of self-reporting.) Fifty percent of our guest speakers in 2018 were women. The steering committee is also half women.

ONLINE ENGAGEMENT

WICI launched its [University of Waterloo WCMS website](http://uwaterloo.ca/complexity-innovation) (uwaterloo.ca/complexity-innovation) in September 2017, and it continues to be the primary source for information relating to the Institute. It is used to share news about upcoming events, profile WICI members, and recruit researchers and staff.

Since last year's report, the WICI website has been steadily averaging over **1,075** visits per month, which is more than double the monthly average of 533 per month at this time last year.

Currently, WICI has **517** active subscribers on its Mail Chimp mailing list (a 7% growth from last year). The Institute has also continued to maintain three social media accounts to share news and events: a [Facebook page](#), a [Twitter feed](#) and a [LinkedIn company page](#). Facebook followers have increased from 315 at the end of last year to **528** at present, and the WICI Twitter feed has **643** followers.

In addition, videos of WICI talks on our Vimeo page were viewed a total of **1783** times in 2018 (95% growth from last year).

STUDENT ENGAGEMENT INITIATIVE

For the winter 2019 term, WICI has hired PhD student Kirsten Wright as a graduate research assistant (10 hours per week) to lead organization of student engagement activities.

Graduate student activities in winter 2019 include a graduate student "Complexity Café," research working groups activities, and graduate and undergraduate student project symposiums.

The graduate student "Complexity Café" is designed to facilitate interaction between WICI student members around complex systems challenges of mutual interest. These sessions involve connecting students working on applied problems with students with particular methodological skills, connecting groups of students to brainstorm a problem of general interest, and supporting working groups. Smaller graduate research groups are emerging focusing on health in complex systems, climate, risk, and frameworks for understanding the relationships among applied complex systems challenges.

The WICI student project symposium is a cross faculty, juried complex systems research competition that will take place Thursday, April 4, 2019. There will be awards of \$250 for first place, \$150 for second place, and \$100 for third place for each of the graduate and undergraduate competitions. All entries judged "Outstanding" will receive a certificate with tailored comments of support from judges. All participants will receive a confidential summary of judge's ranking and comments.

Submissions for poster presentations were invited from all Student members of WICI University communities, including graduate and undergraduate students, with 21 entries received. Each presenter will be scheduled a window to give a three-minute talk of their poster to judges and audience members. Posters may describe research and/or design projects related to complex systems. Posters may also illustrate the application of systems thinking and/or methods to complex challenges more generally.

FALL 2018 OPEN HOUSE AND WINTER FACULTY NETWORKING EVENT

- WICI's fall open house welcomed a balance of new and current members and led to several important network connections, especially around modeling of risk and human-environment interactions.
- WICI held a faculty networking event on February 28th, 2019, with the following goals:
 - *Connect faculty members across campus who share common research interests, to which complex systems methods might usefully be applied.* Participants reported up to three disciplines, application areas, and methods represented in their work and then formed into groups to play "Cooperative Research Question Boggle," where they

worked to identify, in a short time, as many common research questions that the group could address as possible.

- *Visioning a “Canadian Network for Complex Systems.”* Participants were asked to brainstorm around aspects of a potential new organization (responses follow each question):
 - i. What goals/needs might it serve?
 1. Networking: Identify and publicize active complex systems researchers across Canada—facilitate communication. Provide scholar match-making services scholars (i.e. for those seeking particular expertise, data, or research support). “Continue to focus on networking to enhance collaboration instead of competing against each other.” Potentially conduct social network analysis (research) on the community of complex systems scholars.
 2. Methods and other key complex systems educational initiatives: Provide access to “get-started” educational materials for students and other researchers.
 3. Incentivize network development, collaborative engagement and interdisciplinary research at the administrative level.
 4. Enable a cultural shift towards community and interdisciplinary engagement.
 5. Reduce analytical and language barriers to collaborate across fields.
 6. Reduce barriers between theory and practice, or the abstract and the concrete (i.e. computer science and sustainability).
 - ii. What kind of structure might it have?
 1. What should be the key roles and responsibilities of the main node? Open question.
 2. Scale the level of possible involvement for network members, from minimal to significant engagement (i.e. online forum, events, collaborative projects).
 3. Decentralized nodes with a highly flexible structure, but a clearly-defined minimum hurdle for continued membership.
 4. Have rotating activities with internal responsibility for funding (i.e. conferences, summer schools).
 - iii. What kinds of activities might it support?
 1. Identify grand challenges for complexity science that could frame national and international collaborations. Which are we working on? Which do we aspire to contribute to?
 2. Direct support and engagement with governmental actors at all levels, to provide research support for complex management challenges.
 3. Host methodological workshops and develop modules that could be delivered within different courses across faculties.
 4. A summer school, with rotating hosting, was highly supported.
 5. Cross-university advising and student examination.
 6. Host retreats to deepen connections among scholars.
 7. Communicate funding priorities to tri-council and other funding bodies.
 8. Large, multi-institutional grant and infrastructure initiatives.
 - iv. How might it be funded?
 1. Small membership fees (?). Seen as less successful.
 2. Industry – but how do we get their buy-in?
 3. Link with their corporate social responsibility mandates/interest.

4. Internal university funds (though this is decreasing/difficult to secure).
 5. Foundation funding?
 6. [Networks of Centres of Excellence of Canada](#)
- v. What might its mission be?
1. Advance the discipline broadly (i.e., theory) – train the next generation of systems thinkers
 2. In addition, have an applied focus – demonstrate what systems theory/methods applications can do.
 3. More?
- vi. Who else should be involved?
1. First, should inventory who is currently involved.
 2. Example (from Faculty of Science?): could have a key point person from each Faculty. Could hire a co-op student to inventory individuals, interests, research areas and projects, to identify possible synergies/opportunities; this could also help in reducing duplication and/or competition for funding (if members could collaborate).
 3. Invite current WICI members to identify and contact their Canadian collaborative networks.
 4. Invite active WICI members at other universities to start local nodes.

WICI SPEAKER SERIES

2017-2018 SPEAKER SERIES

[Analysing Covert Networks from Unstructured Sources](#)

Dr. Johan Koskinen
University of Manchester, Department of Social Statistics
 October 2, 2017

[Understanding, Modeling, and Managing Interdependent Complex Systems of Systems](#)

Dr. Yacov Y. Haimes
Lawrence R. Quarles Professor of Systems & Information Engineering and of Civil & Environmental Engineering. Founding Director (1987), Center for Risk Management of Engineering Systems
University of Virginia
 October 20, 2017 – Co-sponsored with Waterloo Department of Systems Design Engineering

[Using Deep Learning and Reinforcement Learning to Tame Spatially Spreading Processes](#)

Dr. Mark Crowley
University of Waterloo, Department of Electrical and Computer Engineering
 October 25, 2017

[From Sandpiles to Real Mountains - Complex Dynamics of Tropical Mountainscapes Mediated by Landslides](#)

Dr. Carla Restrepo
University of Puerto Rico-Rio Piedras, Department of Biology
 February 27, 2018

Poetry & Complexity

Readings and conversations between Roald Hoffmann (Nobel prize-winning scientist and poet), Rae Armantrout (Pulitzer prize-winning poet), and Madhur Anand (Director of WICI and poet).
March 27, 2018

Synthetic Evolutionary Transitions: From Cells To Brains And Ecosystems

Dr. Ricard Solé
ICREA-Complex Systems Lab UPF-IBE, Barcelona
April 24, 2018

2018–2019 SPEAKER SERIES

Wisdom in a Complex World: Measurement, Utility, and Interventions

Dr. Igor Grossman
Associate Professor of Psychology, University of Waterloo
November 13, 2018

Demystifying Language and Breaking Down Barriers in Complexity Science and Methods

Dr. Sharon Kirkpatrick, *University of Waterloo, School of Public Health & Health Systems*
Dr. James Shelley, *Western University, Research and Knowledge Translation Coordinator, Health Sciences*
Dr. William Sutherland, *Founder and Director of the Institute for Complexity and Connection Medicine*
January 29, 2019

Graduate Fellowship Awardees: Research Symposium

Amanda Raffoul (*School of Public Health and Health Sciences*): Are we (unintentionally) doing more harm than good? Systems Approaches to the Prevention of Eating-and-Weight-Related Disorders
Kevin Church (*Applied Math*): The Hidden Geometry of Complex Dynamics and How to Exploit It
Katharine Zywert (*School of Environment, Resources and Sustainability*): Social-Ecological Systems Change and the Future of Human Health
February 26, 2019 (Snow date)

Systems Approaches to Sustainability: Climate, Air Pollution, and Toxic Substances

Dr. Noelle Selin-Eckley
Associate Professor in the Institute for Data, Systems and Society and the Department of Earth, Atmospheric and Planetary Sciences at Massachusetts Institute of Technology (MIT)
Director of Technology and Policy Program, MIT
March 26, 2019

SPONSORED EVENTS/WORKSHOPS

2018 FIELDS WORKSHOP ON HUMAN-ENVIRONMENT INTERACTIONS

Core member and former director Madhur Anand served as co-organizer for the week-long Field's Workshop in March 2018 on human-environment systems. WICI co-sponsored the travel of Dr. Carla Restrepo, a presenter who also visited the University of Waterloo to present a WICI talk. WICI also supported the participation of several students from different faculties. Full details are available at: <http://www.fields.utoronto.ca/activities/17-18/MathBiology-human-environment-systems>.

2018 WICI CONFERENCE ON MODELLING COMPLEX URBAN ENVIRONMENTS

Core/Steering committee member Dawn Parker organized the 2018 WICI sponsored specialist conference, titled "**Modelling complex urban environments**," held June 21-22. This small, informal conference brought together 111 scholars and practitioners from multiples disciplines who have activity and interests in modelling the processes that create and shape complex urban environments.

The conference was co-organized by Dawn Parker, Professor, School of planning, University of Waterloo and Allison Heppenstall, Professor, Department of Geography, University of Leeds. Program committee members included:

- Jeremy Pittman, Assistant Professor, School of Planning, University of Waterloo
- Yu Huang, PhD candidate, University of Waterloo School of Planning
- Jorge Garcia, PhD student, Systems Design Engineering
- Fatemeh Jahanmiri, PhD student, University of Waterloo School of Planning
- Iliana Diaz, PhD Student, University of Waterloo Geography (conference assistant)

Conference activities included three keynotes (Hedwig Van Delden, Alex Anas, and Pamela Robinson) and 45 contributed presentations. The conference included the following thematic break-out sessions:

- Integrating "Big Data" and "Smart Cities" Data with Urban Modelling
- Social-Ecological Networks in the City
- Modelling and the Planning Process
- Artificial Intelligence & Optimization Models in Urban Environments
- Agent-Based Models of Housing
- Agent-Based Models of Retail, Office and Industrial Markets, and Integrated Models
- Measuring, Modelling and Interpreting Scaling/Power Laws in Urban Systems
- Identifying the Modelling Needs of Policy Makers and Practitioners
- Learning Session - Data Visualization
- Workshop - A Science of Cities for Sustainable Development

Participants came from all around the globe representing Planning, Geography, English, Land-change science, Computational Social Science (includes Economics, Sociology, Psychology), Ecology, Engineering (Systems, Civil, ECE), Applied mathematics and statistics, and Computer science.

Student participation was extensive:

- The programme committee included four graduate students—one the conference administrative assistant, and the three others session organizers.
- We held a student presentation contest, as well as two artistic challenge contests, with small financial awards for all. Undergraduates were able to participate in the following ways: as presenters; comped entry for the agent-based modeling sessions for those in Parker's "Introduction to agent-based modeling" class; and comped tickets to the conference dinner for students who could not attend the conference due to classes. Conference attendees also guest lectured in Dawn Parker's agent-based modeling course.
- PhD student Perin Ruttonsha was funded to organize a [pre-conference student reading group](#), host a conference discussion session around building a science of complex cities, and author a white paper reporting the results. A draft paper has been submitted.

- Two companion workshops were held, [one organized by Jeremy Pittman and Carrie Mitchell](#) and funded through WICI/CIGI matching funds, and the second organized by Dawn Parker using her IPRG grant (supported by WICI matching funds).
 - Parker’s workshop on agent-based land market models allowed scholars to compare the fine details of their model implementation and discuss the reasons for these differences, as well as their implications. We also had the opportunity to discuss research questions that might be the focus of future collaborations.
 - Participants from both workshops also presented in two organized conference sessions, which also included other conference attendees.

A self-pay conference dinner, with performances and awards for the song contest, was held at Nick and Nat’s Uptown 21 in Waterloo.

Keynote videos for Hedwig Van Delden, Alex Anas, and Pamela Robinson are posted on the WICI Vimeo channel:

- <https://vimeo.com/281469745>
- <https://vimeo.com/281471834>
- <https://vimeo.com/281470724>

Full details are available at the conference website: <https://uwaterloo.ca/complexity-innovation/events/wici-conference-modelling-complex-urban-environments> .

Conference program and abstracts: https://uwaterloo.ca/complexity-innovation/sites/ca.complexity-innovation/files/uploads/files/final_print_wici_ucc_conference_program_17june2018_id.pdf

Song contest entries: https://uwaterloo.ca/complexity-innovation/sites/ca.complexity-innovation/files/uploads/files/wici_song_contest_submissions_2.pdf

Publications in preparation:

- Pittman et. al, overview paper from workshop and sessions: “Disentangling the social-ecological structure of cities” in preparation for Nature Sustainability | People and Nature
- Rushota et al., synthesis paper from pre-conference reading group and interactive discussion sessions “A science of cities for sustainable development”
- Parker et. al., paper outlining the new Mr Potatohead ABM land market model template and comparing 6 models: “MR POTATOHEAD: Property Market Edition” in preparation for submission to Computers, Environment and Urban Systems

Conference survey results (a fairly small number of respondents due to the survey link being mailed out some time after the conference) are included in [Appendix C](#). Here are a few selected quotes:

“I liked the grouped sessions with research paper presentations; it was a chance to see how different aspects of a theory or theme were being addressed, and I like how they were organized so that you could see the key speaker topics directly relate to them. And further to that, the workshop really invited summarizing all the information heard throughout the day, in a more digestible format. Overall the organization of your speakers and the events the preceded and followed them was really good for generating discussion, connections, and new ideas.”

“I think the event was well structured and provided attendees the opportunity to garnish exposure to many different areas of academic and professional research (e.g., transportation issues and International Development problems being addressed in Industry). It certainly added to my academic experience.”

“The multi-disciplinary nature of the event was fascinating and fostered greater interest in new areas of study for me.”

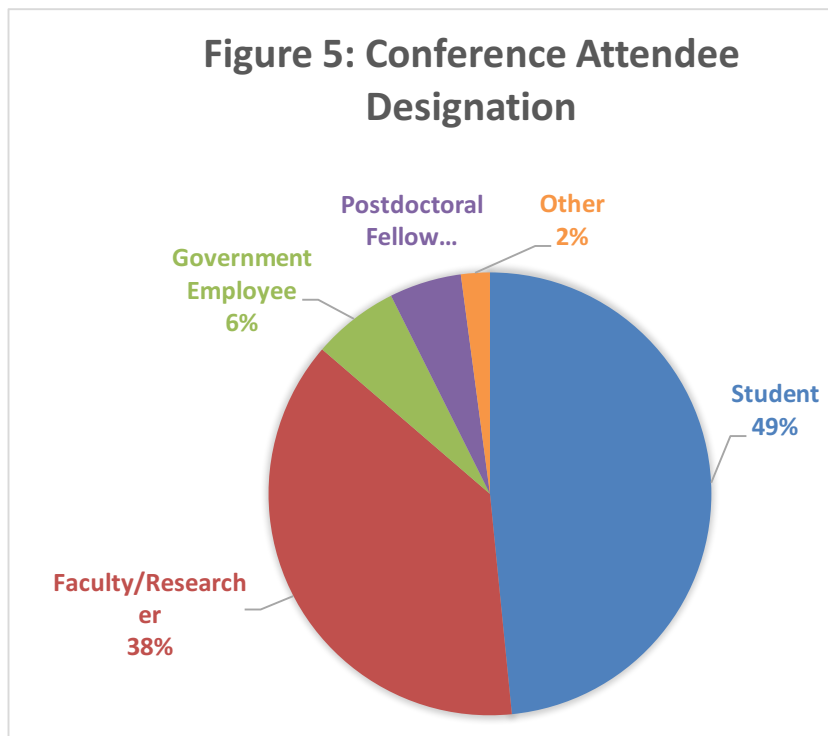
Survey participants provided useful suggestions to improve future events. For instance, we could have better publicized the pre-conference reading group, so that remote scholars planning to attend the conference could have also participated. Generalist introductions to each session and the conference content as a whole, as well as additional time for questions and answers, were also suggested. It was also noted that key sessions were changed—in essence, two very senior keynotes cancelled, one in advance, but the other the day before. The lesson learned is to have a wide range of keynotes planned from the start, including younger and local scholars.

