School of the Environment
UNIVERSITY OF TORONTO

2015-16 ANNUAL REPORT

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2015-16 Annual Report Contents

School of the Environment

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Scott Prudham, Professor, Geography/Environment
John Robinson, Professor, Munk School of Global Affairs/ Environment
Njal Rollinson, Assistant Professor, Ecology & Evolutionary Biology/Environment
Beth Savan, Senior Lecturer Emeritus, Environment; Senior Fellow, Massey College
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Director's Message

Professor Kimberly Strong, Director, School of the Environment, University of Toronto

The 2015-16 academic year was a full and exciting one at the School of the Environment. Some highlights include welcoming four new faculty and one new staff member, launching a new annual symposium, awarding two new graduate fellowships, and offering six new courses.

Interdisciplinary study of the environment is at the heart of what the School does, and it seems that this is clearly recognized by our students, faculty, and staff. As part of our efforts to improve communications, we ran a short survey this past year. In answer to the question: *"What single word or phrase best describes the School of the Environment?"*, the most popular adjective was interdisciplinary or multidisciplinary. Happily, this was closely followed by a group of positive adjectives, including such heartwarming phrases as a*wesome, the best, dynamic, friendly, and welcoming!* It was also interesting to see students' responses to the question "*Why are you enrolled in a School program?*", with almost half indicating that it is because they are passionate about the environment.

In January 2016, **Sarah Finkelstein**, who is an Associate Professor in the Department of Earth Sciences, joined the School as our Academic Associate Director (AAD). I thank her for taking on this important role, and I also thank **Doug Macdonald** for his many contributions as AAD over the previous two-and-a-half years. It was a great pleasure working with Doug, and I appreciated his dedicated and thoughtful approach to every task.

We were also delighted to welcome three more new colleagues this year. **John Robinson**, formerly the Associate Provost of Sustainability at UBC, is a cross-appointment with the Munk School of Global Affairs whose interests lie in the intersection of sustainability, social, technological and behaviour change, and community engagement. Climate physicist **Debra Wunch** is a cross-appointment with the Department of Physics who works in the field of remote sensing of greenhouse gas concentrations in the atmosphere. **Njal Rollinson** is a cross-appointment with the Department of Ecology and Evolutionary Biology, and an aquatic ecologist whose research explores the evolutionary ecology of fish and reptiles. Our new faculty are bringing new energy and ideas to the School and we are thrilled to have them here to help us strengthen and expand our teaching and research capabilities.

We are also looking forward to the arrival of **Tanhum Yoreh** in January 2017, joining us as an Assistant Professor in a three-year appointment in the School. He is interested in religious-based environmental concepts and their modern application to behaviour. And two searches are underway for new cross-appointments, one with the Department of Chemistry in toxicological chemistry, and one with the Department of Computer Science in sustainability and climate informatics.

As for new staff, we were joined by **Cherryl Bird** in a term appointment as Communications and Director's Assistant, replacing **Mona El-Haddad**, who is on leave. Cherryl has a BA in English and Sociology from U of T, extensive administrative experience, including five years as a Departmental Administrative Assistant in the Faculty of Medicine, and more than 10 years of experience in communications and public affairs, making her ideally suited for this position.

In September 2015, the School hosted the inaugural **Beatrice and Arthur Minden Symposium on the Environment**, made possible by a major endowment from the Beatrice and Arthur Minden Foundation. About 45 invited participants engaged in two days of discussion on *"Taking Action: Achieving Ontario and Canadian Climate Change Goals,"* providing input into current carbon pricing initiatives, particularly in Ontario. This endowment was also used to establish the **Beatrice and Arthur Minden Graduate Research Fellowship,** which is intended to support the research activities of our PhD students and was awarded to the first three recipients at our 2**016 Research Day**.

At the same event, we were also pleased to award the inaugural **Alan H. Weatherley Graduate Fellowship in Environmental Leadership**, which was made possible by a generous donation from **Robena C. Weatherley** to honour the memory of her husband and to reflect his life-long commitment to environmental issues. It will be awarded annually to one PhD student enrolled in the School's graduate programs who demonstrates exceptional academic and/or practical leadership in the area of environmental issues.

Continued on next page...

The School's undergraduate programs continue to thrive, with about 750 students enrolled in our majors, minors, and collaborative programs, and more than 3,000 students taking our courses. The **Environmental Studies Major** is our most popular offering, while we were excited to see our first cohort of **Environmental Science Majors** graduate in spring 2016, after we rolled out the new fourth-year Urban Ecology course.

In a two-year pilot project, we offered four new interdisciplinary courses to our students this year, as the Faculty of Arts & Science decided that the School was a natural home for its former first-year Big Ideas courses; all were co-taught by faculty from the humanities, social sciences, and sciences. Two were on **Energy and the Environment**: a second-year course on **Technology and Society**, and a third-year course on **Economics, Politics and Security.** The other two dealt with the **Environment and the Digital World**; a second-year course, **Is the Internet Green?,** and a third-year course on **Social Media and Environmentalism**. The latter, which was developed by **Steve Easterbrook** and **Miriam Diamond**, was highlighted as one of two "cool courses" at U of T in the Maclean's 2016 Canadian Universities Guidebook!

On the graduate front, our **Collaborative Programs in Environmental Studies** and **Environment and Health** are also doing well, with about 140 graduate students from more than 25 units enrolled in 2015-16. Particularly notable this year was the increase in enrollment in ENV 1001, **Environmental Decision Making**, the core course in the Environmental Studies Collaborative Program, which had 51 students. To cope with the demand for this course, we are offering it in both the fall and spring terms in 2016-17. In spring 2016, **John Robinson** introduced a new graduate course: **The Development of Sustainability Thought**. This is a joint course with the Munk School of Global Affairs, and will become JSE 1708 in January 2017. John is also introducing a new joint undergraduate and graduate special topics course on **The U of T Campus as a Living Lab of Sustainability** in fall 2016. We continue to develop the proposal for a new **Master of Environment and Sustainability** program, with this past year seeing extensive consultations with our graduate faculty, other units, and the Faculty of Arts & Science.

The School is blessed with students who are engaged and passionate about their field of study. For example, the **Environmental Students' Union** was the driving force behind the installation of a new plaque next to the 1970 Pollution Probe plaque outside Robarts Library and the development of a peer mentorship program this year. Six of our students (chosen from 58 applicants) attended the **UNFCCC COP21 Climate Change Conference** in Paris in late 2015, reported daily on the proceedings, and gave an excellent presentation on their return. Meanwhile, the **Graduate Students' Environmental Association** continues to flourish, organizing a series of successful events, including a screening of Watermark, followed by a lively panel discussion with the film's director.

The School partnered with a number of organizations this year, consistent with our objective of engaging with the wider community. For example, we co-sponsored talks and events with the French Embassy and the Planet in Focus film festival, and brought some of our students to the 2015 Fall Planning Day event held by the City of Toronto Energy and Environment Division.

Our **Professional Development Program** continues to offer high-quality in-class and distance courses, while the School's **Environmental Finance Advisory Committee** recruited six new members and had another active year. The Committee opened the Toronto Stock Exchange during the Climate Summit of the Americas and organized several highly successful events, including a panel discussion on sustainable investing at the third annual **Willis & White Thought Leadership Event**, an evening discussion on carbon finance in Calgary that raised $11,000 for our **Skip Willis Undergraduate Scholarship**, and a one-day workshop on carbon finance in Toronto that was attended by over 140 people, as well as panels on natural capital, aquaculture, and the Financial Stability Board Task Force on Climate-Related Financial Disclosures.

The success of the School of the Environment is due to the contributions of many people in many different ways. I would like to thank everyone who has supported the School over the past year, including our faculty, sessional lecturers, staff, students, alumni, donors, and those with more informal connections. Looking ahead, there is still plenty to do, and I look forward to working with many of you as we strive to further strengthen and expand the School.

Professor Kimberly Strong gives ENV 316 students a tour of the University of Toronto Atmospheric Observatory.

Beatrice and Arthur Minden Symposium on the Environment

Taking Action on Climate Change panel (L-R): Karsten Mecklenburg, Head of the Trade and Economic Section, Delegation of the European Union to Canada, Jean-Yves Benoit, Directéur, Marché du carbone, Ministère du Développement durable, de l'Environnement et de la lutte contre les changements climatiques, Québec, and Mark Purdon, Professeur invité, Département de science politique, Université de Montréal. Photo: Minrui Fu

The Hon. Glen Murray, Ontario Minister of the Environment and Climate Change, delivers the keynote address. Below: (L-R) Adam Auer, Director of Sustainability, Cement Association of Canada, Minden Symposium Report cover, event audience. Photos: Minrui Fu

In last year's Annual Report, we were pleased to announce that the School was privileged to receive a generous endowment from the Beatrice and Arthur Minden Foundation, giving a huge boost to our educational and research capacities. **Cynthia, George, Jo-Ann, and Robert Minden** selected the School of the Environment to honour the memory and philanthropic spirit of their parents. Their gift allowed us to establish two new programs, both of which were launched this year: an annual symposium intended to make a difference by contributing to scholarly and public debate on environmental issues of the day and the **Beatrice and Arthur Minden Graduate Research Fellowship** (see page 28).

We hosted the inaugural **Beatrice and Arthur Minden Symposium on the Environment** on September 29-30, 2015 at Hart House, bringing together invited participants for two days of discussions on current carbon pricing initiatives. With events such as this, we are expanding opportunities for engagement and interaction between faculty, students, and the wider community beyond the University. Our hope is that these symposia will catalyze meaningful dialogue and collaborations on critical issues, leading to bold new ideas and insights, proposals for workable solutions, and much-needed impetus for action.

Accordingly, with this inaugural Minden Symposium, "**Taking Action: Achieving Ontario and Canadian Climate Change Goals**", we chose to focus on the pressing issue of climate change and how it can be addressed by provincial and federal policy through the development of carbon pricing mechanisms.

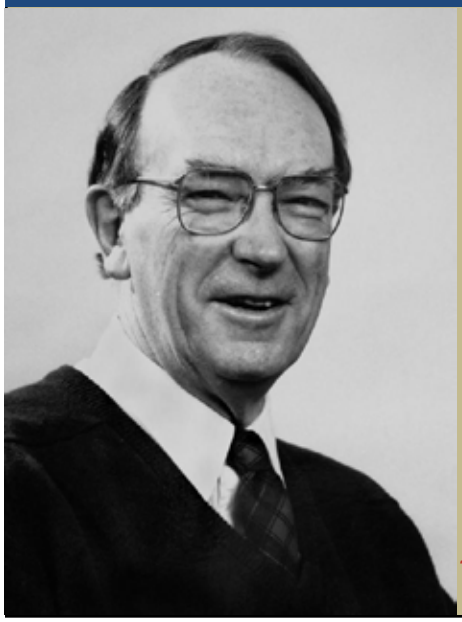
The keynote address on the first day was given by The Honourable **Glen Murray**, Ontario Minister of the Environment and Climate Change. Candidates from three federal parties joined us to debate how Canada in general, and Ontario in particular, should manage climate change. The Symposium was also attended by Ms. **Jo-Ann Minden**, former Director of the Beatrice and Arthur Minden Foundation, who contributed to the opening remarks.

The Symposium brought together 47 academic researchers, government officials, business representatives, and environmental and NGO professionals with two goals. The first was to identify opportunities and challenges facing Ontario policy-makers as the province develops a cap-and-trade system, and the second was to provide recommendations to the incoming federal government regarding national climate change policy.

These topics were addressed through a series of panels, each involving short presentations by invited speakers, followed by a moderated plenary discussion involving all participants. The panels dealt with five themes: *Learning from the Experience of Others*; *Designing the Ontario Cap-and-Trade Program*; *The Challenge of Developing Co-ordinated National Policy*; *Federal Government Leadership for National Climate Change Policy*; and the *Concluding Plenary: Ontario in Canada, Canada in the World*.

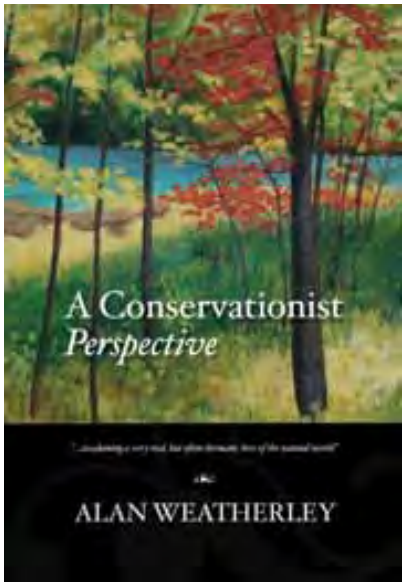
The 2015 Minden Symposium proceedings, including links to the full program, a list of participants, speaker biographies, presentations, photos taken at the event, and the Symposium Report, are available at www.environment.utoronto.ca/MindenSymposium.aspx. The Report provides a summary of the event, serving as a record of the discussions, which we hope will be of value to the wider community as the Ontario and Canadian carbon pricing policy continue to develop.

Inaugural Alan H. Weatherley Graduate Fellowship in Environmental Leadership



The School of the Environment is pleased to announce a new graduate scholarship: the Alan H. Weatherley Graduate Fellowship in Environmental Leadership. This fellowship was established by Robena C. Weatherley to honour the memory of her husband, Professor Emeritus Alan H. Weatherley, and to reflect his personal interest, deep concern and life-long commitment to environmental issues. The Alan H. Weatherley Graduate Fellowship in Environmental Leadership is to be awarded annually to one PhD student enrolled in the School of the Environment's graduate programs, to encourage their research and academic achievement. It will be awarded to a student who demonstrates exceptional academic and/or practical leadership as has a strong academic record in the area of environmental issues. This leadership may be demonstrated in a variety of ways, including environmental research, activism on environmental issues, environmental management, active involvement in significant conservation projects, participation in public debates, professional engagement with governments, environmental non-governmental organizations, or business.

In Memory of Professor Alan Weatherley



ALAN WEATHERLEY (1928-2012) was Professor of Zoology at the University of Toronto from 1975 until his retirement in 1993. He previously taught biology at the University of Tromsø (1973-74) and Australian National University (1961-73). He was the author of more than 75 research articles, published between 1950 and 1994, and three books on fisheries biology. He received his BSc from Sydney University in 1949, MSc from the University of Tasmania in 1959, and PhD from the University of Glasgow in 1961. Much of his early learning and formative experiences as a scientist are documented in his book, ***A Conservationist Perspective***, which he published as Professor Emeritus in 2012.

Professor Weatherley's fascination with nature and the great outdoors started early, having been born in scenic Sydney, Australia. After receiving his BSc, he went on to work in the CSIRO's Fisheries and Oceanography laboratory under the direction of Dr. **Aubrey Nicholls**. This group was investigating the ecology of Tasmanian trout populations and aquaculture potential. He subsequently received his MSc from the University of Tasmania in 1959 with a thesis titled, "Tasmanian fish cultural studies"; a study of the aquaculture potential of fish in Tasmania. In 1961, he was awarded a PhD from the University of Glasgow for his study on thermal biology of perch (Perca fluviatilis) and the role of the interrenal tissue (source of corticoid hormones) in thermal stress.

He began his major scientific research in freshwater biology in Tasmania (1951-57), continued in Scotland (1958-60), and subsequently at the Australian National University from 1961-73 where he became a Reader in Zoology. Professor Weatherley took up a lectureship in the Department of Zoology at the Australian National University in 1961 where he taught courses in vertebrate biology, comparative physiology and freshwater ecology.

In 1972, he published his book ***Growth and Ecology of Fish Populations***, which received the Publication Award of the Wildlife Society (USA) and became a Current Contents Citation Classic. In 1973, he moved to the University of Tromsø, Norway, to become Professor of Fisheries Biology, and from 1975-93 he was Professor of Zoology at the University of Toronto. While at U of T, he established a research group that focused on fish growth and metabolic activity. One major success was the development of telemetry to a level of refinement that made it possible to monitor metabolic activity in free-living fish.

Professor Weatherley co-founded the Australian Society for Limnology (ASL) in 1962 and was its President in 1965. He was also the Secretary of the Ecological Society of Australia and a member of the Executive Committee of the Great Barrier Reef Committee.

He and his wife, **Robena Weatherley**, were active members of Science for Peace for 10 years in Toronto, were early members of Washademoak Environmentalists, and were co-founders of the Canaan-Washademoak Watershed Association. They continued to work in conservation after his retirement from the University of Toronto centred around the area where they lived alongside a tributary of the Saint John River, New Brunswick.

The Polar Environment Atmospheric Research Laboratory at Eureka, Nunavut, the site of research being conducted as part of the Canadian Space Agency's new AVATARS project, led by Professor Kimberly Strong. Photo: Paul Loewen

CHRISTIAN ABIZAID

Assistant Professor, Department of Geography and School of the Environment

A leading member of the Peruvian Amazon Rural Livelihoods and Poverty (PARLAP) project, Professor Christian Abizaid was recently awarded a SSHRC Institutional Grant to assess the importance of rural social networks in reducing environmental shock vulnerability among riverine populations in the Peruvian Amazon, and an SSHRC Insight Development grant as a sole investigator. The Insight Development grant is titled: "Living with environmental change: traditional peoples' vulnerability and adaptation to river dynamics in western Amazonia" for the period of 2016-2018.

Dr. Abizaid's work on rural social networks and on the environmental and economic determinants for rain forest livelihood choice in Amazonia were presented at the Annual Conference of the Forests and Livelihoods: Assessment, Research, and Engagement (FLARE) Network and at the Meeting of the Association of American Geographers.

DOUGLAS MACDONALD

Senior Lecturer, School of the Environment

The subject matter of the teaching and research done at the School of the Environment is often referred to as "coupled human-natural systems" with a focus upon attributes such as carrying capacity, resilience, feedback loops, and planetary boundaries. What are the core assumptions and theoretical insights used by interdisciplinary environmental studies to understand that subject? Just as important – how can we best teach that theoretical understanding? How does that teaching help us to further develop theory?

Senior Lecturer Dr. Douglas Macdonald, course instructor for ENV 222 Interdisciplinary Environmental Studies, is currently working with Evolutionary Anthropology doctoral candidate and course Head TA Laura Eastham to explore those questions through literature review, student focus groups and a faculty/student seminar to be held in March 2017. The work is being done under the Teaching Stream Pedagogical Grant program, jointly funded by the School of the Environment and the Faculty of Arts & Science.

KATE NEVILLE

Assistant Professor, Department of Political Science and School of the Environment

Professor Kate Neville received a SSHRC Institutional Grant (SIG) grant to attend and present a paper at the annual conference of the Canadian Political Science Association (CPSA) held May 31 to June 2, 2016 at the University of Calgary. In an initiative led by Dr. Andrea Olive, from the Department of Political Science at U of T, the CPSA meeting included a multi-panel workshop on the theme of environmental politics.

As part of this workshop, Professor Neville presented a co-authored paper, titled "The revolutionary limits of fracking: have shale developments unleashed new state corporate relationships, or just more oil and gas?" The workshop format not only provided a space in which to share ideas and exchange critiques of specific research articles, but will also supported the development of a community of environmental politics scholars in Canada. The coordinated panels featured 20 papers, and involved participants from across the country.

SCOTT PRUDHAM

Professor, Department of Geography and School of the Environment

Professor Scott Prudham has been invited to be the inaugural visiting professorial fellow in the new Centre for Space, Place and Society (CSPS) at Wageningen University, the Netherlands during the 2016-2017 academic year. As part of the fellowship, he presented a keynote speech during the launch of the Centre on October 21, 2016.

The CSPS was recently founded as an initiative of three Wageningen University chair groups, Cultural Geography, Rural Sociology and Sociology of Development and Change, and aims to advance critical thinking within the social sciences with a particular focus towards pursuing socio-spatial and environmental justice in all its manifestations, and particularly in the domains of food and healthy living environments. As part of the Centre's activities, a visiting fellow programme was established.

JOHN ROBINSON

Professor, Munk School of Global Affairs and School of the Environment

Professor John Robinson has been appointed to the Advisory Board of the Institute for Advanced Sustainability Studies in Potsdam, Germany. Professor Robinson has a global reputation in the areas of urban sustainability, building sustainability, community engagement processes, and university sustainability programming.

A member of the board since 2016, he gave a keynote address in an IASS workshop on **Collective Behaviour Change for Sustainable Futures** held February 7-9, 2016 that brought together experts to consider the concepts,

A.P. (Lino) Grima

Associate Professor (retired), Department of Geography and Planning

Lino Grima, founding Canadian Co-Chair of the Sierra Club Bi-National Great Lakes Committee (BGLC) was awarded the 2016 Raymond J. Sherman International Award from the Sierra Club in honour of his extraordinary volunteer service toward international conservation, and foremost, for defending the Great Lakes from human-caused changes in water levels, invasive species, and pollution. The work of the BGLC is an outstanding example of how citizen organisations can work across borders to protect shared ecosystems. Wayne Howard, the US co-chair of the BGLC, was the co-recipient of the 2016 Sherman award. Through the years there have been a myriad of issues that required their coordination on both research and advocacy. These issues include the establishment of the Great Lakes St. Lawrence Compact/Agreement in 2008, Great Lakes water levels, the threat of Asian carp, harmful algae blooms in Lake Erie, recent pipeline and nuclear waste issues, and the Waukesha Diversion. Professor Lino has taught our graduate course ENV 1703, Water Resources Mangement and Policy, for many years.

Professor Lino Grima (third from left) of School of the Environment accepts the Sherman award from the Sierra Club in a ceremony on Ward's Island, Toronto

methods and case studies that are essential for understanding collective behaviour change and to develop a portfolio of analytical, epistemological, and methodological approaches that will facilitate transformative societal change toward sustainable futures.

Just prior to going to press, U of T announced that Professor Robinson has been appointed as Presidential Advisor on the Environment, Climate Change, and Sustainability for a three-year term beginning January 1, 2017, a new role which will situate him as chair of the University-wide Committee on the Environment, Climate Change, and Sustainability. The creation of this role was a key recommendation in **Beyond Divestment: Taking Decisive Action on Climate Change: Administrative Response of the President's Advisory Committee on Divestment from Fossil-Fuels** (March 2016). The committee's mandate is to identify ways to advance the university's contribution to meeting the challenge of climate change, with a particular focus on research and innovation, teaching, and university operations, to strengthen support for faculty and divisional initiatives, and to identify opportunities to build relationships within and outside the academic community.

NJAL ROLLINSON

Assistant Professor, Department of Ecology and Evolutionary Biology and School of the Environment

Congratulations to Dr. Njal Rollinson for being awarded the 2016 Canadian Society for Ecology and Evolution Early Career Award. This award recognizes outstanding accomplishments and promising future research potential in ecology and evolution by scientists early in their careers. Professor Rollinson also received an NSERC Discovery Grant for his project on "Life-history trade-offs, seasonal time constraints, and the optimization of body size". The Discovery Grants Program supports ongoing long-term programs of research. His research program aims to understand how life histories are influenced by the environment, and to apply this understanding to the conservation of exploited populations and species at risk.

Life-history traits have a direct and context-specific effect on fitness, and understanding the trade-offs and ecological context under which life-histories have evolved is central to understanding local adaptation, demographic rates, and extinction risk. Body size is central to many models of life-history evolution, yet there is no consensus on how body size itself is optimized. His goal in the next few years is to develop a better understanding of how size is optimized, and to explore how optimization is influenced by the physical environment.

BETH SAVAN

Senior Lecturer Emeritus, School of the Environment

Dr. Beth Savan's research on cycling in Toronto and beyond is continuing to attract support and publicity (see Groups hope to make biking in the 'burbs more appealing in TheStar.com). Her five-year SSHRC Insight Grant on Increasing Cycling for Transportation in Canadian Communities has been supplemented by a contract, through the Toronto Centre for Active Transportation (TCAT), to support the Region of Peel in increasing cycling uptake in that region.

Building on that success, again through TCAT, she is working with a range of partners to target (geographically and demographically), develop and evaluate two new cycling hubs in Scarborough. A recent grant to provide support to School Councils wishing to increase roadway safety near schools has resulted in a tool to reduce traffic speeds and improve roadway infrastructure to protect pedestrians and cyclists. Her partnership with this settlement organization is continuing through support for their new program to increase cycling to schools in the Toronto area. A couple of MITACS grants for students at the Master's and Doctoral levels have supplemented this research effort. Finally, her team is supporting the TCAT research into the economic impacts of the proposed cycle track on Bloor Street, through a grant from local Business Improvement Areas and the Metcalf Foundation.

STEPHEN SCHARPER

Associate Professor, Department of Anthropology UTM and School of the Environment

Professor Stephen Scharper has been elected to the Executive Committee of the Senior Common Room at Trinity College, and invited to serve on the Executive Committee of the Centre for Ethics at the University of Toronto. The Executive Committee of the Centre for Ethics helps envision and implement seminars, colloquia, and public events for the Centre.

KIMBERLY STRONG, KALEY WALKER AND JENNIFER MURPHY RECEIVE NEW GRANTS FROM THE CANADIAN SPACE AGENCY

Professors Kimberly Strong, Kaley Walker and Jennifer Murphy have received two $500,000 grants from the Canadian Space Agency's Flights for the Advancement of Science and Technology program (CSA FAST).

Professor Kimberly Strong (Physics and Director, School of the Environment) is leading a national team of 13 in the AVATARS (Arctic Validation and Training for Atmospheric Research in Space) project. AVATARS will use the Polar Environment Atmospheric Research Laboratory (PEARL) in the Canadian High Arctic as a "space station on the ground", and will include development of techniques for remote operation and automation of instruments, improved data analysis, and validation of measurements from current and upcoming space missions. Student training is a large focus of the FAST program, and AVATARS will support nine new graduate students at six universities over a three-year period.

Professor Kaley Walker (Department of Physics and Principal Investigator), Professor Jennifer Murphy (Department of Chemistry) and their colleague Professor Wolfgang Jaeger (Department of Chemistry, University of Alberta) have received an award for the CALASET project, the Canadian Atmospheric Laser Absorption Spectroscopy Experiment Test-bed. This project will train future Earth and space scientists through the development, construction and testing of an innovative instrument for studying how trace gas concentrations in the atmosphere change with height in the atmosphere. In the last year of this three-year project, this instrument will be flown on a high-altitude balloon to assess its performance. The three graduate students working on this project will conduct modelling studies and data analysis, instrument/gondola design and testing and data analysis construct and test the gondola structure needed to support the instrument.

Dr. Walker and Dr. Murphy are instructors of courses in the School of the Environment's BSc Environmental Science program: ENV 237/238H Physics of the Changing Environment and ENV 316H Laboratory & Field Methods in Environmental Science, respectively.

CLARE WISEMAN

Assistant Professor and Coordinator of Graduate Collaborative Program in Environment and Health, School of the Environment

Professor Clare Wiseman has been awarded funding from Health Canada to investigate the concentrations, distribution and bioaccessibility of priority metals in road dust. Funded until March 2018, the purpose of this study is to support Health Canada research under the Chemical Management Plan (CMP) and address information needs on metals of human health concern in urban road dust.

As part of this, the bioaccessibility of metals in road dust will be assessed using information generated from physical fractionation studies on particles of particular concern to human health and through the application of in vitro techniques with simulated lung fluids. This will yield important information on the potential risks associated with exposures to road dust in an urban context.

Professor Wiseman has also been newly cross-appointed (non-budgetary) to the Occupational and Environmental Health Division, Dalla Lana School of Public Health, University of Toronto.