When asked about key connections, participants reported discovering new models, making important connections for future employment, connecting with new collaborators, including many with specific details about progress on particular projects and/or research directions. For instance:

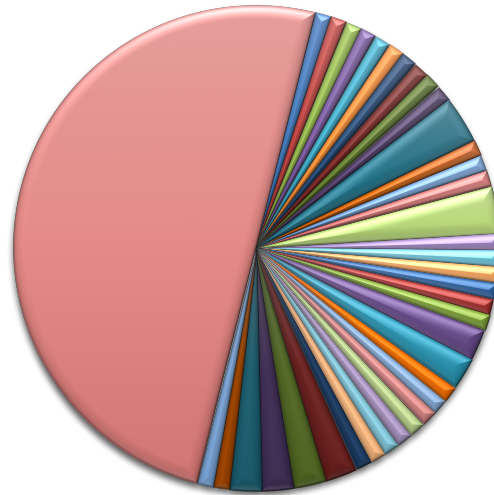
“Potential landscape connectivity modeling / research connection between Waterloo and TRCA”

“I found two collaborators from overseas for other projects I am working on in land use and cycling”

“I connected with some of the UK data scientists and hope to pursue that relationship,” and “A collaborative paper has emerged - as a Master's student I have gained an opportunity to co-author a publication with researchers who have a name in my field.”



**Figure 6: Modelling Complex Urban Environments
Conference Attendees by Affiliation**



- | | |
|---|--|
| Arizona State University | Center for Advancement of Trenchless Technology (CATT) |
| City of London | Cornell University |
| ETH Zurich | George Mason University |
| Hong Kong Polytechnic University | Institute for New Economic Thinking, Oxford University |
| Laurentian University | McMaster University |
| Municipal Property Assessment Corporation | Northern Kentucky University |
| Okrent Kiesel Associates | Ontario Growth Secretariat/Ministry of Municipal Affairs |
| Region of Waterloo | Research Institute for Knowledge Systems |
| Ruhr Universität Bochum | Ryerson University |
| Simon Fraser University | Stanford Knowledge Integration Lab |
| Texas A&M University | The James Hutton Institute |
| The New School | The University of the West Indies |
| Toronto & Region Conservation Authority | TU Delft |
| Uni-vative Designs Inc. | United States Forestry Service |
| Universidad de Chile | University of Alabama |
| University of Buffalo | University of Corsica |
| University of Guelph | University of Leeds |
| University of Toronto | University of Turin |
| University of Twente | University of Waterloo |

WICI VISITING STUDENTS 2018

WICI hosted two visiting research students in 2018.

Tristan de Wildt, a PhD researcher in Energy and Industry from TU Delft visited in May-June 2018. He worked with Vanessa Schweizer (Knowledge Integration) on Cross-Impact Balances. A paper is currently being written applying this method to the decentralization of electricity supply. Additionally, Tristan worked with Bissan Ghaddar (Department of Management Sciences) on creating fair allocations of shared energy storage systems among households using an agent-based model. Tristan also presented at the WICI Conference on Modelling Complex Urban Environments, gave guest lectures as part of the

courses 'INTEG 475 - Special topics: Decision Making Under (Deep) Uncertainty' and 'PLAN 474/764 - Introduction to Agent-Based Modelling', and was involved in student supervision.

Meike Will, a PhD student in Ecological Modelling with Hemholtz Centre for Environmental Research (Leipzig, Germany) and Netherlands, visited with Dawn Parker's research group in July 2018. She presented her work on the effects of microinsurance on informal risk-sharing arrangements in Parker's ABM class. Furthermore, she had the opportunity to discuss various aspects of her research, in particular the coupling of agent-based modelling and social network analysis and the representation of human decision-making in models with different scientists. With Jeremy Pittman and Derek Robinson, both working on socio-ecological systems, Will had an exchange about the potential of agent-based models and social networks in the field of land-use change; with Igor Grossmann she discussed the implementation of wisdom in agent-based models. In addition, Will met several PhD students who also use or plan to use agent-based models. They were interested in Will's experience with this approach for modelling human behavior and for integrating social network analysis. She issued an invitation to ABM students to apply for visiting studentships at the Hemholtz Centre (applications now open). Further, she participated with Dawn Parker in a six-country Trans Atlantic Partnership application, where she will be a post-doc, if the proposal is funded.

WICI SPONSORED STUDENT RESEARCH AND TRAVEL

Thomas Bury: Attendance and presentation at "[Dynamics Days](#)" Conference in Denver, Colorado January 4-6, 2018

Thomas Bury & Diana Luna Gonzalez: Attendance at the [Fields Institute Workshop on Human-Environment Systems: Feedback and Management](#) in Toronto, ON, March 5-9, 2018

Katherine Laycock: Attendance and presentation at '[Urban Affairs Conference](#)' in Toronto, ON, April 4-7, 2018

Scott Janzwood: joined the [Future of Humanity Institute \(FHI\)](#) at the University of Oxford as a Visiting Fellow from April to June 2018 for ERC Advanced Project on Uncertainty and Precaution.

Julia Goyal: Attendance at the [2018 Qualitative Analysis Conference](#) in Fredericton, NB, May 16-18 2018

Kathryn Fair & Thomas Bury: Attendance at the [Ecological Society of America \(ESA\) Conference](#) in New Orleans, USA from August 5-10, 2018.

Jude Kurniawan: Attendance and presentation at [Pycon Canada 2018](#), Toronto, ON, November 10-13, 2018

UPDATES ON 2017 WICI SPONSORED WORKSHOPS (COMPETITIVELY AWARDED)

COMPLEX INSTITUTIONAL SYSTEMS AND URBAN SUSTAINABILITY OUTCOMES/SOCIAL-ECOLOGICAL NETWORKS IN THE CITY

The Social-Ecological Networks in the City workshop, led by Dr. Jeremy Pittman and Dr. Carrie Mitchell (School of Planning), received \$5000 support from the Waterloo Institute for Complexity and Innovation

and matching funds from the Balsillie School of International Affairs. The workshop brought together experts in urban ecology, stewardship, resilience, and planning for a two-day event, which aimed to develop a collaborative paper and funding proposal related to further exploring social-ecological networks in urban contexts. The participants included Michelle Johnson from the United States Forestry Service, Kirsten Schwarz from Northern Kentucky University, Sara Meerow from Arizona State University, Sierra Woodruff from Texas A & M University, Örjan Bodin from the Stockholm Resilience Center, and multiple graduate students from the University of Waterloo and Balsillie School of International Affairs, including Joanne Marie Fitzgibbons, Priyal Agarwal, Garrett Mombourquette, and Dyson Smirle. The organizers and participants are currently preparing collaborative papers and proposals to be submitted in the near future.

ENHANCING CAPACITY TO APPLY SYSTEMS APPROACHES TO IMPROVE HUMAN AND PLANETARY HEALTH

In April 2018, S. Kirkpatrick and A. Raffoul received a grant of \$8000 to host a workshop for faculty and trainees, funded by WICI, on enhancing capacity to apply systems approaches to improve human and planetary health.

The objectives of this workshop were to expose faculty and trainees from various disciplines with relevance to human and planetary health (e.g., public health, environment, engineering, anthropology) to systems thinking, and provide hands-on training in systems methods with relevance to challenges encompassing both domains. Over the course of two days, faculty and trainees were exposed to and engaged with systems thinking, but also fostered the use of a systems lens to bring together existing campus efforts to promote health while also reducing our environmental footprint. A copy of the detailed program including abstracts and presenter biographies can be viewed in on the [conference website](http://www.sharonkirkpatrick.ca/systems-workshop-2018.html) (<http://www.sharonkirkpatrick.ca/systems-workshop-2018.html>).

The first day of the workshop featured two keynote speakers, Dr. Bruce Lee, Executive Director of the Global Obesity Prevention Center at Johns Hopkins Bloomberg School of Public Health, and Dr. Vanessa Schweizer, Assistant Professor in Knowledge Integration and a WICI Core member at University of Waterloo. Additionally, several case studies from a variety of fields and practices (i.e., environmental sciences, clinical medicine) were presented and tied together with discussant panels led by faculty and graduate students. In the afternoon, there were 7 oral and 10 poster presentations (plus a sculpture). Trainee presentations were judged and prizes awarded to Katherine Zywert (Social and Ecological Sustainability) and Ana Carolina Esteves Dias (Environment, Resources and Sustainability) for oral presentations, and to Diana V. Luna-Gonzalez (Environment, Resources and Sustainability) and Sara R. Packull-McCormick (SPHHS) for poster presentations.

On the second day, participants self-registered for one of two hands-on morning sessions, focusing on either quantitative (e.g., agent-based modeling, system dynamics) or qualitative systems (e.g., concept-mapping, cross-impact balance) methods. The afternoon session, led by Dr. Katie Plaisance, led participants through the basics of team science, including barriers and facilitators to interdisciplinary collaboration.

There were 72 attendees comprised of faculty (16), students and post- doctoral fellows (40), and other participants who work in related fields on- and off-campus (16) (there may have been additional attendees who did not register but who came for sessions throughout the first day). The composition of the workshop audience was diverse, and included participants from public health, environment, psychology, engineering, medicine, and biostatistics. Many participants commented that this workshop

was some of their earliest exposure to the work being conducted in other departments and faculties at the University of Waterloo, and highlighted the potential opportunities that they had established to connect with faculty and trainees across disciplines.

An evaluation survey was circulated using Google Forms and 26 responses were received. Overall, participants noted the lively and useful program, though a few noted that the day might have been a bit too packed. Comments and feedback from the workshop highlight the need for greater efforts to enhance capacity to apply systems approaches and facilitate transdisciplinary networks across campus. Campus-wide initiatives, such as this WICI-funded workshop, provide promising avenues to foster greater collaboration and fill the gap that is currently present in systems thinking opportunities on campus. A copy of the full workshop report is included in [Appendix D](#).

THE IDEOLOGICAL CONFLICT PROJECT

This research project affiliated with WICI and the Balsillie School for International Affairs – received \$8000 in WICI workshop funding along with matching funds from the BSIA research budget to host a workshop on complexity approaches to understanding the phenomenon of right-wing populism, under the joint supervision of Prof. Thomas Homer-Dixon, Prof. Bessma Momani and Dr. Steven J. Mock. The workshop, “Deconstructing the Ideological Complexity of Right-Wing Populism Across Borders”, took place at BSIA, April 2-3 2018.

The workshop aimed to explore how methods developed by the ICP derived from complexity theory could be used to analyze populist ideology and mobilization as an emergent phenomenon resulting from a pattern of interaction between systems that operate on different levels of analysis: economic, cultural, institutional and psychological. The flyer included in [Appendix E](#) further elaborates on the workshop’s mandate.

Funds were used to support travel and accommodation for two overseas guest speakers: Daphne Halikiopoulou (University of Reading, UK; *The Golden Dawn's 'Nationalist Solution': Explaining the Rise of the Far Right in Greece*, Palgrave 2015) and Eric Kaufmann (Birkbeck College, University of London, UK; *Whiteshift: Populism, Immigration and the Future of White Majorities*, Abrams 2018); as well as Canada-based experts Daniel Stockemer (University of Ottawa; *The Front National in France: Continuity and Change Under Jean-Marie Le Pen and Marine Le Pen*, Springer 2017) and Darrell Bricker (CEO of Ipsos Global Public Affairs). Students and junior scholars who participated included Jordan Mansell (University of Oxford, UK) and Andrew Jones (York University), along with BSIA-affiliated PhD. students and researchers Jinelle Piereder and Kira Williams. The program in [Appendix F](#) includes a complete list of sessions and participants.

Bessma Momani and Steven Mock are preparing a co-authored paper drawing from the outcomes of the workshop, outlining how ICP methods can be used to resolve definitional and methodological issues in the study of populism (publication venue to be decided). Dr. Mock is scheduled to present this paper at the International Studies Association regional conference in Belgrade, Serbia in June 2019. Additional collaborations remain ongoing with several workshop participants, such as Dr. Mansell who has since joined the ICP research team and is assisting in the development of methods for field testing the project’s “state-space” approach to classifying political ideology.

“TOWARDS A SCIENCE OF CITIES” READING AND WRITING GROUP

The WICI 2018 reading and writing seminar series, *Navigating the Complexity of Urban Systems*, was designed to lead into its spring conference on *Modelling Complex Urban Environments*. The series

spanned four key topics, as follows: (1) cities as complex adaptive socio-ecological systems; (2) qualitative, quantitative, and design-based urban analyses; (3) networks, scale and emergence; and, (4) planning for transition. Within these sessions, participants reviewed, discussed and reflected on select readings (27 in total) related to each theme, drawn primarily from the works of the conference keynote speakers. As part of this, the group compared, critiqued and charted quantitative, qualitative and design-based approaches to analysing complexity within urban systems, considering how to balance between theory and practice. Work also included simple creative design and modelling exercises. A few key areas of interest, dialogue and debate that arose pertained to prospects for optimization, non-rational drivers of change, patterns of spatial organization, connectivity, approaches to participatory processes, the role of cognition, and climate change resilience.

In conjunction, as part of the WICI 2018 spring conference, the group held two 1-hour workshops. In the first session, the key components of a science of cities was discussed, debating whether it is possible to arrive at a comprehensive, cohesive or universal approach. In the second, the group explored how science of cities could be applied to enable sustainable development within urban contexts. During these workshops, participant responses on the following questions were collected: *How can qualitative, quantitative and design-based approaches to urban analyses be integrated to inform a comprehensive science of cities? What key findings have emerged from recent work in this area? What are the implications for urban planning? What are the implications for sustainability transition?* Participants recorded their individual as well as group responses; in total, 22 unique individual written responses were submitted. Of this, approximately half were from graduate students and the other half research or policy professionals; approximately half specialize in ecological/environmental research, management and related fields, while the other half in planning, architecture, or engineering, and related fields; approximately two thirds apply quantitative methods in their work. Generally, to enrich science of cities thinking, the group recommended including more investigation within the following clusters: (a) trade-offs between decision options, how to establish goals in light of these, the significance of SDG indicators, and inequalities that might arise through transition; (b) triggers of change, early warning signals of crises, and possible unintended consequences and cascading effects of interventions; (c) historical context, temporal changes, long-range scenarios, and multi-generational studies; (d) relationships among cities, as well as between cities and their hinterlands; and, (e) metabolic flows, feedbacks, correlated dynamics, and the relationship of local dynamics to macro-level, emergent patterns.

Finally, in conjunction with this work, the group is preparing a journal article, “A Science of Cities for Sustainable Development” (Ruttonsha, Milne, Wright et al., in preparation). Against the backdrop of an increasingly urbanizing global setting, and a newly released set of sustainable development goals (SDGs), this article captures the inclination of science of cities research to become a central analytical discourse by which to plan for sustainability, and formalizes the convergence among the three domains of complexity science, sustainability transition, and urban planning. The article orients around four foci through which we can study both the complexity and sustainability of cities/systems of settlements, while also revealing the relationship between the two. Namely, by examining their (I) coupled social-ecological-technological phenomena, we can aim to synchronize human-constructed systems with natural ecosystems; by deducing their (II) fundamental nature and functions, we can establish performance goals for quality of life and development; by illustrating the (III) processes embodied in patterns, we can illuminate the cumulative and morphological effects of actors’ interactions; and, by tracking (IV) multi-scale emergent outcomes, we can manage the globalized interdependencies of urbanization, minimizing externalities and trade-offs. Following this, we explore how related concepts, methodologies and findings, drawn from science of cities research, could be combined to generate insights within areas of interest common to both complexity and sustainability thinking, as follows: optimization, organization, adaptivity, connectivity, self-organization and emergence, growth, and cognizance. Finally, the article concludes by discussing how science of cities research could be applied to

(a) attain the stated targets for SDG Goal 11 (Sustainable Cities and Communities); (b) assess intersections among the seventeen SDG goals, as these pertain to systems of settlements; and, (c) reorganize development patterns to mitigate externalities. This article incorporates ideas from the seminar sessions and conference workshops, and is being prepared together with seminar participants, the WICI membership, conference keynotes, and select conference attendees as a shared statement on how to apply science of cities research to enable sustainable development, with the objective of prompting further academic collaborations, as well as research-practice partnerships within municipalities.

WICI 2017 GRADUATE STUDENT FELLOWSHIP AWARDS UPDATES

Amanda Raffoul, Kevin Church and Katharine Zywert were each awarded \$4,000 in 2017. On Tuesday, February 26th, WICI held a talk featuring these three students and their WICI related work.