DEBRA WUNCH

Assistant Professor, Department of Physics and School of the Environment

Professor Debra Wunch has been awarded an NSERC Discovery Grant to study "Canada's Impact on the Global-Scale and Urban-Scale Carbon Cycle". This grant will help fund the analyses of atmospheric greenhouse gas abundance data from Canada's Boreal forest and from Toronto. The focus of the Boreal aspect of this research is to relate temperature, soil moisture, fires and other disturbance to the Boreal forest's ability to take carbon dioxide out of the atmosphere. The focus of the analysis of measurements from Toronto is to quantify and locate Toronto's greenhouse gas emissions, specifically those of methane.

Dr. Wunch has also been awarded a grant from Canada Foundation for Innovation's (CFI) John R. Evans Leaders Fund (JELF) for her project "Constraining Canada's Regional and Urban Carbon Cycle using Atmospheric Greenhouse Gas Measurements". This grant will fund the infrastructure required to install state-of-the-art greenhouse gas monitoring stations in the Boreal forest and in Toronto. The data produced from these stations will be used to investigate the effects of climate change on the Boreal forest, and quantify Canada's urban emissions.

Sarah Finkelstein

Appointed Academic Associate Director

Dr. **Sarah Finkelstein** joined the School of the Environment as Academic Associate Director from January 1, 2016 to June 30, 2020. In this role, she will coordinate and oversee the School's undergraduate programs and graduate collaborative programs, assist in advising students, and oversee other academic program-related activities. Dr. Finkelstein succeeds Dr. **Douglas Macdonald**, who held this role for the past two-and-a-half years.

Dr. Finkelstein is an Associate Professor in the Department of Earth Sciences, where she studies climate history and the drivers of ecological change through the analysis of core samples and sediment records. She is cross-appointed to the graduate faculty in the Department of Geography and the Department of Physical and Environmental Sciences at the University of Toronto Scarborough and is a Research Associate at the Royal Ontario Museum.

She has conducted research on both recent and paleo-environmental change in the Canadian High Arctic, the Hudson Bay Lowlands in Ontario's Far North, the coastal wetlands of the lower Great Lakes as well as Barro Colorado Island in Panama, and the savanna region of South Africa.

Dr. Finkelstein obtained degrees at Princeton University (AB, Ecology and Evolutionary Biology, 1998), Cambridge (MPhil, Plant Sciences, 1999) and the University of Toronto (PhD, Physical Geography, 2004), and completed an NSERC Post-Doctoral Fellowship at the University of Ottawa (2004-05) prior to her appointment to U of T as faculty in 2006.

John Robinson

Professor and leading scholar in sustainability studies is appointed jointly with the Munk School of Global Affairs

Dr. **John Robinson** joined the School as a Full Professor on January 1, 2016 in a joint appointment with the Munk School of Global Affairs. Professor Robinson has a global reputation in the areas of urban sustainability, building sustainability, community engagement processes, and university sustainability programming.

Dr. Robinson is also actively involved in establishing such programs at other institutions, including the Copenhagen Business School, where he is an Adjunct Professor, and Gros Morne National Park in Newfoundland. He will be developing regenerative sustainability and living lab programs at U of T. Starting in fall 2016, he will be teaching a joint undergraduate/graduate special topics course focused on *U of T Campus as a Living Lab of Sustainability*.

From 1992-2015, he was a Professor with the Institute for Resources, Environment & Sustainability, and the Department of Geography at the University of British Columbia (UBC). From 2012-15, he was Associate Provost, Sustainability at UBC, responsible for leading the integration of academic and operational sustainability on UBC's Vancouver Campus. Professor Robinson's own research focuses on the intersection of climate change mitigation, adaptation and sustainability; the use of visualization, modeling, and citizen engagement to explore sustainable futures; sustainable buildings and urban design; creating partnerships for sustainability with non-academic partners; and, generally, the intersection of sustainability, social and technological change, behaviour change, and community engagement processes.

In 2012 Dr. Robinson received the Metro Vancouver Architecture Canada Architecture Advocacy Award and was named Environmental Scientist of the Year by Canadian Geographic magazine. In 2011, he received the Canada Green Building Council Education Leadership Award, and in 2010 he was given BC Hydro's Larry Bell Award for advancing energy conservation in British Columbia. He was a Fellow of the Pierre Elliot Trudeau Foundation from 2008-11, and, as a Lead Author, he contributed to the 1995, 2001 and 2007 reports of the Intergovernmental Panel on Climate Change, which won the Nobel Peace Prize in 2007 with Al Gore. At the Munk School, Professor Robinson will be a member of the Environmental Governance Lab and he will teach in the MGA program.

Njal Rollinson

Assistant Professor, studies ecological, life-historical and political factors involved in the decline of reptiles, amphibians and fish

Dr. **Njal Rollinson** became a member of the School's faculty as an Assistant Professor on July 1, 2016 in a joint appointment with the Department of Ecology and Evolutionary Biology. Dr. Rollinson's current research explores the evolutionary ecology and life-history of reptiles, amphibians, and fish. He has a background in field ecology and an interest in the ecological and political factors involved in population declines, including the impact of road networks and climate change on population persistence. He oversees one of the world's longest-running research investigation on reptiles, a long-term turtle life-history study based in Algonquin Park.

Dr. Rollinson completed his PhD in Biology at Dalhousie University in 2013, with a dissertation on the ecology and evolution of offspring size in Atlantic salmon. He has an MSc in integrative biology from the University of Guelph, and a Bachelor of Applied Technology in environmental biology from Nipissing University.

In addition to having an impressive publication record, with numerous papers in leading ecological journals, Dr. Rollinson was awarded the 2016 Canadian Society for Ecology and Evolution Early Career Award. He also recently received an NSERC Discovery Grant for his project on "Life-history trade-offs, seasonal time constraints, and the optimization of body size". His research aims to understand how life histories are influenced by the environment, and to apply this understanding to the conservation of exploited populations and species at risk.

Life-history traits have a direct and context-specific effect on fitness. Understanding the trade-offs and ecological context under which life-histories have evolved is central to understanding local adaptation, demographic rates and extinction risk. Body size is central to many models of life-history evolution, yet there is no consensus on how body size itself is optimized. His goal in the next few years is to develop a better understanding of how size is optimized and to explore how optimization is influenced by the physical environment.

Debra Wunch

Assistant Professor, studies the carbon cycle, a critical tool for understanding current and future climate

Dr. **Debra Wunch** joined the School of the Environment as an Assistant Professor on January 1, 2016 in a joint appointment with the Department of Physics.

Dr. Wunch is an experimental atmospheric physicist who has an exceptional record in hands-on development and construction of remote-sensing experiments to measure trace gas concentrations in the atmosphere. She obtained her PhD in 2007 at the University of Toronto under the supervision of Professor Emeritus James R. Drummond. From 2007 to 2015, she was at the California Institute of Technology, where she played a key role in the Total Carbon Column Observing Network (TCCON), which monitors greenhouse gases with unprecedented precision and accuracy.

Dr. Wunch has co-authored more than 60 papers in top journals in the field. Her particular specialty is measuring the concentration of greenhouse gases, including CO_2, an area in which she is an acknowledged world-wide authority. Her current interests lie in understanding the Earth's carbon cycle, both on urban and global scales. She has been actively involved in all aspects of the TCCON, which is a global network of ground-based, solar-viewing Fourier transform spectrometers that measure atmospheric trace gases, such as CO_2, CO and CH_4. She was responsible for the TCCON stations in Lamont, Oklahoma and Pasadena, California, and in her new position, she will be setting up a new TCCON station in western Canada to measure carbon uptake and release in the boreal forest, which is an important but little studied component of the Earth's carbon system.

With the TCCON data, she has been providing support for the evaluation of satellite data from the Greenhouse Gases Observing Satellite (GOSAT) and the Orbiting Carbon Observatory (OCO-2). She also studies the carbon cycle and emissions within large urban areas ('megacities') and plans to extend this work to Toronto.

Forecasting 2016 at the School of the Environment

BY KIMBERLY STRONG

The Faculty of Arts & Science News asked some Faculty leaders what's ahead in their fields in 2016 and beyond in a series titled Forecasting 2016.

Environmental challenges are everywhere, from the local to the global, and the need for deeper understanding, evidence-based decisions, and sustainable solutions continues apace.

Paris climate change conference + new Canadian federal government = action on carbon pricing?

The recent agreement at the COP21 Climate Change Conference in Paris, together with a new federal government in Canada, signals that real action on carbon pricing is in the air. This topic was tackled at the School of the Environment's Minden Symposium in fall 2015, where delegates agreed that a co-ordinated federal-provincial approach is essential for an effective national climate policy. Senior Lecturer **Douglas Macdonald** has developed workable approaches and is encouraging the federal government to ensure that the provinces take significant new action matched by new federal policies, to negotiate an equitable sharing of the cost of emission reductions.

Monitoring and measuring urban emissions will be key factors in helping Canada attain its goals. Toronto has committed to ambitious emissions reductions and Assistant Professor **Debra Wunch** is helping by setting up a mobile measurement system to monitor atmospheric greenhouse gas abundances in the city, as well as a new station in the boreal region of western Canada. Wunch is also making use of data from the new Orbiting Carbon Observatory (OCO-2) which will help us distinguish global sources and sinks of CO2 with a spatial and temporal precision previously unattainable.

Global poverty and religious worldviews are part of the equation, too

Increased linkages between climate change and global poverty have increased awareness of climate change as a moral issue. Such concerns were raised by Pope Francis in his Fall 2015 visit to the UN and in his encyclical on the environment, Laudato Si'. Associate Professor **Stephen Scharper** is exploring these dimensions as he examines how religious worldviews are impacting both environmental perceptions and policy.

Increasing attention is also being paid to the ecological impacts of climate change. Beyond its effects on ecosystem functioning and species interactions, climate change is affecting the physiology of organisms. In the next few years, Assistant Professor **Njal Rollinson** will try to figure out why these changes are occurring by examining trade-offs between growth and reproduction under different climactic regimes, shedding light on why optimal body size might be expected to change with temperature.

Not just CO_2 — it's urbanization, population growth, agricultural intensification, economic globalization and all that stuff we make and buy

Of course, environmental change is also being created by urbanization, population growth, agricultural intensification, economic globalization and the mass production and consumption of commodities. These forces are exerting pressure on global ecosystems that challenge our existing governance arrangements, and, in turn, catalyze changes in social and political relationships. Three broad trends can be discerned in this area: the intersection of indigenous rights, social justice, and environment; a re-imagination of citizenship and borders; and innovation and technological change. With her research on non-conventional energy resources, commodities and technologies, Assistant Professor **Kate Neville** is immersed in addressing these questions.

Another growing area is the impact of environment on human health. Assistant Professor **Clare Wiseman** is helping inform Canada's Chemicals Management Plan on priority metals contained in urban road dust. The focus is on metals contained in fine particles that can undergo long-distance transport and also penetrate indoor home environments and be breathed deep into the lungs. An examination of the composition of dust deposited in roadside environments is crucial to determine its impact on local air and water quality, and on human health.

Not just research; universities are powerful change agents for sustainability

Many environmental issues can be embedded within a sustainability framework. Trends in this area include the role of cities, the role of information technologies and social/digital media, and, the shift from selling products to selling/renting services. Professor **John Robinson** is examining how to make buildings, neighbourhoods and cities contribute to improving environmental and human well-being, and how to engage politically significant numbers of citizens in exploring the outlines of a sustainable future for their community. Robinson's interests also include the role of art and the interpretive social sciences and humanities in the sustainability transition. Universities are ideally placed to play a key role in this transition, serving as living labs and agents of change that can support society's transition to a sustainable future. With this in mind, the School of the Environment is in the early stages of developing a new Master of Environment and Sustainability degree that responds to the growing interest of students and the growing needs of society in this area.

Article courtesy of Arts & Science News

Research Day 2016

The School's annual Research Day showcases research conducted by our faculty, post-doctoral and graduate students. Presentations on April 20, 2016 examined techno-economic analysis and life cycle assessment tools that can assist in evaluating sustainability, with a focus on emerging energy technologies (**Heather Maclean**); evidence of glacial impact during the ice-age from geophysical markers recording the retreat of ice sheets, space-based measurements of the motion of the continental crust induced by glacial recovery and a new model of measuring the viscosity of the Earth's interior and ice sheet cover during the last glaciation-deglaciation cycle (**Kevin Roy**); the cross-country variance in how developing states have responded to Reducing Emissions from Avoided Deforestation and Forest Degradation financial incentives in exchange for GHG emission reduction credits for sale on global carbon markets to reduce deforestation (**Beth Jean Evans**); and the need to develop a suitable framework and simple narratives for relevant disciplines based on big ideas found within them, and to link them to other disciplines; particularly, in energy markets (**Adonis Yatchew**).

ADONIS YATCHEW, Professor, Department of Economics; Co-Instructor of School of the Environment's Big Ideas in Energy courses, Editor-in-Chief, The Energy Journal: "Big Ideas: How an Interdisciplinary Approach Can Broaden Our Understanding of Energy and the Environment"

HEATHER MACLEAN, Professor, Department of Civil Engineering; Graduate Faculty Member, School of the Environment: "Life Cycle Approaches for Assessing Emerging Energy Technologies"

KEVEN ROY, Doctoral candidate, Department of Physics and School of the Environment Collaborative Program: "Climate Change and Rising Sea Levels: What Can We Learn from the Past?"

BETH JEAN EVANS, PhD candidate, Department of Political Science and School of the Environment Collaborative Program: "The REDD Mechanism (Reducing Emissions from Deforestation and Forest Degradation) in Latin America: Why do Some Countries Oppose it and Why do Some Support it?"

Traditional Peoples' Vulnerability and Adaptation to Change in West Amazonia

BY CHRISTIAN ABIZAID

For more than 12 years now, Professor **Christian Abizaid** (Geography and the School of the Environment) has been studying how rural populations adapt to rapid environmental change in the Peruvian Amazon. With its headwaters in the Andes, people living in this area face serious threats from climate change, yet little research has been done on how Amazonian riverine populations will be affected and their ability to respond.

A river capture of an oxbow lake along the Ucayali River in Peru, 2011 (Photo by C. Abizaid)

The main objective of this project is to document river dynamics and their socioeconomic impacts on riverine populations, both in the short and long term. Results from this research, which has been published in Ambio, The Geographical Review and Fisheries Management and Ecology, has helped to document some of the most salient short-term hardships endured by floodplain residents downstream, including higher flood levels that destroyed crops and farmland being washed away by increased riverbank erosion. His research showed very different short-term patterns upstream, where lower flood levels and a shorter river travel route, due to channel straightening, created significant opportunities for subsistence and commercial faming among smallholders. Currently and with the support of a SSHRC Insight Development Grant, Dr. Abizaid is working with his students examining how short-term challenges and opportunities identified in his earlier work play out in the long run, with the goal of informing our understanding of the dynamic nature of vulnerability and long-term prospects for adaptation. He will continue to document how livelihoods evolve in the context of environmental change in and is expanding his research program to study the linkages between environmental risk exposure and migration and the importance of social networks for adaptation.

The Impact of Peat-forming Wetlands on Climate Change in Sub-Arctic Regions of Northern Ontario

Sphagnum mosses and other bog plants on a peatland surface, Attawapiskat River watershed, Hudson Bay Lowlands, Northern Ontario. (Photo: Sarah Finkelstein)

BY SARAH FINKELSTEIN

Among other ecological functions, peat-forming wetlands play a critical role in the global carbon cycle both through the uptake and storage of carbon under waterlogged conditions, and the release of methane, thus potentially influencing global climate. Despite the demonstrated importance of peatlands in global biogeochemical cycles and in the climate, peatlands remain severely threatened and degraded ecosystems. Further, peatlands are still poorly represented in Earth system models because of uncertainties in the size of past and present peatland carbon pools and in the controls on the rate of carbon uptake.

To address these critical issues, my research group uses the lens of Earth history to better understand and quantify the importance of peat-forming wetlands in global carbon cycling and climate change. We analyze wetland dynamics over recent and ancient timescales through field and lab-based studies of geochemical tracers and plant remains in peat sediment records. Our ongoing work on the spatially extensive peatlands of the Hudson Bay Lowlands in Ontario's Far North has shown the relative importance of climate, vegetation and local drainage in controlling the rate of carbon accumulation and methane release from sub-arctic wetlands.

We are also working on peat-forming wetlands in lower latitudes, which can be difficult to study because of the massive losses of wetlands in these regions due to human activity. Our efforts to map distribution of wetlands prior to land-use changes, to measure the impacts of different types of land use change, and to quantify the role of those systems in carbon cycling will help make a stronger case for wetland conservation and restoration.

What is Interdisciplinary Environmental Studies?

BY DOUG MACDONALD

During my experience teaching ENV222 Interdisciplinary Environmental Studies over the past decade, I have been developing and teaching answers to two questions central to interdisciplinary environmental studies (IES): "What are the causes of the ecological crisis?"; and "What are the solutions?" This has led me to consider a third: "What are the core theoretical conceptualizations which provide a foundation for IES?" This year, my colleague **Laura Eastham** (doctoral candidate Evolutionary Anthropology) and I are engaged in a research project, funded by the School and the Faculty of Arts & Science, investigating such questions, both in terms of theory and teaching in the classroom. We are exploring these possible answers.

> The basic cause is the vast increase in human physical capacity (physical power) since emergence of Homo sapiens two hundred thousand years ago, due to changes in technology and human organization for use of that technology. Organization was vastly accelerated with the emergence of language and social organization some sixty thousand years ago; with the appearance of social stratification (human power) in the Neolithic Revolution ten thousand years ago; and with the more recent appearance of two new organizational forms, both central to capitalism (itself a form of organization of society), the state and the firm. This increase in organization, coupled with the empirical method, allows development of technologies which vastly expand human physical power, symbolized by the 1945 Manhattan Project which created the atomic bomb.
>
> The core concept of IES today is the conceptualization of coupled human-natural systems (CHANS), with feedback loops. It is not clear, however, which of many possibilities are the main drivers of such interconnected systems. We are developing the argument that there is theoretical value in a focus on one basic, two-part system, the human-nonhuman (H-NH) relationship. The central driver in that relationship is physical capacity (energy), which flows from NH to H and in reverse. Physical power in the case of NH comes from the sun and the heat inside the earth. In the case of H, it is derived from technology which gives access to energy sources, but ultimately from the social organization which first appeared with the development of language and has been amplified since.

Comments and suggestions are welcome.
Douglas Macdonald, PhD
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The Politics of Resource Extraction and Land Use

BY KATE NEVILLE

Whitehorse residents protest against hydraulic fracturing in a rally outside the Yukon Legislative Assembly administrative building. (Photo: Kate Harris)

My work focuses on *the politics of open spaces*, particularly, on resource extraction and land use debates in northern Canada. With Professor Erika Weinthal at Duke University, I have been investigating the dynamics of public consultation processes over contested energy developments, especially hydraulic fracturing ("fracking"). In a forthcoming article in the *Review of Policy Research*, we document the ways in which processes intended to involve citizens in public policy decisions, such as public hearings, can instead reinforce mistrust and intensify divides.

Overlapping commons: Alliances, ownership, and conceptions of land and wilderness: Linked with the previous project, this work examines land use debates in northern Canada, with a focus on the Yukon's Peel Watershed. A multi-year planning process for the watershed has ended up in court battles, with the case to be heard by the Supreme Court of Canada in 2017 on questions of treaty agreements. The legal action and the accompanying public campaigns involve alliances among Indigenous groups and environmental activists, and illuminate efforts to reconcile differing conceptions of land and property. My work, in collaboration with Erika Weinthal, explores these dynamics, including political and philosophical understandings of wilderness, the commons, and belonging.

Investor-activism, information disclosure, and hydraulic fracturing: The controversial technology of fracking has led to heated public debate and intensive scientific research about the associated risks. Much public activism involves demands for information and risk disclosures, particularly for the chemical composition of the fluids injected in the fracturing process. In this project, I am working with collaborators from Duke University, the University of British Columbia, Pennsylvania State University, and the consulting firm CookESG, to understand how investors use insider strategies to influence corporate governance, most notably through shareholder resolutions on disclosure to shift company practices from within.

Sustainability in an Imaginary World

BY JOHN ROBINSON

Typically, the challenge of sustainability has been viewed as one of proving the world real. Solutions to environmental problems come from science, providing the indispensable factual basis for telling people what to do. This project proposes a different track.

We begin with a view of sustainability as an essentially contested concept and therefore as an emergent property of negotiations amongst interested parties about what kind of world we want to live in, what we refer to as procedural sustainability. This view places emphasis on the imagination, as sustainability relies on how well we explore and imaginatively inhabit multiple possible futures. This implies a significant shift in worldview: instead of a world made of objectively verifiable objects, we must contend with dynamic and contingent cultural forms which shape the ways such facts are constituted, expressed and interpreted. Our goal is to develop approaches to sustainability engagement which shift away from efforts to make people face some brute reality of their worlds and towards enchanting them with the openness of the world as an imaginary place.

The vehicle we designed to explore these questions is part immersive theatre, part interactive installation. The goal is an interactive experience that is aesthetically driven, that prioritizes the capacity of the arts to engage, provoke and destabilize through its expressive powers, and draws audiences into an interactive, collaborative engagement with elements of future-making and sustainability.

The first public previews took place in January 2016. A total of 172 participants took part in these initial runs. Based on our initial findings, and our experience with the January 2016 run, the installation is being revised and will be re-mounted in early 2017.

Draft floor plan for Sustainability in an Imaginary World installation. (Image: Obi Vattanawong)

Preserving the Genetic Diversity of Endangered Species

BY NJAL ROLLINSON

Captive-breeding programs can be implemented to preserve the genetic diversity of endangered populations such that the controlled release of captive-bred individuals into the wild may promote recovery. A common difficulty, however, is that programs are founded with limited wild broodstock, and inbreeding can become increasingly difficult to avoid with successive generations in captivity.
Program managers must choose between maintaining the genetic purity of populations, at the risk of inbreeding depression, or interbreeding populations, at the risk of outbreeding depression.

Njal Rollinson is conducting a long-term life-history study of turtles in Algonquin Park. (Courtesy of njalrollinson.com)

We evaluate these relative risks in a captive-breeding program for 3 endangered populations of Atlantic salmon (Salmo salar). In each of 2 years, we released juvenile F(1) and F(2) interpopulation hybrids, backcrosses, as well as inbred and noninbred within-population crosstypes into 9 wild streams. Juvenile size and survival was quantified in each year. Few crosstype effects were observed, but interestingly, the relative fitness consequences of inbreeding and outbreeding varied from year to year. Temporal variation in environmental quality might have driven some of these annual differences, by exacerbating the importance of maternal effects on juvenile fitness in a year of low environmental quality and by affecting the severity of inbreeding depression differently in different years. Nonetheless, inbreeding was more consistently associated with a negative effect on fitness, whereas the consequences of outbreeding were less predictable.

Considering the challenges associated with a sound risk assessment in the wild and given that the effect of inbreeding on fitness is relatively predictable, we suggest that risk can be weighted more strongly in terms of the probable outcome of outbreeding. Factors such as genetic similarities between populations and the number of generations in isolation can sometimes be used to assess outbreeding risk, in lieu of experimentation.

Reference article: Rollinson, N., Keith, D. M., Houde, A. L. S., Debes, P. V., Mcbride, M. C., & Hutchings, J. A. (2014). Risk Assessment of Inbreeding and Outbreeding Depression in a Captive-Breeding Program. Conservation biology, 28(2), 529-540.

Health Care Green Revolving Fund Initiative: *Driving energy conservation in Ontario hospitals*

BY JOHN MAIORANO AND BETH SAVAN

Investment in energy efficiency is considered one of the fastest and most cost-effective methods of reducing global GHG emissions and simultaneously promotes environmental protection and public health. While a major source of primary energy use is buildings, hospitals are among the most energy intensive as they operate around the clock and have extra requirements for clean air, disease control, imaging equipment and waste management. Hospitals in Ontario also face challenges, as capital is constrained and prioritized for patient care, and decision-making often occurs in departmental silos, marginalizing energy efficiency. A Green Revolving Fund (GRF) is an investment vehicle that addresses these challenges by freeing up capital and prioritizing energy efficiency. A GRF provides a dedicated source of funding for energy efficiency measures, and the resulting utility savings are tracked and used to replenish the fund for the next round of cost-saving energy conservation investments.

Jointly funded by an Ontario Centres of Excellence fellowship awarded to PhD Candidate **John Maiorano**, OISE/School of the Environment and a SSHRC Connection Grant led by both **Dr. Beth Savan**, School of the Environment and **Dr. Don Dewees**, Department of Economics. With our project partner, the Canadian Coalition for Green Health Care (CCGHC), we have been working with government, health care and industry representatives to gather ideas and shape initiatives that will reduce energy use and provide greater resiliency in the health care sector. Our focus has been on the use of GRFs in health care, but we also promote complementary initiatives that foster an energy conservation culture, such as behavior intervention programs and training.

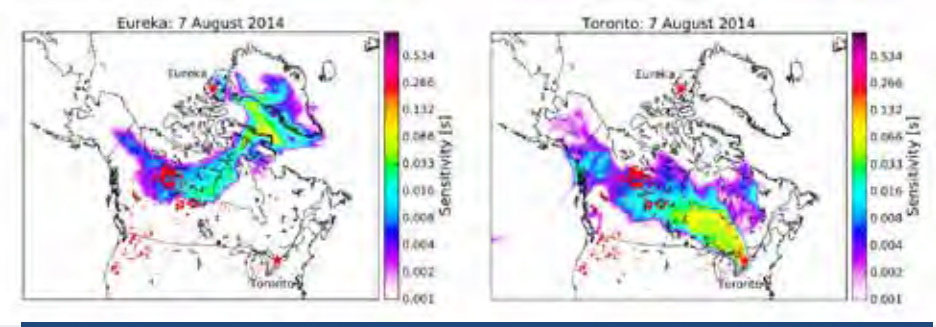
Meeting with the Canadian Coalition for Green Health Care, March 2016

Our initiative has supported a series of key informant interviews and the convening of an expert advisory panel, and we are gratified that these efforts are contributing to innovative instruments for health care energy conservation in the province, including the incorporation of a GRF in the Ontario Climate Plan. This policy action results in part from a roundtable discussion we held in March 2016, the CCGHC, Health Canada, the Ontario Ministry of the Environment & Climate Change, along with industry, hospital and academic representatives. Presentations by practitioners and academics fostered discussion on opportunities in the sector to improve infrastructure, increase resilience and reduce both energy use and GHG emissions. See http://www.greenrevolvingfund.ca and http://www.greenhealthcare.ca/grfr/ for more information.

Long-range Transport of Emissions from Forest Fires

KIMBERLY STRONG AND ERIK LUTSCH (PHD STUDENT)

The troposphere is a chemically complex region of the atmosphere, where gases from natural and anthropogenic sources undergo transport and chemical processing on similar time scales. While an urban location like Toronto is clearly subject to pollution events, the Arctic also experiences poor air quality due to transport from mid-latitudes. One focus of attention over the last several years has been the impact of smoke plumes transported from forest fires. We have used infrared spectrometers located at the University of Toronto Atmospheric Observatory (TAO) and at the Polar Environment Atmospheric Research Laboratory (PEARL) located in the high Arctic at Eureka, Nunavut to measure a suite of trace gases.



FLEXPART sensitivity of the Eureka and Toronto measurements on August 7, 2014 (the date of peak enhancement of CO, HCN and C2H6 total columns at both sites) to the Northwest Territories fires. The red points are the MODIS fire hot spots, indicating the location of wildfires.

Emissions from boreal wildfires clearly contribute to the day-to-day variability of seven tropospheric species. Carbon monoxide (CO), hydrogen cyanide (HCN), and ethane (C_2H_6), in particular, are emitted in large abundances from wildfires, and enhancements of their total columns observed at Eureka and Toronto have been attributed to forest fires as far away as Russia. Pollution was observed at both sites in July-August 2014. To determine the sensitivity of the measurements to various source regions, the particle dispersion model FLEXPART was run backwards in time. An example is shown in the figure for the 2014 Northwest Territories fires. The fire locations are indicated by the Moderate Resolution Imaging Spectroradiometer (MODIS) fire hot-spots, plotted in red. For both sites, sensitivity of the measurements to the NWT fires was observed. Using this approach, we recently reported the first long-term measurements of ammonia (NH_3) in the high Arctic, and showed that the 2014 NWT fires were a considerable episodic source of NH_3 in the summertime Arctic, while enhancements at Toronto further demonstrated the transport of NH_3 emissions. Measurements of pollution are thus not only influenced by nearby sources, but also by long-range transport from distant sources; this is particularly important in the Arctic, a region isolated from local anthropogenic and biomass burning sources. We are now working on a pan-Arctic study of the impact of biomass burning, combining data from other sites with satellite data and atmospheric models.

Reference article: E. Lutsch, E. Dammers, S. Conway, and K. Strong, Long-range transport of NH_3, CO, HCN, and C_2H_6 from the 2014 Canadian Wildfires, Geophys. Res. Lett., 43, 8286-8297, doi:10.1002/2016GL070114, 2016.

When the Dust Flies: *Metals in Toronto road dust and urban health*

CLARE WISEMAN

Dust that accumulates on roads contains a range of toxic metals of human health concern such as cadmium, lead and arsenic. In urban areas, traffic is a primary source of metal-enriched road dust. In addition to tailpipe emissions, metals are released from non-exhaust, traffic-related sources as a result of the wear-and-tear of roadway surfaces and automotive parts and components such as brake linings, wheel weights and tires. These emissions accumulate on roadway surfaces in the form of dust and has been identified as a potentially important contributor of metal contamination to air, water and soil.

A new research study, led by Professor **Clare Wiseman** in collaboration with Health Canada, seeks to examine the concentration of priority metals of human health concern and their patterns of distribution and bioaccessibility in particle size fractions of road dust collected from Toronto streets. This Health Canada-funded study aims to address information needs under Canada's Chemicals Management Plan and Clean Air Regulatory Agenda.

Dust of concern to human health in Road Sweeps

Larger components of Road Sweep

Street dust samples are currently being collected in collaboration with the Transportation Services Division, City of Toronto, which uses regenerative street sweepers to clean city roads. These sweepers are unique for they are capable of dry-fractionating dust sweeps into coarse and fine dust fractions; the latter of which contains smaller particles capable of being respired by exposed individuals. A focus of the study will be to characterize the physical and chemical speciation of metals associated with road dust particles, particularly those contained in finer particle fractions that are easily mobilized to the air via re-suspension processes and potentially inhaled.

As part of this, *in vitro* methods using simulated human lung fluids are currently being developed to reliably assess the bioaccessibility of metals in collected road dust samples. In addition to supporting information needs under Canada's Chemicals Management Plan, the study results will help contribute important data in support of the City of Toronto's Clean Roads to Clean Air Program.

Measuring Methane Emissions from Sources Within the Los Angeles Basin

DEBRA WUNCH

Methane is a potent greenhouse gas that is emitted to the atmosphere from many sources: for example, rice paddies, wetlands, wastewater treatment plants, termites, ruminants, landfills, and fossil fuel burning, distribution, explorationwn and extraction. There has been much recent effort in attempting to quantify and verify the emissions of methane to the atmosphere from urban regions, since they are arguably easier places in which to curb emissions. City-wide inventories of methane are computed by summing up the different sources of methane known to exist in that city. Businesses and industry often self-report emissions and the inventories are then compiled with state-of-the-art knowledge about energy consumption, waste production, water usage, emissions factors, and so on. It is essential to verify these inventories to determine whether there are additional, unknown sources of methane, or whether the emissions from known sources are under- or overestimated.

To verify these inventories in Los Angeles, we have been measuring methane in the Los Angeles atmosphere for many years. Many research groups have deduced that the methane emitted from sources within the Los Angeles basin into its atmosphere is the result of significantly larger emissions than the estimates from inventories. The underestimate of emissions from inventories has also been found in other North American cities.

Currently, Professor **Debra Wunch** is working with a summer student to develop a methane inventory for the greater Toronto area. Her plans for the next few years are to put the measurement and analysis techniques developed for Los Angeles into practice for Toronto, by setting up observing stations to monitor the methane abundances in Toronto's atmosphere. This is timely, as Toronto has several ambitious greenhouse gas reduction goals in the next few years, and only long-term atmospheric measurements will be able to verify reductions in the emissions.

A view of the Los Angeles Basin from the International Space Station. (Photo: Col. Chris Hadfield)

Academic Associate Director's Message

In January 2016, I took on the role of Academic Associate Director for the School of the Environment. My responsibilities include overseeing graduate and undergraduate academic programming, supporting our instructors, and working to promote the high quality of teaching and academic excellence our students enjoy. I would like to thank my predecessor **Douglas Macdonald**, who served for several years in this role, and did much to position the School so well within the Faculty, the University, the City of Toronto, and the world. I am thrilled to be involved in such a vibrant and multi-disciplinary academic community.

With over 750 students enrolled in our undergraduate programs, over 3300 students enrolled in our courses, and over 140 graduate students in our collaborative programs spanning more than 20 disciplines, the School is thriving. Given the strong interest on the part of U of T students in environment-themed courses and programs, the excellence of our faculty, and the success of our alumni, we continue to make a substantive difference in terms of environmental awareness, and creative solutions to the pressing issues we face as humanity.

Looking ahead to 2016-17, the year will be a busy one with a record number of incoming graduate students, seminar series touching on themes relevant to the research and teaching at the core of the School's mission, and some new courses. We are delighted to announce the first time offering of a capstone seminar in Environmental Science (ENV 452) taught by our new faculty member Professor **Debra Wunch**, and a special topics course titled "The U of T Campus as a Living Lab of Sustainability" taught by another new faculty member, Professor **John Robinson**. Both courses will allow our students unique opportunities to engage deeply in current issues in a highly hands-on fashion.

While the environmental issues facing the Earth are deeply daunting, the passion, the dedication and the academic achievement of our students, alumni and faculty give cause for optimism. I look forward to another successful year with the School and would be pleased to hear your thoughts on how to better deliver this important material to as wide a group of students as possible.

Sarah Finkelstein, Academic Associate Director, School of the Environment & Associate Professor, Department of Earth Sciences, University of Toronto

The School of the Environment offers Undergraduate degrees: a BA program in Environmental Studies and a BSc program in Environmental Science, as well as collaborative programs with departments and programs at the University of Toronto such as chemistry, geography, geology, human biology, physics, philosophy, psychology, and others. At the Graduate level, interdisciplinary collaborative programs in Environmental Studies, as well as in Environment and Health, are offered in partnersvhip with more than twenty other units at the University. For information on the School's academic programs, please visit: http://www.environment.utoronto.ca/Undergraduate.aspx and http://www.environment.utoronto.ca/Graduate.aspx.

New Undergraduate Courses for 2016-17

ENV 481 / ENV 2002

The U of T Campus as a Living Lab of Sustainability

Sustainability is a growing priority for universities all over the world. Many are developing strong operational sustainability goals and targets, and are giving increasing emphasis to teaching and research on sustainability issues. Yet few have committed at the executive level to integrating academic and operational sustainability in the context of treating their campus as a living laboratory of sustainable practice, research and teaching. Arguably, it is such living lab approaches that offer the largest potential for universities to play a significant role in the sustainability transition. This course will explore and apply the living lab concept, in the context of operational sustainability at the University of Toronto. We will begin by looking at the literature on university sustainability and the living lab concept. The bulk of the course will involve undertaking an applied research project on some aspect of campus sustainability, working in close partnership with operational staff at the University of Toronto. Students will develop the skills needed to work across disciplines and fields of study, and with non-academic partners.

ENV 452H1

Environmental Science Major

The new capstone course for the BSc

Scientists from within and external to the university share and discuss challenges, findings and opportunities. Specific topics (and speakers) vary from year to year but may draw from rehabilitation techniques, contaminants in our environment, environmental health, impacts on landscapes and communities, biodiversity, water, and modelling of environmental processes.

Undergraduate Programs

For more information, please visit www.environment.utoronto.ca, or contact David Powell, Undergraduate Student Advisor: 416-946-8100; David.Powell@utoronto.ca

Core Programs

The School of the Environment offers two core interdisciplinary undergraduate programs:

1. Environmental Science (BSc Major and Minor)
2. Environmental Studies (BA Major and Minor)

Collaborative Programs

The following collaborative programs combine the School's interdisciplinary core with a set of discipline-specific courses:

Specialist Programs

1. Environmental Chemistry (BSc, with the Department of Chemistry)
2. Environmental Geosciences (BSc, with the Department of Earth Sciences)
3. Environment and Health (BSc, with the Human Biology Program)
4. Environment and Toxicology (BSc, with the Department of Pharmacology and Toxicology)

Major Programs

1. Environmental Ethics (BA, with the Department of Philosophy)
2. Environment and Health (BSc, with the Human Biology Program)

Minor Programs

1. Environment and Behaviour (BSc, with the Department of Psychology)
2. Environmental Ethics (BA, with the Department of Philosophy)
3. Environment and Energy (BSc, with the Department of Geography)

Directed Minors

The following directed minor programs are offered by other departments and are for students interested in acquiring a limited body of knowledge in a specific discipline.

1. Environmental Anthropology (BA)
2. Environmental Biology (BSc)
3. Environmental Chemistry (BSc)
4. Environmental Economics (BA)
5. Environmental Geography (BA)
6. Geographic Information Systems (BA)
7. Physical and Environmental Geography (BSc)

Undergraduate Courses

2015-16 School of the Environment undergraduate offerings and instructors.

ENV 100H	Introduction to Environmental Studies *(Summer 2015: Stephen Scharper, Anthropology UTM/Environment, Fall 2015: Simon Appolloni, sessional)*
SII 199HF	Debating and Understanding Current Environmental Issues *(Faculty of Arts & Sciences, FAS, seminar course; Karen Ing, Environment)*
SII 199HS	Sustainable and Just Futures: Environmental Politics in an Age of Global Warming * *(FAS first-year seminar course)*
ENV 200H	Assessing Global Change: Science and the Environment *(Summer 2015: Romila Verma, sessional; Spring 2016: Karen Ing, Environment)*
ENV 221H	Multidisciplinary Perspectives on Environment *(Summer 2015: David Pond, sessional; Fall 2015: Karen Ing, Environment)*
ENV 222H	Interdisciplinary Environmental Studies *(Douglas Macdonald, Environment)*
ENV 223H	Fundamental Environmental Skills *(Karen Morrison, sessional)*
ENV 233H	Earth Systems Chemistry *(Tugce Sahin, PhD candidate, Earth Sciences)*
ENV 234H	Environmental Biology *(Hélène Cyr, Ecology & Evolutionary Biology; Penelope Gorton, Ecology & Evolutionary Biology; Jörg Bollmann, Earth Sciences)*
ENV 237/8H	Physics of the Changing Environment *(Kaley Walker, Physics)*
ENV 281H	Big Ideas in the Digital World I: Is the Internet Green? *(Miriam Diamond, Earth Sciences; Steve Easterbrook, Computer Science; Florence Pasche Guignard, Post-Doctoral Fellow, Religion)*
ENV 282H	Big Ideas in Energy I: Technology & Society *(Ben Akrigg, Classics; Adonis Yatchew, Economics; Sedef Akinli Kocak, sessional)*
ENV 299Y	Research Opportunity Program *(Brad Bass, sessional)*
ENV 307H	Urban Sustainability *(David Sider, sessional)*
ENV 316H	Laboratory & Field Methods in Environmental Science *(Jennifer Murphy, Chemistry; Andrew Drake, Ecology & Evolutionary Biology)*
ENV 320H	National Environmental Policy *(Douglas Macdonald, Environment)*
JGE 321H	Multicultural Perspectives on Environmental Management *(Joint course with Geography; Christian Abizaid, Geography/Environment)*
ENV 322H	International Environmental Policy *(Kate Neville, Political Science/Environment)*
ENV 323H	Ontario Environmental Policy *(Russ Houldin, sessional)*
JGE 331H	Resource and Environmental Theory *(James Nugent, sessional)*
ENV 333H	Ecological Worldviews *(Mark Hathaway, PhD candidate, OISE)*
ENV 334H	Environmental Biology: Applied Ecology *(Hélène Cyr, Ecology & Evolutionary Biology)*
ENV 335H	Environmental Design *(Sheila Waite-Chuah, sessional)*
ENV 336H	Ecology in Human Dominated Landscapes *
JEE 337H	Human Interactions with the Environment *(Joint course with Earth Sciences; Marco Belmont, sessional)*
ENV 341H	Environment and Human Health *(Clare Wiseman, Environment)*
ENV 346H	Terrestrial Energy Systems *(Ian Sinclair, Civil Engineering sessional)*
ENV 347H	The Power of Economic Ideas *(Russ Houldin, sessional)*
ENV 350H	Energy Policy and Environment *(Keith Stewart, sessional)*
ENV 381H	Big Ideas in the Digital World II: Social Media & Environmentalism *(Miriam Diamond, Earth Sciences; Steve Easterbrook, Computer Science; Florence Pasche Guignard, Post-Doctoral Fellow, Religion)*
ENV 382H	Big Ideas in Energy II: Economics, Politics & Security *(Ben Akrigg, Classics; Adonis Yatchew, Economics; Sedef Akinli Kocak, sessional)*
ENV 395Y	Special Topics Field Course. Ecology and Conservation in the Amazon, Galápagos, and Andes *(Barbara Murck Geography UTM; & Monika Havelka, Geography, UTM)*
ENV 396Y	Australian Environment, Wildlife and Conservation *(offered by the University of New South Wales)*
ENV 421HY	Environmental Research *(David Sider, sessional)*
ENV 422H	Environmental Law *(Paul Muldoon, sessional)*
ENV 430H	Environment and Health of Vulnerable Populativons *
ENV 431H	Urban Sustainability and Ecological Technology *
ENV 432H	Urban Ecology *(Don Jackson, Ecology & Evolutionary Biology; Karen Ing, Environment)*
ENV 440H	Professional Experience Course (*David Sider, sessional*)
ENV 451F	Current Environmental Debates *(Erich Vogt, sessional)*
JEH 455H	Current Issues in Environment and Health *(Ron Wilson, Human Biology Program, New College)*
ENV 481/2H	Special Topics in the Environment I/II *
ENV 492/3H	Independent Studies Project *(various faculty)*

* Not offered in 2015-16.

New Undergraduate Courses for 2015-16

Environmental Science Major

We have been rolling out courses in the new undergraduate Environmental Science Major since it started in 2013-14, in collaboration with the Departments of Chemistry, Physics, Earth Sciences, and Ecology & Evolutionary Biology.

In 2013-14, two new second-year courses were offered: ENV 233H Earth Systems Chemistry and ENV237/238H Physics of the Changing Environment. **In 2014-15**, two new third-year courses were introduced: ENV 316 Laboratory and Field Methods in Environmental Science and JEE 337 Human Interactions with the Environment.

Newly offered in 2015-16, ENV 432H Urban Ecology was taught by Don Jackson (Department of Ecology and Evolutionary Biology) and Karen Ing (School of the Environment). **In 2016-17**, ENV 452H Environmental Science Seminar, the new capstone course for the major, will be rolled out.

ENV 432H1 Urban Ecology

Instructors: Don Jackson, Karen Ing

The course examines the ecology of urban areas through consideration of the biological and physical environments, in particular how the human-constructed environment alters pre-existing biophysical conditions and interactions. It encompasses a comparative perspective to study the development of these emerging ecosystems of increasing importance given global urbanization. Topics covered include physical impacts of human settlement and urbanization on natural ecosystems (impacts on soils, air and water; biosphere; and issues of contaminants and pollution), wildlife (plants, mammals, insects, fishes, etc) and factors impacting their dynamics and the biodiversity of urban systems, restoration theories and goals, and includes regional & local case studies.

Big Ideas In The Digital World And In Energy

The School of the Environment became the new home of the Faculty of Arts & Science's "Big Ideas" courses in 2015-16, designed to give students an opportunity to explore topical and challenging issues from a variety of disciplinary perspectives. Four new courses were offered as special topics: ENV 281 and ENV 381 on the environment and the digital world and ENV 282 and ENV 382 addressing energy and the environment. Each course is taught by a team of faculty who weave together perspectives from the sciences, social sciences, and humanities. We are happy to announce that the ENV381 course on Social Media and Environmentalism was featured as one of two "cool courses" U of T in the 2016 Maclean's Canadian Universities Guidebook.

BIG IDEAS IN THE DIGITAL WORLD

Instructors: Miriam Diamond (Professor, Department of Earth Sciences), Steve Easterbrook (Professor, Department of Computer Science), Florence Pasche Guignard (Post-Doctoral Fellow, Department for the Study of Religion)

ENV 281H1 Special Topics in the Environment: Big Ideas in the Digital World 1 - Is the Internet Green?

The Internet is growing at an exponential rate. Most assume it is "green" as the internet replaces paper. This course explored the seldom discussed issues of the environment impacts and social sustainability of the internet, spanning the resources and energy the internet consumes to the huge pile of e-waste produced. The inequitably distributed benefits and costs, as well as the hidden current and mounting future costs of the internet were also discussed. Social and environmental impacts of the internet were examined using analytical skills such as life-cycle assessment and systems analysis for analyzing inequality, resource implications, waste generation, and changing social relationships, etc.

ENV 381H1 Special Topics in the Environment: Big Ideas in the Digital World 2 - Social Media and Environmentalism

Contemporary experience of environmentalist thought is increasingly mediated through internet technologies. The dynamics of how people engage with social media often determines how they learn about topics such as climate change, environmental policy, and the nature of protest movements. At the same time, the power of governments and corporations to conduct mass surveillance can have a chilling effect on those who express dissent over social, economic and environmental policy. This course aims to engage students in critical thinking about the impacts and ethics of social media, and the ways in which it is used to foster or stifle social change, as well as the impacts of social media on environmental thinking and policy-making.

BIG IDEAS IN ENERGY

Instructors: Ben Akrigg (Professor, Department of Classics), Adonis Yatchew (Professor, Department of Economics), Sedef Akinli Kocak, Sessional Lecturer.

ENV 282H1 Special Topics in the Environment: Big Ideas in Energy 1 - Technology and Society

This course focussed on the development of energy technologies, and how it has influenced and been influenced by the development of human societies from the distant past, through the present and into the future. The possibilities and constraints provided by available energy technology was examined by looking at historical case studies. The key issues included the circumstances that are required for both the invention and the widespread adoption of new energy technologies, the time-scale over which significant change takes place, and the relationship between technological change and the political, economic, and legal framework of the affected societies. This historical perspective provides context for discussion of the challenges we are facing in the modern world. The course explored the range of alternatives in energy technologies and their possible wider social implications.

ENV 382H1 Special Topics in the Environment: Big Ideas in Energy 2 - Economics, Politics and Security

The pursuit of energy has fundamentally shaped human civilization. It has led to great progress, but it could also profoundly change our environment. This course focussed on the central ideas in economics, politics and security that are essential to understanding today's complex energy and environmental decisions. The course began by suggesting 10 'big ideas' that are fundamental to understanding energy issues, then covered energy markets - their successes and failures, and outlined basic remedies for the latter. It discussed how energy security has shaped world politics in the 20th and 21st centuries, and the design, efficiency and efficacy of regulatory institutions. The importance of resources and energy in shaping Canada's past, present and future was also discussed.

Undergraduate Research Courses

ENV 421H Environmental Research

2015-16 Instructor: David Sider, Sessional Lecturer

In this course, senior undergraduate students work together over the fall and winter terms in small groups to conduct research related to a broad environmental research theme for the class. In 2015-16, the research theme was urban sustainability in Toronto and a total of 26 students undertook research projects on urban agriculture, green spaces, waterfront urban renewal, light rail transit expansion, and light and noise pollution. Through the course, students gained valuable experience in conducting social science research projects from start to finish. Research projects entail conceptualizing the topic or problem, carrying out a background literature search, formulating research questions or hypotheses, developing a research design, writing a research proposal, submitting the project for an ethics review, undertaking the primary research and, lastly, data analysis and report-writing. Student groups also presented their findings at the final class.

ENV 492/493H Independent Studies Projects

The following undergraduate students completed independent studies/ research courses in the 2015-16 academic year (May 1, 2015 to April 30, 2016).

Alessandro Trimarchi. Third year student in 2015-16, Majors in Environmental Studies and Human Geography, and Minors in Environmental Ethics. ENV 493H research topic: **"Green Building: An Examination of Best Practices and Applications to Local Developments".** Supervisor: **John Robinson**, Munk School of Global Affairs and School of the Environment.

Ozora Amin. June 2016 alumnus, Majors in Environmental Studies and Criminology & Sociolegal Studies, and Minors in Environmental Geography. ENV 493H research topic: **"Militarism and its Environmental Impacts".** Supervisor: **Ju Hui Judy Han**, Department of Geography.

Xia (Alice) Zhu. Third year student in 2015-16, Specialist in Environmental Chemistry. ENV 493H research topic: **"Origins of Attitudes Towards Climate Change of Students at the University of Toronto"**. Supervisor: **Paul Corey**, Dalla Lana School of Public Health.

International Courses

BY KAREN ING

The School of the Environment continues to support and promote international opportunities for our students. This interest coincides with the University's commitment to international partnerships, one of three current strategic priorities for the university alongside: city building and transformative education.

Students in Nightcap National Park, Byron Bay, New South Wales, Australia, June 2016

A sampling of these opportunities include:

- **ENV 396Y - SPECIAL TOPICS:**
  Australian Environment, Wildlife and Conservation
- **ENV 395Y SPECIAL TOPICS FIELD COURSE:**
  Ecology and Conservation in the Amazon, Galápagos, and Andes
- **UNIVERSITY OF BONN, GERMANY:**
  Renewable Energy Policy and Development (ENV 3**H credit)
- **GOETHE UNIVERSITY FRANKFURT:**
  Biodiversity in the Context of Global Change (ENV 3**H credit)
- **CHINESE UNIVERSITY OF HONG KONG:**
  Energy and Green Society (ENV 2**H credit)
- **ROTHBERG INTERNATIONAL SCHOOL AT HEBREW UNIVERSITY OF JERUSALEM**: Transboundary Water Cooperation (ENV2**H credit
- **NATIONAL UNIVERSITY OF SINGAPORE:**
  Wildlife Protection in Southeast Asia (ENV 2**H credit)

In the past year, the School hosted a delegation from Utrecht University, Netherlands to discuss creating defined pathways to facilitate student mobility between our two institutions, especially in the areas around the environment. We also continue to explore a variety of initiatives with strategic partners to strengthen and create further collaborations in other parts of the globe. One such example is discussions with the National University of Singapore to explore the expansion of our current joint minor program offerings to include a joint minor in environmental science.

Based on the success of our international field course offerings in Ecuador (ENV395Y) and Australia (ENV396Y), we are also exploring the possibility of mounting another field course to Guatamala, an area of research interest of one of our sessional faculty, to examine how this developing Central American country has demonstrated socio and ecological resilience when confronted with past/present/future environmental changes.

Working with the Study Abroad Office at Woodsworth College and the Centre for International Experience Office, the School has assembled a variety of opportunities that would complement the studies of our environmental studies and environmental sciences students. (http://www.environment.utoronto.ca/Undergraduate/InternationalOpportunities.aspx).

Students on a Summer Abroad

Isabelle Washkurak encounters blue-footed boobies on North Seymour Island, the Galápagos, which she studied as part of her course preparation. Photo: C. Reid

Ecology and Conservation in the Andes, Western Amazonia and the Galápagos

ENV 395Y: May 11-June 12, 2016

Instructors: Monika Havelka and **Barbara Murck**, Senior Lecturers, Geography, UTM.

This course examines fundamental concepts in ecology, evolution, biodiversity, geology and conservation biology through lectures and fieldwork in highland, tropical and island ecosystems in Ecuador. The complex relations between these environments and the people who depend on them is examined through analysis of the social, cultural and economic transformations that have taken place in recent years. Ecuador is the smallest of the Andean countries but it has huge physical and biological diversity. This is examined by taking field trips to three very different parts of the country: the High Andes, the western Amazon Basin, and the Galápagos Archipelago. In the 10th and 11th offering of this course in 2015 and 2016, 21 and 24 students were enrolled respectively.

Students begin in Quito with orientations and introductory lectures, including visits to old Quito and Mitad del Mundo (the Equator). They will then spend several days in the Andes highlands studying its unique flora and fauna, and examining the economy and culture of the indigenous mountain peoples. The next course segment consists of eight days at the Tiputini Biodiversity Station, situated along one of the headwaters of the Amazon River in one of the few remaining pristine rainforests in Ecuador. Here students will focus on tropical forest ecology, and the impacts of oil exploration on wildlife and indigenous peoples. For the second half of the course students will be in the Galápagos, a chain of active volcanic islands that has played a crucial role in the history of science, examining how plants, animals and people interact in this fragile and threatened environment. This will include five days of lectures and field trips based at the GAIAS institute on San Cristobal, followed by a five-day island-hopping tour of other islands. The program concludes in Quito.

For more information, contact barbara.murck@utoronto.ca or monika.havelka@utoronto.ca.

Students on the beach in Byron Bay, New South Wales, Australia, June 2016. Photo: R. Chapple

Australian Environment, Wildlife and Conservation

ENV 396Y: June 17-July 22, 2016

Instructors: Rosalie Chapple, Institute of Environmental Studies, University of New South Wales; B**rad Nesbitt** and **Geoff Ross** of New South Wales National Parks and Wildlife Service.

Hosted by the University of New South Wales (UNSW) and The Education Abroad Network, this five-week course provides an unparalleled opportunity for U of T and U.S. students to be introduced to Australia's environment and wildlife by local experts. In Summer 2015, 30 students were enrolled (13 from U of T) and in Summer 2016, 40 students were enrolled (half from U of T).

This course offers an unparalleled opportunity for students to receive a first-hand introduction to Australia's environment and wildlife through the eyes of local experts. This course is contextualized within the global ecological crisis and considers the development of environmental values and awareness and describes environmental controversies and how they are addressed. In consideration of these issues, Australia's unique flora and fauna are examined and the various climatically varied regions visited are highlighted throughout the course. The program outlines and exposes students to the challenges in managing natural and cultural heritage in the 21st century. Aboriginal perspectives of the Australian landscape and their cultural ties to the environment are explored, along with how these considerations are incorporated into management of national parks.

The course introduces the diverse landscape types in Australia: (a) Wet/Dry tropics: Kakadu National Park (World Heritage Area), Northern Territory; (b) Coastal temperate: Blue Mountains National Park (World Heritage Area), Sydney Harbour National Park, NSW; (c) Tropical rainforest: Daintree National Park (Wet Tropics World Heritage Area), Far North Queensland.