1. Are we (unintentionally) doing more harm than good? Systems approaches to the prevention of eating- and weight-related disorders – Amanda Raffoul (PhD Candidate in School of Public Health and Health Systems)

Weight management strategies, such as dieting, are often unsuccessful in achieving long-term weight loss and can increase risk of weight gain, disordered eating, and engagement in other health-compromising behaviours. A focus on individual responsibility to maintain a 'healthy weight' can also elicit stigmatization of individuals with higher weights. My research embraces a complex systems approach to explore the potential unintended consequences of interventions aiming to prevent or reduce obesity on other eating- and weight-related disorders, related psychosocial indicators of wellbeing, and other health-related behaviours among young Canadians. My work to date suggests that engagement in weight management approaches, such as dieting, is associated with the uptake of other health-compromising behaviours. My subsequent research will examine the unintended consequences of population-level obesity interventions on psychosocial well-being and disordered eating. This research will help address and prevent policy resistance by informing a more holistic approach to health policies and programs addressing weight.

2. The hidden geometry of complex dynamics and how to exploit it – Kevin Church (PhD Candidate, Applied Mathematics)

Many large-scale problems in our world are inherently dynamic. That is to say, there is a quantity or a collection of quantities that continue to change, and we wish to either slow down this change, speed it up or completely alter its trajectory. The increasing volatility of our planet's weather, for example, poses problems for countless species of animals including humans, and it certainly should be our goal to slow down this progression to an uninhabitable planet. Any such dynamic system, be it the climate or some other physical, chemical or biological system can be rather complex with many interacting elements. Even if these interactions are well-understood, it can be very difficult to determine what, if any, intervention should be made to push the system toward a desired outcome.

Complex dynamic systems such as those described above are often amenable to some form of mathematical modelling. There is an entire mathematical field called *dynamical systems* that is devoted to the analysis of such temporally-changing models. A central idea in this field is that even though a dynamical system might be globally complex and difficult to analyze, the behaviour near well-behaved states can be fairly predictable and comparatively easier to study. The possible range of dynamic behaviour near such well-behaved states is actually confined to surfaces called *invariant manifolds*. We mere mortals cannot typically see these invariant manifolds, but they are nonetheless present. By

computing these hidden geometric objects, we can design sustainable interventions that suppress undesirable system behaviour, leaving only the ideal dynamics behind. This design process is computationally feasible because the invariant manifold data is much easier to work with than the complex system as a whole.

I will present an overview of these ideas as they apply to a class of dynamical systems I have studied during my doctoral degree: impulsive functional differential equations. These systems exhibit two fundamental properties. First, the instantaneous rate of change of the system is allowed to depend on not only its present state, but on its state in the past. Second, at certain times the system is allowed to abruptly jump from one state to another. The latter provides a formalization of control measures or interventions that act on short time scales, while the latter is useful for accounting for such things as incubation periods of infectious diseases, latency in computer networks, or the gestation period of a given species in an ecological model.

3. Social-Ecological Systems Change and the Future of Human Health – Katharine Zywert (PhD Candidate, Social and Ecological Sustainability)

Human health and health systems change through time alongside transitions from one dominant social-ecological regime to another. My PhD research investigates imminent transformations in human health in response to profound reorientations of complex social-ecological systems in the Anthropocene. I argue that as climate change and other ecological changes accelerate, maintaining strong health outcomes will require us to 1) recognize the extent to which human health is dependent on the resilience of complex social-ecological systems at both global and local scales, 2) redesign health care activities to lower their environmental impact, and 3) learn from successful social innovations that blur the boundaries between individual, cultural, and ecosystem health. My presentation will discuss several social innovations for health and care that could build resilience in a context of rising social instability, economic decline, and energy scarcity. While these alternatives are currently fringe approaches, together they prefigure an unexpected future for health in the Anthropocene.

WICI 2016 SEED GRANT CHALLENGE UPDATES

WICI invited applications for small grants to support development and submission of funding proposals to support complex systems research at the University of Waterloo (\$5,000-\$10,000, commensurate with the scope of the developed proposal). Applications were to have a substantive complex systems focus, but could be from any academic domain, and had to clearly indicate how the work would lead to a novel direction. Three applications were successful:

1) Tejal Patel (PI), *Complexity in Medication Use: Older Adults and Capacity to Manage Medications*, \$9,950.00. Co-Principal Applicants: Robert Robson MDCM, William Sutherland MD and William Wong, PhD.

The short-term intention of this project was to perform a literature review to examine the research addressing complexity of medication use in the older adult. Additional objectives included the design and conduct of a pilot qualitative study and design of a system level simulation model that integrates data from a literature review and pilot study. A co-op student was hired in January 2017 for a period of four months to design and conduct, in collaboration with a librarian, the literature search and review. A search revealed few, if any, research addressing medication use as a complex adaptive system.

In January 2018, Tejal Patel was successful in securing a grant from Centre for Aging and Brain Health Innovation in the amount of \$50,000 to test the usability of a number of medication management

products as well as validate an instrument to measure capacity in older adults. Since then Patel and her research team have established face and content validity of the Domain Specific Limitation in Medication Management Capacity, as well as tested the usability and workload of a number of medication management products. In the upcoming year, they hope to validate the tool for reliability, as well as develop a clinician guide for the use of these products in older adults. They are also planning to examine medication management within the home by patients with a qualitative study.

2) Chris Bauch, *Using digital social data to detect early warning signals of regime shifts in coupled human-environment systems*, \$ 10,000.00.

The funds from the WICI Seed Grant Challenge were used to extend the appointment of research associate Justin Schonfeld to help develop a database of tweets about climate change and vaccines. The seed grant funds have allowed for the development of a draft manuscript “Vaccination and Climate Change: Sentiment and Community Structure on Twitter” (Justin Schonfeld, Jeffery Cheng, Madhur Anand, Chris Bauch). Preliminary results from the seed grant were also used in Bauch’s NSERC Discovery Grant renewal submitted in Fall 2018, and an AI for Social Good proposal submitted in Winter 2019.

3) Peter Deadman, *Impact of Tank Rehabilitation on the Resilience of Rainwater Harvesting Institutions in South India*, \$ 9,200.00.

Funding from the WICI seed grant was used to provide RA funding for a doctoral student, Tejasvi Hora (TJ), during the spring 2017 term. During this term, TJ undertook an analysis of the data collected from over 70 interviews of local farmers and officials living within one cascade of irrigation tanks located southwest of Madurai, India, collected in the previous summer and fall. TJ undertook content analysis of these interviews, transcribing voice recordings and written notes to develop a database of farming practices in this watershed. This research identifies common themes surrounding the impact and reception of an irrigation tank rehabilitation project funded by the DHAN Foundation. This analysis has clarified the common cropping rotations, patterns of water use (from the tank or from bore wells), and strategies for dealing with drought seen in the watershed. In addition, the responses of farmers to the rehabilitation of the water control structures in the tank and changing climatic patterns, has been recorded.

The analysis of this data is being undertaken within a social-ecological systems framework, exploring themes of resilience, equity, and sustainability in relation to the changing hydrological characteristics of the irrigation system and the watershed, and the individual and collective response of the farmers operating within this system. We are now nearing completion of a paper with the working title “Traditional tank rehabilitation as a panacea: change and adaptation in a social-ecological system”. We anticipate that the paper will be ready for review in the spring of 2019.

In addition to the paper, this research is informing the preparation of research funding proposals (specifically a SSHRC Insight Development Grant and Global Water Futures Grant) led by Johanna Wandel and Peter Deadman.

FINANCIAL REPORT (MAY 1, 2017 - APRIL 30, 2018)

BUDGET 2017-2018	BUDGETED 2017-18	Actuals May 1, 2017 - April 25, 2018	Forecast April 26 -April 30, 2018	Variance
Anticipated income				
2017-2018 Carryforward	\$21,530.65	\$55,578.00	\$0.00	\$34,047.35
Requested UWaterloo funding	\$70,000.00	\$70,000.00	\$0.00	\$0.00
Fields Institute Registration Fees Collected for 2017 Conference on Resilience	\$4,000.00	\$4,442.48	\$0.00	\$442.48
CAIMS Support for Resilience Conference [May 2017]	\$1,000.00	\$1,000.00	\$0.00	\$0.00
U of G: shared conference costs	\$0.00	\$848.00	\$0.00	\$848.00
TOTAL INCOME	\$96,530.65	\$131,868.48	\$0.00	\$35,337.83
Anticipated expenses				
SALARIES				
Admin Assistant	\$18,000.00	\$20,971.68	\$0.00	-\$2,971.68
IT Technician – Research Group Websites	\$1,000.00	\$0.00	\$0.00	\$1,000.00
SPEAKERS SERIES, WORKSHOPS AND OTHER EVENTS				
Catering for Speakers Series and Meetings	\$2,000.00	\$1,390.17	\$0.00	\$609.83
Travel, Accommodation and Meals for Speakers Series	\$10,000.00	\$6,498.42	\$0.00	\$3,501.58
Sponsored Workshops (3 were supported)	\$16,000.00	\$21,000.00	\$0.00	-\$5,000.00
Promotion and Marketing	\$500.00	\$636.74	\$0.00	-\$136.74
2018 Conference on Modelling Complex Urban Environments	\$11,000.00	\$0.00	\$0.00	\$11,000.00
Resilience Conference	\$0.00	\$15,297.92	\$0.00	-\$15,297.92
GRANT SUPPORT EXPENSES				
Research Honorarium for Interim WICI Director Madhur Anand	\$10,000.00	\$10,000.00	\$0.00	\$0.00
OTHER RESEARCH FUNDING				
Core Members Travel for Conferences and Networking	\$7,500.00	\$2,898.84	\$0.00	\$4,601.16
WICI Student Membership Initiative	\$3,000.00	\$3,000.00	\$0.00	\$0.00
Student Research and Travel Grants	\$5,000.00	\$4,555.79	\$0.00	\$444.21
WICI Award of Excellence		\$12,000.00	\$0.00	-\$12,000.00
Remaining Grant for Dawn Parker (Note 1)	\$0.00	\$8,892.00	\$0.00	-\$8,892.00
OTHER				
IT Development and Maintenance (<i>includes yearly account subscriptions, software, etc.</i>)	\$1,500.00	\$1,168.33	\$0.00	\$331.67
Contracted Services (<i>including editing of publications</i>)	\$500.00	\$0.00	\$0.00	\$500.00
Telephone Service	\$240.00	\$240.64	\$0.00	-\$0.64
Miscellaneous	\$500.00	\$514.19	\$0.00	-\$14.19
Unallocated carry forward budgeted	\$9,790.65	\$0.00	\$0.00	\$9,790.65
TOTAL EXPENSES	\$96,530.65	\$109,064.72	\$0.00	(\$12,534.07)
NET FUNDS AVAILABLE/ANTICIPATED CARRY-FORWARD		\$22,803.76		\$22,803.76

WICI BUDGET 2018-19

BUDGET 2018-2019	BUDGETED 2018-19	Actuals May 1, 2018 - present	Forecast Expenses to April 30, 2019	Variance
Anticipated income				
2017-2018 Carryforward	\$21,136.00	\$21,136.00	\$0.00	\$0.00
Requested UWaterloo funding	\$75,000.00	\$75,000.00	\$0.00	\$0.00
TOTAL INCOME	\$96,136.00	\$96,136.00	\$0.00	\$0.00
Anticipated expenses				
SALARIES				
Admin Assistant	\$19,000.00	\$16,835.70	\$4,590.00	(\$2,425.70) ¹
IT Technician – Research Group Websites	\$1,000.00	\$0.00	\$0.00	\$1,000.00 ²
Research Assistant (GRA)	\$7,988.24	\$1,997.24	\$5,991.00	\$0.00 ³
SPEAKERS SERIES, WORKSHOPS AND OTHER EVENTS				
Catering for Speakers Series and Meetings	\$2,000.00	\$540.75	\$1,045.00	\$414.25
Travel, Accommodation and Meals for Speakers Series	\$10,000.00	\$2,396.60	\$2,127.00	\$5,476.40 ⁴
Sponsored Workshops	\$0.00	\$0.00	\$0.00	\$0.00
Promotion and Marketing	\$500.00	\$47.40	\$316.00	\$136.60
2018 Conference on Modelling Complex Urban Environments	\$0.00	\$11,017.41	\$0.00	(\$11,017.41) ⁵
GRANT SUPPORT EXPENSES				
Academic Stipend for WICI Director Dawn Parker	\$10,000.00	\$10,000.00	\$0.00	\$0.00
OTHER RESEARCH FUNDING				
Core Members Travel for Conferences and Networking	\$7,000.00	\$2,908.59	\$1,500.00	\$2,591.41 ⁶
WICI Student Membership Initiative	\$3,000.00	\$0.00	\$2,000.00	\$1,000.00 ⁷
Student Research and Travel Grants	\$5,000.00	\$3,530.96	\$0.00	\$1,469.04 ⁸
WICI Awards for Student Project Symposium	\$0.00	\$0.00	\$0.00	\$0.00
WICI Partnership Match: SEED Grants	\$16,000.00	\$0.00	\$16,000.00	\$0.00
WICI Partnership Match: Matching Grants	\$15,000.00	\$0.00	\$15,000.00	\$0.00 ⁹
OTHER				
IT Development and Maintenance (includes yearly account subscriptions, software, etc.)	\$1,500.00	\$496.42	\$0.00	\$1,003.58
Contracted Services (including editing of publications)	\$500.00	\$0.00	\$1,500.00	(\$1,000.00) ¹⁰
Telephone Service	\$240.00	\$139.71	\$60.00	\$40.29
Miscellaneous	\$500.00	\$0.00	\$0.00	\$500.00
TOTAL EXPENSES BUDGETED	\$99,228.24			
TOTAL EXPENSES TO DATE		\$49,910.78		
PROJECTED EXPENSES FOR WINTER TERM			\$50,129.00	
PROJECTED VARIANCE FOR CARRYOVER				(\$811.54)

Notes on Variances:

- 1 Admin Assistant salary includes overlap of training and vacation payout for departing admin
- 2 IT support is now provided by UW
- 3 Research GRA is based on \$7,681 x 1.04 VAC for 4 months
- 4 Travel for speakers series reflects airfare for Ricard Solevicente (Spain) from April 2018; Saskia Sassen's cancellation in the fall
- 5 2018 Conference on Modelling Complex Urban Environments was funded with carryforward from 2017-18 as per budget
- 6 \$1500 for Core Member travel has been committed for next year as carry-over
- 7 Unused student funds may be utilized for possible CANSEE registration support
- 8 There is \$500 committed for student in May; unused student funds may be utilized for possible CANSEE registration(s) as above
- 9 Partnership matching grant of \$5000 is committed to Parker's TAP grant
- 10 Contracted professional editing services will be used as required but capped at a maximum amount as discussed at Steering Committee meeting Jan 15th

APPENDIX A: WICI GOVERNANCE COMMITTEES

WICI BOARD

Charmaine	Dean	UW VP, University Research
James	Rush	UW VP, Academic and Provost
Deans or their representatives from the primary participating faculties		
Keith	Hipel	Professor, System Design Engineering, UW
Paul	Thagard	Professor of Philosophy and Director of the Cognitive Science Program, University of Waterloo
Monica	Cojocar	Professor, Mathematics, University of Guelph
Anna	Lawniczak	Professor, Department of Mathematics & Statistics, University of Guelph
Sarah	Tolmie	Associate Professor, Department of English Language and Literature
William	Sutherland	MD, Assistant Clinical Professor (Adjunct), Family Medicine, McMaster University, and Founder and Director of the Institute for Complexity & Connection Medicine

SCIENTIFIC ADVISORY COUNCIL

W. Brian	Arthur	External Professor, Santa Fe Institute
Robert	Axtell	Professor and Chair, Dept. of Computational Social Science, George Mason University
Yaneer	Bar-Yam	President, New England Complex Systems Institute
Michael	Batty	Professor of Planning, Director, Center of Advanced Spatial Analysis, University College London
Eric	Beinhocker	Executive Director, Institute for New Economic Thinking at the Oxford Martin School, University of Oxford
Monica	Cojocar	Associate professor, Department of Mathematics & Statistics, University of Guelph.
J. Doyne	Farmer	Professor of Mathematics and Director of Complexity Economics, Institute for New Economic Thinking at the Oxford Martin School, University of Oxford
Carl	Folke	Science Director, Stockholm Resilience Centre
Ian	Goldin	Director, Oxford Martin School, Oxford University
Matthew	Hoffman	Associate professor of political science, University of Toronto
Eric	Lambin	Professor, Dept. of Geography, University of Louvain; Professor, School of Earth Sciences, Stanford University
Jukka-Pekka	Onnela	Assistant Professor of Biostatistics, Department of Biostatistics, Harvard School of Public Health
Felix	Reed-Tsochas	Co-Director of the CABDyN Complexity Centre University of Oxford
Marten	Scheffer	Professor, Aquatic Ecology, Wageningen University
Lee	Smolin	Perimeter Institute; Adjunct Professor, Dept. of Physics, UW
William	Sutherland	MD, Assistant Clinical Professor (Adjunct), Family Medicine, McMaster University, and Founder and Director of the Institute for Complexity & Connection Medicine