For more information, contact Dr. Chapple at r.chapple@bmwhi.org.au.

Undergraduate Awards

Congratulations to the following undergraduate students who were awarded School of the Environment scholarships in 2015-16.

Frances L. Allen Scholarship

Awarded to second or third-year students in a School of the Environment specialist or double major program. The recipient was **Elizabeth Wilhelm**, Environmental Studies Major.

Chachra Family Scholarship in Environment and Science

Awarded to students in a School of the Environment BSc specialist or major program. The recipient was **Xia (Alice) Zhu**, Environmental Chemistry Specialist.

Dr. Stanley Allan Cord Scholarship in Environmental Studies

Awarded to School of the Environment students in their third or fourth year. The recipient was **Lucy Genua**, Environmental Science Major.

Jane Goodall Scholarship

Awarded to outstanding students enrolled in a School of the Environment program. Preference is given to students studying environment and development. The recipient was **Adriana Shu-Yin**, Environmental Science and Environment & Health Majors, Environmental Geography Minor.

Peter John Hare Memorial Scholarship in Environment

Awarded to students in a School of the Environment specialist or major program. The recipient was **Michelle Lee**, Environmental Science Major.

Robert Hunter Scholarship

Awarded to outstanding School of the Environment students in memory of Robert Hunter, journalist and co-founder of Greenpeace. The scholarship was presented to two undergraduate students at the Robert Hunter Memorial Lecture on April 14, 2016: **Conrad Pratt** (Environmental Science Major, Ecology & Environmental Biology Major, and Environmental Studies Minor) and **Kristen Vitullo** (Environmental Studies Major, Human Geography Major, and Environmental Ethics Minor).

Jane Joy Memorial Scholarship: Excellence in Environmental Sustainability

Created with a donation by the University of Toronto Women's Association, this is awarded to a student specializing or majoring in Environmental Science at the School of the Environment who has demonstrated involvement in sustainability issues. The recipient was **Shirley Chen**, Environment & Science Major, Environmental Geography Minor.

Kathryn S. Rolph Scholarship

Awarded to an outstanding student in a program offered by the School of the Environment who has achieved a high mark in a course on environmental issues. The recipient was **Arielle Diane Lopez**, Environmental Science Major and Environmental Biology Minor.

Sidney and Lucille Silver Scholarship

Awarded to a third-year student in a School of the Environment or Geography specialist or major program. The recipient was **Yekaterina Vasilyeva**, Environmental Geography Specialist.

(L-R) Bobbi Hunter, widow of the late Robert Hunter, presents the Robert Hunter Scholarship to Conrad Pratt and Kristen Vitullo at the Hunter Memorial Lecture on April 14, 2016. Photo: Daniel Joseph

Douglas Pimlott Awards and Scholarships

These awards are in honour of **Douglas Pimlott**, the first Director of the former Environmental Studies Program at Innis College. They are awarded to School of the Environment students with excellent levels of academic achievement combined with a demonstrated commitment to social involvement in environmental issues. These awards and scholarships were presented to the following undergraduate students at the Douglas Pimlott Memorial Lecture on April 21, 2016.

(L-R) Alice (Xia) Zhu, Helen Willoughby, Award presenter and WWF President Emeritus Monte Hummel, Mark Pimlott (Douglas Pimlott's son), Monica Dairo. Absent from photo: Anne-Marie Macloughlin and Ross Plourde.

Pimlott Award Recipients

Alice (Xia) Zhu, Environmental Chemistry Specialist; **Monica Dairo**, Environmental Studies Major; **Ross Plourde**, Environmental Studies Major.

Pimlott Entrance Scholarship

Amanda Harvey-Sanchez, Environmental Studies Major, Environmental Biology Major; **Anne-Marie Macloughlin,** Environmental Studies Major.

Graduating Scholarship

Helen Willoughby, Environmental Studies Major.

This year we were delighted to award the second **Rodney White Environmental Studies Scholarship** *and the third* **Skip Willis Undergraduate Scholarship**. *These scholarships have been established by the families and friends of Rodney and Skip. The School of the Environment is very grateful to both families for choosing to endow the scholarships here for our students, and to all of the donors for their generous contributions.*

Rodney White Environmental Studies Scholarship

This award was established in memory of Professor Rodney White, Director of the former Institute for Environmental Studies and co-founder of the Centre for Environment, which became the School of the Environment. The Rodney White Environmental Studies Scholarship is awarded to a third-year undergraduate student on the basis of academic merit, with preference to a student studying topics related to environment and international development. This year's winner was **Kayla Kraiker**, who is doing a double major in Environmental Studies and Political Science, and Environmental Geography Minor and has a particular interest in the intersection of international development, climate and ecological justice, and environmental governance. **Sue White** introduced Kayla and presented her with the scholarship at the 2015 Willis & White Thought Leadership Event organized by the School of the Environment Environmental Finance Advisory Committee and held on Dec. 16, 2015.

Skip Willis Undergraduate Scholarship

This award was established in memory of Errik (Skip) Willis, Principal of the Willis Climate Group and a founding member of the Professional Development Program's Environmental Finance program. The award is given to an undergraduate student at the School who has demonstrated interest in adaption and mitigation of climate change in Canada, market-based instruments, and carbon offset projects. The recipient was **Francesca Hannan**, who is pursuing a double major in Environmental Studies and Economics. The award was presented to her by **Kelly Willis** at the 2015 Willis & White Thought Leadership Event organized by the School's Environmental Finance Advisory Committee. The Skip Willis Undergraduate Scholarship is awarded on the basis of academic merit, with preference for demonstrated passion for issues directly related to adaption and mitigation of climate change, including interest in the use of international capital markets and the linkages to international carbon offset project as solutions to the challenge of climate change.

2015 Rodney White scholarship - Sue White and Kayla Kraiker. Photo: Daniel Joseph

2015 Skip Willis Scholarship - Kelly Willis and Francesca Hannan. Photo: Daniel Joseph

Graduate Collaborative Programs

The School of the Environment offers two collaborative programs at the Master's and Doctoral level: (1) **Environmental Studies**, and (2) **Environment and Health**. Students who are admitted to a "home" unit apply to the collaborative program and pursue course work and research in environmental areas. Through these programs, students have the opportunity to pursue interdisciplinary graduate work in the field of the environment and to interact with students and faculty from other units who are also interested in environment. Over twenty-five degree programs from different departments on campus participate in our collaborative programs. In 2015-16, the School of the Environment was pleased to welcome 59 new students into the two collaborative programs and to have 22 alumni graduate (3 PhD, 1 JD, and 18 Master's). A total of 140 students were enrolled in these programs this year, 117 in Environmental Studies and 23 in Environment & Health. We are also working on the development of a stand-alone graduate program, beginning with a new Master of Environment and Sustainability (MES). Following an extensive consultation process last winter and spring, we are working with the Dean`s Office to finalize the proposal to move it onto the Provost`s Office and external review, aiming for a roll-out in September 2018.

Environmental Studies Collaborative Program

One of the compelling strengths of this program is the interdisciplinary environment in which teaching and research are conducted. In this program, students are both able to specialize in an area of environmental research and gain exposure to a wide range of intellectual and methodological disciplines focused on environmental issues. The program currently has students from across the disciplinary spectrum. Collaborating units and programs include Adult Education & Community Development (OISE), Anthropology, Chemical Engineering & Applied Chemistry, Chemistry, Earth Sciences, Ecology & Evolutionary Biology, Forest Conservation, Forestry, Geography, Global Affairs, Information, Management, Physics, Program in Planning (Geography), Political Science, Public Policy & Governance, Religion, Social Justice Education (OISE), Sociology, Sustainability Management, and Women & Gender Studies.

Students may also be admitted from other units on an individual basis. For example, we have students enrolled from such diverse home units as Cell & Systems Biology, Civil Engineering, Drama, Theatre & Performance Studies, East Asian Studies, Electrical & Computer Engineering, English, Law, Physical & Environmental Sciences, and Social Work.

Program requirements vary with each home unit or program. Along with the core course in Environmental Decision Making (ENV 1001), students are typically required to take an elective course and conduct research on an environmental topic that also fulfills the requirements of their home unit (i.e., thesis or research paper). Non-thesis Master's students are required to also complete an internship and Doctoral students are also required to present a seminar on their research.

ENV 1001 proved to be a highly popular course in 2015-16, with 51 students enrolled. The course examines environmental decisions made by individuals, business firms, NGOs and governments, both policy and regulatory approvals decisions, as well as decisions regarding program design, domestically and at the international scale. To meet the growing demand, we have decided to offer the course in both the fall and spring terms in 2016-17, taught by Kate Neville and Doug Macdonald, respectively. Enrolment numbers suggest that about 60 students will take the course in 2016-17.

We introduced a new graduate course on The Development of Sustainability Thought in spring 2016, initially offered as a joint special topics course with the Munk School of Global Affairs and taught by John Robinson. This course examines how attitudes towards human nature and non-human nature have changed over the period from Mesolithic times until the present in Western society. The underlying question is whether contemporary concerns about sustainability require fundamental changes in the way we conceive of ourselves and our environment. This course has since been approved as JSE 1708 and will be offered in January 2017. As noted on page 17, John Robinson is also introducing a new joint undergraduate and graduate special topics course on The U of T Campus as a Living Lab of Sustainability in fall 2016.

Environment and Health Collaborative Program

The School's collaborative graduate program in Environment and Health is offered in conjunction with various doctoral and masters programs offered by the Dalla Lana School of Public Health, Department of Physical and Environmental Sciences, Department of Geography and Program in Planning, Faculty of Medicine, and Women and Gender Studies Institute.

The program provides an interdisciplinary perspective on the field of environment and health for students interested in studying how various chemical, biological and radiological exposures in the indoor and outdoor environments can affect the health of individuals and communities, as well as the social, policy and ethical dimensions of environment and health issues.

The public Environment and Health Seminar Series and Spring term core course (ENV 4001) seek to bring in top academics and experts from a wide range of fields, backgrounds and affiliations to present their research and introduce students to a variety of interdisciplinary perspectives, methods and concepts. Last year's series, for instance, included presentations on the following topics: "Exposure of Canadians to Environmental Chemicals: An Overview of Health Canada's Human Biomonitoring Initiatives" (Doug Haines, Health Canada), "Ecosystem Approaches: Navigating Complexity, Promoting Health" (Martin Bunch, York University) and "The Healthy Cities – Diabetes Prevention Project: New Insights on the Built Environment and Obesity-related Diseases" (Gillian Booth, St. Michael's Hospital & U of T). (See page 42 for seminar abstracts).

Current and past students of the program have contributed greatly to the field of environment and health, researching a broad range of highly pertinent and interesting topics.

For more information, contact Dr. Clare Wiseman, Assistant Professor and Coordinator of the Graduate Collaborative Program in Environment and Health.

Graduate Faculty

The following individuals have graduate faculty appointments at the School of the Environment.

New Members

Christoph Becker, Information
Laura Brown, Geography, UTM
Susannah Bunce, Geography, UTSC
Simon Coleman, Religion
Sarah Finkelstein, Earth Sciences
Yuhong He, Geography, UTM
Jacob Hirsh, Management
Thembela Kepe, Geography, UTSC
Martin Krkosek, Ecology & Evolutionary Biology/Environment
Igor Lehnherr, Geography, UTM
Andrea Most, English
Kate Neville, Political Science/Environment
Andrea Olive, Political Science, UTM
Richard Peltier, Physics
John Robinson, Munk School of Global Affairs/Environment
Njal Rollinson, Ecology & Evolutionary Biology/Environment
Shiho Satsuka, Anthropology
Edward Swenson, Anthropology
Judith Teichman, Political Science, UTSC
Marcelo Vieta, OISE Leadership, Higher and Adult Education
Kaley Walker, Physics
Debra Wunch, Physics/Environment
Tanhum Yoreh, Environment

Full Members

Jonathan Abbatt, Chemistry
Grant Allen, Chemical Eng. & Applied Chemistry
Robert Andrews, Civil Engineering
George Arhonditsis, Physical & Environmental Sciences, UTSC
Spencer Barrett, Ecology & Evolutionary Biology
Steven Bernstein, Political Science
Alana Boland, Geography
Michael Bunce, Social Sciences, UTSC
Arthur Chan, Chemical Eng. & App. Chem.
Jing Chen, Geography
Tenley Conway, Geography, UTM
Paul Corey, Public Health
Sharon Cowling, Earth Sciences
Hilary Cunningham, Anthropology
Amrita Daniere, Geography
George Dei, OISE Leadership, Higher and Adult Education
Donald Dewees, Economics
Miriam Diamond, Earth Sciences
Maria Dittrich, Physical & Environ. Sci., UTSC
Birsen Donmez, Mechanical and Industrial Eng.
Steve Easterbrook, Computer Science
Elizabeth Edwards, Chemical Eng. & App. Chem.
Mark Engstrom, Ecology & Evol. Biology/ROM
Greg Evans, Chemical Eng. & Applied Chemistry
Roberta Fulthorpe, Physical & Env. Sci., UTSC
William Gough, Physical & Environ. Sci., UTSC
Mart Gross, Ecology & Evolutionary Biology
L. Danny Harvey, Geography
D. Linn Holness, Public Health
Ken Howard, Physical & Environ. Sci., UTSC
Donald Jackson, Ecology & Evol. Biology
Charles Jia, Chemical Eng. & Applied Chemistry
Shashi Kant, Forestry
Bryan Karney, Civil Engineering
Chris Kennedy, Civil Engineering
J. Gary Knowles, OISE Leadership, Higher and Adult Education
Scott Mabury, Chemistry
Laurel MacDowell, History, UTM
Virginia Maclaren, Geography
Heather MacLean, Civil Engineering
Jay Malcolm, Forestry
David Martell, Forestry
Patricia McCarney, Political Science
Andrew Miall, Earth Sciences
Eric Miller, Civil Engineering
Carl Mitchell, Physical & Envir. Sciences, UTSC
G.W. Kent Moore, Physics, UTM
D. Scott Munro, Geography, UTMJennifer Murphy, Chemistry
Michelle Murphy, History
Blake Poland, Public Health
Anthony Price, Physical & Environ. Sci., UTSC
W. Scott Prudham, Geography/Environment
Douglas Reeve, Chemical Eng. & Applied Chem.
Helen Rodd, Ecology & Evolutionary Biology
Shiho Satsuka, Anthropology
Rowan Sage, Ecology & Evolutionary Biology
Mohini Sain, Forestry
K. Richard Sandbrook, Political Science
Andrea Sass-Kortsak, Public Health
Lawrence Sawchuk, Social Sciences, UTSC
Stephen Scharper, Anthropology, UTM/Environment
Barbara Sherwood Lollar, Earth Sciences
Frances Silverman, Medicine
André Simpson, Physical & Environ. Sci., UTSC
Myrna Simpson, Physical & Environ. Sci., UTSC
Grace Skogstad, Social Sciences, UTSC
C. Tattersall Smith, Geography
Sandy Smith, Forestry
Mark Stabile, Economics
Kimberly Strong, Physics/Environment
Susan Tarlo, Medicine
Ross Upshur, Medical Science
Willem Vanderburg, Civil Engineering
Sarah Wakefield, Geography
Denis Walsh, Philosophy
Frank Wania, Physical & Environ. Sci., UTSC
Peter Wells, Pharmacy
Kathi Wilson, Geography, UTM

Associate Members

Christian Abizaid, Geography/Environment
Kerry Bowman, Bioethics
Andrew Green, Law
A.P. (Lino) Grima, Geography
Paul Helm, Ont. Ministry of the Environment
Marney Isaac, Physical & Environ. Sci., UTSC
Andy Kenney, Forestry
Douglas Macdonald, Environment
Barbara Murck, Geography, UTM
Dennis O'Hara, St. Michael's College
Matthew Ratto, Information
Beth Savan, Environment
Helene Wagner, Ecology & Evolutionary Biology
Clare Wiseman, Environment
Cindy Woodland, Pharmacology

Members Emeriti

Paul Aird, Forestry
Terry Blake, Forestry
Frances Burton, Social Sciences, UTSC
Philip Byer, Civil Engineering
Catherine Chalin Clark, Public Health
Frank Cunningham, Philosophy
Brian Greenwood, Physical & Env. Sci., UTSC
Ingrid Leman Stefanovic, Philosophy
William Michelson, Sociology
Edmund O'Sullivan, OISE Leadership, Higher and Adult Education
Henry Regier, Environment
D.N. Roy, Forestry
Richard Stren, Political Science
Wayne Sumner, Philosophy
Dudley Williams, Physical & Env. Sci., UTSC
G. Ronald Williams, Biochemistry

Graduate Courses

2015-16 School of the Environment graduate course offerings and instructors.

Graduate Courses: Fall 2015

ENV 1001H Environmental Decision Making, *Doug Macdonald and Kate Neville*

ENV 1701H Environmental Law *(also undergrad **ENV 422H**), Paul Muldoon*

ENV 1707H Environmental Finance: Risk Management and Business Opportunities, *Sue McGeachie and Tom Rand*

JGE 1425H Livelihoods, Poverty and Environment in Developing Countries*

Graduate Courses: Spring 2016

ENV 1002H Environmental Policy, *Doug Macdonald*

ENV 1008H Worldviews and Ecology, *Simon Appolloni*

ENV 1444H Capitalist Nature, *Scott Prudham*

ENV 4001H Graduate Seminars in Environment and Health, *Clare Wiseman*

ENV 1703H Water Resources Management*

ENV 1704H Risk Analysis & Management, *Chris Ollson*

JSE 1708H The Development of Sustainability Thought, *John Robinson taught as* **ENV 2002** *Special Topics course. Now a joint course with Munk School of Global Affairs*

* Not offered in 2015-16

For more information, visit www.environment.utoronto.ca or contact Pavel Pripa, Program and Graduate Student Administrator, 416-978-3475; Pavel.Pripa@utoronto.ca

2015-16 Alumni of the Graduate Collaborative Programs (CP) in Environmental Studies (ES) and Environment & Health (EH)

November 2015 Convocation

STUDENT	DEPARTMENT	CP	DEGREE	SUPERVISOR	THESIS OR PROJECT
Graham Carey	Electrical & Computer Engineering	ES	PhD	Ted Sargent	A Surface Chemistry Approach to Enhancing Colloidal Quantum Dot Solids for Photovoltaics
Kelly Chan	Geography	ES	MA	Andre Sorensen	Active Transportation: Measuring Pedestrian Trips for Elementary School Children in Scarborough, Toronto, Canada
David Houle	Political Science	ES	PhD	Grace Skogstad	Carbon Pricing in Canadian Provinces: from Early Experiments to Adoption (1995-2014)
Amy Bliss Mui	Geography	ES	PhD	Yuhong He	A Multi-Temporal Remote Sensing Approach to Freshwater Turtle Conservation
Lea Ravensbergen-Hodgins	Geography	EH	MA	Ron Buliung & Kathi Wilson	Socioeconomic Discrepancies in Children's Accessibility to Health Promoting Resources: An Activity Space Analysis
Marie-Line Sarrazin	Geography	ES	MA	Christian Abizaid	The Political Ecology of Indigenous Territorial Struggles in the Darién, Panama: Land Invasions, Partial State Recognition, and Racialized Discrimination in the Emberá-Wounaan Collective
Jo Anne Tacorda	AECD/LHAE/OISE	ES	MA	Jennifer Sumner	We Are What We Eat: Cultivating Well-being and Happiness through Sustainable Food Systems
Ahmad Yahaya Munir	AECD/LHAE/OISE	ES	MEd	Jean-Paul Restoule	On Being Tutored by Nature

June 2016 Convocation

Sang-Kyun (Rafael) Bong	Law	ES	JD	Andrew Green	Properly Incentivizing the FIT Market Participants: A Call for Weather Derivatives
Cuyler Borrowman	Chemistry	ES	MSc	Jonathan Abbatt	Formation and Behaviour of Environmentally Persistent Free Radicals from the Heterogeneous Reaction of Ozone with Combustion Particulate Matter
Andrea Brunton	Political Science	ES	MA	Victor Falkenheim	Water Shortages and Outlier Cases; When Water Shortages Can Lead to Developmental Outcomes
Janet Lynn Damianopoulos	Forestry	ES	MFC	Anne Koven	Planting the Seeds of Stewardship: Making Forest Conservation Matter to Urban Communities at Ontario's Royal Botanical Gardens
Alexandra del Castello	SJE/OISE	ES	MEd	Terezia Zoric	WWF and Wildlife Conservation: Using Social Media as an Awareness Raising Tool
Stefana Dranga	Forestry	ES	MFC	Sean Thomas	Investigation of Productivity, Composition and Biodiversity of Young Mixed Stands at Malcolm Knapp Research Forest
Nicole Grgic	Forestry	ES	MFC	Sandy Smith	An Educational Workbook on Restoring a Black Oak Savannah Hillside from Dog-strangling Vine (Cynanchum rossicum) in High Park
Ronnie Huang	Forestry	ES	MFC	Sally Krigstin	Markets for Woody Sawmill Residue in Ontario
Virginia Hudson	Forestry	ES	MFC	Jay Malcolm	An Assessment of Habitat Suitability in Old Growth and Second Growth Retention Area's On Haida Gwaii
Julia Levin	AECD/LHAE	ES	Med	Jennifer Sumner	Environmental Activism: How Environmental Organisations Can Ensure Sustained Activist Commitment
Caitlin Mullen	Information	ES	MI	Brian Cantwell Smith	Digital Desire Lines: Evaluating Sustainability for Two GPS-Based Mobile Apps for Cycling
Daniella Jean Florence Quarrey	Global Affairs	ES	MGA	Scott Aquanno	Coca Community: A Deeper Look into the Jungle
Catherine Slavik	Public Health	EH	MPH	Paul Demers	Leveraging the Ontario Toxics Reduction Act (2009) to Assess Potential Exposure to Select Carcinogens in Ontario
Amy Strizic	Forestry	ES	MFC	Jay Malcolm	Comparing Visual and Audio Surveys of Anurans in Thousand Islands National Park, Ontario, and Vicinity

Graduate Awards

ARTHUR AND SONIA LABATT GRADUATE FELLOWSHIPS

These fellowships were established through a generous donation from **Arthur** and **Sonia Labatt** and given to students enrolled in one of the graduate programs of the School of the Environment or in the JD/Certificate Program offered by the Faculty of Law and the School of the Environment. Preference is given to students who are exploring practical solutions to environmental issues. This year, eight scholars in the School of the Environment's **Collaborative Program in Environmental Studies** received this award.

1. **Rafael Bong**, Juris Doctor student, Faculty of Law. His paper looked at business and market-based solutions that can economically address environmental issues with conflicting interests.

2. **Brianna Botchwey**, PhD student, Department of Political Science. Her paper addressed the primary challenges of international environmental decision-making and the problems of the conflicting interests.

3. **Laura Bryson**, Master of Science student, Department of Geography. Her paper investigated the role of protected areas in tropical rainforest conservation, with a particular emphasis on indigenous and community conserved areas

4. **Matthew De Vries**, Master of Science student, Department of Anthropology. Matthew is investigating whether emperor tamarins at a site in Southeastern Peru alter their behaviour in degraded habitat known as forest edge.

5. **Anastasia Hervas**, PhD student, Department of Geography. Anastasia's project examines the socio-ecological implications of the recent expansion of oil palm (a common biodiesel feedstock) plantations in Northern Guatemala.

6. **Stephane Liegey**, Masters of Applied Science student, Department of Chemical Engineering. Her paper investigated the difficulty of reaching environmental agreements within the North-South paradigm due mainly to historical constructions.

7. **Malcom Ramsay**, Master of Science student, Department of Anthropology. The paper investigates the outcomes of human interactions with non-human primates; specifically, whether endangered mouse lemurs on the island of Madagascar are able to cross a highway that cuts through their natural habitat.

8. **Alissa Saieva**, Juris Doctor student, Faculty of Law. The paper examines an unprecedented momentum and interest in addressing climate change at the international and domestic level.

GEORGE BURWASH LANGFORD PRIZE

This is awarded to a School of the Environment graduate student who best combines excellence in research and contribution to the work of the School. This year's recipients are:

1. **Suleiman Demi**, PhD student, Department of Social Justice Education at the Ontario Institute for Studies in Education, and the Collaborative Program in Environmental Studies. His research examines what we can learn from Indigenous food cultures as a knowledge base for environmental education.

2. **Keven Roy**, PhD student, Department of Physics and the Collaborative Program in Environmental Studies. He is researching high-quality constraints on the evolution of sea level and the shape of the Earth in response to past and present climate change.

JOHN R. BROWN AWARD

This prize is in memory of the late **John R. Brown**, Professor of Environmental Health and Medicine. It was awarded to **Catherine Slavik**, Master of Public Health (MPH) student, Dalla Lana School of Public Health and the Collaborative Program in Environment and Health. Her research evaluates Ontario's Toxics Reduction Act. She is assessing trends as well as the geographic distribution of toxic substance use and release in Ontario, to help quantify potential population exposures to toxic chemicals and assess the impact of these substances on health outcomes, in order to develop regional cancer prevention strategies.

SPERRIN CHANT AWARD IN TOXICOLOGY

This award is given to a School of the Environment graduate student doing research in toxicology. This year's recipient is **Guangyu Song**, Master of Engineering student, Department of Chemical Engineering and the Collaborative Program in Environment and Health. His research is focused on developing new strategies for particulate matter detection based on Gas Chromatography/Mass Spectrometry, understanding the pollution source, environmental pathways, and their impact on climate change and human health.

ALEXANDER B. LEMAN MEMORIAL AWARD

(Presented with Michael Leman, Alexander's brother)

This award was established by the Leman family, friends and colleagues of **Alexander B. Leman**, an architect and urban planner who founded his own architectural firm (as well as Leman Group Inc., an urban development and planning consulting company). It is awarded to a graduate student enrolled in a collaborative program at the School of the Environment and the Department of Geography's Program in Planning; and is based on academic merit and financial need. This year's recipient is **Jielan Xu**, PhD student, Department of Geography's Program in Planning and the Collaborative Program in Environment and Health. His research looks at how the built-environment can potentially affect active lifestyles and the health and well-being of the aging population.

GREENSAVER ALASTAIR FAIRWEATHER MEMORIAL AWARD IN THE ENVIRONMENT

This award was established in memory of Alastair Fairweather, a member of the Board of Directors of GreenSaver. The recipient is **Rafael Bong**, Juris Doctor student, Faculty of Law and the Collaborative Program in Environmental Studies. His research analyzes the changes in the weather risk market with the onset of increasing anomalous weather patterns, with the goal of determining how can a particular market instrument of derivatives, especially ones that hedge on weather anomalies and risks, can address environmental problems.

ERIC DAVID BAKER KRAUSE GRADUATE FELLOWSHIP

(Presented at the Eric Krause Memorial Lecture on April 6, 2016) This fellowship is in memory of the late **Eric Krause**, a U of T Master's graduate of Geography and Environmental Studies.

1. **Shirley Chen**, Master of Public Health student, Dalla Lana School of Public Health and the Collaborative Program in Environment and Health. Her research addresses the impacts of climate change on public health, particularly the health of populations that are already experiencing health inequities.

2. **Jon Albert Obnamia** (Presented at Research Day) PhD student, Department of Chemical Engineering and the Collaborative Program in Environmental Studies. His research assesses the environmental impacts and advanced liquid biofuels production technologies and their environmental impacts.