Leigh	Tesfatsion	Professor of Economics, Mathematics, and Electrical & Computer Engineering, Dept. of Economics, Iowa State
Jan	Wouter Vasbinder	Director of the Complexity Program at the Nanyang Technological University at Singapore

STEERING COMMITTEE

Dawn	Parker	WICI Director, Professor, School of Planning, Faculty of Environment, University of Waterloo
Peter	Deadman	WICI Associate Director, Associate Professor, Geography and Environmental Management, University of Waterloo
Madhur	Anand	Professor, School of Environmental Sciences, University of Guelph (through January 2019)
Chris	Bauch	Professor, Applied Mathematics, University of Waterloo
Mark	Crowley	Assistant Professor, Pattern Recognition and Machine Intelligence group, Department of Electrical and Computer Engineering, University of Waterloo (through Sept. 2018)
Sharon	Kirkpatrick	Associate Professor, School of Public Health & Health Systems, University of Waterloo (from Sept. 2018)
Chrystopher	Nehaniv	Professor, Systems Design Engineering, University of Waterloo (from Sept. 2018)
Stephen	Quilley	WICI Director of Development; Associate Professor, SiG, Department of Environment and Resource Studies, University of Waterloo
Vanessa	Schweizer	Assistant Professor in Knowledge Integration, University of Waterloo

APPENDIX B: 2018 PRODUCTIVITY REPORT - DETAILS OF INDIVIDUAL CORE WICI-RELATED ACTIVITIES

NAME	STATUS	CONTRIBUTIONS
Madhur Anand	Core	<p><u>Publications</u></p> <p>R. Leon Cordero, S. M., S. Krishnan, C. T. Bauch, M. Anand (2018). 'Elements of indigenous socio-ecological knowledge show resilience despite ecosystem change in the forest-grassland mosaics of the Nilgiri Hills, India.' <i>Palgrave communications</i> 4: 105.</p> <p>S. Rizvi, <u>C. Pagnutti</u>, C.T. Bauch, M. Anand (2018). 'Global land use implications of dietary trends'. <i>PLOS ONE</i>, 13(8): e0200781.</p> <p><u>P. Jentsch</u>, M. Anand, C.T. Bauch (2018). 'Spatial correlation as an early warning signal of regime shifts in a multiplex disease-behaviour network.' <i>Journal of Theoretical Biology</i> 448: 17-25.</p> <p><u>V. Thampi</u>, M. Anand, C.T. Bauch (2018). 'Socio-ecological dynamics of Caribbean coral reef ecosystems and conservation opinion propagation'. <i>Scientific reports</i>, 8(1): 2597.</p> <p><u>Publications in press</u></p> <p><u>T. Oraby</u>, C.T. Bauch, M. Anand (submitted 2018, accepted 2018). The Environmental Kuznets Curve Fails in a Globalized Socio-Ecological Metapopulation: A Sustainability Game Theory Approach. <i>Handbook of Statistics</i>.</p> <p><u>R. Sigdel</u>, M. Anand, C.T. Bauch (submitted 2018, accepted 2018). 'Convergence of socio-ecological dynamics in disparate ecological systems under strong coupling to human social systems'. <i>Theoretical ecology</i>.</p> <p><u>Workshop/Conference Organization</u></p> <p>Workshop on Human-Environment Systems: Feedback & Management. March 5-9, 2018 at the Fields Institute</p> <p>Poetry and Complexity, March 27, 2018. Readings and discussions with Nobel prize winning scientist and poet Roald Hoffman and Pulitzer prize winning poet Rae Armantrout.</p> <p><u>Student Supervision</u></p> <p>Peter Jentsch (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2016. Co-supervised with Chris Bauch.</p>

		<p>Thomas Bury (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2015. Co-supervised with Chris Bauch.</p> <p>Kat Fair (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2014. Co-supervised with Chris Bauch.</p>
Chris Bauch	Core	<p><u>Publications</u></p> <p>S. Zhao, D. He, C.T. Bauch (2018). ‘Strategic decision-making about travel during disease outbreaks: a game theoretical approach’. <i>J. R. Soc. Interface</i>, 20180515.</p> <p>R. Leon Cordero, S. M., S. Krishnan, C. T. Bauch, M. Anand (2018). ‘Elements of indigenous socio-ecological knowledge show resilience despite ecosystem change in the forest-grassland mosaics of the Nilgiri Hills, India.’ <i>Palgrave communications</i> 4: 105.</p> <p>S. Rizvi, <u>C. Pagnutti</u>, C.T. Bauch, M. Anand (2018). ‘Global land use implications of dietary trends’. <i>PLOS ONE</i>, 13(8): e0200781.</p> <p><u>J. Pharaon</u>, C.T. Bauch (2018). ‘The influence of social behaviour on competition between virulent pathogen strains’. <i>Journal of Theoretical Biology</i> 455: 47-53.</p> <p><u>P. Jentsch</u>, M. Anand, C.T. Bauch (2018). ‘Spatial correlation as an early warning signal of regime shifts in a multiplex disease-behaviour network.’ <i>Journal of Theoretical Biology</i> 448: 17-25.</p> <p>D.R. Grimes, C.T. Bauch, J.P.A. Ioannidas (2018). ‘Modeling science trustworthiness under publish or perish pressure’. <i>Royal Society Open Science</i> 5(1): 171511.</p> <p><u>V. Thampi</u>, M. Anand, C.T. Bauch (2018). ‘Socio-ecological dynamics of Caribbean coral reef ecosystems and conservation opinion propagation’. <i>Scientific reports</i>, 8(1): 2597.</p> <p>C.T. Bauch (2018). ‘Statistical challenges and opportunities in modelling coupled behaviour-disease dynamics of vaccine refusal’. Italian Statistical Society, 2018 Annual Conference. <i>Book of Short Papers SIS 2018</i>, page 32. Eds. A. Abbruzzo, E. Brentari, M. Chiodi, D. Piacentino. Pearson Publishing.</p> <p>O. Menin, C.T. Bauch (2018). ‘Solving the patient zero inverse problem by using generalized simulated annealing’. <i>Physica A</i> 490: 1513-1521.</p> <p><u>N. Ringa</u>, C.T. Bauch (2018). ‘Spatially implicit modelling of disease-behaviour interactions in the context of non-pharmaceutical interventions’. <i>Mathematical Biosciences and Engineering</i> 15(2): 461-483.</p>

Publications in Press

T. Oraby, C.T. Bauch, M. Anand (submitted 2018, accepted 2018). The Environmental Kuznets Curve Fails in a Globalized Socio-Ecological Metapopulation: A Sustainability Game Theory Approach. *Handbook of Statistics*.

R. Sigdel, M. Anand, C.T. Bauch (submitted 2018, accepted 2018). 'Convergence of socio-ecological dynamics in disparate ecological systems under strong coupling to human social systems'. *Theoretical ecology*.

Presentation

'Some Simple(ish) Models of Complex Coupled Human-Environment Systems'. March 7, 2018 at the Fields Institute Workshop on Human-Environment Systems: Feedback and Management

Media Outreach

Land use implications of dietary trends:

- CBC London: London Morning. Radio Interview. Host: Julianne Hazlewood. 17 August 2018.
- CBC Thunder Bay: Superior Morning. Radio Interview. Host: Lisa Laco. 17 August 2018.
- CBC Sudbury: Morning North. Radio Interview. Host: Jessica Pope. 17 August 2018.
- CBC Winnipeg: Information Radio. Radio Interview. Host: Marcy Markusa. 17 August 2018.
- CBC Edmonton: Edmonton AM. Radio Interview. Host: Mark Connolly. 17 August 2018.
- CBC Cape Breton: Information Morning. Radio Interview. Host: Steve Sutherland. 17 August 2018.
- CBC Vancouver: The Early Edition. Radio Interview. Host: Stephen Quinn. 17 August 2018.
- CBC Regina: The Morning Edition. Radio Interview. Host: Zarqa Nawaz. 17 August 2018.
- CBC Whitehorse: A New Day. Radio Interview. Host: Sandi Coleman. 17 August 2018.
- CBC.ca. "If the world ate the USDA-recommended diet, there wouldn't be enough land to grow it". Writer: Showwei Chu. 16 August 2018. <http://www.cbc.ca/news/health/usda-guidelines-diet-agricultural-land-use-study-1.4781291>
- Global News Radio, 640 Toronto: The Exchange. Radio Interview. Host: Matt Gurney. 16 August 2018.

Student Supervision

Peter Jentsch (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2016. Co-supervised with Madhur Anand.

		<p>Thomas Bury (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2015. Co-supervised with Madhur Anand.</p> <p>Kat Fair (PhD in Applied Mathematics, University of Waterloo, Dept. of Applied Mathematics). Start date: Fall 2014. Co-supervised with Madhur Anand.</p> <p>Ram Sigdel (PhD in Mathematics, University of Guelph, Dept. of Mathematics and Statistics). Fall 2013 to Fall 2018.</p>
Mark Crowley	Core	<p><u>Publications</u></p> <p>Sriram Subramanian*, Mark Crowley. "Using Spatial Reinforcement Learning to Build Forest Wildfire Dynamics Models from Satellite Images". <i>Frontiers in ICT: Environmental Informatics</i>. Editor: Nathaniel K. Newlands. 30 pages. 2018.</p> <p>Ganapathi Subramanian S., Crowley M. "Combining MCTS and A3C for Prediction of Spatially Spreading Processes in Forest Wildfire Settings". In: Bagheri E., Cheung J. (eds) <i>Advances in Artificial Intelligence. Canadian AI 2018 (CAI-2018)</i>. Lecture Notes in Computer Science, vol 10832, pp.285-291. Springer, Cham.</p> <p>Sriram Subramanian*, Mark Crowley. "Combining MCTS and A3C for Prediction of Spatially Spreading Processes in Forest Wildfire Settings". <i>The Canadian Conference on Artificial Intelligence</i>, Toronto, 2018.</p> <p>Sushrut Bhalla*, Sriram Subramanian*, Mark Crowley. "Training Cooperative Agents for Multi-Agent Reinforcement Learning". <i>International Conference on Autonomous Agents and Multiagent Systems (AAMAS)</i>. 9 pages. Montreal, 2019.</p> <p>Sriram Subramanian*, Mark Crowley. "A Complementary Approach to Improve Wild Fire Prediction Systems". <i>AI for Social Good Workshop at the 2018 Neural Information Processing Systems (NeurIPS) conference</i>. 4 pages, peer reviewed workshop. Montreal, 2018.</p> <p><u>Presentations</u></p> <p>Not the New Normal: BC AI Wildfire Symposium, Vancouver, BC, October, 2018. "Fighting Fire with AI: Why AI is Different...and How." Host: Matthew Toner.</p> <p>Wildland Fire Appropriate Response Workshop: Generating and Using Science, Feb. 27-28, 2018. London, ON.</p> <p><u>Workshop/Conference Organization</u></p> <p>Lead co-organizer of the first <i>AI for Social Good Workshop</i> - This workshop at the <i>Neural Information Processing Systems (NeurIPS) conference</i> held in Montreal in December 2018. NeurIPS is seen as the premier world academic conference on</p>

		<p>Machine Learning which very selective publication even in workshops. Our workshop was selected during a competitive process and brought together world leaders in AI/ML and their impact on civil society, medicine, environment, and government policy. I was in charge of the peer review process for our submitted works track, we received around 100 submissions and selected 30 of these for posters and 6 as short presentations. I defined the review policy, coordinated the online review process, invited reviewers in collaboration with a couple graduate students on the workshop committee. The workshop was a great success with over 400 attendees.</p>
Peter Deadman	Core	<p><u>Publication</u></p> <p>Zhao, Y., J. Andrey, P. Deadman. 2018. Whether conversion and weather matter to roundabout safety. <i>Journal of Safety Research</i> (66) 151-159.</p> <p><u>Presentations</u></p> <p>Deadman, P., D. Robinson, J. Wandel, L. Guo. “Modelling the influence of land management decisions on phosphorus transport in an agricultural watershed”. Annual Meeting of the American Association of Geographers. New Orleans, USA, April 13, 2018.</p> <p>Frank A., P. Deadman, R. Brouwer, R. de Loë, D. Robinson. 2018. Modeling of agricultural system impacts on phosphorus loads in the Thames River watershed: overview of research approach. Global Water Futures Annual Science Meeting. Hamilton, Ontario. June 2-4, 2018. (Poster)</p> <p>Mirnasl S., P. Deadman, A. Frank, D. Robinson. 2018. What is the impact of the spatial distribution of Beneficial Management Practices (BMPs) on phosphorous loading? GWF – Local Water Solutions in a Changing Climate, Waterloo, Ontario, Dec 5, 2018 (Poster)</p> <p>Mirnasl S., P. Deadman, A. Frank, M. Macrae, D. Robinson. 2018. Assessing the impact of spatial distribution of beneficial management practices on phosphorous loading. GWF – Young Professionals MTG, Hamilton, ON, Dec 2018 (Poster)</p> <p><u>Student Supervision</u></p> <ul style="list-style-type: none"> • Seyedeh Nayyer Mirnasl Bonab • Duo Zhang
Keith Hipel	Core	<p><u>Publications</u></p> <p>Talukder, B., vanLoon, G., and Hipel, K.W, “Energy Efficiency of Agricultural Systems in the Southwest Coastal Zone of Bangladesh’, <i>Ecological Indicators</i>, DOI: 10.1016/j.ecolind.2018.11.030, Vol. 98, pp. 641-648, 2018.</p> <p>Xiao, Y., Fang, L., and Hipel, K.W., “Centralized and Decentralized Approaches for Water Demand Management”, <i>Sustainability</i>, DOI: 10.3390/su10103466,</p>