3. **Ramona Reece**, Master of Arts student, Department of Political Science and the Collaborative Program in Environmental Studies. Her research explores the idea of ecological jurisprudence and decision-making from an indigenous perspective under the rubric of critical geopolitics.

4. **Alissa Saieva**, Juris Doctor student, Faculty of Law and the Collaborative Program in Environmental Studies. She is examining the unprecedented momentum and interest in addressing climate change at the international and domestic level.

Inaugural Beatrice and Arthur Minden Graduate Research Fellowship

The Beatrice and Arthur Minden Graduate Research Fellowship was established to honour the memory and philanthropic spirit of Beatrice and Arthur Minden. It is to be awarded annually to one or more PhD students enrolled in the School of the Environment's graduate programs to provide them with support during the research stage of their dissertations, including enabling their involvement in conferences, summer schools, field work and collaborative visits to research groups across Canada and around the world. Preference is given to graduate students who have demonstrated academic excellence and whose PhD research is specifically focused on environmental issues, and on projects that open up new intellectual avenues and/or foster interdisciplinary activity related to the environment.

Minden Graduate Research Fellowship Recipients

We are delighted to announce three exceptional students as inaugural winners in 2016: one from the natural sciences, one from the social sciences, and one from the humanities, showing the outstanding breadth of environmental research happening at U of T and at the School of the Environment. Each of these students has proposed projects involving extensive field work, community consultation, and engagement in Canada or internationally, and each one includes multiple perspectives on research topics that are timely and relevant. These exciting and innovative projects have great potential to contribute to key environmental issues, including species at risk, lowering carbon emissions in cities, and environmental issues confronting First Nations in Canada. At this year's Research Day, Jo-Ann Minden presented the awards to these graduate students: **Keren Klass**, **Laura Tozer**, and **Meaghan Weatherdon**.

Recipients of the inaugural Minden Research Fellowships: (L-R) Keren Klass, Meaghan Weatherdon, with Jo-Ann Minden at 2016 Research Day. Photo: Daniel Joseph

Keren Klass is a PhD student in the Department of Anthropology and the School's Environmental Studies Collaborative Program. Karen's innovative research combines approaches from landscape modelling and genetics with behavioral ecology and primatology. These novel approaches will help shape conservation policy and land use decisions designed to protect endangered primates. Keren's proposed research project involves a year-long field campaign in Mexico studying the effects of habitat fragmentation on behavior and genetics of an endangered species of black howler monkey.

Laura Tozer is a PhD student in the Department of Geography and the School's Environmental Studies Collaborative Program. Her doctoral research focus is on decarbonization in urban environments and the potential of the Carbon Neutral Cities Alliance. Combining approaches from political science and geography, her work on how cities can transition to carbon neutrality will inform public policy and help catalyze these transitions. Laura's proposed project involves field research in San Francisco to evaluate progress towards decarbonization through building retrofits. This case study will be used in a comparative analysis with Stockholm and London.

Meaghan Weatherdon is a PhD student in the Department of Religion and the School's Environmental Studies Collaborative Program. Her doctoral dissertation focuses on the Nishiyuu Walkers, a group of Cree youth who walked 1600 km from Whapmagoostui, Quebec to Parliament Hill in Ottawa to raise awareness about a variety of social, environmental and health issues confronting First Nations communities in Canada. With the support of Chief Stanley George of Whapmagoostui First Nation, Meaghan is proposing embodied, experiential research at the interface of religion and environmental studies in Northern Quebec to better understand this grassroots social movement and its potential to raise awareness about environmental issues in Canada and internationally.

Alan H. Weatherley Graduate Fellowship in Environmental Leadership

Joshua Steckley and Robena Weatherley at Research Day, April 20, 2016

At the School's 2016 Research Day, we were honoured to have **Robena Weatherley** attend and give a moving tribute to her husband. She then presented the inaugural Alan H. Weatherley Graduate Fellowship to **Joshua Steckley,** a first year PhD student in the Department of Geography and the Environmental Studies Collaborative Program.

In addition to academic excellence, Joshua has an outstanding track record of practical leadership on environmental issues, particularly in his work as a Community Development Coordinator in Haiti. Joshua's leadership skills were directly responsible for the successful completion of several major environmental initiatives, including a soil conservation program, a clean water initiative now serving 12,000 people, and an environmental education program. He co-founded a Haitian sustainable food movement and spearheaded several conferences on local food and environmental sustainability, both there and in Canada. Joshua also used his skills as a documentary film maker to address other environmental issues such as the impacts of mining on Haitian ecosystems and communities. Joshua intends to use his considerable leadership experience in international development and environmental issues to form his doctoral work on land tenure arrangements in Haiti, and the social and environmental relations underlying them.

Alan Weatherley (1928-2012) was Professor of Zoology at the University of Toronto from 1975 to 1993. He was the author of more than 75 research articles and three books on fisheries biology. Professor Weatherley continued to work in conservation after his retirement. All recipients of the fellowship will also receive a copy of his 2012 book titled *A Conservationist Perspective*.

Kari Bourrie, who works in the NGO sector, most recently with the Jane Goodall Institute, gives a presentation at Environmental Career Day 2016 at Hart House, U of T, presented by the School of the Environment. Photo: Daniel Joseph

Environmental Finance Advisory Committee

The Environmental Finance Advisory Committee (EFAC) consists of members of the business and university community. It provides a forum for the exchange of innovative ideas in environmental finance between the University and the commercial sector. It organizes educational workshops and programs on topics within the field of environmental finance to promote dialogue among business, industry, government, academia and the private sector.

ROSEMARY MARTIN - COMMITTEE CO-CHAIR

Rosemary Martin was elected Co-Chair of the Environmental Finance Committee in 2015 and serves as lead alongside Kimberly Strong, Director of the School of the Environment. Martin has 25 years of experience identifying environmental opportunities and risks, developing environmental strategies, and implementing environmental programs. She has developed environmental compliance, product safety, risk management, and sustainability programs in the steel, chemical, R & D, financial, real estate, and consulting sectors. Martin is a Vice President and the Chief Sustainability Officer at First Capital Realty Inc.. In 2011 she wrote the first Global Reporting Initiative (GRI)-compliant, externally assured, level B+ Corporate Responsibility and Sustainability (CRS) Report in the Canadian real estate sector. She is an active member of several professional sustainability associations. Martin graduated with a Bachelor of Science from the University of Toronto and is a former Certified Environmental Auditor with the Canadian Environmental Auditing Association.

Environmental Finance Advisory Committee Events

(June 2015 to July 2016)

June 4, 2015 - **"Natural Capital: Its Significance to Business & Society at Large".**
Panelists: Brian DePratto (Environmental Economist, TD Canada Trust), Dan Kraus (Senior Director of Conservation Program Development, The Nature Conservancy of Canada), Barb Steele (Managing Director, Natural Step), and Steve Hounsell (Chair, Ontario Biodiversity Council), with Pat Koval (Partner, Torys LLP) moderating.

July 9, 2015 - EFAC opened the Toronto Stock Exchange in celebration of the **Climate Summit of the Americas,** and held a round-table discussion on carbon markets.

October 7, 2015 - **"Investment Opportunities in Canada's Emerging Aquaculture Industry".**
Panelists: Grimur Valdimarsson (Senior Advisor to the Icelandic Minister of Fisheries and Agriculture and former Director of the Fish Products and Industry Division, UN Food and Agriculture Organization), Doug Blair (Economist with RIAS Inc.), Leon Raubenheimer (Managing Partner and Founder of ZED Financial Partners), David Smith (Principal, Orion Global Business Sustainability Consultants , and former VP Sustainability, Sobeys Inc.), and Professor Martin Krkosek (Department of Ecology and Evolutionary Biology, U of T), with Susan McGeachie (Market Leader, Climate Change and Sustainability Services, EY) moderating.

December 16, 2015 - Third Annual **Willis & White Thought Leadership Event: "Can Sustainable Investing Save the World? Lessons Learned and Reasons for Optimism".**
Panelists: Martin Whittaker (Chief Executive Officer of JUST Capital), Joy Williams (Environmental Specialist, Responsible Investing, Ontario Teachers' Pension Plan), Andrew Park (former Head of Sustainable Finance Programs, Bloomberg LP's Sustainable Business & Finance Group), Jane Kearns (Senior Advisor, Cleantech, MaRS), and Gerry Rocchi (CEO, Green Power Action), with Toby Heaps (President of Corporate Knights) moderating.

April 27, 2016 in Calgary - **"An Evening Discussing Carbon Finance: Technology – Projects – Emissions Reductions".**
This event raised $11,000 for the Skip Willis Undergraduate Scholarship through sponsorships from Gray Taylor Law, Coop Carbone, PWC, Blue Source Canada ULC, Carbon Credit Solutions, the School of the Environment, and the Industry Provincial Offset Group.
Panelists: Paul Vickers (Portfolio Manager, Climate Solutions Management), Katie Sullivan (Director, The Americas & Climate Finance, IETA), Yvan Champagne (President, Blue Source Canada), Gray Taylor (Barrister & Solicitor, Gray Taylor Law), David Moffat (Managing Director, Transactions, Climate Solutions Management), Ed Alfke (Chairman, Carbon Credit Solutions), Mel Wilson (Partner, PriceWaterhouseCoopers), Christine Schuh (President, Ie-ef.com, Consulting Corp.), and Lorraine Becker (Founder, Green Investment Bank of Canada).

June 3, 2016 - One-day workshop on **"Today's New and Developing Carbon Markets"**
Speakers: Patricia Koval (Partner, Torys LLP), Gray Taylor (Gray Taylor Law), Katie Sullivan (Director, The Americas & Climate Finance, IETA), Bob Page (Chair, ISO 14000 Series), Barbara Hendrickson (BAX Securities Law), Rob Wilson (Director, Carbon Finance, Nature Conservancy of Canada), and Sarah Keyes (CPA Canada).

July 15, 2016 - **"Industry Update: Financial Stability Board Task Force on Climate-Related Financial Disclosures"**
Seminar jointly hosted by the School of the Environment and Rotman School of Management.
Speakers: Jane Ambachtsheer (Partner and Chair of Mercer's Global Responsible Investment Business, and Adjunct Professor, School of the Environment) and Julie Desjardins (Consultant representing the Chartered Professional Accountants of Canada).

NEW MEMBERS

We would like to thank the following retiring EFAC members for their service to the committee: **Alex Chamberlain** (Managing Partner, Investeco Capital), **Barbara Hendrickson** (Counsel, Bax Securities Law), **Eric Kirzner** (John H. Watson Chair in Value Investing and Professor, Rotman School of Management), **Phillip Ludvigsen** (Director, Carbon Advisory Services, KPMG Canada) and, **Susan McLean** (Director, GreenEdge Capital).

COMMITTEE MEMBERS

1. **Amanda Ackerman** - *Senior Consultant, Energy, Navigant Consulting*
2. **Michael Barrett** - *Partner, Corporate, Bennett Jones LLP*
3. **David Berliner** - *Co-Founder and CEO, CoPower*
4. **Richard Blundell** - *Adjunct Professor, Executive-in-Residence, Business Sustainability, Rotman School of Management*
5. **Jessica Butts** - *Director, The Delphi Group*
6. **Lisa DeMarco** - *Senior Partner, DeMarco Allan LLP*
7. **Julie Desjardins** - *President, Desjardins & Associates Consulting Inc.*
8. **Toby Heaps** - President and Co-Founder, Corporate Knights
9. **Peter Johnson** - *Senior Manager Environmental and Social Risk, Scotiabank*
10. **Hyewon Kong** - *Associate Portfolio Manager, AGF Investments Inc.*
11. **Patricia Koval** - *Partner, Torys LLP*
12. **Sonia Labatt** - *School of the Environment, Dean's Advisory Board Member, Faculty of Arts & Science*
13. **Todd Latham** - *President, Actual Media*
14. **Rosemary Martin** - *Chief Sustainability Officer, First Capital Realty and Committee Co-Chair*
15. **Susan McGeachie** - *Market Leader, Climate Change and Sustainability Services, E&Y*
16. **Andrea Moffat** - *Vice President, Ivey Foundation*
17. **Donna Nielsen** - *Manager, Program & Partnership Development, School of the Environment*
18. **Susan Sheehan** - *VP Sustainability, iCompli Sustainability; Founder, President & CEO, Getcleantech*
19. **Kimberly Strong** - *Director, School of the Environment and Committee Co-Chair*
20. **Katie Sullivan** - *Director, North America Policy and International Climate Finance, International Emissions Trading Association*
21. **Gray Taylor** - *Barrister and Solicitor, Gray Taylor Law and Distinguished Visiting Fellow, School of the Environment*
22. **Bill Tharp** - *CEO, Climate Change Infrastructure Corporation*
23. **Rob Wilson** - *Director, Carbon Finance, The Nature Conservancy of Canada*

For more information, visit:
http://learn.environment.utoronto.ca

Blue = New Members in 2015-16

Third Annual Willis & White Thought Leadership Event

(L-R)): Thought Leadership Event panelists Martin Whittaker, Joy Williams, Andrew Parks, Jane Kearns and Gerry Rocchi. Photos: Daniel Joseph

Can Sustainable Investing Save the World? Lessons Learned and Reasons for Optimism

Members of U of T and the business community gathered to discuss sustainable investing at the School of the Environment's third annual Willis & White Thought Leadership Event on December 16, 2015. It combined an informative and thought-provoking panel discussion entitled ***"Can Sustainable Investing Save the World? Lessons Learned and Reasons for Optimism"*** with the presentation of two undergraduate scholarships. This event was hosted by the School's Director **Kimberly Strong** and organized by the Environmental Finance Advisory Committee.

The keynote speaker was **Martin Whittaker**, CEO of JUST Capital located in New York City, who reflected on how sustainable investing has grown over the past 15 years, and the changing dynamics both good and bad, and also described some of the opportunities for, and challenges to, future growth in this area. He was joined by four panelists, each approaching the topic from a different angle. **Joy Williams,** Environmental Specialist, Responsible Investing, Ontario Teachers' Pension Plan, spoke about Ontario Teachers' responsible investing initiative, how it affects their investments, and how a renewed and consistent focus on environmental, social and governance (ESG) issues drive better investment management. **Andrew Park**, Former Head of Sustainable Finance Programs for Bloomberg LP's Sustainable Business & Finance Group talked about reporting standards, financial data and the challenges of ESG integration. He was followed by **Jane Kearns**, Senior Advisor, Cleantech, MaRS, who spoke about Canadian cleantech innovation and the exciting new opportunities that have the power to change the world through investment in new technologies and companies that are positioned to dramatically improve the odds of avoiding catastrophic climate change, effectively manage our precious water resources, and feed our ever-growing global population. The final panelist was **Gerry Rocchi**, CEO of Green Power Action, the manager of the Greening Canada Fund, and a director of Standard Life Investments. He argued that sustainable investing is a necessary part of the solution but cannot save the world on its own; it needs special conditions to play its part and so we should be smart about enabling those conditions. The panel was moderated by **Toby Heaps**, President of Corporate Knights, who also guided a question and answer session with a very engaged audience.

The second part of the evening involved the presentation of two scholarships established to honour the memory of Rodney White and Skip Willis, both former members of the School's Environmental Finance Advisory Committee (EFAC), which was formed in 2003 to provide a forum for the exchange of innovative ideas in environmental finance between the University and the private sector.

Sonia Labatt, an EFAC member and a member of the Faculty of Arts & Science Dean's Advisory Board at U of T spoke about Rodney White, who was a close friend and colleague. Together, they co-authored two books *Environmental Finance* and *Carbon Finance*, topics which are becoming increasingly relevant as the importance of carbon pricing becomes ever more widely recognized. **Rodney White** was a Professor in the Department of Geography, and from 1994 to 2005, he served as the Director of the Institute for Environmental Studies, a forerunner of the School of the Environment. Rodney was an internationally renowned authority in transdisciplinary and international research relating to urban and environmental infrastructure and management, adaptation to climate change, and environmental risk and liability.

It was these interests that led to the establishment of EFAC, where Rodney brought together academic and business leaders in the fields of environmental finance, business, law, and management. One of these leaders was **Errick "Skip" Willis**, principal of the Willis Climate Group, who was an internationally recognized business advisor on climate change and greenhouse gas markets in Canada. His focus was on developing solutions that would unite the interests of

Continued on next page...

Third Annual 2015 Willis & White Thought Leadership Event

Above (L-R): Thought Leadership Event audience; Kelly Willis, Francesca Hannan (recipient of the Skip Willis scholarship), Sue White and Kayla Kraiker (recipient of the Rodney White Scholarship). Photos: Daniel Joseph

...Continued from previous page

the environment and business by bringing market solutions to climate change issues. Skip was also dedicated to the education and mentoring of the next generation of leaders in the area where business and environment can overlap, and he took great pride in his role as a visiting lecturer in the Carbon Finance program at U of T. **Gray Taylor**, Barrister and Solicitor with Gray Taylor Law, and Distinguished Visiting Fellow in Environment at the School, spoke about Skip Willis and noted how his legacy lives on through his ideas and the people he mentored, some of whom were actively engaged in the recent COP21 Climate Conference in Paris.

Above (L-R): Gray Taylor, Kimberly Strong and Sonia Labatt. Photos: Daniel Joseph

The formal proceedings were followed by a reception, which continued well into the evening. The event was held downtown in the offices of Bennett Jones LLP, who kindly provided the venue, and it was attended by about 50 members of the business community, as well as faculty, students, and members and friends of the Willis & White families. The School of the Environment encourages interdisciplinary study of a range of environmental issues. With events such as this, we continue to foster interaction and engagement between faculty, students, and the wider community beyond the University.

Members of the School of the Environment's Environmental Finance Advisory Committee open the Toronto Stock Exchange on July 9, 2015 in honour of Climate Summit of the Americas. Photo: Marc Rochette

Online Certificate Programs & Courses

The School of the Environment's Professional Development Program offers courses, seminars and workshops developed in collaboration with industry experts and taught by leading industry practitioners ensuring current and leading edge knowledge and skills. Courses are developed for mid-career professionals and entrepreneurs who need to enhance their expertise, internationally educated professionals augmenting credentials for the Canadian context, and recent college and university graduates seeking to advance their careers. (See page 57 for brief profiles of instructors.)

Learn more: http://learn.environment.utoronto.ca or contact Donna Nielsen, Manager, Professional Development Programs, 416-978-7077, d.nielsen@utoronto.ca

Climate Change Policy and Practice

The Certificate in Climate Change Policy and Practice is designed to prepare professionals with the practical skills to better understand their environmental footprints. The greenhouse gas accounting, reporting and verification aspects of the program are grounded in ISO standards.

The combination of practical and theoretical components will provide individuals with the tools required to steer their organizations in the direction of sustainable practices and to meet the challenges of an expanding regulatory framework and the increasing need for sustainable initiatives. Explore the causes and impacts of global warming; government policies and the economics of climate change; strategic planning to respond to and minimize climate change; and the financial, environmental and business aspects of adaptation and mitigation efforts.

It is comprised of four compulsory courses:

CCP 400 Climate Policy and Corporate Responses
CCP 401 Sustainability Reporting
CCP 402 GHG Accounting and Reporting ISO 14064-I
CCP 403 Greenhouse Gas Validation and Verification ISO 14064-3

Environmental Management

Environmental management includes impact assessment and also involves other strategies and tools, such as adaptive management, risk assessment, environmental site audits, assessments, remediation and conflict resolution. The objectives of this program are to develop an understanding of environmental management and to provide insight into the systems approach which can be employed to mitigate a wide range of environmental problems. Grounded in a holistic approach to sustainable development, it aims to develop strategic and inclusive solutions to resource and management case studies. It also covers the complexity of risk management in addressing health, economics and conservation.

It is comprised of four compulsory courses:

CEM 400 Fundamentals of Environmental Management
CEM 401 Urban Water Issues
CEM 402 Strategies in Environmental Management
CEM 403 Environmental Risk Assessment

Advanced Study in Environmental Management

This course focuses on key approaches, processes, challenges, and problems related to the field of environmental management. Through the introduction of a wide variety of course materials, on-going discussions, and assignments, students will become familiar with, and equipped to engage in, the cooperative resolution of complex environmental issues. When one thinks about the natural environment, often images of majestic waterfalls, pristine forests and wild animals wandering endless savannah come to mind. In recent years, these images are being overshadowed by the impact of human activities on the environment - images of melting polar caps, reports of depleted fish stocks, satellite imagery showing large tracts of burning forests due to anthropogenic effects, and increased incidence of diseases like SARS and swine flu that are a result of globalization and other factors. We are becoming increasingly aware of the far-reaching impacts of humans on the natural environment. The study of environmental management requires an understanding from a multitude of perspectives, drawing upon skills from numerous areas. The effects of environmental management can be critical for both developed and developing countries, often requiring different approaches and decision-making processes. Through an interdisciplinary approach, CEM 400 engages students in various environmental issues and imparts a set of skills they can utilize in the decision-making process for environmental management.

The Advanced Certificate Program is comprised of six courses:

CEM 400 - Fundamentals of Environmental Management
CEM 441 - Urban Sustainability
CEM 402 - Strategies in Environmental Management
CEM 403 - Environmental Risk Assessment
WRM 402 - Urban Water Issues
CEM 444 - Global Environmental Issues

Online Certificate Programs & Courses

Renewable Energy

Renewable energy is becoming one of the fastest growing industries in the face of the current environmental crisis, resulting from dependence on fossil fuels and unprecedented global rate of development. In this program students will explore historical and current perspectives on forms of renewable energy, their current usage in developed and developing nations, drivers in forming markets, and political will. The interdisciplinary approach challenges students to pursue an interdisciplinary view of the impact of renewable energy on the current global energy picture. It aims to develop strategic, consensual, and inclusive solutions to the renewable energy and environmental management case studies.

It is comprised of two compulsory courses:

CRE 400 Principles of Renewable Energy
CRE 401 Biofuels
And two of the following courses:
CRE 402 Wind Energy
CRE 403 Urban Energy Systems
CRE 404 Solar Energy

Geographic Information Systems (GIS) for Environmental Management

Environmental Geographic Information System (GIS) describes the use of geo-spatial management methodology and tools in order to assist in developing an environmental management strategy. As GIS applications reach a broader audience, and the utilization of GIS spreads into new industries every day, the demand within the private and public sectors continues to grow. GIS has become a primary means of communicating spatial information in a multitude of settings in environmental applications. The objectives of this program are to build a foundation for understanding of GIS and Remote Sensing theory and techniques, and develop GIS software skills to solve practical tasks related to environmental management.

It is comprised of four compulsory courses:

GEM 400 Introduction to GIS for Environmental Management
GEM 401 Advanced GIS for Environmental Management
GEM 402 Geospatial Technologies for Environmental Mapping with GIS
GEM 403 Environmental Remote Sensing

Advanced Study in GIS for Environmental Management

This Certificate is designed for professionals who wish to achieve greater conceptual understanding and technical expertise to master the field of GIS.

It is comprised of six compulsory courses:

GEM 400 Introduction to GIS for Environmental Management
GEM 401 Advanced GIS for Environmental Management
GEM 402 Geospatial Technologies for Environmental Mapping with GIS
GEM 403 Environmental Remote Sensing
GEM 404 GIS Modeling for Environmental Applications
GEM 405 Advanced Remote Sensing Techniques for Environmental Applications

Water Resource Management

Renewable water resources at both the global and local levels will undergo marked changes in our lifetime. Population growth in urban centres, climate change and an increasingly dependent energy infrastructure on water creates a dynamic and challenging context for ensuring adequate financing and responsible development for use of water. This new certificate program aims to increase participants' "water IQ", as well as provide a basis for learning about current and emerging water issues at the global, regional and local scale.

It is comprised of three compulsory courses:

WRM 400 Water Resource Management
CEM 401 Urban Water Issues
WRM 401 Water Auditing
And one of the following courses:
CRE 400 Principles of Renewable Energy
GEM 400 Introduction to GIS for Environmental Management

Photo: William Suarez

In-Class Certificate Programs

Greenhouse Gas (GHG)

GHG Inventory, Accounting and Reporting ISO 14064-1

Climate change has become an issue of critical importance to business as regulations continue to emerge and stakeholders demand increasing levels of information related to environmental performance. Many companies are seeking to manage their exposure to climate risks and realize the growing opportunities through developing a carbon management strategy.

This course covers the principles and process of preparing a facility or company-wide greenhouse gas'(GHG) inventory. Participants will become very familiar with the International Organization for Standardization (ISO) standard, ISO 14064-1 and the World Business Council for Sustainable Development and World Resources Institute Greenhouse Gas Protocol. These standards have become the foundation for most regulated and voluntary GHG reporting systems in North America.

GHG Project Quantification, Monitoring and Reporting ISO 14064-2

Climate change policy and programs are developing quickly in jurisdictions around the world. A large focus of this activity is to mitigate greenhouse gas (GHG) emissions with discrete projects. GHG projects that are quantified, monitored and reported using recognized standards, such as the International Organization for Standardization (ISO) standard, ISO 14064-2, may result in a commoditized "credit" that is traded in regulatory and voluntary schemes. This course covers the principles and process of preparing a GHG project. Participants will become very familiar with ISO 14064-2 and the World Business Council for Sustainable Development and World Resources Institute's Greenhouse Gas Protocol for Project Accounting. Anyone intending to develop or manage GHG projects will benefit from the information and interactive exercises in this course. People intending to become a GHG verifier will also benefit from this course (additional courses specifically focused on GHG verification are available).

Greenhouse Gas Validation and Verification

The projected environmental impacts of greenhouse gas (GHG) emissions are driving many organizations to reduce their GHG emissions, using independent, third-party verifiers to measure and verify their GHG emissions as part of an overall strategy that could lead to becoming net carbon neutral. This 2-day course will provide detailed training on the approach to using the ISO 14064-3 standard, with specific examples of how verification would be applied to a GHG inventory prepared according to the ISO 14064-1 standard, or a project that conforms with the ISO 14064-2 standard. An overview of GHG Inventory and Project accounting (following ISO 14064-1, ISO 14064-2, respectively) is also provided.

Energy Programs

Renwable Energy Systems

As we move into a carbon-constrained era, the use of available sources of carbon-free energy will intensify. However, renewable energy systems are poorly understood and mistakes are made as systems are integrated into buildings and utility systems without proper understanding. This course explores the major renewable energy systems: the technologies, applications, constraints, economics, integration and installation. It is based on Natural Resources Canada's RETScreen analysis tool.

Implementing Energy Systems Management (ISO 50001)

Energy is critical to organizational operations and can be a major cost to any business. Although organizations cannot control energy prices, government policies or the global economy, how their energy is managed can be improved. Along with rising energy costs, the effects of climate change and increasing GHG emissions, planning for energy management and increased efficiency has become vital to the sustainability of every organization and business world-wide, providing a solution to address global warming, energy security and fossil fuel depletion. Accounting for and making efforts to bring utility consumption down makes perfect business sense. This course will provide owners, managers, consultants and other building professionals a roadmap to assess utility costs and consumption; how to develop retrofit programs; and detail the various methods employed to identify, implement, monitor and sustain conservation programs.

Sustainability Reporting

The objective of this 2-day course is to provide participants with the knowledge to start or enhance their organization's sustainability reporting projects through providing a current and relevant overview of the Sustainability reporting universe. Students will gain a strong understanding of sustainability reporting practices, pitfalls to avoid, and ways to ensure their sustainability reporting is meaningful and value-added to their organization. This will be done through discussion, review of up-to-date research, and analysis of current existing sustainability reports. Additionally, participants will gain an enhanced ability to assess and evaluate other organization's sustainability reports.

Water Auditing ISO 14046

An expanding population, urbanization, escalating standards of living and climate change all place pressure on the world's water resources. Its treatment, distribution, usage and waste management are all key issues for both urban and rural populations. The ability to understand, manage and then reduce your water footprint will be key to the ability of your business to manage with these risks. This certificate program will provide a thorough background to understand and manage issues facing the world's water supply, including current best practices to manage and reduce a water footprint. In this two-day course, students learn best practices for water consumption management and related resource and waste management issues to ensure your organization is managing its water footprint effectively and economically.

Environmental Student Groups

Photo: Nathan Warkewwwntin

ENSU

The Environmental Students' Union (ENSU) is a student-run organization representing the undergraduate students enrolled in the programs at the School of the Environment with the goals of connecting students to the School and to the larger environmental comunity on campus.

ENSU organized the 45th anniversary of Pollution Probe, the oldest enviromental student group on campus, with a rdedication ceremony on Oct. 14, 2015 and a seminar with speakers **Ryan O'Connor**, Associate Member, University of Stirling, Scotland, and author of *The First Green Wave: Pollution Probe and the Origins of Environmental Activism in Ontario*, and **Ben Donato-Woodger**, U of T alumnus and activist.

In 2015-16, ENSU organized a workshop on ***The Zero Waste Lifestyle*** with **Peggy Cao,** founder of Zero Waste Ontario, a graduate resource group, socials and pub nights.

This past year, ENSU introduced a **Peer Mentorship Program** designed to help first and second-year students who wish to learn more about subject POSts, classes, and student life at U of T by forming mentorship relationships with committed, experienced third and fourth-year students at the School of the Environment. As mentors, the latter can share their experiences as students and help others in the U of T community. As part of this pilot program, ENSU hosted a Mentor-Mentee Speed-Dating Night to introduce participants to each other.

GESA

The Graduate Environmental Students' Association (GESA) was established to help foster a sense of community among the graduate students at the School of the Environment. The aim of the Executive has been to create opportunities for interdisciplinary thinking, involving social and academic events. If you'd like to be involved, we'd love your help. At least drop into one of our socials and join us for a drink, a chat, and a few laughs.

In addition to brown bag lunches and pub nights, events organized by GESA in 2015-16 included a Science Communication Workshop to help students communicate with members of the community and policy makers about the value of environmental research and the work that they do. It was led by **Dr. Chelsea Rochman**, a David H. Smith Post-Doctoral Fellow in Conservation Biology working in the Aquatic Health Program at the UC Davis School of Veterinary Medicine and in the lab of **Dr. Miriam Diamond** at the University of Toronto.

GESA also organized a screening of Watermark, a breathtaking documentary about the photography of **Edward Burtynsky**, at the George Ignatieff Theatre. The film combines Burtynsky's images with stories that focus on water, humanity and their intersection. The event featured a panel discussion with the film's director **Jennifer Baichwal**, moderated by PhD student **Brianna Botchwey** (Political Science and Environment). The panel also included the Director of the Program on Water Issues, **Adele Hurley** (Munk School of Global Affairs), Professor **Brian Jacobson** (Cinema Studies Institute and Department of History), retired Professor **Lino Grima** (Geography and Environment), and MASc student **Vivek Nemani** (Drinking Water Research Group, Department of Civil Engineering).

2015-16 ENSU EXECUTIVE

- **Monica Dairo**, President; Environmental Studies Major
- **Melissa Murara**, Secretary; Environmental Studies Minor
- **Kristen Vitullo,** Mentorship Coordinator; Environmental Studies Major, Environmental Ethics Minor
- **Victoria Shirriff**, Social Media Coordinator; Environmental Science Minor
- **Zoe Zhao,** Webmaster; Environmental Studies Major
- **Rhea Joseph**, Treasurer; Environmental Studies Major
- **Adriana Shu-Yin**, Sustainability officer; Environmental Science Major, Environment & Health Major
- **Lika Miao**, Sustainability Officer; Environmental Science Major, Environment & Energy Minor
- **Daphne Wang**, External Liaison; Environment & Energy Minor
- **Kelly Emblem**, Newsletter organizer; Environmental Studies Major
- **Yi Fan Yin**, Newsletter Organizer; Environmental Studies Minor
- **Michelle Newson**, Upper Year Representative; Environmental Studies Major
- **Seiah Kim**, Upper Year Representative; Environmental Studies Major
- **Anne Boucher,** Lower Year Representative; Environmental Studies Major
- **James Povilonis**, Lower Year Representative; Environmental Studies Major

Contact:
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Office: Room 1042A, Earths Sciences Building, 5 Bancroft Ave.

2015-16 GESA EXECUTIVE

- **Sang-Kyun (Rafael) Bong**, GESA President (JD, Law)
- **Joaquin Bardallo Bandera**, GESA Vice-President (PhD, Political Science)
- **Brianna Botchwey**, GESA Secretary (PhD, Political Science)
- **Brendan Byrne**, GESA Treasurer (PhD, Physics)
- **Emile Lavergne**, GESA Social Events Coordinator (MGA, Global Affairs)
- **Ellen Gute**, GESA Communications Coordinator

Contact:
http://gesa.sa.utoronto.ca
https://www.facebook.com/GESAatUofT
https://twitter.com/gesa_uoft
Email: gesa@utoronto.ca

Campus Farms Tour - Hart House, Sidney Smith and U of T Student Union office farms tour. Photo: Monica Dairo

Bees Tour - Month of the Local on U of T campus. Photo Monica Dairo

Christian Abizaid (Professor of Geography and Environment), Joaquin Bardallo Bandera (PhD student, Political Science and Environmental Studies), Sedef Akinli Kocak (Sessional Lecturer, Environment), Nasim Ramezani (Master's student, Forestry and Environmental Studies), and David Powell (Undergraduate Student Advisor, Environment). Photo: William Suarez

GESA poster for the viewing of Watermark and panel discussion on water issues, Nov. 24, 2015

Bring Your Own Lunch student social gathering organized by ENSU. Photo: Monica Dairo

U of T Activism Still Flourishing

Forty-five years later to the day, U of T Environment students show student activism is still flourishing

BY MONICA DAIRO, PRESIDENT, ENVIRONMENTAL STUDENTS' UNION

Pollution Probe dedication ceremony at St. George and Harbord Streets. Photo: Diana Tyszko

Members of the University of Toronto's thriving environmental movement marked the 45th anniversary of the installation on October 14, 1970 of a plaque by Pollution Probe, the earliest environmental student group on campus. Forty-five years later, on October 14, 2015 at 3 p.m., there was a dedication ceremony for a new and second plaque at the same site,on the north-west corner of St. George and Harbord Streets, beside Robarts Library.

To celebrate this anniversary, a small committee of student representatives and Dr. **Douglas Macdonald** (of the School of the Environment) worked with 17 environmental student groups to get the necessary approvals for the new plaque. Like the first, the second plaque reflects the visions of the contemporary environmental student movement. The plaque illustrates the development of this movement on campus and symbolizes the alliance of the environmental student movement at the University.

Ryan O'Connor. Photo: Diana Tyszko

Ben Danato-Woodger. Photo: Diana Tyszko

With collaboration between the environmental groups listed on the plaque, the final wording of the second plaque is:

"Our fight now is climate change
and our numbers have grown.
Not separate from nature,
united in goal
our commitment to foster a sustainable world
ever grows".

At 4 p.m., the celebration shifted to a School of the Environment seminar, as part of the School's series held at the Earth Sciences building. Two talks were given, the first presented by Ryan O'Connor, Associate Member of the Centre for Environment, Heritage and Policy at the University of Stirling (Scotland) and author of *The First Green Wave: Pollution Probe and the Origins of Environmental Activism in Ontario* (2015, UBC Press), and the second by **Ben Donato-Woodger**, U of T alumnus and activist.

O'Connor first spoke about the history of Pollution Probe during the first wave of the Canadian environmental movement, followed by Donato-Woodger's analysis of toronto350.org's on-going divestment campaign on campus to convince U of T to redirect investments away from fossil fuels. The juxtaposition of the talks was meant to complement the ceremony that occurred an hour earlier: the shift from past to present environmental student activism at the University. The talks shed some light on both the priorities and challenges of past and present environmental groups on campus.

First plaque above installed by Pollution Probe on Oct. 14, 1970 and second plaque installed 45 years later.

U of T Environment Students Head to Paris Climate Change Conference

COP21 delegates with Professor Stephen Scharper (left) and students, Larissa Parker, Christelle Broux, Sophie Guilbault, Xia (Alice) Zhu and Keven Roy. Photo: Mira Kanaan

Six University of Toronto (U of T) students, five of whom are official delegates, attended the UNFCCC COP21 Climate Change Conference in Paris, France from Nov. 30 – Dec. 11, 2015. The students were selected from among 58 applicants, using a comprehensive criteria based on their academic background, knowledge of climate change, relevant practical skills, and active involvement in climate change issues.

Three of the six students are undergraduates enrolled in School of the Environment programs; one student is an Environmental Studies alumna who is now in law school at U of T, and the other two are graduate students enrolled in the School's Collaborative Program (CP) in Environmental Studies.

U of T students (L-R) Keven Roy, Sophie Guilbault, Larissa Parker, Christelle Broux, Xia (Alice) Zhu, and Alissa Saieva. Photo: Mira Kanaan

The six students: **Christelle Broux**, 4th year, BSc (Hons.) student, Environment & Science and Physical & Environmental Geography majors, Environmental Studies Minor; **Larissa Parker**, 4th year, BA (Hons.) student, Environmental Studies and Ethics, Society & the Law majors, Political Science Minor; **Xia (Alice) Zhu**, 3rd year, BSc student, Environmental Chemistry Specialist; **Alissa Saieva**, JD student, Certificate in Aboriginal Legal Studies, Faculty of Law and Environmental Studies CP; BA (Hons.) alumna, Environmental Studies and Political Science majors; **Sophie Guilbault**, PhD candidate, Planning program and Environmental Studies CP; and **Keven Roy**, PhD candidate, Physics and Environmental Studies CP.

Their aim is was "to actively represent the voices of students and future generations by connecting with other COP21 attendees during the conference to build a strong exchange network for climate initiatives. Leading up to COP21, we hope to stimulate student engagement through events and provide opportunities for discussion on a number of relevant topics. Following the conference, the group continues the dialogue among students to further the climate change movement. The students were joined by Professor **Stephen Scharper** (Anthropology UTM and School of the Environment), who met with the students and also conducted research on the role of faith groups and their impact on climate policy.

(L-R) Student delegates Alissa Saieva with MP Elizabeth May (Leader of the Green Party of Canada), Christelle Broux and Sophie Guibault. Photos: @COP21UTstudents

During the Fall 2015 term, the delegates helped to organize a series of documentary screenings and a roundtable discussion evening about climate change issues. In winter 2016, they participated in a number of seminars on campus to discuss and analyze their experiences in Paris, including the Environment Seminar Series held by the School of the Environment with ***"Report from Paris: U of T student delegates discuss their experiences at COP21"***.

Christelle Broux and Sophie Guilbault try out an energy-saving bike at the Paris Conference on Climate Change

The delegates reported from the Paris Conference using social media:
Blog: www.utcop21.org
Facebook: https://www.facebook.com/COP21UofTStudents
Twitter at: @cop21utstudents

Backpack to Briefcase (b2B): Mentorship dinners

At the Faculty of Arts & Science's Backpack to Briefcase (b2B) events, School of the Environment undergraduate and graduate students meet with alumni from their programs, who are invited back to share their education and career experiences and to offer encouragement and advice. b2B dinners were held on Oct. 29, 2015 and March 2, 2016 at the U of T Faculty Club. The events provide opportunities for students to understand their education in a broader context – opening discussions with alumni, faculty members, staff and peers about life after graduation.

Environment alumni guests in Oct. 2015:

- **Rohit Mehta**, Development Assistant, Credit Valley Conservation Foundation
- **Faisal Shaheen**, Manager, Information Systems, City of Toronto
- **Joanna Vince**, Associate, Willms & Shier Environmental Lawyers LLP
- **Ruth Richardson**, Executive Director, Global Alliance for the Future of Food

Environment alumni guests at the March 2016 dinner:

- **Michelle Grinstein**, Senior Policy Advisor, Ontario Ministry of the Environment and Climate Change;
- **Keri Hyde**, Senior Research Advisor, Ministry of Transportation, Ontario Public Service;
- **Michael Lawler**, Community Outreach Staff, Friends of the Greenbelt Foundation; and
- **Colin Love**, Supervisor, Outreach Education, Toronto and Region Conservation.

(L-R) Professor Sarah Finkelstein (Academic Associate Director), Conrad Pratt (BSc student, Environmental Science/Ecology and Evolutionary Biology), Mike Lawler (Community Outreach, Friends of the Greenbelt Foundation and School alumnus), and Ellen Gute (PhD student, Physical and Environmental Science and the School's Environmental Studies Collaborative Program). Photo: Courtesy of Faculty of Arts & Science

For more information, please contact Carlo Siochi, Alumni Relations Officer, Office of Advancement, A&S, carlo.siochi@utoronto.ca

Marketing Critical-Thinking Skills to Employers

For the second year, the School of the Environment held a workshop on **Marketing Your Critical Thinking Skills** for about 20 third and fourth-year Environment students, on Saturday, January 16 and 23, 2016, in conjunction with the Faculty of Arts & Sciences' STEP Forward program.

Students at School's STEP workshop (L-R): Zhen Kai Lin, Biology/Environment and Health; Hiba Alam, Environment and Health; Tsz Lam Vivien Yeung, Environmental Studies; Madeleine Crist, Environmental Studies; and Ashwati Michael, Environmental Studies/Sociology. Photo: Lauren Differ

Led by workshop facilitators **Rachel York-Bridgers** and **Dorothy Gordon**, the objective was to help prepare students for pursuit of a career through the provision of tools and strategies to market and present themselves effectively to employers. Interactive sessions were used to help students gain:

- a better understanding of the importance and shortage of critical thinking skills in the workforce, and the high employer demand for these skills;
- an understanding and awareness of the critical-thinking skills that students have acquired during their undergraduate studies, and a review of what these are;
- an understanding of how employers and graduate schools assess and review critical thinking skills, and how to present them during the entire selection process from resume screening to the face-to-face interview.

On January 16, York-Bridgers reviewed why employers value critical thinking skills, and explained how to utilize them in developing a career path, apply them to professional, personal and community development, and create a professional profile or narrative to develop and present them. York-Bridgers holds a doctorate from OISE/UT in Curriculum, Teaching and Learning, completed the School of the Environment's graduate Collaborative Program in Environmental Studies, and currently teaches English and Critical Thinking at Southwestern Community College in Sylva, North Carolina.

On January 23, Gordon, a human resources specialist who has more than 25 years of private and public industry experience in this area, demonstrated how to incorporate and present critical thinking skills in the application cover letter and resume, and in telephone screening and face-to-face interviews. She also provided guidance on interview skills and strategies, which the students put to the test in mock interviews.

One of the student participants, Christelle Broux (Hons. BSc, Environment and Science and Physical and Environmental Geography/ Environmental Studies), offered these comments on the value of the workshop:

"I would highly recommend this unique workshop to any student looking to expand their knowledge on the applicability of critical thinking skills in the workplace. Both instructors were excellent at engaging participants, and I learned valuable information on how to market myself as I seek employment after graduation. They were also really helpful in providing feedback on how to tailor a resume and cover letter, while also providing the class a chance to reflect on the many aspects of interviewing and demonstrating your skill set."

A second student participant, Hiba Alam (Hons. BSc, Env. & Health/Geographic Information Systems, and Physiology), stated:

"The workshop clarified how critical thinking skills developed in university are sought after by employers because it translates to a higher level of decision-making, communication and problem-solving skills."

For more information on the STEP workshop, please contact David Powell, Undergraduate Student Advisor, David.Powell@utoronto.ca.

2016 Environmental Career Day: Students prepare for the future

BY DAVID POWELL

The School of the Environment co-presented the 2016 Environmental Career Day, a day-long event open to all registered university students, at the University of Toronto and elsewhere. This annual event is a collaborative effort with the School's Environmental Students' Union (ENSU), Graduate Environmental Students' Association (GESA) and the Toronto Undergraduate Geography Society (TUGS).

Held at Hart House Great Hall with 130 students in attendance, the event included a career expo with 28 exhibitors from government, consulting and non-governmental organizations, as well as from professional graduate programs and student unions at U of T, all of whom provided students with useful information, career advice and many potential career, job and volunteer opportunities.

The day included presentations by speakers from various sectors in the environmental field: **Kelly McLean**, a staff biologist at Dillon Consulting; **Dr. Ray Clement**, President, EnviroAnalysis; **Dorothy Gordon**, Human Resources Professional and HR Consultant; **Kari Bourrie**, who works in the NGO sector, most recently with the Jane Goodall Institute; and **Christelle Broux**, who just completed her BSc at U of T in Environment and Science, Physical and Environmental Geography, and Environmental Studies. They discussed and answered questions from students about current actions and post-graduation preparation for the job market in the following areas:

Skills & Knowledge

- hone strong written and verbal communication skills;
- take training courses/programs for specific tasks and job requirements;
- commit to continuous learning; get a graduate degree, when relevant to do so.

Experience

- get involved on campus with extracurricular activities;
- volunteer during and after completing university;
- make the most of any volunteer and paid work you do, and do that work with a positive attitude, in order to build your experience and reputation – if you are generous and helpful to others, you will be a desired candidate for jobs.

Determining your career interest

- develop and nurture a network, with professors, fellow students, individuals in the work world, professional associations, and employment-networking groups;
- do informational interviews with those working in jobs of interest to you;
- select a career focus in order to stand out as a job candidate, but also be flexible about what jobs you will consider, in light of knowledge gained in seeking work.

Preparation and Presentation

- take advantage of career support offered by your university;
- build a professional presence on social media (e.g. LinkedIn, Twitter);
- have a current resume that reflects your skills, work history and volunteer experience – think advertisement not autobiography;
- ensure your cover letter addresses what the job requires, and accurately reflects what is in your resume;
- be well-prepared for job interviews – dress appropriately for the job, research the organizations to which you apply, focus on answering the questions you are asked, and show enthusiasm for the job and the organization.

The School's Environmental Career Day assists students as they plan their futures, March 4, 2016. Photo: Daniel Joseph

Stay positive and focused in a difficult job market – there are jobs out there, so being well-prepared and building a network is the key to finding them.

For more information, please go to:
http://careerday.environment.utoronto.ca
David Powell is Undergraduate Student Advisor and Placement Coordinator at the School of the Environment.

ENV 440H Professional Experience Course

2015-16 Instructor: David Sider, Sessional Lecture

This course provides an opportunity for students to gain practical work experience in the environmental field through placements with organizations and agencies engaged in a wide range of issues from local to global scales. Student placements include activities such as research, policy development, project administration, proposal writing, networking, community organizing, and public awareness. In 2015-16, 57 students did summer/fall placements at non-profit/charitable groups (e.g., Evergreen, Foodshare, Jane Goodall Institute), government agencies (e.g., Toronto Environment & Energy Division, Environment Canada), private sector companies (e.g., Better Current, Triovest), and U of T organizations (Sustainability Office, Food Policy Council). The academic component of the course is oriented toward reflection on, and analysis of, students' placement experiences and their placement organizations. Together, the practical and academic parts of the course are geared toward preparing students for successful careers in the environmental field.

Alumni Profiles Project

The School of the Environment's website will soon feature Environment Alumni Profiles in which alumni are asked questions about their career path, the influence of their Environment program on their career, and career suggestions for our students. We have been interviewing our alumni and are planning to feature a series of profiles starting in mid-2017.

Career Navigator

The U of T Career Centre has launched a Career Navigator webpage for the School of the Environment and about 40 other units in the Faculty of Arts & Science. This new webpage allows students in to consider the possibilities provided by their degrees by highlighting alumni stories, employment data, and co-curricular programming, without limiting those possibilities by enumerating a list of possible professions. The web-based resource encourages students to develop their career capacities while embracing the concept of planned happenstance in career planning. Career Navigator content is featured on the Career Centre website but is available for re-use by academic departments, recruitment and alumni relations, ensuring that the University is delivering a cohesive, research-driven message about possible career paths.

Visit the websites:
BA: http://careernavigator.studentlife.utoronto.ca/department/school-environment-ba
BSc: http://careernavigator.studentlife.utoronto.ca/department/school-environment-bsc

Jane Goodall Institute of Canada

The Jane Goodall Institute of Canada has been a proud partner of the University of Toronto's School of the Environment for nearly 10 years.

Dr. Goodall with the JGI Canada staff

Led by Chief Executive Officer, A**ndria Teather**, JGI Canada continues to offer, and benefit from, opportunities to students and faculty alike to learn more about their field research as it relates to JGI's conservation initiatives and contribute to **Jane Goodall**'s **Roots & Shoots** youth-action program.

Professor **Shawn Lehman** in the Department of Anthropology joined JGI Canada's board in 2013, bringing his expertise in primates and conservation. Most recently, he represented JGI Canada at the Royal Ontario Museum, educating the public on the plight of chimpanzees and JGI Canada's conservation strategies working with local communities in the Democratic Republic of Congo.

University students who volunteer with JGI Canada are able to apply their academic learning to real-world situations while getting valuable workplace experience. JGI Canada deeply appreciates the commitment of the U of T students who have donated so many hours to our work: **Allegra Bethlenfalvy**, **Emma Harrison**, **Daniel Jose**, **Thalia Kornhauser**, **Sabrina Lau**, **Conrad Pratt**, **Kaylah Kranjc** and **Meera Shukla**. All provide ongoing assistance to the JGI Canada team that supports our fundraising, communication, and outreach efforts for important campaigns to protect chimpanzee habitat and community-led conservation projects.

U of T volunteers working at Dr. Goodall's April 12, 2016 lecture in Toronto

The 2016 **Jane Goodall scholarship** recipient was **Adriana Shu-Yin**, a BSc student majoring in Environmental Science and in Environment & Health with a minor in Environmental Geography.

JGI Canada continues to provide unique opportunities for students and faculty to be involved. In October, the Institute introduced a new youth program called **Roots & Shoots: Launch + Link**. **David Powell**, Undergraduate Student Advisor and Placement Coordinator at the School of the Environment was an advisor for the program, which engages high school students in designing and leading innovative sustainability projects that will make a difference for the people, animals and environment in their communities.

For more information and volunteer opportunities, visit:
www.janegoodall.ca
www.janegoodall.ca;
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2015-16 ENVIRONMENT AND ENVIRONMENT & HEALTH SEMINAR SERIES

SATYENDRA BHAVSAR, *Research Scientist, Ontario Ministry of the Environment and Climate Change, and Adjunct Professor, School of the Environment, U of T.*
What Fish Tell Us About Contaminants in Our Environment.

GILLIAN BOOTH, *Scientist, Li Ka Shing Knowledge Institute, Division of Endocrinology, St. Michael's Hospital; and Associate Professor, Departments of Medicine, and Health Policy, Management, and Evaluation, U of T.*
The Healthy Cities – Diabetes Prevention Project: New Insights on the Built Environment and Obesity-Related Diseases.

DAVID R. BOYD, *Adjunct Professor, Simon Fraser University and the University of British Columbia.*
The Optimistic Environmentalist: Progressing Towards a Greener Future.

DOLON CHAKRAVARTTY, *PhD student, Dalla Lana School of Public Health and School of the Environment, University of Toronto.*
Metals in Newcomer Women: A Preliminary Exploration of the Role of Compounded Vulnerabilities in Environmental Exposures and Outcomes.

BEN DONATO-WOODGER, *BA, Social Anthropology, University of Toronto, 2015*
Building the Climate Justice Movement on University Campuses.

NATALIE FRIJIA, *PhD candidate, Centre for Drama, Theatre and Performance Studies, and the School of the Environment's collaborative program in Environmental Studies.*
The Role of the Animal in Spectacle-Based Performance.

DOUGLAS HAINES, *Science Advisor, Healthy Environments and Consumer Safety Branch, Health Canada.* **Exposure of Canadians to Environmental Chemicals: An Overview of Health Canada's Human Biomonitoring Initiatives.**

JOSEPH MENDONCA, *PhD candidate, Department of Physics and the School of the Environment's collaborative program in Environmental Studies.*
Remote Sensing of Greenhouse Gases in the High Arctic.

JULIO MORALES, *Associate Professor and Research Station Director*; **CARLOS AVENDANO**, *Professor;* **OSCAR ROJAS**, undergraduate student, from the School of Biology, San Carlos University, Guatemala.
Oil Palm, Water, and the People: Socio-ecological impacts of the oil palm boom in Northern Guatemala.

KATE NEVILLE, *Assistant Professor, Department of Political Science and School of the Environment, University of Toronto.*
The Politics of Open Spaces: Energy Resource Contestation in the Canadian North.

RYAN O'CONNOR, *Associate Member of the Centre for Environment, Heritage and Policy, University of Stirling, UK.*
Pollution Probe and the Survival Day Time Capsule: A Brief History.

ELODIE PASSEPORT, *Assistant Professor, Department of Civil Engineering and the Department of Chemical Engineering and Applied Chemistry, U of T.*
Monitoring the Natural Attenuation of Chlorinated Benzenes in Contaminated Groundwater and Sediments.

GRIMUR VALDIMARSSON, *Senior Advisor to the Icelandic Minister of Fisheries and Agriculture, former Director of the Fish Products and Industry Division, UN Food and Agriculture Organization.*
Global Capture Fisheries as a Food Production System: Icelandic Perspectives.

FRANK von LAERHOVEN, *Assistant Professor of Environmental Studies, Utrecht University.* **Integrating natural and social science research on sustainability: Three examples from the Copernicus Institute of Sustainable Development (Utrecht University, The Netherlands).**

DEBRA WUNCH, *Assistant Professor, Department of Physics and School of the Environment.* **New Measurements of Carbon Dioxide from Space: The First Year of the Orbiting Carbon Observatory.**

ANNA YUSA, *Acting Senior Policy Analyst, Climate Change and Health Division, Health Canada.* **Climate Change and Health: Close-up on Drought in Canada.**

An Evening with Dr. VANDANA SHIVA, including a Screening of the short film "The Living Sea" was offered in partnership with the 16th Annual Film Festival of Planet in Focus

COP21 Climate Conference

UNFCCC COP21 Student Delegation presenting their findings in a lecture at the Environment Seminar Series at the School after attending the Paris Climate Change Conference.

Audience at the COP21 delegates' presentation. Photos: Daniel Joseph

HIGH SCHOOL VISIT

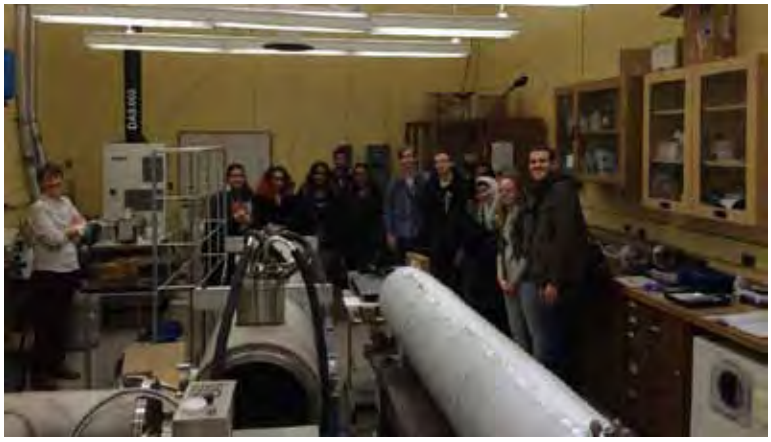
École secondaire Ronald-Marion Visits our Labs

BY AUBYN O'GRADY

On March 9, 2016, nine grade 10 and 11 students in the Environmental Science Specialist program at École secondaire Ronald-Marion French-language high school in Pickering visited four labs at the University of Toronto.