		<p>Vol. 10, No. 10, 3346: pp.1-16, 2018.</p> <p>Talukder, B. and Hipel, K.W., "The PROMETHEE Framework for Comparing Sustainability of Agricultural Systems", Resources, DOI: 10.3390/resources7040074, Vol. 7, No.4, 74: pp. 1-22, 2018.</p> <p>Hipel, K.W., Fang, L., and Xiao, Y., "Managing Conflict in Aquaculture", Marine Economics and Management, lead article in the first issue of this newly launched journal, DOI: 10.1108/MAEM-06-2018-001, Vol. 1, No. 1, pp. 1-19, 2018.</p> <p>Han, Q., Zhu, Y., Ke, G.Y., and Hipel, K.W., "An Ordinal Classification of Brownfield Remediation Projects in China for the Allocation of Government Funding", Land Use Planning, DOI: 10.1016/j.landusepol.2018.05.046, Vol. 77, pp. 220-230, 2018.</p> <p>Aljefri, Y., Hipel, K.W., and Fang, L., "General Hypergame Analysis within the Graph Model for Conflict Analysis", International Journal of Systems Science: Operations and Logistics, DOI: 10.1080/23302674.2018.1476604, for accepted for publication on April 29, 2018.</p> <p>Talukder, B., Hipel, K.W., and van Loon, G.W., "Using Multi-Criteria Decision Analysis for Assessing Sustainability of Agricultural Systems", Sustainable Development, DOI: 10.1002/SD.1848, accepted for publication on April 4, 2018, pp. 1-19, 2018.</p> <p>Yousefi, S., Hipel, K.W., and Hegazy, T., "Attitude-Based Conflict Management for Resolving Disputes over Water Quality of the Seymareh River in Iran", Scientia Iranica, Transactions A: Civil Engineering, DOI: 10.24200/SCI.2018.20599, accepted for publication on March 10, 2018, official acceptance letter received on June 23rd, 2018.</p> <p>Garcia, A., Obeidi, A., and Hipel, K.W., "Strategic Advice for Decision-making under Conflict Based on Observed Behaviour", Applied Mathematics and Computation, DOI: 10.1016/j.amc.2018.03.031, Vol. 332, pp. 96-104, 2018.</p> <p>Wang, J., Hipel, K.W., Fang, L., and Dang, Y., "Matrix Representations of the Inverse Problem in the Graph Model for Conflict Resolution", European Journal of Operational Research, DOI:10.1016/j.ejor.2018.03.007, published online March 14, 2018, Vol. 270, No. 1, pp. 282-293, 2018.</p> <p>Zhu, Z., Kilgour, D.M., and Hipel, K.W., "A New Approach to Coalition Analysis within the Graph Model", IEEE Transactions on Systems, Man, and Cybernetics: Systems, Technical Correspondence, DOI: 10.1109/TSMC.2018.2811402, accepted for publication on February 28, 2018.</p> <p>Ding, S., Hipel, K.W., and Dang, Y-g, "Forecasting China's Electricity Consumption</p>
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		<p>using a New Grey Prediction Model”, Energy, DOI:10.1016/j.energy.2018.01.169, Vol. 149, pp. 314-328, 2018.</p> <p>Xu, H., Hipel, K.W., Kilgour, D.M., and Fang, L., “Conflict Resolution Using the Graph Model: Strategic Interactions in Competition and Cooperation”, Studies in Systems, Decision and Control 153, Springer, Cham, Switzerland, DOI: 10.1007/978-3-319-77670-5, ISBN 978-3-319-77669-9 (hard copy), ISBN 978-3-319-77670-5 (eBook), 436 pp., 2018. (Book chapter).</p> <p><u>Publications in Press</u></p> <p>Yu, J., Hipel, K.W., Kilgour, D.M., and Fang, L., “Fuzzy Levels of Preference Strength in a Graph Model with Multiple Decision Makers”, Fuzzy Sets and Systems, DOI: 10.1016/j.fss.2018.12.016, accepted for publication on December 13, 2018.</p> <p>Garcia, A., Hipel, K.W., and Obeidi, A., “Inverse Engineering Preferences in the Graph Model for Conflict Resolution”, IEEE Transactions on Systems, Man, and Cybernetics: Systems, accepted for publication on October 2, 2018.</p> <p>Xiao, Y., Fang, L., and Hipel, K.W., “Conservation-Targeted Hydrologic-Economic Models for Water Demand Management”, Journal of Environmental Informatics, accepted for publication on July 30, 2018.</p> <p>Garcia, A., Obeidi, A., and Hipel, K.W., “Initial State Stability for n-Decision-Maker Conflicts”, INFOR: Information Systems and Operational Research. accepted for publication on March 2, 2018.</p> <p>He, S., and Hipel, K.W., “A Hierarchical Graph Model for Conflict Resolution with Sequential Moves”, INFOR: Information Systems and Operational Research, accepted for publication on February 16, 2018.</p> <p><u>Keynote Presentation</u></p> <p>After receiving the 2018 Ven Te Chow Award at the Watershed Council and Awards Lecture on Thursday, June 7, 2018, from 1 to 1:45 pm Hipel delivered the Keynote Address entitled “Hydrologic Engineering in a Changing World”.</p> <p><u>Honours, Distinctions and Awards</u></p> <ol style="list-style-type: none"> 1. Elected Fellow of the American Association for the Advancement of Science (FAAS) on November 12th, 2018. On behalf of the Council of the AAAS, Dr. Rush D. Holt, the Chief Executive Officer, AAAS, and Executive Publisher, Science Family of Journals, informed K.W. Hipel in a letter dated November 12th, 2018, that he was being honoured “For interdisciplinary developments in conflict resolution, time series modelling, multiple criteria decision analysis and related decision making methodologies for addressing complex
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		<p>system of systems engineering problems”. In his letter, Dr. Rush mentioned that a certificate and rosette would be presented to Hipel in Washington, DC at the Omni Shoreham Hotel, on Saturday, February 16, 2019 during the AAAS Fellows Forum, as part of the Association’s Annual Meeting which was held from February 14th to 17th, 2019.</p> <ol style="list-style-type: none"> 2. K.W. Hipel was granted the status of Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE) as of January 1, 2019. Dr. José M.F. Moura, the 2019 IEEE President and CEO, formlly informed Hipel about this prestigious designation in a letter dated September 1, 2018, on behalf of the IEEE Board of Directors and more than 420,000 members throughout the world. His letter states: “This special honor is reserved for individuals who have truly distinguished themselves through their sustained and lasting contributions to IEEE. Your Life Member status speaks to both your professional achievements in technology as well as the significant impact you have had on the growth and development of IEEE. We are grateful for your exemplary service to our association, for your leadership, volunteerism and dedication to advancing technology for humanity.” 3. K.W. Hipel was awarded the designation of Honorary Professor of Hohai University by President Xu Hui at a ceremony held at Hohai University in Nanjing, China, on April 21st, 2018. This was followed by a formal dinner convened in honour of K.W. Hipel at the Hohai International Conference Center and Hotel. 4. Recipient of the 2018 Ven Te Chow Award from the Environmental and Water Resources Institute (EWRI), American Society of Civil Engineers (ASCE), in recognition of Keith’s “pioneering contributions in environmental impact assessment, simulation, forecasting and the Hurst Phenomenon in stochastic hydrology and in conflict resolution, water resources management and fair water allocation for making informed hydrological decisions from a system-of-systems perspective”. “The Ven Te Chow Award was established to recognize lifetime achievement in the field of hydrologic engineering.” On January 12, 2018, Mr. Thomas W. Smith III, Executive Director of EWRI informed K.W. Hipel in a formal letter that he would receive this award which consists of a trophy and cash prize in the amount of \$1,400 US during the 2018 EWRI World Environmental and Water Resources Congress in Minneapolis, Minnesota, USA, which took place from June 3rd to 7th, 2018.
Thomas Homer-Dixon	Core	<p><u>Keynote Presentation</u></p> <p>“Honesty and Hope: Inclusive green politics and the challenge of telling the truth,” keynote opening speech, National Convention of the Green Party of Canada, Vancouver, Sept. 28, 2018</p> <p><u>Other Presentations</u></p> <p>“Commanding Hope: How we create a humane future for a tumultuous world,” Third Age Lecture Series, Waterloo, Nov. 29, 2018.</p>

		<p>“Climate Change: Science, politics, and ideology,” Senior Fellow’s Luncheon talk, Massey College, Toronto, Nov. 28, 2018.</p> <p>“Commanding Hope: How we create a humane future for a tumultuous world,” public talk, University of Victoria, Nov. 20, 2018.</p> <p>“Catastrophic Dehumanization: The mathematics of critical transitions,” research presentation, Centre for Global Studies, University of Victoria, August 9, 2018</p> <p>“Mindscape: A complex-systems approach to understanding the structure and dynamics of ideology,” research presentation, Centre for Global Studies, University of Victoria, June 6, 2018</p> <p><u>Op-Ed</u></p> <p>“The great Canadian climate delusion,” with Yonatan Strauch, June 1, 2018 in the <i>Toronto Globe and Mail</i></p> <p><u>Student Supervision</u></p> <p>Clay DaSilva Scott Janzwood Jinelle Piereder Mike Lawrence</p>
Sharon Kirkpatrick	Core	<p><u>Publications</u></p> <p>Kirkpatrick SI, Guenther P, Douglass D, Zimmerman TP, Atoloye A, Marcinow M*, Kahle LL, Dodd KW, Durward C. The provision of assistance does not substantially impact the accuracy of 24-hour dietary recalls completed using the Automated Self-Administered 24-hour Dietary Assessment Tool among women with low incomes. <i>Journal of Nutrition</i>. Epub ahead of print. doi: 10.1093/jn/nxy207.</p> <p>Frongillo EA, Baranowski T, Subar AF, Toozee JA, Kirkpatrick SI. Establishing validity and cross-context equivalence of measures and indicators. <i>Journal of the Academy of Nutrition and Dietetics</i>, Epub ahead of print. doi: 10.1016/j.jand.2018.09.005.</p> <p>Vanderlee L, Reid JL, White CM, Acton RB, Kirkpatrick SI, Ching-I P, Rybak ME, Hammond D. Evaluation of 24-hour caffeine intake assessment compared to urinary biomarkers of caffeine intake among young adults in Canada. <i>Journal of the Academy of Nutrition and Dietetics</i>, 2018, 118(12):2245-2253. doi: 10.1016/j.jand.2018.07.016.</p> <p>Kirkpatrick SI. Examining the quality of foods and beverages across the food stream. <i>Journal of the Academy of Nutrition and Dietetics</i>. Epub ahead of print. doi: 10.1016/j.jand.2018.08.166.</p> <p>Gilsing A, Mayhew AJ, Payette H, Shatenstein B, Kirkpatrick SI, Amog K, Griffith</p>

	<p>LE, Raina P. Validity and reliability of a short diet questionnaire to estimate dietary intake in older adults in a subsample of the Canadian Longitudinal Study on Aging. <i>Nutrients</i>, 2018, 10(10):1522. doi: 10.3390/nu10101522.</p> <p>Maynard M*, Dean J, Rodriguez P*, Sriranganathan G*, Qutub M*, Kirkpatrick SI. The experience of food insecurity among immigrants: A scoping review. <i>Journal of Immigrant and Minority Health</i>, 2018, Epub ahead of print.</p> <p>Maynard M*, Meyer SB, Perlman C, Kirkpatrick SI. Experiences of food insecurity among undergraduate students: 'You can't starve yourself through school'. <i>Canadian Journal of Higher Education</i>, 2018, 48(2):1-19.</p> <p>Kirkpatrick SI, Reedy J, Krebs-Smith SM, Pannucci TE, Subar AF, Wilson MM, Lerman J, Tooze JA. Applications of the Healthy Eating Index for surveillance, epidemiology, and intervention research: Considerations and caveats. <i>Journal of the Academy of Nutrition and Dietetics</i>, 2018, 118(9): 1603-1621. doi: 10.1016/j.jand.2018.05.020.</p> <p>Krebs-Smith SM, Pannucci TE, Subar AF, Kirkpatrick SI, Lerman J, Tooze J, Wilson MM, Reedy J. Update of the Healthy Eating Index: HEI-2015. <i>Journal of the Academy of Nutrition and Dietetics</i>, 2018, 118(9):1591-1602. doi: 10.1016/j.jand.2018.05.021.</p> <p>Reedy J, Lerman J, Krebs-Smith SM, Kirkpatrick SI, Pannucci TE, Subar AF, Kahle LL, Tooze J. Evaluation of the Healthy Eating Index-2015. <i>Journal of the Academy of Nutrition and Dietetics</i>, 2018, 118(9):1622-1633. doi: 10.1016/j.jand.2018.05.019.</p> <p>Kirkpatrick SI, Maynard M*, Raffoul A*, Lee KM*, Stapleton J. Gaps in the evidence on population health interventions to reduce consumption of sugars: A review of reviews. <i>Nutrients</i>, 2018, 10(8), 1036; doi: 10.3390/nu10081036.</p> <p>Vanderlee L, Reid JL, White CM, Hobin EP, Acton RB, Jones AC, O'Neill M, Kirkpatrick SI, Hammond D. Evaluation of the online Beverage Frequency Questionnaire (BFQ). <i>Nutrition Journal</i>, 2018, 17:73. doi: 10.1186/s12937-018-0380-8.</p> <p>Kirkpatrick SI, Collins CE, Keogh RH, Krebs-Smith SM, Neuhouser ML, Wallace A. Assessing dietary outcomes in intervention studies: Pitfalls, strategies, and research needs. <i>Nutrients</i>, 2018, 10(8):1001. doi: 10.3390/nu10081001.</p> <p>Wallace A, Kirkpatrick SI, Darlington G, Haines J. Accuracy of parental reporting of preschoolers' dietary intake using an online self-administered 24-hour recall. <i>Nutrients</i>, 2018, 10(8):187. doi: 10.3390/nu10080987.</p> <p>Maynard M*, Andrade L*, Packull-McCormick S*, Perlman C, Leos-Toro C*, Kirkpatrick SI. Food insecurity and mental health among females in high-income countries. <i>International Journal of Environmental Research and Public Health</i>, 2018, 15:1424. doi:10.3390/ijerph15071424.</p>
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	<p>Raffoul A*, Leatherdale ST, Kirkpatrick SI. Weight management, weight perception, and health-compromising behaviours among adolescent girls in the COMPASS study. <i>Journal of Primary Prevention</i>, 2018, 39(4):345-360. doi: 10.1007/s10935-018-0512-0.</p> <p>Pannucci TE, Thompson FE, Bailey RL, Dodd KW, Dixit-Joshi S, Potischman N, Kirkpatrick SI, Alexander GL, Coleman LA, Kushi LH, Groesbeck M, Sundaram M, Clancy H, Zimmerman TP, Douglass D, Mittl B, George SM, Gahche JJ, Kahle L, Subar AF. Comparing reported dietary supplement intakes between two 24-hour recall methods: The Automated Self-administered 24-hour recall (ASA24) and the interviewer-administered Automated Multiple-Pass Method (AMPM). <i>Journal of the Academy of Nutrition and Dietetics</i>, 2018, 118(6):1080-1086. Epub ahead of print. doi: 10.1016/j.jand.2018.02.013.</p> <p>Raffoul A*, Leatherdale ST, Kirkpatrick SI. Dieting predicts engagement in multiple risky behaviours among adolescent Canadian girls: A longitudinal analysis. <i>Canadian Journal of Public Health</i>, 2018, 109(1):61-69. doi: 10.17269/s41997-018-0025-x.</p> <p>Ryan C, Cooke M, Kirkpatrick SI, Leatherdale S, Wilk P. The correlates of physical activity among adult Métis. <i>Ethnicity and Health</i>, 2018, 23(6):629-648. doi: 10.1080/13557858.2017.1294655. PubMed</p> <p><u>Publications in Press</u></p> <p>Kirkpatrick SI, Raffoul A*, Lee KM*, Jones AC. Sources of energy, sugars, sodium, and saturated fats among Canadians. <i>Applied Physiology, Nutrition, and Metabolism</i>, In press.</p> <p>Thomas H, Azevedo Perry E, Manowiec E, Slack J, Samra R, Petermann L, Manof E, Kirkpatrick SI. Complexities in conceptualizing and measuring food literacy. <i>Journal of the Academy of Nutrition and Dietetics</i>, In press.</p> <p>Kirkpatrick SI. Nutrition monitoring in the United States: Sources of data and their uses. In: <i>Research: Successful Approaches</i>. Van Horn L, Beto J, Eds. Book chapter, In press.</p> <p><u>Presentations</u></p> <p>Kirkpatrick SI. The validation of dietary assessment tools. <i>Journal of the Academy of Nutrition and Dietetics Podcast</i>. 2018.</p> <p>Kirkpatrick SI, Collins CE. The process of developing food-based dietary guidelines. <i>Food and Agriculture Organization of the United Nations and Wageningen University Technical Workshop on Food-Based Dietary Guidelines</i>. 2018.</p> <p>Kirkpatrick SI. Challenges and opportunities in nutrition research. <i>Canadian Nutrition Society (webinar)</i>. 2018.</p>
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	<p>Guo Y, Leatherdale ST, Kirkpatrick SI, Cooke MJ. Risk factors for type 2 diabetes among Métis and First Nations living off-reserve: Evidence from the 2012 Aboriginal Peoples Survey. Canadian Research Data Centre Conference, 2018, Hamilton, ON.</p> <p>Raffoul A*, Kirkpatrick SI. Top sources of energy, sodium, sugars, and saturated fat among Canadians: Insights from the 2015 Canadian Community Health Survey. Canadian Research Data Centre Conference, 2018, Hamilton, ON.</p> <p>Andrade L*, Lee K*, Stapleton J, Kirkpatrick SI. Impact of non-nutritive sweeteners on obesity and metabolic health: A rapid review of reviews. Canadian Obesity Student Meeting, 2018, London, ON.</p> <p>Price M*, Ferro MA, Raffoul A*, Hammond D, Kirkpatrick SI. Youth and young adults attempting to lose weight use a combination of strategies, with potential implications for health. Canadian Obesity Student Meeting, 2018, London, ON.</p> <p>Raffoul A*, Kirkpatrick SI. Dietary sources of energy, sodium, sugars, and saturated fat among Canadians. Canadian Obesity Student Meeting, 2018, London, ON.</p> <p>Zimmerman TP, Miller E, Kirkpatrick S, Kaefer C, Lerman J, Subar AF. Updates to the Automated Self-Administered 24-hour Dietary Assessment Tool. National Nutrient Databank Conference 2018, Minneapolis, MN.</p> <p>Lo Siou G, Solbak NM, Akawung AK, Rajabi AA, Kirkpatrick SI, Robson PJ. Comparing methods for identifying energy intake misreporters and the effect of misreporting on dietary patterns derived by K-means clustering: Findings from Alberta's Tomorrow Project. Statistical Society of Canada Annual Conference, 2018, Montreal, QC.</p> <p>Solbak NM, Lo Siou G, Akawung AK, Rajabi AA, Kirkpatrick SI, Robson PJ. The effect of energy intake misreporting on associations between dietary patterns derived by K-means clustering and risk of all cancers: Findings from Alberta's Tomorrow Project. Canadian Nutrition Society Annual Meeting, 2018, Halifax, NS.</p> <p>Kirkpatrick SI, Guenther PM, Douglass D, Subar AF, Zimmerman T, Kahle LL, Atoloye A, Marcinow M*, Savoie Roskos MR, Dodd KW, Durward C. Accuracy of 24-Hour recalls completed by women with low incomes using the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24). Nutrition 2018, Boston, MA.</p> <p>Vanderlee L*, Andrade L*, Hammond D, Chriqui J, Kirkpatrick SI. Examining variations between countries to advance our understanding of the potential for policies to support healthy eating. Nutrition 2018, Boston, MA.</p> <p>Price M*, Boluk K, Neiterman E, Kirkpatrick SI. #URWhatUTweat: The potential for social media to enhance motivation among students and instructors. University of Waterloo Teaching and Learning Conference, 2018, Waterloo, ON.</p>
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		<p>Jones AC, Kirkpatrick S, Hammond D. Canadians' beverage consumption: Analyses of 2004 and 2015 national dietary intake data. Public Health 2018, Montreal, QC, accepted.</p> <p>Price M, Boluk K, Neiterman E, Kirkpatrick SI. #URWhatUTweat: The potential for social media to enhance higher education in public health. Public Health 2018, Montreal, QC.</p> <p><u>Workshop/Conference Organization</u></p> <p>Analyzing dietary data, with a focus on distributions of usual intake. University of Waterloo, June 19, 2018. 30 attendees. http://www.sharonkirkpatrick.ca/cchs-2015-workshop.html. Hosted international keynote speaker. Worked with Health Canada to plan and implement complementary webinars.</p> <p>Leveraging systems approaches to improve human and planetary health. University of Waterloo, April 25-26, 2018. 100 attendees. http://www.sharonkirkpatrick.ca/systems-workshop-2018.html. Hosted international keynote speaker, solicited and reviewed abstracts for faculty and student presentations, adjudicated student awards.</p> <p><u>Student Supervision</u></p> <p>Lesley Andrade, PhD student (2017-present) Kirsten Lee, PhD student (2016-present) Amanda Raffoul, PhD student (2016-present)</p>
Chrystopher Nehaniv	Core	<p><u>Joined UW in fall 2018</u> <i>Achievements for 2019 to be included in next year's report.</i></p>
Dawn Parker	WICI Director and Core	<p><u>Keynote Presentations</u></p> <p>D. Parker. "Combining household survey data, key informant interviews, and hedonic modelling to understand housing demand in a dynamically shifting market." Invited presentation, Oxford Institute for New Economic Thinking, Oxford, UK, 23 April 2018; Invited Keynote, DEVS Francophones, 1 May 2018, Corsica, France.</p> <p>D. Parker. "'Exciting times' for K-W residential markets: GTH buyers, Central Transit Corridor impacts, and missing markets." Invited keynote, Kitchener-Waterloo Association of Realtors, "Housing market insights" event, 6 Nov. 2018.</p> <p><u>Other Presentations</u></p> <p>D. C. Parker. "Tracking impacts of light rail investment through a volatile housing market: Combining qualitative and quantitative methods to understand dynamic influences of demographic change and investment incentives." Presented at the 2018 Association of Collegiate Schools of Planning annual conference, Buffalo, NY, Oct. 25-28th, 2018.</p>