Organized by teacher **Mathieu Morin** and Professor **Sarah Finkelstein**, Academic Associate Director at the School of the Environment, the goals of the lab tours were to expose students to the different ways that they can pursue science at the university level, to show them the current environmental research happening at the University of Toronto, and to get them to reflect on how research happening here could be relevant to their own lives. In the morning, they were given an overview of environmental programs at the School of the Environment and toured the atmospheric physics labs with Professor **Kimberly Strong**. After a lunch at the Harvest Noon Café, they toured the atmospheric chemistry labs with Professor **Jennifer Murphy**, the Stable Isotope Geochemistry lab with Professor **Barb Sherwood Lollar,** and the environmental science labs with Professor **Miriam Diamond**. The students were excited to be at the university and asked many thoughtful and engaging questions throughout the tours.

After their visit, Mathieu Morin said that the students had unanimously declared that the lab tours were their favorite outing of the year so far, also saying, "I can tell the visit has had an influence on the students' thinking in terms of their career objectives."



High school students tour Professor Kimberly Strong's atmospheric physics lab at U of T. Photo: Aubyn O'Grady

MEMORIAL LECTURES

Eric Krause Memorial Lecture

John Robinson, Professor, Munk School of Global Affairs and School of the Environment, at the "Engaging Futures: Creating Sustainable Cities" lecture, April 6, 2016. Photo: Lauren Differ

At the 2016 Eric Krause Memorial Lecture, with (L-R) Krause lecturer John Robinson (Professor, Munk School of Global Affairs and School of the Environment), Katy Krause (Eric's sister), Fellowship recipient Shirley Chen, Arnold Krause (Eric's father), and recipients Alissa Saieva and Ramona Reece. Photo: Lauren Differ

While work continues on national and international approaches to climate change and sustainability issues, much of the impetus and energy has shifted to the scale of cities, which will be the home to all global population growth over the next century. But what does it mean to create a climate friendly or sustainable city? Robinson argues that this implies going beyond traditional climate and sustainability policy levers to explore the potential for transformative change in the underlying development paths of a city. In turn this points to the need for much more fundamental levels of community engagement than has been the case in the past. Following a discussion of how such engagement might be undertaken effectively, the presentation concluded with some thoughts on the role of the university in fostering transformative social change.

Douglas Pimlott Memorial Lecture

Since 2001, when the European Environment Agency (EEA) published its first report on **"Late Lessons from Early Warnings"** (EEA, 2001) the pace of development and global impacts of new products and technologies has increased, alongside enhanced scientific awareness about the complexity and uncertainties of biological, ecological and social systems. In response to these more difficult contexts for policymaking the second report on **"Late Lessons from Early Warnings"** was released by the EEA in 2013 (http://www.eea.europa.eu/publications/late-lessons-2). It analyses historical hazards, such as Minamata mercury poisoning and leaded petrol pollution, as well as emerging issues, such as pharmaceuticals in the environment, neonicotinoid pesticides, radiation from mobile phones, nanomaterials, and GM feed. In each case the growth of knowledge, from the first scientifically plausible early warnings to current knowledge, is analyzed alongside the responses of society and stakeholders and the consequential costs and benefits of action or inaction. Concluding chapters provide insights into "false positives"; precautionary science; the costs of inaction; why businesses usually ignore early warnings; better protection for victims and harassed early warning scientists; and whether more or less precaution would be wise.

David Gee, former Senior Advisor at the EEA, Late Lessons from Early Warnings lecture, April 21, 2016. Photo Daniel Joseph

Both reports call for greater public and stakeholder engagement in helping to choose strategic innovation pathways to energy and food security. The 2013 report's 20 case studies complement the 14 cases analyzed in vol 1 of Late Lessons from Early Warnings: these included asbestos, acid rain, PCBs, TBT, DES, BSE, CFCs, X rays, and antibiotics in animal feed, and which generated "Twelve Late Lessons" that may help us to minimize future harms, whilst maximizing useful innovations.

Professor Miriam Diamond and David Gee at the Pimlott Memorial Lecture. Photo: Daniel Joseph

2016 Pimlott Memorial Lecture. Photo: Daniel Joseph

Robert Hunter Memorial Lecture

John Bennett, Senior Policy Advisor, Friends of the Earth Canada. Photo: Daniel Joseph

Environmental campaign veterans **Dan McDermott** and **John Bennett** discussed the environmental movement and their involvement dating back to the 1970s when their personal interactions with Bob Hunter and Greenpeace set them on a path of life-long activism. They shared some of their personal experiences with Bob's mind-bombing approach to environmental activism, often taking different perspectives that led to lively discussions.

Dan McDermott, Ontario Chapter Director, Sierra Club of Canada Foundation, "The Environmental Movement, Yesterday, Today and Tomorrow" lecture, April 14, 2016. Photo: Daniel Joseph

Mr. Bennett and Mr. McDermott were part of, or associated with, most of the environmental achievements of the last 40 years: nuclear power, whales and seals, acid rain, old-growth forests, ozone depletion, climate change, and recently the Greenbank and the decline of pollinators. They have been in the streets with placards, canoed and parachuted into nuclear sites, climbed smokestacks, and disrupted an election campaign. They have also sat in boardrooms with business executives and across the table from prime ministers and premiers. Their knowledge and experience have caused them to ask: *Has progress been made? Are those who say the environmental movement has failed correct? And what's next? What should the next generation of activists take on and how should they do it?*

We were saddened to learn of the passing of Dan McDermott on January 4, 2017. The School extends its sincere condolences to the family and friends of this environmental champion.

Christian Abizaid

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Licenciatura (International Relations), Iberoamericana, Mexico; MA and PhD (Geography), McGill

2015-16 Instructor of JGE 321H Multicultural Perspectives on Environmental Management

Research Interests:
Rural livelihoods; indigenous and folk societies; resource use; environmental shocks; vulnerability and resilience; agrobiodiversity; rural poverty; social network analysis; cultural & political ecology; human responses to environmental change; land use and land cover change; environment and development; Neotropical forests; Latin America (Amazon & Mexico).

Featured Research Projects:
Floodplain Dynamics, Socioeconomic Change, and Traditional Livelihoods in the Upper Amazon. This project examines the prospects for economic livelihood within the context of rapid environmental and socioeconomic change. As part of my dissertation, I studied the origins, and the (social and economic) consequences of a large meander cutoff along the Ucayali River in Peru. Since then, South American governments announced important infrastructure projects in the Amazon, which are likely to change the prospects for economic livelihood in my study area. Building on my earlier research, I document long-term livelihood responses to river channel dynamics in a socioeconomic context that is rapidly changing.

Peruvian Amazon Rural Livelihoods and Poverty (PARLAP) Project
This project is in collaboration with Yoshito Takasaki (University of Tsukuba), Oliver T. Coomes (McGill University) and Pablo Arroyo (McGill) and Margaret Kalacsksa (McGill). It uses remote sensing imagery and community/household surveys to study the determinants and implications of geographical location of rural settlements in the Peruvian Amazon as a new approach that promises to improve our understanding of geographical poverty traps, vulnerability, and community-based conservation and development.

Recent Publications:
Abizaid, C., O.T. Coomes, and M. Perrault-Archambault. 2016 (in press). Seed sharing in Amazonian indigenous rain forest communities: A social network analysis in three Achuar villages, Peru. Human Ecology.

Coomes, O.T., Y. Takasaki, C. Abizaid, and P. Arroyo-Mora. 2016. Environmental and market determinants of economic orientation among rain forest communities: Evidence from a large-scale survey in western Amazonia. Ecological Economics 129:260-271.

Webster, K., J.P. Arroyo-Mora, O.T. Coomes, Y. Takasaki, and C. Abizaid. 2016. A cost path and network analysis methodology to calculate distances along a complex river network in the Peruvian Amazon. Applied Geography 73:13-25.

Abizaid, C., O.T. Coomes, Y. Takasaki, and S. Brisson. 2015. Social network analysis and peasant agriculture: cooperative labor as gendered relational networks. The Professional Geographer 67(3): 447-463.

Sarah Finkelstein

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BSc (Ecology & Evolutionary Biology), Princeton; M.Phil. (Plant Sciences), Cambridge; PhD (Physical Geography), Toronto

Research Interests:
Quaternary paleoclimates in arctic and sub-arctic regions, landscape evolution and ecological change in response to long-term natural climate variability, northern wetlands, lake sediment records, Quaternary glacials and interglacials, and the impacts of recent climate warming on freshwater ecosystems.

Featured Research Projects:
Wetland dynamics in the Holocene and Pleistocene: hydro-climatic change and carbon storage
Wetlands are vitally important ecosystems. One critical area is carbon storage, yet information is lacking on how carbon storage in wetlands responds to climate change. Through analysis of peat cores, our group is developing new reconstructions of paleoclimatic changes over recent millennia, and associated impacts on wetland vegetation, peat and carbon accumulation. These results can be integrated into process based models used to predict impacts of climatic changes and other disturbances on these important areas. A major area of focus is the Hudson/James Bay Lowlands, one of Canada's most extensive and most important wetlands

Paleoclimatology and paleolimnology in Arctic Canada
Arctic ecosystems are changing rapidly in response to climate change, but the impacts of these changes are not yet fully understood due to lack of information about long-term climate history. Paleoenvironmental records document the effects of past climatic changes on ecosystem dynamics. We are using the sediments of Arctic lakes to reconstruct spatial and temporal patterns of climate change over past centuries and millennia in the Canadian Arctic and to determine relationships between aquatic biodiversity and responses to paleo- and recent climatic changes. Some of our sites have been selected for specific examination of recent human impact; for example, we are collaborating on a paleolimnological study to track the effects of urbanization on fish populations in an urban lake in Yellowknife, NWT.

Recent Publications:
* indicates student co-authors

Dalton AS*, Finkelstein SA, Barnett PJ, Forman SL. 2016. Constraining the late Pleistocene history of the Laurentide Ice Sheet by dating the Missinaibi Formation, Hudson Bay Lowlands, Canada. Quaternary Science Reviews 146: 288-299.

Packalen MS*, Finkelstein SA, McLaughlin, J. 2016. Climate and peat type in relation to the spatial distribution of the peat carbon mass in the Hudson Bay Lowland, Canada. Journal of Geophysical Research – Biogeosciences, doi:10.1002/2015JG002938.

Finkelstein SA, Bunbury J*, Gajewski K, Wolfe AP, Adams JK*, Devlin J*. 2014. Evaluating diatom-inferred Holocene pH reconstructions for arctic lakes derived from an expanded 171-lake training set. Journal of Quaternary Science 29(3): 249-260.

Karen Ing

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MSc (Zoology), Toronto

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2015-16 Instructor of:

ENV/SII 199H Debating and Understanding Current Environmental Issues,
ENV 200H Assessing Global Change: Science and the Environment,
ENV 221H Multidisciplinary Perspectives on Environment, and
ENV432H Urban Ecology.

Teaching and Research Interests:
Environmental education, interdisciplinary team teaching, urban ecology.

Development of International Opportunities for School of the Environment undergraduate students: As part of her role as the School's International Liaison representative within the Faculty of Arts & Science International Liaison Committee, the goal is to promote international opportunities for students and to support any international students within our unit.

Featured Research Projects:
Incentive Mechanisms for the Provision of Ecosystem Services in Ontario

The provision of ecosystem services poses challenges similar to those associated with the provision of public goods. These challenges become more serious when the providers are private landowners. In partnership with conservation authorities in Southern Ontario, this project is being undertaken to enable community organizations to implement the most appropriate incentive mechanisms by enhancing their capacities, and to facilitate relevant policy changes related to the provision of ecosystem services, at the national, provincial, and municipal levels.

Ecosystems and Human Well-Being (UNEP)
In collaboration with Professor Shashi Kant (Faculty of Forestry, U of T), the goal of this project is to increase awareness and understanding of the links between ecosystem and human well-being, especially in developing countries. Workshops have been offered in China and Vietnam.

Team Teaching: Does It Strengthen Or Undermine a Learning Community?
With a cross-disciplinary group of U of T colleagues, this study explores the extent and variety of team teaching models at U of T. Over 64 team-taught courses were surveyed in the Faculty of Arts & Science to assess the perceived advantages and disadvantages of team teaching both from the faculty and student perspective.

Douglas Macdonald

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Hon. BA, MA, Toronto; PhD (Environmental Studies), York.

2015-16 Instructor of:

ENV 222H Interdisciplinary Environmental Studies,
ENV320 National Environmental Policy
ENV493 Independent Studies Course Ontario Energy Policy: Political Activity by the Renewables Industry
ENV 1001H Environmental Decision Making (co-taught with Kate Neville)
ENV 1002H Environmental Policy

Research Interests:
Politics of Canadian environmental policy making; business as an environmental policy actors, Canadian national, federal-provincial climate-change policy; distributive effects of climate policy and associated political resistance; theoretical approaches to interdisciplinary environmental studies

Research Projects:
Carbon Province, Hydro Province: The Challenge of Canadian Energy and Climate Federalism. Working title of a book presently in preparation, scheduled to be completed fall, 2017.

Articles on different aspects of the *political implications of the distributive effects of climate policy*; being drafted, revised or currently under consideration by journals:

Local resident perceptions of fairness as a factor in opposition to wind turbine siting, Madison Van West, Cristian Ches, David Houle, Douglas Macdonald;

Political Implications of the Distributive Effects of Canadian Climate Change Policy, Douglas Macdonald and David Houle;

Influence of the renewable energy industry on Ontario electricity policy, Douglas Macdonald

Human capacity, self-interest and moral restraint: attempting to understand the ecological crisis, 2015 conference paper on theoretical approaches to interdisciplinary environmental studies, currently doing further research to generate a revised iteration, to be co-authored with Laura Eastham

Recent Publications:
Macdonald D. with M. Lesch. Forthcoming. Management of Distributive Impacts Impeding Expansion of Interprovincial Hydro-electricity Transmission. Journal of Canadian Studies, Vol 49, No 2 Fall 2015.

Macdonald D. 2016. Climate Change Policy. In Debora L. VanNijnatten, ed. Canadian Environmental Policy and Politics: The Challenges of Austerity and Ambivalence. Don Mills: Oxford University Press.

Macdonald, D. 2013. Principal Investigator. Allocating Canadian Greenhouse Emission Reductions Amongst Sources and Provinces: Learning from the EU and Germany. Available at http://www.environment.utoronto.ca/Research/Publications.aspx.

Kate Neville

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BScH, Queen's; MESc, Yale; PhD, British Columbia

2015-16 Instructor of ENV 322H International Environmental Policy and Co-Instructor of ENV 1001H Environmental Decision Making

Research Interests:
Global environmental politics, with a focus on the dynamics of state-society-corporate relations, environmental activism, resource governance, and contested water and energy developments.

Featured Research Projects:
The politics of open spaces: This project is a continuation of my post-doctoral work on resource extraction and land use debates in northern Canada. Part of this project is an investigation into the dynamics of public consultation processes over contested energy developments, especially hydraulic fracturing ("fracking"). With Erika Weinthal at Duke University, I have been investigating the ways in which processes intended to involve citizens in public policy decisions, such as public hearings, can instead reinforce mistrust and intensify divides. Some of our work on this is available in a forthcoming article in the *Review of Policy Research* (citation below).

Overlapping commons—alliances, ownership, and conceptions of land in resource extraction debates: Linked with the previous project, this work examines land use debates in northern Canada, with a focus on the Peel Watershed planning process in the Yukon. A multi-year planning process for the watershed has ended up in court battles—with the case to be heard by the Supreme Court of Canada in 2017 on the issue of the territorial government's breaching of treaty agreements. The legal action and the accompanying public campaigns have revealed new alliances among Indigenous groups and environmental activists, and have illuminated efforts to reconcile differing conceptions of land and property. My work, in collaboration with Erika Weinthal, explores these dynamics, including political and philosophical understandings of wilderness, the commons, and belonging.

Investor-activism, information disclosure, and hydraulic fracturing: The controversial technology of fracking has led to heated public debate and intensive scientific research about the associated risks. Much public activism involves demands for information and risk disclosures, particularly for the chemical composition of the fluids injected in the fracturing process. In this project, I am working with collaborators from Duke University, the University of British Columbia, Pennsylvania State University, and the consulting firm CookESG, to understand the ways in which investors are using insider strategies to influence corporate governance, most notably through shareholder resolutions on disclosure to shift company practices from within.

Recent Publications:
Neville, Kate J., and Weinthal, Erika. Forthcoming (accepted). Mitigating mistrust? Participation and expertise in hydraulic fracturing governance. *Review of Policy Research*.

Neville, Kate J., and Weinthal, Erika. 2016. Scaling up site disputes: strategies to redefine 'local' in the fight against fracking. *Environmental Politics,* 25(4): 569-592.

Neville, Kate J., and Dauvergne, Peter. 2016. "The problematic of biofuels for development." Pp. 649-668 in *The Palgrave Handbook of International Development,* Jean Grugel and Daniel Hammett (eds.), Palgrave Macmillan.
Neville, Kate J. 2015. The contentious political economy of biofuels. *Global Environmental Politics,* 15(1): 21-40.

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BA& BSc, McMaster; MA (Geography), Victoria; PhD (Energy and Resources), California, Berkeley

2015-16 Instructor of ENV 1444H Capitalist Nature

Research Interests:
The commodification of nature; market-based and neoliberal mechanisms for dealing with environmental problems; political ecology, political economy and environmental change; industrial and alternative forestry in western North America; social regulation of commercial biotechnology in agriculture and forestry.

Recently Completed Research Project:
Special themed collection of papers in *Environment and Planning A* published in 2015 and co-edited with Mike Ekers of UTSC dealing with the concept of the socio-ecological fix, that is, broadly, the relationship between capitalist crises, their resolution through long term investments in the built environment, environmental change and environmental politics. We also have two theoretical papers on the subject forthcoming in the Annals of the Association of American Geographers.

Current Projects:
Exploring theoretical foundation of the socio-ecological fix (see above).
Researching the dramatic uptake of organic wine production in Languedoc (France) and the role of and implications for village level co-operatives.

Recent Publications:
Ekers, M. and S. Prudham (2015) Towards the socio-ecological fix: Key questions. Environment and planning A 47: 2438–2445.

Prudham, S. (2016) Perspectives on natural resources in the global economy. Polity Series Review. Journal of Agrarian Change 16(2): 342-255.

Prudham, S. (2015) Property and Commodification. In: McCarthy, J., G. Bridge and T.A. Perrault (Eds). The Routledge handbook of political ecology. Abingdon, Oxon; New York, NY, Routledge. Pages 440-445.

Prudham, S. 2013. Men and things: Karl Polanyi, primitive accumulation, and their relevance to a radical green political economy. *Environment and Planning A* 45(7) :1569-1587.

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BA, U of T; MES, York; PhD, U of T (Geography)

2015-16 Instructor of ENV 2002H Special Topics in Environmental Studies: The Development of Sustainability Thought

Research Interests:
Urban sustainability, building sustainability, community engagement processes, and university sustainability programming.

Featured Research Projects:
Sustainability Groundswell at U of T
I am interested in exploring the potential for U of T to play a more active role in the transition to sustainability. The overall idea is simple: U of T could transform itself into a sustainability test-bed, a living lab and agent of change that would integrate academic and operational sustainability activities to advance learning, provide extremely useful and popular teaching, transform the physical campus, and contribute to the sustainability agendas of partners in the private, public and NGO sectors. The goal is to contribute to a groundswell of sustainability projects at U of T that combine operations, research and teaching in a living laboratory approach.

FutureTalks: Engaging Citizens in Exploring Toronto's Future
I am working with a current (**Steve Williams**) and incoming (**Kim Slater**) PhD student to develop a project intended to engage citizens of Toronto in exploring what kind of city they want to live in. We are working with the City to present the School of the Environment 2016 Minden Symposium on this topic. We expect to submit a proposal for an SSHRC Partnership Development Grant in Nov. I am also on the Modeling Advisory Group of the City of Toronto's Transformation Toronto 2050 program aimed at developing a new climate change policy for the City.

Waterloo Sustainable Region Net positive Building Project
I am an advisor for the proposed Net Positive Building project for Waterloo Sustainable Region project. The idea is that some of the lessons we learned in creating the Centre for Interactive Research on Sustainability (www.cirs.ubc.ca), a building designed to be net positive in both human and environmental terms, are of direct relevance to the Waterloo project.

Copenhagen Business School Campus Development Project
As part of my role as an Adjunct Professor at Copenhagen Business School I have been asked to lead the sustainability components of their campus redevelopment. If funded, I will be actively engaged in developing regenerative sustainability and living lab projects.

Recent Publications:
Fedoruk, L., Cole, R., Robinson, J., Cayuela, A., (2015) "Learning from failure: understanding the anticipated-achieved building energy performance gap", Building Research & Information, 43(6): 750-763.

Marcus, J., Coops, N., Ellis, S. and Robinson, J., (2015) "Embedding sustainability learning pathways across the university" Current Opinion in Environmental Sustainability, 16: 7–13.

Robinson, J. and Cole, R., (2015) "Theoretical Underpinnings of Regenerative Sustainability", Building Research and Information, 43(2): 133-143.

Njal Rollinson

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BScT, Nipissing; MSc, Guelph; PhD, Dalhousie (Biology)

2015-16 Instructor of ENV 316F Laboratory & Field Methods in Environmental Science

Research Interests:
Evolutionary ecology and conservation; use of long-term monitoring data and metadata to test theory, understand ecological and adaptive processes, and to inform conservation decisions; evolutionary ecology of reptiles, amphibians, and cold-water fishes near their northern range limits.

Featured Research Projects:
Phenotypic Response of Juvenile Salmon to Stream Nutrient Enrichment (with Tim Burton, Trondheim Norway)
This work investigates whether adaptive phenotypic plasticity of maternal reproductive allocation occurs in response to the juvenile growth environment.

Evolution of Phenotypic Plasticity in Long-lived Reptiles (with Chris Edge, Toronto; Justin Congdon, Michigan; Ron Brooks, Guelph)
We explore how phenotypic plasticity of nest timing in turtles has evolved since post-glacial recolonization of Ontario, how climate change might impact phenological timing and sex ratios in these northern populations.

Bergmann Clines in Amphibians (with Locke Rowe, Toronto)
This work tests the hypothesis that interspecific variation in propagule size is negatively related to temperature for aquatic-breeding species, but not for terrestrial breeding species, thereby providing an indirect test of whether oxygen limitation plays an important role in body-size evolution.

Costs of Reproduction in Long-Lived Turtles (with **Doug Armstrong***, New Zealand;* **Ron Brooks***, Guelph)*
Using 30-years of long-term mark recapture data, this work tests the "costs of reproduction" hypothesis by exploring trade-offs between growth rate, fecundity, and survival in long-lived snapping turtles from Algonquin Park.

Recent Publications:
Rollinson N., Rowe L. 2016. The positive correlation between maternal size and offspring size: fitting pieces of a life-history puzzle. in press. Biological Reviews.

Rollinson N., Rowe L. 2015. Persistent directional selection on body size and a resolution to the paradox of stasis. Evolution 69:2441-2451.

Rollinson N., Hackett D. 2015. Experimental assessment of agonistic behavior, chemical communication, spacing, and intersexual associations of the red-backed salamanders near its northern range limit. Canadian Journal of Zoology 93:773-781.

Stephen B. Scharper

Associate Professor, Department of Anthropology, UTM and School of the Environment
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BA Hons., Toronto; MA (Theology), Toronto; PhD (Religious Studies), McGill

2015-16 Instructor of ENV 100H Introduction to Environment and ENV 1008H Worldviews and Ecology

Research Interests:
Environmental ethics, environmental worldviews, liberation theology and ecology, religions and environmentalism, ecological worldviews.

Research Projects:
Water: From Resource to Elemental Foundation of Life (with Tim Leduc (Environmental Studies, York University). Investigates the importance for environ-mental thought and policy of reflecting on water not just as a precious resource, but as a vital element, foundational to all life.

Cosmological Underpinnings of Urban Sustainability
This research has explored some of the cosmological and spiritual presuppositions that lie behind the integration of urban ecological thought and planning, involving the work of wildlife biologist Aldo Leopold and cultural historian and Passionist priest Thomas Berry.

Religion and Ecology
Exploring the Interconnection of Liberationist and Ecological Theologies (recently completed SSHRC project). While much of the religious conversation around ecology has entailed ontological, doctrinal, and cosmological or "worldview" questions, there have also been religious responses that take issues of class, race, gender, poverty, and justice seriously. The question has emerged whether the ecological contributions of the world's religions are chiefly in the realm of worldviews, doctrine, and cosmology, or in the realm of a political and economic critique. This research focussed on the theology of liberation, a theology that takes poverty, and increasingly, ecological destruction, seriously.

Recent Publications:
Scharper, S. B. 2014. Option for the poor and option for the Earth: toward a sustainable solidarity. In G. Gutierrez and D. Groody (eds.) Option for the Poor: An Interdisciplinary Perspective. University of Notre Dame Press. Page 97-120.

Scharper, S. B. and H. Cunningham. Lifeform, livelihood and lifeway: reflections on urban and planetary futures. In D. Nonini (ed). The Future of Cities, Blackwell Publishers. (Forthcoming.)

Scharper, S. B. 2013. For Earth's Sake: Toward a Compassionate Ecology. Toronto: Novalis. 224 pages.

Stefanovic, I.L. and S.B. Scharper (eds.) 2012. The Natural City: Re-Envisioning the Built Environment. University of Toronto Press. 356 pages.

Kimberly Strong

Professor, Department of Physics
Director, School of the Environment
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http://www.atmosp.physics.utoronto.ca/people/strong/strong.html
BSc Hons. (Physics), Memorial; D. Phil. (Atmospheric Physics), Oxford

Research Interests:
Atmospheric remote sounding using ground-based, balloon-borne, and satellite instruments for studies of ozone chemistry, climate, and air quality. Founder of the U of T Atmospheric Observatory; Deputy Principal Investigator (PI) of Probing the Atmosphere of the High Arctic program, which runs the PEARL facility on Ellesmere Island; Co-I on the ACE and Odin satellite missions; PI of the Canadian FTIR Observing Network and the AVATARS project, and Director of the NSERC CREATE Training Program in Arctic Atmospheric Science.

Featured Research Projects:
Arctic Atmospheric Science
Our group has been making measurements at Eureka, Nunavut since 1999 and we were involved in establishing the Polar Environment Atmospheric Research Laboratory (PEARL) in 2005. Science activities are currently supported by NSERC's Climate Change and Atmospheric Research program for the project "Probing the Atmosphere of the High Arctic (PAHA)". PEARL houses about 20 instruments, four of which are run by students and postdocs in my group. I am leader of the Composition Measurements theme, which is acquiring trace gas time series to improve our understanding of processes and trends related to the carbon cycle; ozone depletion; biomass burning; and clouds, aerosols, and precipitation.