		<p>Huang, Y., Parker, D., Dean, J., Cook, J. “Unfolding housing market complexity: empirical housing market analysis and spatial agent-based modeling.” Waterloo Institute for Complexity and Innovation (WICI) conference on “Modelling complex urban environments”. Waterloo, Ontario, Canada, June21-22, 2018.</p> <p>Opening remarks, Waterloo Institute for Complexity and Innovation conference on “Modelling Complex Urban Environments,” June 20th, 2018.</p> <p><u>Workshop/Conference Organization</u></p> <p>“Development of a code kernel for agent-based land market models, Part 1” – held concurrently with the Modelling Complex Urban Environments conference, June 2018, University of Waterloo, Canada.</p> <p>“Development of a code kernel for agent-based land market models, Part 1” – held at the Oxford Institute for New Economic Thinking, September 2018, Oxford, UK.</p> <p>Lead organizer, “Modelling Complex Urban Environments”- WICI conference, June 2018, University of Waterloo, Canada.</p> <p><u>Media Outreach</u></p> <p>3 radio interviews, approximately 4 print quotes</p> <p><u>Honours, Distinctions and Awards</u></p> <p>Named a Fellow of the Global Land Project in fall 2018</p> <p><u>Student Supervision</u></p> <p>Milton Friessen – PhD Candidate, Planning Fatima Jahanmiri – PhD Candidate, Planning Hazem Ahmed – PhD, Planning Kaitlin Webber – MA, Planning Devin Feng – MS, Civil Engineering (co-advisor with Chris Bachman) Yu Huang – PhD Candidate, Planning</p>
Steve Quilley	Core	<p><u>Publications</u></p> <p>Bonnell, C, Melendez-Torres, G.J. and S. Quilley (2018) ‘The potential role for sociologists in designing RCTs and of RCTs in refining sociological theory: A commentary on Deaton and Cartwright’ <i>Social Science & Medicine</i>, 26 April 2018.</p> <p>Kish, K., Davy, B., Quilley, S., McCarthy, D. D. P. and Murphy, S. J. (2018). Novel Psycho-Social Approaches to Restoration. <i>Ecology and Society</i>.</p> <p>Davy, B. J. & S. Quilley. 2018. “Ritual Matters: Changing Ontologies, Values, and Ecological Conscience Formation” <i>Journal for the Study of Religion, Nature, and Culture</i>. 12.4.</p>

	<p>Loyal, S. and S. Quilley, (2018). <i>State Power and Asylum Seekers in Ireland</i> (New York: Springer).</p> <p><u>Publications in Press</u></p> <p>Barb Davy and Stephen Quilley (2019) ‘Reconstructing Alternatives: Wicked Dilemmas for Contemporary Pagan Responses to Modernity’ <i>Pomegranate</i> Publication subject to revisions.</p> <p>Kish, K. and Quilley, S. (2019). ‘Livelihood and the Individual: New Ecological Economic Development Goals’. In: <i>BSIA-10: Reflections on the Sustainable Development Goals</i>. By: Dalby, S. University of Toronto Press: Toronto, ON. (Book chapter in press).</p> <p>Kish, K. and Quilley, S. (2019). Labour and Regenerative Production. In: <i>A Research Agenda for Ecological Economics</i>. By: Costanza, B., Farley, J., and Kubiszewski, I. Edward Elgar: New York, NY. (Book chapter in press).</p> <p>Quilley, S. (2018). ‘Individual or Community as a Frame of Reference for Health in Modernity and in the Anthropocene’ In <i>Health in the Anthropocene: Living well on a finite planet</i>. By Quilley, S. and Zywert, K. (eds) Toronto University Press (Accepted).</p> <p>Zywert, K., Quilley, S., Eds. (Forthcoming 2019) <i>Health in the Anthropocene: Living Well on a Finite Planet</i>. University of Toronto Press. (Book in press).</p> <p><u>Keynote Presentation</u></p> <p>‘The double-edged discourse of individualism in medicine: How ontological commitments to the ‘rational’ individual impede efforts to achieve population health’ <i>Health in the Anthropocene</i> symposium, University of Waterloo, April 7, 2018.</p> <p><u>Other Presentation</u></p> <p>‘State, Market and Livelihood. What the changing I/We balance means for feminism, nationalism, liberalism, socialism and conservatism’ Liberty in the Anthropocene Symposium, McGill University, Nov 2018.</p> <p><u>Workshop/Conference Organization</u></p> <p>With the ongoing research on the SSHRC <i>Hedgelaying in the Ontario Greenbelt</i> project, Perin Ruttonsha and Stephen Quilley have organized four community workshops, four site visits and four pilot initiatives.</p> <p>With Katharine Zywert, co-organized a two-day international symposium (CIHR-funded) on <i>Health in the Anthropocene</i>. April 6th and 7th 2018.</p>
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		<p>With Steve Mock, co-organized a two-day international symposium on ‘Deconstructing the Ideological Complexity of Right-Wing Populism Across Borders’, Balsillie School, Waterloo, 2nd -3rd April 2018</p> <p><u>Magazine Article</u></p> <p>Quilley, S. (2018) Relearning: Education for the survival of the species and the planet <i>Alternatives Journal</i> 43 3/4</p> <p><u>Student Supervision</u></p> <p>Through the WICI collaboration with the SSHRC-funded ‘Economics for the Anthropocene’ at McGill and Vermont Universities, I am on the doctoral committee of Christopher Orr (supervised by Professor Peter Brown, McGill)</p> <ul style="list-style-type: none"> • Katharine Zywert • Perin Ruttonsha • Barb Davy • Anna Beresford
Vanessa Schweizer	Core	<p><u>Publications</u></p> <p>Schweizer, V. (2018) Decision Support: A Few Scenarios Still Do Not Fit All. News & Views article in <i>Nature Climate Change</i>, 8, 361–362.</p> <p>Scheele, R., Kearney, N.M., Kurniawan, J.H., Schweizer, V.J. (2018) What Scenarios Are You Missing? Poststructuralism for Deconstructing and Reconstructing Organizational Futures. Book chapter in H. Krämer and M. Wenzel (Eds.) <i>Organizing (for) the Future: How Organizations Manage Things to Come</i>. Palgrave Macmillan.</p> <p><u>Publications in press</u></p> <p>Schweizer, V. (in press) Development as a determinant of climate risk and policy challenge. In S. Dalby, S. Horton, and R. Mahon (Eds.) <i>Achieving the Sustainable Development Goals: Global Governance Challenges</i>. Routledge.</p> <p>Schweizer, V., Scheele, R., Kosow, H. (in press) Practical Poststructuralism for Confronting Wicked Problems. In: Arabi, M., O. David, J. Carlson, D.P. Ames (Eds.), <i>Proceedings of the 9th International Congress on Environmental Modelling and Software</i>, June 25-28 2018, Fort Collins, Colorado, USA.</p> <p><u>Presentations</u></p> <p>Schweizer, V. and Kurniawan, J. (2018) Pathways and constraints for national low-carbon transitions. Presentation at the Climate Change and Energy Futures Workshop, 11 October 2018, St. John’s, NL.</p>

		<p>Kurniawan, J. and Schweizer, V. (2018) Application of Network Analysis in Scenario Studies: Visualizing Relational Patterns of Scenario Elements. Presentation at the Climate Change and Energy Futures Workshop, 11 October 2018, St. John's, NL.</p> <p>Schweizer, V. (2018) International development and climate risk. Presentation at the Annual Meeting of the Society for Risk Analysis, 4 December 2018, New Orleans.</p> <p>Schweizer, V. (2018) Uncovering pathways for sustainability transitions: Beyond buzzwords. Presentation at the RC-24 Pre-conference to the 19th International Sociological Association World Congress, 14 July 2018, Toronto.</p> <p>Schweizer, V., Scheele, R., and Kosow, H. (2018) Practical Poststructuralism for Confronting Wicked Problems. Presentation at the 9th International Congress of the Environmental Modelling & Software Society, "Modelling for Sustainable Food-Energy-Water Systems", 28 June 2018, Fort Collins, CO.</p> <p>Lee, K., Mock, S., Raffoul, A. and Schweizer, V. (2018) Qualitative methods as tools for enacting a systems approach. Waterloo Institute for Complexity and Innovation (WICI) Hands-on Workshop, 26 April 2018, Waterloo, ON.</p> <p>Schweizer, V. (2018) Effectively working across disciplines to address complex challenges. Keynote presentation at the Waterloo Institute for Complexity & Innovation (WICI) Workshop, "Leveraging systems approaches to improve human and planetary health", 25-26 April 2018, Waterloo, ON.</p>
Paul Thagard	Core	<p><u>Publications</u></p> <p>Thagard, P. (2018). Computational models in science and philosophy. In S. O. Hansson & V. F. Hendricks (Eds.), <i>Introduction to formal philosophy</i> (pp. 457-467). Berlin: Springer.</p> <p>Thagard, P. (2018). Mind, consciousness, and free will. <i>Frontiers of Philosophy in China</i>, 12(3), 377-393.</p> <p>Thagard, P. (2018). Social equality: Cognitive modeling based on emotional coherence explains attitude change. <i>Policy Insights from Behavioral and Brain Sciences</i>, 5(2), 247-256.</p> <p>Thagard, P., & Larocque, L. (2018). Mental health assessment: Inference, explanation, and coherence. <i>Journal of Evaluation in Clinical Practice</i>, 24(3), 649-654.</p> <p><u>Publications In Press</u></p> <p>Thagard, P. (2019). <i>Brain-mind: From neurons to consciousness and creativity</i>. New York: Oxford University Press.</p> <p>Thagard, P. (2019). <i>Mind-society: From brains to social sciences and professions</i></p>

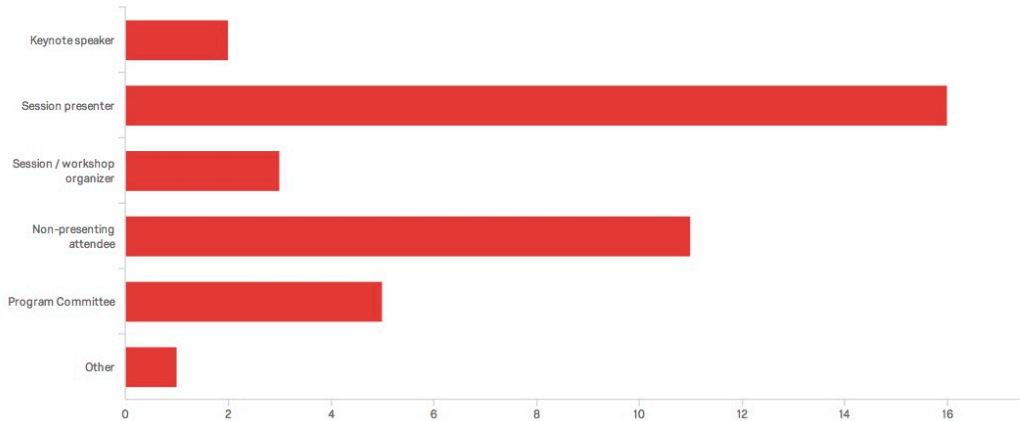
	<p>New York: Oxford University Press.</p> <p>Thagard, P. (2019). <i>Natural philosophy: From social brains to knowledge, reality, morality, and beauty</i>. New York: Oxford University Press.</p> <p><u>Keynote Presentations</u></p> <p>Brain Mechanisms Explain Emotions and Consciousness (Autonomous University of Mexico)</p> <p>The Emotional Coherence of Donald Trump and the Islamic State (University of Victoria)</p> <p>How Population Health Emerges from Individual Health (Invited by University of Toronto)</p> <p>Medical Inference: Using Computer Modelling to Explain Mental Health Assessment and Epidemiological Reasoning (Invited by University of Pittsburgh, National Autonomous University of Mexico, University of Seville)</p> <p>Mental Health in Individuals and Populations (Invited by Tufts University)</p> <p>Procedural Creativity in Scientific Discovery (Invited by Cognitive Science Society)</p> <p><u>Conference Presentation</u></p> <p>Why Psychotherapy Works: Emotional Mechanisms and Tipping Points (Austen Riggs Center)</p> <p><u>Media Outreach</u></p> <p>CBC Interview 'The psychology of climate change: Why people deny the evidence'. December 2018.</p>
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APPENDIX C: 2018 CONFERENCE ON MODELLING SURVEY REPORT

Default Report

Feedback and publication opportunity post-conference survey for the 2018 Conference on Modelling Com
 February 14, 2019 8:48 AM MST

Q1 - How did you participate in the conference as (check all that apply)



#	Field	Choice Count
1	Keynote speaker	5.26% 2
2	Session presenter	42.11% 16
3	Session / workshop organizer	7.89% 3
4	Non-presenting attendee	28.95% 11
5	Program Committee	13.16% 5
6	Other	2.63% 1

38

Showing rows 1 - 7 of 7

Other

Other

coauthor

Q2 - How would you describe your scientific discipline/area of research?

How would you describe your scientific discipline/area of research?

Architecture

Town/Rural Planning

Urban Economics

Architecture student exploring how complex digital models can allow designers to engage avian habitat networks and inform ecological interventions in the city core.

Geography, modelling human-natural systems

Urban Ecology

Modelling and decision making in societal and environmental systems

Geography, intersection of agriculture, geopolitics, and climate change

Computer science, multiagent systems, artificial intelligence

Human-environment geography, agent-based modeling

Global (rather than ABM) modeler and video maker to describe reality.

Agent-based modelling on urban land cover and land use

Public finance economics

Abs

Transdisciplinary, innovative and challenging.

none

GIS Applications, Limited Job Experience (4 Months) in Planning, Geomorphology (e.g., Of Southern Ontario).

urban geography

land-change science, computational social science, economics, geography, computer science

Agent based modeling.

Transportation engineering: traffic modelling and vehicle emissions modelling

Planning and governance

How would you describe your scientific discipline/area of research?

agent-based modeling; housing; complex urban systems

Planning, Sustainability

Nuclear waste management

social-ecological systems

Media Studies, Critical Data Studies

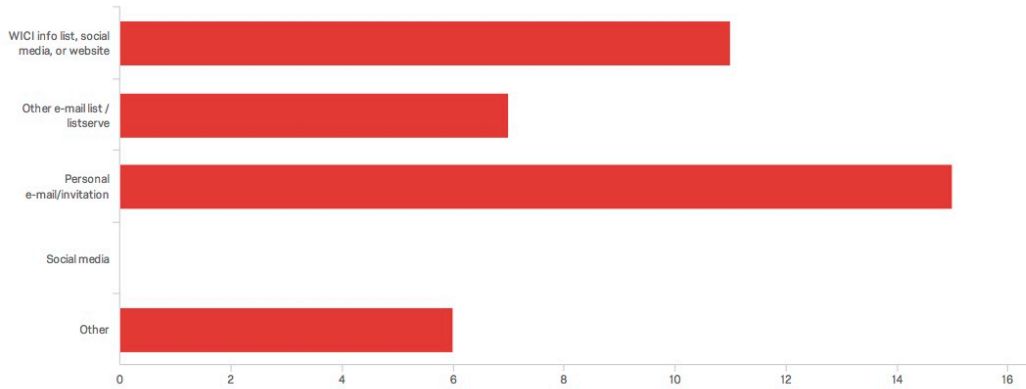
Spatial analysis, ecology, ecological modeling

Healthy communities

regional science; urban economics

urban planning/geography

Q3 - How did you find out about the conference?



#	Field	Choice Count
1	WICI info list, social media, or website	28.21% 11
2	Other e-mail list / listserv	17.95% 7
3	Personal e-mail/invitation	38.46% 15
4	Social media	0.00% 0
5	Other	15.38% 6
		39

Showing rows 1 - 6 of 6

Other e-mail list / listserv

Other e-mail list / listserv

University of Guelph SEDRD listserv

Parkin

Ponnambalam

Env listserv

Liu

My supervisor suggested that we attend

Q4 - What were your favourite aspects of the event?

What were your favourite aspects of the event?

I liked the grouped sessions with research paper presentations; it was a chance to see how different aspects of a theory or theme were being addressed, and I like how they were organized so that you could see the key speaker topics directly relate to them. And further to that, the workshop really invited summarizing all the information heard throughout the day, in a more digestible format. Overall the organization of your speakers and the events the preceded and followed them was really good for generating discussion, connections, and new ideas.

Good presentations and discussions that followed, generally good organization/division of topics

Strong interdisciplinary

Enjoyed the sessions with other researchers I would not have met otherwise. Keynotes were interesting, dinner was a great ending.

presentations and dinner at Nat's

The emphasis on the theory and practice of urban planning.

Good talks, lunch

There was a lot of room for conversation among participants, I found. I think as a whole I enjoyed being involved in the conference.

The keynote speakers were interesting, and the smaller size of the conference made it easier to network with other attendees.

The speakers were disciplined ABMer's I found the work in side the boundaries they made explicit to be clear. Unfortunately these people were blind or ignored the variables that lay outside of their defined boundaries. Thus the policy for a city or state proposed by their work will be not what is needed as described by the variables they left outside of their analysis.

Every presenter gave me excellent presentations.

Lots of interesting papers

meeting

Diversity of the scientific presentation (topics and disciplinary background)

none

I think the event was well structured and provided attendees the opportunity to garnish exposure to many different areas of academic and professional research (e.g., transportation issues and International Development problems being addressed in Industry). It certainly added to my academic experience.

Meeting people I already knew, plus many I knew from publications

It happened. St. Jerome's staff were great.

Multidisciplinary Nature of talks and background of presentations

Networking, sharing ideas

What were your favourite aspects of the event?

The content

The multi-disciplinary nature of the event was fascinating and fostered greater interest in new areas of study for me.

Great academic content

the interdisciplinary aspect of the papers

Innovative; different perspectives on the issues I work on

Networking and discussion opportunities

focus on ABM; gathering experts in this field

Hearing all the interesting presentations, informal lunch discussions, and the final dinner

Q5 - What aspect did you find less successful/ having potential for improvement?

What aspect did you find less successful/ having potential for improvement?

Some people weren't too happy in the workshop because I think it seemed to them a superficial activity (to get conclusions from a 3 hr activity for example); is there a way to make a reading list for a very general introduction to the workshop prior to the event, and then this way perhaps more preparation and a detailed conversation can be had? I liked the references to Geoffrey West's book, but I didn't have it beforehand. I still like the idea of the workshop as a quick brainstorm type of activity; sometimes those are the times that the main areas of focus get attention, precisely because lack of detail, so I found the timing and format fine, but it could be also because I came as an attendee and not a field expert.

Sometimes too focused on theory and on major cities

Sessions maybe could have had more substantial intros to help people from other fields understand the topics.

Some of the sessions that were advertised as interactive were not very interactive.

posters

I think the poster session could be improved upon. I think the recruitment of more posters and a designated room for posters could be relevant for this type of conference.

Beyond suggesting future research, as any good graduate defense might include, the report must include that while the relationships discovered are correct, they could completely suggest the wrong policy of the excluded variables are dominant in the time frame of interest. If policy makers are using too short a time frame to make decisions it is the responsibility of the honest researcher to make this clear.

Maybe more time should be allocated to the question answering section of each presenter.

adds

all

I think the event was well organized personally, thus don't feel there are any suggestions I can make in this regard at this time.

Not enough automation for program, review. Too much money spent on UW conference registration.

None as far as conferences go this was great

One could attend only half the sessions. I wanted to attend two sessions which ran parallel. There was no way to source the recordings or the presentations.

The introductory session should have been more engaging and should have played a part in explaining complexity theory and how all of these seemingly disparate research disciplines and projects are brought together by common ground. In particular, many of the presenters seemed to focus on spatial and environmental issues ranging from ecology to transportation planning, but the introductory speaker spoke more about informatics/computers/a topic that I'm not sure everyone fully related to.

More opportunity for interaction; some key sessions was changed last minute; moderation could be better

The workshop discussion events about what is urban complexity and network

leaving more time for discussion

Q6 - Please tell us about any particular networking or future collaboration connections that you made at the conference.

Please tell us about any particular networking or future collaboration conn...

I watched the UrbanSystemsLab (workshop?) presentation, and I liked their methods and research topics, I also spoke to the presenter after about how they got involved in the field and have their contact for future questions.

I am a grad student and I made good connections with a municipal worker from the City of London and a researcher from Cardus, both of which may aid in finding employment after completing my degree

Met with members of the Toronto Region Conservation Authority, discussed methods and potential collaborations.

New collaborations with University of Waterloo faculty.

learnt about some visitors from other countries who are at uw.

Participation in a workshop and follow-on work with Dawn Parker to develop a common ABM code base.

I would very much like to come to WICI and give a seminar or two on what I felt were parameters that lie outside of those that are commonly used in the ABM that I saw presented.

I have a chance to know lots of great scientists in the field of agent-based modelling.

with the Institute for New Economic Thinking at the Oxford Martin School University of Oxford Eagle House

many

No such connections were personally made (though I think, in my case, I was not actively looking to establish such connections at this event).

Alex Anas invited me to collaborate on a project

Potential PhD program, others interested in my work.

A collaborative paper has emerged - as a Master's student I have gained an opportunity to co-author a publication with researchers who have a name in my field.

Three connections with PhD students.

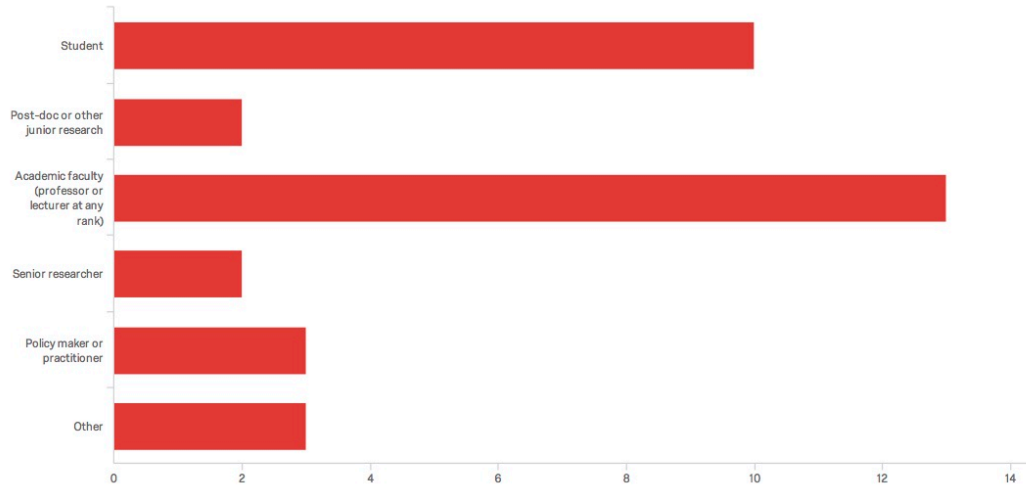
I connected with some of the UK data scientists and hope to pursue that relationship

Potential landscape connectivity modeling / research connection between Waterloo and TRCA

I found two collaborators from overseas for other projects I am working on in land use and cycling

I have introduced my ABM ideas to the big names in this field and joined the network for further Mr. Potato collaboration.

Q7 - Are you currently a:

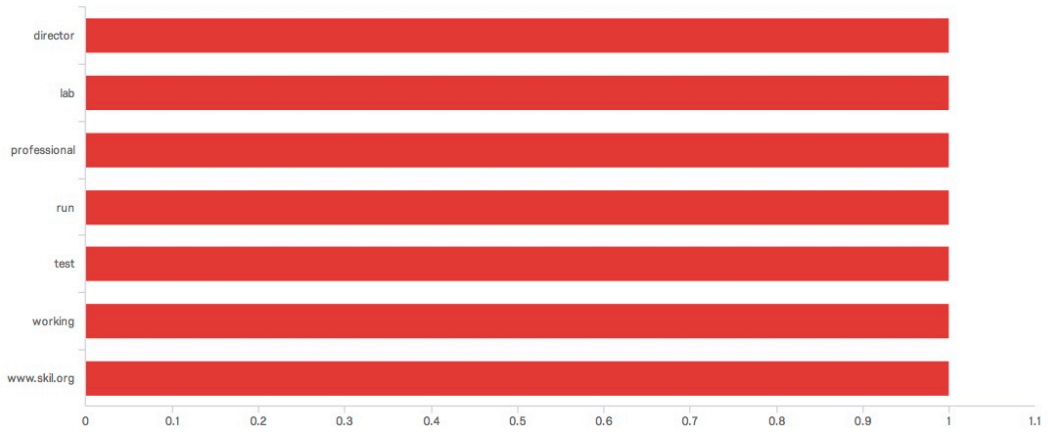


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Are you currently a: - Selected Choice	1.00	6.00	2.85	1.58	2.49	33

#	Field	Choice Count
1	Student	30.30% 10
2	Post-doc or other junior research	6.06% 2
3	Academic faculty (professor or lecturer at any rank)	39.39% 13
4	Senior researcher	6.06% 2
5	Policy maker or practitioner	9.09% 3
6	Other	9.09% 3

33

Showing rows 1 - 7 of 7




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#	Field	Choice Count
1	director	14.29% 1
2	lab	14.29% 1
3	professional	14.29% 1
4	run	14.29% 1
5	test	14.29% 1
6	working	14.29% 1
7	www.skil.org	14.29% 1
		7

Showing rows 1 - 8 of 8

Q8 - What are your home department and home institution?

What are your home department and home institution?

Architecture, University of Waterloo

School of Environmental Design and Rural Development, University of Guelph

Department of Economics and Statistics, University of Turin

University of Waterloo School of Architecture

Geography

Biological Sciences, Northern Kentucky University

engineering

Geography & Environmental Management, University of Waterloo

University of Waterloo

Department of Geography, University of Alabama

Stanford Knowledge Integration Laboratory (no longer affiliated with Stanford University).

Faculty of Environment, University of Waterloo

Laurentian University Economics

fdasfds

University of Corsica Pascal Paoli, UMR CNRS 6240 LISA

Faculty of Environment (Department of Geography and Environmental Management), University of Waterloo

School of Planning, University of Waterloo

Uwaterloo department of civil and environmental engineering

University of Waterloo

Information and Computational Science, James Hutton Institute

Planning, University of Waterloo

Engineering

What are your home department and home institution?

School of Planning, University of Waterloo

UW English

U of T, TRCA

Planning, University of Waterloo

Cornell Institute of China Economic Research; Department of City and Regional Planning, Cornell University

School of Geographical Sciences and Urban Planning, Arizona State University

Q9 - What country do you consider your permanent home?

What country do you consider your permanent home?

Canada

Canada

Italy

Canada

Canada

USA

Canada

Canada

Canada

United States of America

USA

China

Canada

sdfasf

France

Canada

Canada

Canada

Canada

UK

Canada

Canada

What country do you consider your permanent home?

Canada

Canada

Canada

Canada

China

US

APPENDIX D: ENHANCING CAPACITY TO APPLY SYSTEMS APPROACHES TO IMPROVE HUMAN AND PLANETARY HEALTH – WORKSHOP REPORT

Report: Enhancing capacity to apply systems approaches to improve human and planetary health

Final report: Enhancing capacity to apply systems approaches to improve human and planetary health

Kirkpatrick SI, Raffoul A, Lee KL

Overview

On April 25 and 26, 2018, we hosted a workshop, entitled *Leveraging Systems Approaches to Improve Human & Planetary Health*, at the University of Waterloo. This workshop was funded by a workshop funding opportunity from the Waterloo Institute for Complexity & Innovation (WICI), and coordinated by a planning committee comprised of faculty and trainees from multiple faculties and schools at the University of Waterloo:

- Scott Janzwood, PhD candidate, Balsillie School of International Affairs
- Sharon Kirkpatrick, PhD RD, Public Health and Health Systems
- Kirsten Lee, PhD student, Public Health and Health Systems
- Amanda Raffoul, PhD candidate, Public Health and Health Systems
- Vanessa Schweizer, PhD, Knowledge Integration
- Katharine Zywert, PhD student, Social and Ecological Sustainability



The objectives of this workshop were to expose faculty members and trainees from various disciplines with relevance to human and planetary health to systems thinking, and to provide hands-on training in systems methods to challenges encompassing both domains. Over the course of two days, faculty and trainees were exposed to and engaged with systems thinking, but also fostered the use of a systems lens to bring together existing campus efforts to promote health while also reducing our environmental footprint.

Workshop program

The full program can be accessed on the [workshop website](#).

The first day of the workshop featured two keynote speakers, Dr. Bruce Lee and Dr. Vanessa Schweizer. Additionally, several case studies from a variety of fields and practices (i.e., environmental sciences, clinical medicine) were presented and tied together with discussant panels led by faculty and graduate students. In the afternoon, there were 7 oral and 10 poster presentations (plus a sculpture). Trainee presentations were judged and prizes awarded:

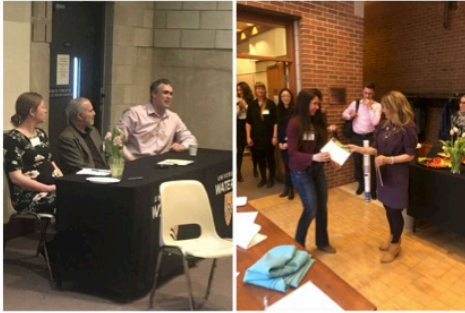


- *Oral presentations:* Katherine Zywert (Social and Ecological Sustainability), Ana Carolina Esteves Dias (Environment, Resources and Sustainability)
- *Poster presentations:* Diana V. Luna-Gonzalez (Environment, Resources and Sustainability), Sara R. Packull-McCormick (Public Health and Health Systems)

Kirkpatrick SI, Raffoul A, Lee KL

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Report: Enhancing capacity to apply systems approaches to improve human and planetary health

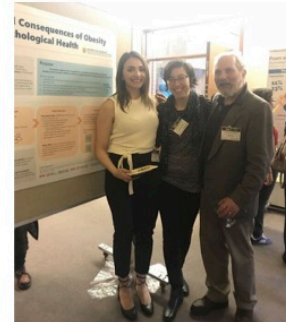


On the second day, participants self-registered for one of two hands-on morning sessions, focusing on either quantitative (e.g., agent-based modeling, system dynamics) or qualitative systems (e.g., concept-mapping, cross-impact balance) methods. The afternoon session, led by Dr. Katie Plaisance, led participants through the basics of team science, including barriers and facilitators to interdisciplinary collaboration.

Workshop participants

There were 72 attendees comprised of faculty (16), students and post-doctoral fellows (40), and other participants who work in related fields on- and off-campus (16) (there may have been additional attendees who did not register but who came for sessions throughout the first day).

The composition of the workshop audience was diverse, and included participants from public health, environment, psychology, engineering, medicine, and biostatistics. Many participants commented that this workshop was some of their earliest exposure to the work being conducted in other departments and faculties at the University of Waterloo, and highlighted the potential opportunities that they had established to connect with faculty and trainees across disciplines.



Feedback

An evaluation survey was circulated using Google Forms and 26 responses were received—the feedback is summarized in the Appendix. Overall, participants noted the lively and useful program, though a few noted that the day might have been a bit too packed.

Future directions



Systems approaches can facilitate transdisciplinary teams, which are essential to addressing these complex challenges, but comments at and feedback on the workshop highlights the need for greater efforts to enhance our capacity to apply such approaches and facilitate transdisciplinary networks across campus. Campus-wide initiatives, such as this WICI-funded workshop, provide promising avenues to foster greater collaboration and fill the gap that is currently present in systems thinking opportunities on campus.

Based on feedback from participants and our own observations in hosting this workshop, recommendations include:

- A follow-up workshop to demystify systems science language, its multi-functional use across disciplines, and methods to address language as a barrier to collaboration
- A hands-on workshop, aimed at both faculty and trainees, providing tips and resources for grant-writing, particularly among disciplines with less exposure to systems thinking in faculty curricula
- Opportunities for researchers trained in systems methods (i.e., modelers) and content experts across disciplines to collaborate on projects
- Systems methods workshop/collaboration focused specifically on the food system, leveraging on-campus research/practice opportunities

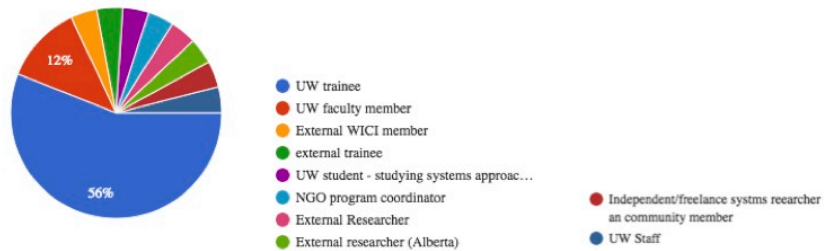
Acknowledgements

We are very grateful to WICI for sponsoring this event, and to the members of our planning committee for their assistance in creating the workshop program. We are deeply appreciative of all our presenters, discussants, oral and poster presentation judges, and workshop facilitators for their contributions. We are grateful to Kirsten Lee (SPHHS) for sharing her talents to help organize this workshop and for designing the program, Andy Xu (SPHHS), Eden Mekonen, Bernice Ma, and Leanne Wright (AHS) for their assistance with planning, Donna Schell for answering our frequent queries about campus resources for events, and Noelle Hakim (WICI) for helping us to disseminate information about this workshop.

APPENDIX A: SUMMARY OF FEEDBACK GATHERED THROUGH ONLINE EVALUATION

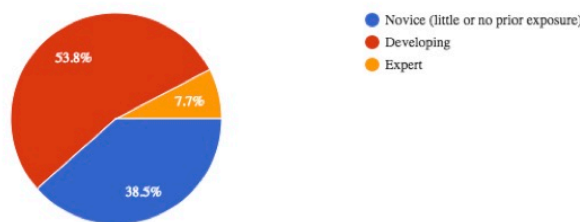
Please tell us who you are:

25 responses



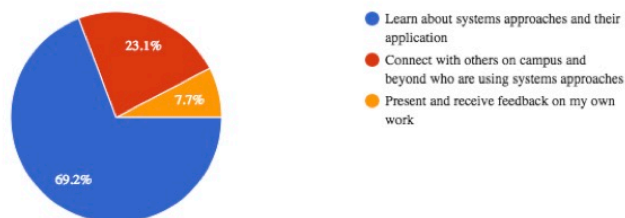
Prior to the workshop, what would you consider to be your level of expertise in systems approaches?

26 responses



What was your primary motivation for attending the workshop?

26 responses

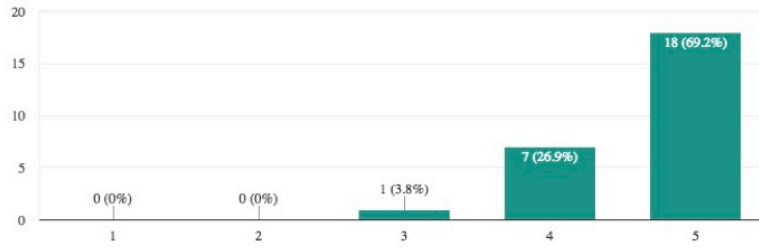


Report: Enhancing capacity to apply systems approaches to improve human and planetary health

The keynotes and day 2 hands-on workshops were considered the most useful for enhancing capacity in systems approaches.

How likely would you be to attend a similar event in the future?

26 responses

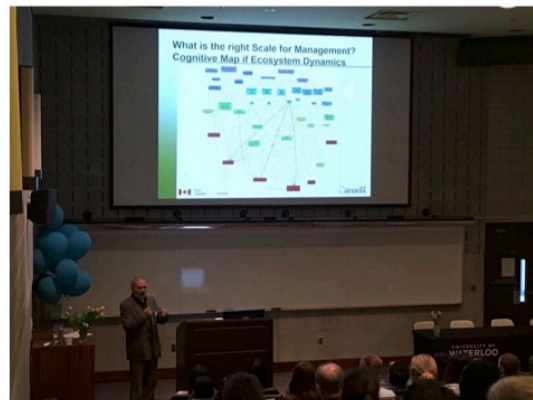


(5 is considered most likely)

APPENDIX B: SAMPLE OF PHOTOS FROM DAY ONE



Keynote presenter Dr. Bruce Lee

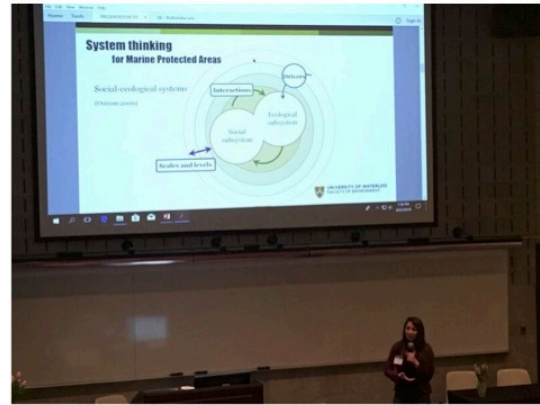
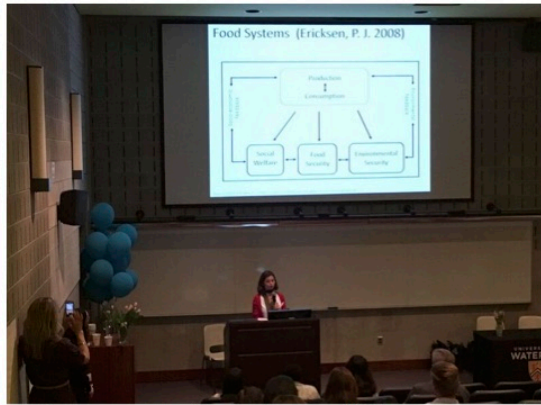


Case study presenters Dr. Brad Bass (left) and Dr. William Sutherland (right)

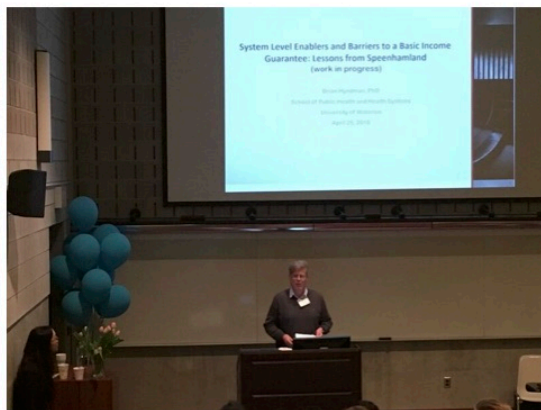


Oral presentations by Sophia Sanniti & Katie Kish (left) and Roxanne Springer (right)

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Oral presentations by Basak Topcu (left) and Ana Carolina Esteves Dias (right)

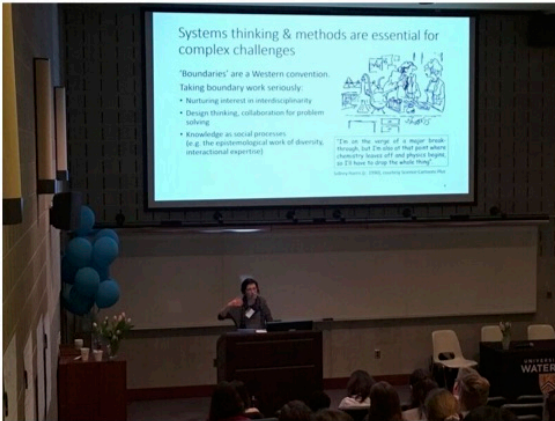


Oral presentations by Brian Hyndman (left) and Perin Ruttonsha (right)



Katharine Zywert (left), and facilitated group discussion by Dr. Warren Dodd

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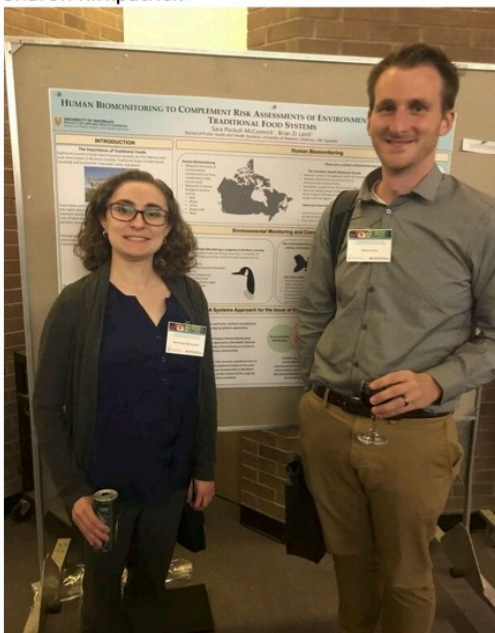
Keynote presenter Dr. Vanessa Schweizer (left) and concluding panel (right), featuring moderator Dr. Sharon Kirkpatrick and panelists Dr. Bruce Lee, Amanda Raffoul, Dr. Vanessa Schweizer, and Mat Thijssen



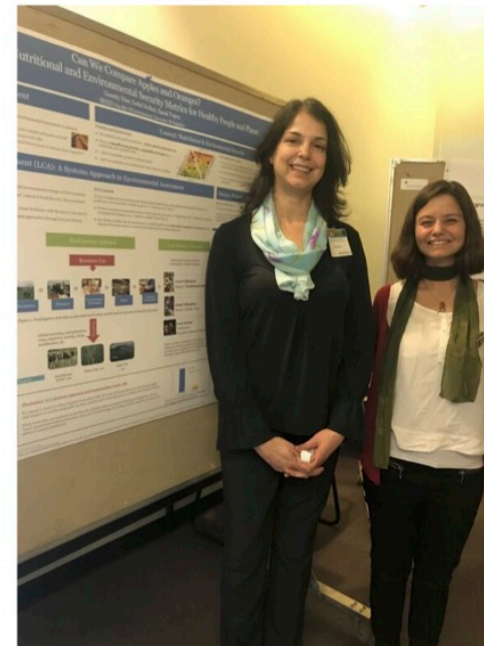
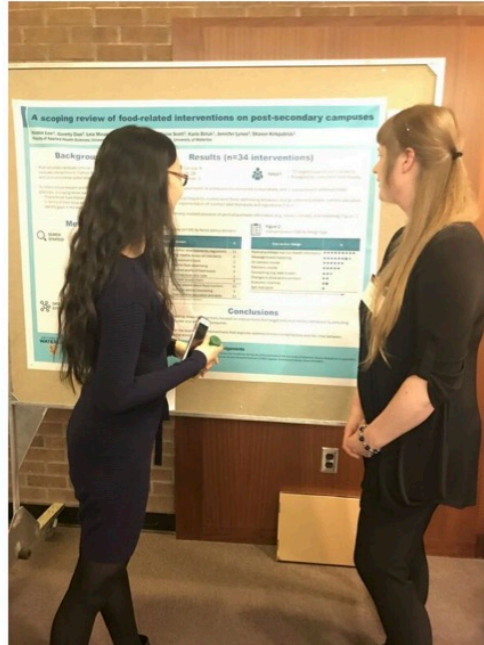
Oral presentation award recipients Katharine Zywert (left) and Ana Carolina Esteves Dias (right) with Dr. Sharon Kirkpatrick



Poster presentation award recipients Diana V. Luna-Gonzalez (left) and Sara R. Packull-McCormick (right) with Dr. Sharon Kirkpatrick



Report: Enhancing capacity to apply systems approaches to improve human and planetary health



Kirkpatrick SI, Raffoul A, Lee KL



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Deconstructing the Ideological Complexity of Right-Wing Populism Across Borders

BSIA, April 2-3, 2018

The political landscape of Western nations has been in upheaval in recent years, between the election of Donald Trump in the United States; the “Brexit” referendum in the UK; and the increasing electoral strength of the National Front in France, the Party for Freedom in the Netherlands, the Alternative for Germany, the Swiss People’s Party and the Sweden Democrats, among others. These movements often appear radically different from one another in their positions on economic, social and foreign policy; their tactics, allegiances and rhetoric, as well as in their ultimate impact. Nonetheless, they share enough in common to justify widespread intuition that they represent a global ideological phenomenon variously labelled “the new nationalism”, “right-wing populism” or the “radical right”.

Factors used to explain the rise and appeal of these movements include increased economic dislocation, insecurity and inequality due to globalization and workplace automation; mass migration and influxes of new immigrants, especially visible and religious minorities, triggering nativists’ cultural anxieties; and rising mistrust of governments, media, academics, experts, and political elites fuelled by polarizing social media. But approaches that focus too heavily on any one of these factors, or even any simple combination of factors fall short of capturing the nuances of this complex phenomenon.

A better approach is one that frames populist ideology and mobilization as an emergent phenomenon resulting from a pattern of interaction between factors; a pattern that is difficult to discern because these factors operate on different levels of analysis: economic, cultural, institutional and psychological. Methods developed by the Ideological Conflict Project, operating under the BSIA and WICI, can be used to explore how changes to the international political environment have served to open a new “basin of attraction” in the global ideological landscape; in effect, a growing mass market for an otherwise underrepresented convergence of beliefs. While the ideological movements that fill this space each bear the marks of their particular national contexts, they also share a number of commonalities in terms of how they make sense of a changing world. All of these similarities and differences must be accounted for by scholars, activists and politicians grappling with the phenomenon.

This workshop will assemble a team of emerging and established scholars interested in contributing to the development of a comprehensive framework for analyzing right-wing populist ideologies and movements that integrates a diversity of theoretical and disciplinary insights. We would especially like to hear from scholars whose work involves close case analysis or comparative study of how particular national identities and politics interact with a shifting global ideological and economic environment to create space for the formation, rise and/or decline of distinctive right-wing populist movements in the U.S., Canada, U.K., France, the Netherlands, Switzerland, Sweden, Hungary, Poland and Greece.

APPENDIX F: IDEOLOGICAL CONFLICT PROJECT - PROGRAM



BALSILLIE SCHOOL
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WATERLOO INSTITUTE
for COMPLEXITY & INNOVATION

Deconstructing the Ideological Complexity of Right-Wing Populism Across Borders

Balsillie School of International Affairs, CIGI Campus, April 2-3, 2018 (BSIA 123)
67 Erb St W, Waterloo, ON N2L 6C2

Agenda

Monday, April 2 (1pm-7pm)

1:00pm: Welcome and introductions

1:30pm: Complex Systems Theory and the Rise of Right-Wing Populism: Contributions from the Ideological Conflict Project

Thomas Homer-Dixon: *A state space model of ideological structure and change*

Steven Mock: *Defining Populism through a Multi-level Systems Framework*

Jinelle Piereder: *Populism, globalization, and conspiracy theories*

3:00pm: Coffee Break

3:15pm: Discussion: Approaches to Right-Wing Populism: Theories, Methods and Definitions

4:15pm: Milan Bernard and Phillip Bernier Arcand: *Trans-Atlantic Diffusion Of Right-Wing Populism: The France-Quebec Trajectory*

5:00pm-7:00pm: Dinner and public talk (BSIA 142): *Canada and the Global Forces of Populism*
Darrell Bricker (CEO, Ipsos Global Public Affairs)

Tuesday, April 3 (9am-5pm)

9:00am: Jordan Mansell: *Competition, Self-Esteem, and Attitude Towards the Otherness: the Psychological Foundations of Right-Wing Populism*
Andrew Jones: *What is the Alt-Right?*

10:30am: Coffee Break

10:45am: Margaret Jenkins: *Political Liberal Responses to Right-Wing Populism: A Consideration of Hungary's Illiberal Ethno-Nationalism*
Patrick Ciaschi: *"Order is the Soul of Everything!": A Complex Approach to Populism in Contemporary Hungary*