AVATARS (Arctic Validation And Training for Atmospheric Research in Space)
This is a new project supported by the Canadian Space Agency that will use PEARL as a "space station on the ground" as its remote location provides an environment that simulates many of the constraints and challenges of a space mission. AVATARS will support several end-to-end projects that extend from the development of techniques for remote operation and automation of instruments, through improved data analysis methodologies, to the use of PEARL measurements of composition, aerosols, and clouds to validate satellite data products. Student training is a large focus of the project, and AVATARS will support nine graduate students at six universities over a three-year period.

Recent Publications:
* indicates student authors

* C.H. Whaley, K. Strong, et al., Toronto area ozone: Long-term measurements and modeled sources of poor air quality events. J. Geophys. Res. Atmos., 120 (D21), 11,368-11,390, 2015.

* X. Zhao, K. Strong, et al., A case study of a transported bromine explosion event in the Canadian high Arctic, J. Geophys. Res. Atmos., 121 (D1), 457-477, 2016.

* J. Mendonca, K. Strong, et al., Improving atmospheric CO_2 retrievals using line mixing and speed-dependence when fitting high-resolution ground-based solar spectra. J. Mol. Spectroscopy, 323, 15-27, 2016.

* E. Lutsch, E. Dammers, S. Conway, and K. Strong. Long-range transport of NH_3, CO, HCN and C_2H_6 from the 2014 Canadian wildfires. Geophys. Res. Lett., 43, 8286-8297, 2016.

Clare Wiseman

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B.E.S. Hons., Waterloo; M.Nat.Res.Mgmt., Simon Fraser; Dr. phil.nat., Frankfurt

2015-16 Instructor of ENV 341H Environment and Human Health and ENV 4001H Graduate Seminars in Environment and Health

Research Interests:
Metal emissions in urban environments and their human health impacts, contaminants and urban gardening, environmental health of vulnerable populations.

Featured Research Projects:
Assessing Metal and Metalloid Concentrations and their Bioaccessibility in Urban Road Dust (In collaboration with Health Canada and the City of Toronto)
This research examines the metal and metalloid concentrations and their patterns of distribution and bioaccessibility in fractionated road dust collected from Toronto streets. *In vitro* techniques using simulated human lung fluids are applied to fine and ultrafine fractions of road dust, capable of being respired by exposed individuals, to assess toxic potential and help inform Canada's Chemicals Management Plan. Data collected will also help support the City of Toronto's Clean Roads to Clean Air program.

Metals in Newcomer Women (In collaboration with Public Health Ontario, Health Canada and the City of Toronto)
The purpose of the study is to characterize blood concentrations of toxic metals among newcomer women of reproductive age (19-45 years of age) living in the Greater Toronto Area, Canada and assess environmental sources of exposures. This study will help contribute needed information on the body burden levels of priority metals of human health concern and exposure sources to aid in the development of culturally-sensitive health interventions which ensure the maternal and fetal health of newcomer populations.

Platinum Group Element Emissions: Environmental Concentrations, Exposure Levels and Human Health Risks (Ongoing collaboration with the University of Frankfurt)
Investigates platinum group element (PGE) emissions in automotive exhaust and their environmental fate and bioaccessibility. Current collaborative research examines the role of common environmental complexing agents in the transformation of PGE into more toxic species and the application of simulated biological fluids to assess PGE bioaccessibility in the human lung.

Recent Publications:
Wiseman CLS, Hassan Pour Z, Zereini F (2016). Platinum group element and cerium concentrations in roadside environments in Toronto, Canada. Chemosphere 145: 61-67.

Wiseman CLS, Zereini F, Puttmann W (2015). Metal and metalloid accumulation in cultivated urban soils: A medium-term study of trends in Toronto, Canada. Science of the Total Environment 538: 564-572.

Wiseman CLS (2015). Analytical methods for assessing metal bioaccessibility in airborne particulate matter: A scoping review. Analytica Chimica Acta 877: 9-18.

Debra Wunch

Assistant Professor, Department of Physics and School of the Environment
Office: Department of Physics, Room 707A, McLennan Physical Labs, 60 St. George St. Toronto, M5S 1A7
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BSc, MSc, PhD, Toronto (Physics)

Research Interests: Experimental atmospheric physics, carbon cycle, remote-sensing measurements of trace gases in the atmosphere.

Featured Research Projects:
Fugitive Emissions of Natural Gas from Los Angeles
Much recent activity has focused on quantifying and attributing the sources of emissions of methane from large urban centres. We attempt to attribute the sources of Los Angeles' significant methane emissions by looking at atmospheric measurements of methane and ethane. There are many sources of methane in Los Angeles, including delivered natural gas, oil and gas seeps, landfills, wastewater treatment plants and ruminants. Only the natural gas and other fossil fuel sources co-emit ethane, providing a method of attributing the emissions we measure in the atmosphere. We found that about half of the urban source was from the natural gas infrastructure, which represents about 2% losses in the infrastructure as fugitive emissions.

The Orbiting Carbon Observatory-2
The Orbiting Carbon Observatory-2 (OCO-2) is a NASA satellite that was launched in 2014, and was designed to measure precise and accurate atmospheric abundances of carbon dioxide (CO_2). After almost two years of measurements, we are beginning to see the crucially important patterns of the carbon cycle emerge from the data: the strong seasonal cycle driven by the Boreal forest's growth in the summer and dormancy in the winter, and the changes in CO_2 with latitude due to the strong CO_2 emissions in the northern mid-latitudes. To achieve data of this quality, the satellite measurements are continuously validated against "ground truth". For OCO-2 this is provided by a network of instruments that measure CO_2 from various locations around the world, called the Total Carbon Column Observing Network (TCCON). Our recent work comparing OCO-2 measurements to those from TCCON showed that while some biases remain in the OCO-2 measurements, they are generally of high quality and are very promising for scientific studies.

Recent Publications:
Wunch, D., Toon, G. C., Hedelius, J., Vizenor, N., Roehl, C. M., Saad, K. M., Blavier, J.-F. L., Blake, D. R., and Wennberg, P. O.: Quantifying the Loss of Processed Natural Gas Within California's South Coast Air Basin Using Long-term Measurements of Ethane and Methane, Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-359, under review, 2016.

Wunch, D., P. Wennberg, G. Osterman, B. Fisher, B. Naylor, C. Roehl, C. O'Dell, L. Mandrake, C. Viatte, D. Griffith, N. Deutscher, V. Velazco, J. Notholt, T. Warneke, C. Petri, M. De Maziere, M. Sha, R. Sussmann, M. Rettinger, D. Pollard, J. Robinson, I. Morino, O. Uchino, F. Hase, T. Blumenstock, M. Kiel, D. Feist, S. Arnold, K. Strong, J. Mendonca, R. Kivi, P. Heikkinen, L. Iraci, J. Podolske, P. Hillyard, S. Kawakami, M. Dubey, H. Parker, E. Sepulveda, O. Rodriguez, Y. Te, P. Jesseck, M. Gunson, D. Crisp, and A. Eldering: Comparisons of the Orbiting Carbon Observatory-2 (OCO-2) XCO2 measurements with TCCON, Atmos. Meas. Tech. Discuss., MS No.: amt-2016-227, submitted, 2016.

Kulawik, S., Wunch, D., O'Dell, C., Frankenberg, C., Reuter, M., Oda, T., Chevallier, F., Sherlock, V., Buchwitz, M., Osterman, G., Miller, C. E., Wennberg, P. O., Griffith, D., Morino, I., Dubey, M. K., Deutscher, N. M., Notholt, J., Hase, F., Warneke, T., Sussmann, R., Robinson, J., Strong, K., Schneider, M., De Mazière, M., Shiomi, K., Feist, D. G., Iraci, L. T., and Wolf, J.: Consistent evaluation of ACOS-GOSAT, BESD-SCIAMACHY, CarbonTracker, and MACC through comparisons to TCCON, Atmos. Meas. Tech., 9, 683-709, doi:10.5194/amt-9-683-2016, 2016.

Jane Ambachtsheer

Ms. Ambachtsheer is a Partner of Mercer, based in Toronto. She leads Mercer's global responsible investment business, and consults to North American and international investors. She was a consultant to the United Nations in developing the principles for responsible investment, and is a global advisor to the carbon disclosure project and sits on the investment committee of the Toronto Atmospheric Fund. She is Co-Instructor (Sessional Lecturer) of the School of the Environment's graduate course ENV 1707H Environmental Finance and Sustainable Investing.

Satyendra Bhavsar

Dr. Bhavsar is a Research Scientist in the Environmental Monitoring & Reporting Branch at the Ontario Ministry of the Environment and Climate Change. His research interests include environmental behaviour of contaminants, monitoring, fate and transport in multimedia environment, exposure and risk assessment, mathematical modelling, and identification and understanding of contaminant patterns. He is currently assessing status of Fish Consumption Beneficial Use Impairment at two Areas of Concern in the Great Lakes in a School of the Environment research project.

Susan McGeachie

Ms. McGeachie is the Central Canada Leader of Climate Change and Sustainability Services at EY. She advises companies on managing risks associated with environmental, social and governance issues, as well as developing appropriate governance and management models. She is a member and former chair of the School of the Environment's Environmental Finance Advisory Committee and is Co-Instructor (Sessional Lecturer) of the graduate course ENV 1707H Environmental Finance and Sustainable Investing.

Namrata Shrestha

Dr. Shrestha is a Landscape Ecologist, Research & Development at the Toronto and Region Conservation Authority (TRCA). She holds a PhD in Geography with expertise in landscape and urban ecology, and conservation planning. Her appointment at the School offers an opportunity for research collaboration with TRCA in the area of integrating science into policy and practice, especially in urban ecosystems management. She is currently working with a post-doctoral fellow in the Department of Ecology and Evolutionary Biology on a joint project on road and ecology in urban landscapes.

Brad Bass

Dr. Bass is a researcher and member of Environment Canada's Great Lakes Nutrient Initiative team. His research interests include best management practices and policies for limiting phosphorus loads from urban areas, green infrastructure, modelling phosphorus flows with fuzzy cognitive maps, ecological and socio-economic simulation with emergent computing, and community energy systems planning. He is Instructor (Sessional Lecturer) of the School of the Environment's undergraduate course, ENV 299Y, Research Opportunity Program.

Paul Helm

Dr. Helm is a Senior Research Scientist for contaminant issues in the Great Lakes with the Ontario Ministry of the Environment in the Water Monitoring Section of the Environmental Monitoring & Reporting Branch. His research interests include: fate and transport of emerging organic contaminants in aquatic and urban environments; sources and impacts of microplastics in the Great Lakes; passive sampling approaches for contaminant monitoring, reconnaissance, and assessment; and, non-target mass spectrometric analysis and screening for unknown contaminants/ transformation products. He is also an Associate member of the School's graduate faculty.

Paul Muldoon

Mr. Muldoon is Vice-Chair of the Environmental Review Tribunal, a body that adjudicates appeals, applications and referrals under 12 statutes. He is the former Executive Director of the Canadian Environmental Law Association. He has graduate degrees from McMaster University and McGill University and has written and co-written books and articles on Canadian environmental law and policy. He is also Instructor (Sessional Lecturer) of the School of the Environment's graduate and undergraduate course ENV 1701H / ENV 422H Environmental Law.

Gray Taylor

Mr. Taylor is the School's inaugural Distinguished Visiting Fellow in Environment. He practices business law including climate change and emission trading, environmental and sustainability law at Gray Taylor Law after decades of Bay Street practice in the same areas. He has been making a significant contribution to the School through his membership in its Environmental Finance Advisory Committee, playing a major role in planning events and raising funds for scholarships.

PROFILES - GRADUATE INSTRUCTORS & SESSIONAL LECTURERS

Simon Appolloni

Sessional Lecturer

ENV 1008 Introduction to Environmental Studies

He received his PhD in the Study of Religion with the Collaborative Program in Environmental Studies, School of the Environment, University of Toronto. His focus is on the intersection of religion, science, environmental and social ethics. He has taught an array of courses on ethics, worldviews, religion and environment, world religions, religion-science, and cultural heritage, at Brock University, Humber College, and U of T.

Susan McGeachie

Adjunct Professor and Sessional Lecturer

ENV 1707H Environmental Finance and Sustainable Investing

Ms. McGeachie is the Central Canada Leader of Climate Change and Sustainability Services at EY. She advises companies on managing risks associated with environmental, social and governance issues, as well as developing appropriate governance and management models. She is a member and former chair of the School of the Environment's Environmental Finance Advisory Committee.

Christopher Ollson

Sessional Lecturer

ENV 1704H Risk Analysis & Management

Dr. Ollson is Owner of Ollson Environmental Health Sciences. He has been practicing in the field of environmental risk and toxicology for almost 20 years and has an active research program in the field of Health Impact Assessment and health issues associated with living in proximity to Renewable Energy projects. He also teaches Physical and Environmental Sciences Department at UTSC.

Charles Jia

Professor, Chemical Engineering & Applied Chemistry, U of T, JNC 2503H Environmental Pathways

Dr. Jia is Associate Chair -Graduate Studies at Chemical Engineering Department. His research concerns with sustainable energy and the environment. His current projects address clean air, clean water and climate change through the development of new technologies. He is also interested in the fate, transport and impact of pollutants in the natural environment.

Paul Muldoon

Adjunct Professor and Sessional Lecturer

ENV 1701H Environmental Law

Mr. Muldoon is Vice-Chair of the Environmental Review Tribunal, a body that adjudicates appeals, applications and referrals under 12 statutes. He is the former Executive Director of the Canadian Environmental Law Association. He has graduate degrees from McMaster University and McGill University and has written and co-written books and articles on Canadian environmental law and policy. He teaches graduate and undergraduate courses.

Tom Rand

Sessional Lecturer, ENV 1707H Environmental Finance and Sustainable Investing

Dr. Rand is active in clean tech finance and climate advocacy, Managing Partner, ARCTERN VENTURES, Senior Advisor, MaRS Cleantech Venture Group and Author, *Kick the Fossil Fuel Habit* (2010) and *Waking the Frog* (2015) and *Climate Capitalism* (forthcoming). He has a BASc. in Electrical Engineering (Waterloo), an MSc (London), an MA and a PhD (Toronto).

PROFILES - UNDERGRADUATE INSTRUCTORS & SESSIONAL LECTURERS

Sedef Akinli Kocak

Sessional Lecturer, ENV 282H Big Ideas in Energy I: Technology & Society; ENV 382H Big Ideas in Energy II: Economics, Politics & Security

Ms. Akinli Kocak is a PhD Candidate at Environmental Applied Science and Management and a Research Assistant in the Data Science Lab at Ryerson University. Her research interests are energy and environmental data analytics, trade-off models on energy, sustainability design of information technologies, green IT and software development.

Simon Appolloni

Sessional Lecturer

ENV 100 Introduction to Environmental Studies

Dr. Appolloni received his PhD in the Study of Religion with the Collaborative Program in Environmental Studies, School of the Environment (Toronto). His focus is on the intersection of religion, science, environmental and social ethics. He has taught an array of courses on ethics, worldviews, religion and environment, world religions, religion-science, and cultural heritage, at Brock University, Humber College and U of T.

Ben Akrigg

Associate Professor, Classics, U of T, ENV 282H Big Ideas in Energy I: Technology & Society; ENV 382H Big Ideas in Energy II: Economics, Politics & Security

Dr. Akrigg's principal area of research is the economic history of archaic and classical Greece. Current projects include the historical demography of Athens in the fifth and fourth centuries BC, Athens' fuel supply, and the mobility of labour in antiquity.

Marco Belmont

Sessional Lecturer

JEE 337H Human Interactions with the Environment

Dr. Belmont is a Health Research Specialist at Toronto Public Health in the Healthy Public Policy directorate. He has a BSc (Hons) in Chemistry and an MSc in Physical Chemistry (National University of Mexico). After working for the Ministry of Environmental Protection, Mexico, he earned a PhD in Environmental Toxicology (Trent). He conducted postdoctoral work in Biogeochemistry in the US. He teaches at U of T and Ryerson University.

Jörg Bollman

Associate Professor, Department of Earth Sciences, U of T, ENV 234H Environmental Biology

Dr. Bolmann received his PhD in 1995 from the Swiss Federal Institute of Technology Zurich, and a Diploma in 1990 from the Free University of Berlin, Germany. His research focus is Marine Geobiology, particularly the history of the global oceans including paleo-ecology, paleo-biogeography and the evolution of calcareous marine microorganisms.

Miriam Diamond

Professor, Department of Earth Sciences, U of T ENV 281H Big Ideas in the Digital World I: Is the Internet Green?; ENV 381H Big Ideas in the Digital World II: Social Media & Environmentalism

Dr. Diamond earned a PhD in Chemical Engineering and Applied Chemistry and a BSc from (Toronto), an MScEng. in Mining Engineering (Queen's) and an MSc in Zoology (Alberta). She examines chemical contaminants from emission, to transport indoors, and on human and ecological exposure to inform regulation, policy and public health.

Steve Easterbrook

Professor, Department of Computer Science, U of T, ENV 281H Big Ideas in the Digital World I: Is the Internet Green?; ENV 381H Big Ideas in the Digital World II: Social Media & Environmentalism

Dr. Easterbrook received his PhD from Imperial College, London. He studies the development of computational model for understanding climate change, along with the role of models and data visualizations for sharing that knowledge about climate and sustainability with other communities. He teaches courses on Systems Thinking, Climate Literacy, and Software Design.

Monika Havelka

Senior Lecturer, Environment Programs, UTM ENV 395Y Special Topics Field Course: Ecology and Conservation in the Andes, Western Amazonia & Galápagos

Dr. Havelka received her PhD in Zoology at the University of Western Ontario. She has taught a wide variety of courses in evolutionary biology, ecology and environmental science, and field courses in Ecuador, Ontario, and the Arctic. She was twice a semi-finalist and once a finalist in the TVO Best Lecturer Competition.

Donald Jackson

Professor & Chair, Ecology & Evolutionary Biology, U of T, ENV 432 Urban Ecology

Dr. Jackson is former Interim Director of the School of the Environment. His research examines the structure and composition of ecological communities in aquatic ecosystems. His work focuses on comparing fish communities in lakes and streams to determine the relative importance of environmental factors in determining the species composition. His current work looks at the colonization and extinction of fish species in lakes and connecting waterways.

Hélène Cyr

Associate Professor, Department of Ecology and Evolutionary Biology, University of Toronto ENV 234H Environmental Biology; ENV 334H Environmental Biology: Applied Ecology

Dr. Cyr's interests are in the ecology of littoral areas in lakes (spatial and temporal distribution of habitats and benthic communities), foodwebs (feeding interactions in planktonic and benthic communities, especially between invertebrates and algae), and macroecology.

Andrew Drake

Sessional Lecturer, ENV 316H Laboratory & Field Methods in Environmental Science

Dr. Drake is a Research Scientist with Fisheries and Oceans Canada. He completed a Post-Doctoral Fellowship in Biological Sciences at U of T. His research involves quantifying human-mediated change in aquatic ecosystems, drawing on principles from landscape ecology, ecological risk assessment, and natural resource management.

Mark Hathaway

Sessional Lecturer, ENV 333H Ecological Worldviews

Mr. Hathaway is a PhD candidate in Adult Education and Community Development (OISE/UT) and the School of the Environment. He researches the relationship between adult transformative learning, ecological worldviews, and engagement for sustainability. He co-wrote The Tao of Liberation (Orbis, 2009). He has extensive experience in social and ecological justice issues pertaining to Canada and Latin America.

Russ Houldin

Sessional Lecturer, ENV 323 Ontario Environmental Policy; ENV 347 Power of Economic Ideas

Mr. Houldin has worked in the Ontario Public Service for over 30 years. He recently retired as senior adviser to the Ontario Energy Board. He continues to work as an energy and environment consultant. His interests include environmental and ecological economics, sustainable electricity systems, environmental and economic regulation, and Ontario environmental policy.

Karen Morrison

Sessional Lecturer

ENV 223 Fundamental Environmental Skills

Dr. Morrison is Vice-President of the International Association for Ecology and Health and a member of the Steering Committees of Ecohealth Ontario and the Ontario Biodiversity Council. Her work focuses on the intersection of ecology and public health, with a particular focus on watersheds as settings for health and well-being. She is an adjunct professor in the Faculty of Environmental Studies at York University.

Paul Muldoon

Adjunct Professor and Sessional Lecturer
ENV422H Environmental Law

Mr. Muldoon is Vice-Chair of the Environmental Review Tribunal, a body that adjudicates appeals, applications and referrals under 12 statutes. He is the former Executive Director of the Canadian Environmental Law Association. He has graduate degrees from McMaster University and McGill University and has written and co-written books and articles on Canadian environmental law and policy. He teaches graduate and undergraduate courses.

Jennifer Murphy

Associate Professor, Chemistry, U of T, ENV316H Lab & Field Methods in Environmental Science

Dr. Murphy's research group applies state-of-the-art science analytical techniques to address issues including urban air quality, climate change, acid precipitation, and ecosystem function. Their focus is on field measurements, particularly of reactive nitrogen compounds, that can be used to evaluate our understanding of the rates and mechanisms of chemical transformations in the environment.

Florence Pasche Guignard

ENV 281H Big Ideas in the Digital World I: Is the Internet Green?; ENV 381H Big Ideas in the Digital World II: Social Media & Environmentalism

Dr. Pasche Guignard holds a PhD in the study of religions from the Université de Lausanne (Switzerland). She conducted her postdoctoral research (Toronto) entitled "Natural Parenting in the Digital Age". Her research engages issues at the intersection of religion, environmentalism, gender, embodiment, technology, media, and ritual.

Tugce Sahin

Sessional Lecturer
ENV 233 Earth System Chemistry

Ms. Sahin is in the PhD program in the Department of Earth Sciences and U of T School of the Environment in Geology and Earth Science. She received her MA in Earth Science and Geology and a BA with a focus on Geological/Geophysical Engineering, both from Hacettepe Universitesi. Her work examines how the chemistry of the Earth's System has changed through geologic time including recent perturbations by humans.

Keith Stewart

Sessional Lecturer
ENV 350H Energy Policy and Environment

Mr. Stewart has worked as an energy policy analyst and advocate for various non-profit groups for over a decade and currently works for Greenpeace Canada where he promotes the efficient use of renewable energy. He is the co-author of the book *Hydro: The Decline and Fall of Ontario's Electric Empire* and author of numerous articles, reports and op-eds on climate change policy and politics.

Barbara Murck

Senior Lecturer, Geography, UTM, ENV 395Y Special Topics Field Course: Ecology and Conservation in the Andes, Western Amazonia & Galápagos

Dr. Murck received her undergraduate degree from Princeton and her PhD in Geology from U of T. She has focused on international development, through environmental management projects in Africa, China, and SE Asia. She is an award-winning lecturer (President's Teaching Award 2010) and has written many books in geology and environmental science.

James Nugent

PhD candidate, Department of Geography, U of T JGE331H Resource & Environmental Theory

Mr. Nugent is a PhD candidate in the Department of Geography at U of T. He examines the responses of trade unions to the current dual ecological and economic crisis viewed through climate change politics and the dawn of the "green economy". He is also interested in biological conservation through an environmental justice lens and in the reproduction of environmental ideologies.

David Pond

Sessional Lecturer, ENV 320H National Environmental Policy; ENV 221H Multidisciplinary Perspectives on Environment

Dr. Pond teaches environmental politics and public policy in the Department of Political Science at U of T. He has published a comparative study of the federal Commissioner of the Environment and Sustainable Development and the Environmental Commissioner of Ontario (Canadian Study of Parliament Group, 2010).

David Sider

Sessional Lecturer, ENV 421HY Environmental Research; ENV 307H Urban Sustainability; ENV 440H Professional Experience Course

Dr. Sider is an instructor in the Environmental Management and Water Resources Management certificate programs and teaches in the undergraduate program at the School. He completed his PhD in Geography and Environmental Studies (Toronto), doctoral research on community-based environmental management in low-income urban settlements in India, and worked with environmental groups in Nicaragua, Malaysia and Canada.

Romila Verma

Sessional Lecturer; ENV200 Assessing Global Change: Science & the Environment

Dr. Verma is an Environmental and Physical Geographer. She has worked on Canadian and International issues including Ontario's source water protection plan, impact of weather variables on municipal water use, indicators of environmental change in Lake Simcoe, and hydrological parameters in Mahanadi river basin in India. Current interest is finding a sustainable solution to water crisis in Sahel region of Africa.

Erich Vogt

Sessional Lecturer
ENV 322H International Environmental Policy
ENV 451H Current Environmental Debates

Dr. Vogt's interests address the policies and politics of climate change, contemporary international environmental issues and global governance innovations. He has taught at George Washington University and American University in Washington, D.C. and was IUCN's senior multilateral policy advisor and managing editor of World Bank-incubated Development Gateway.

Kaley Walker

Associate Professor, Department of Physics, U of T
ENV 237/8H Physics of the Changing Environment

Dr. Walker's research group uses spectroscopic remote sounding techniques to study the composition and chemistry of the Earth's atmosphere. They use instruments carried by balloons and satellites as well as those located at the Earth's surface. These atmospheric composition measurements provide the data needed to investigate stratospheric ozone depletion, tropospheric air pollution and climate change.

Sheila Waite-Chuah

Sessional Lecturer
ENV 335H Environmental Design

Ms. Waite-Chuah has been teaching environmental/sustainable design for 15 years. Her interest in sustainable design is intimately linked with sustainable development, in both local and global contexts. She received a Masters in Environmental Studies from York University. She also teaches sustainable design at the Ontario College of Arts and Design University.

Adonis Yatchew

Professor, Department of Economics
ENV 282H Big Ideas in Energy I: Technology & Society
ENV 382H Big Ideas in Energy II: Economics, Politics and Security

Dr. Yatchew's research focuses on energy and regulatory economics, and econometrics. Since completing his PhD (Harvard) he has taught at U of T and has held visiting appointments at Trinity College, Cambridge, Australian National University and the University of Chicago. His work on semiparametric regression techniques has been published by Cambridge University Press. He is the Editor of The Energy Journal.

Dr. Doug Macdonald (Senior Lecturer and former Academic Associate Director, Environment) and Dr. Kate Neville (Professor of Political Science and Environment) lecture to graduate students in ENV 1001 Environmental Decision Making. Photo: William Suarez

Oliver Bussler

Climate Change Policy and Practice Program (DE)

Mr. Bussler is a distance education (DE) instructor who developed the materials for the Climate Policy and Corporate Responses course, co-developed and instructs the Sustainability Reporting course, and is an expert in climate change policy and sustainability reporting. He holds an MSc in Agricultural Economics from the University of Saskatchewan and an undergraduate degree from the Royal Military College of Canada.

Gennady Gienko

GIS for Environmental Management Certificate Program (DE)

Dr. Gienko is a School DE instructor, and Professor in the Department of Geomatics, College of Engineering at the University of Alaska, Anchorage, where he develops and teaches undergraduate and graduate courses in geographic information systems, geospatial image analysis, remote sensing and photogrammetry. He has extensive international experience in geospatial science, geomatics and photogrammetry.

Michael Govorov

GIS for Environmental Management Certificate Program (DE)

Dr. Govorov has instructed in the School's GIS (geographic information systems) in Environment Management distance program since its advent and was instrumental in its initial development. He has been teaching GIS and remote sensing in the online environment for over eight years and currently teaches and prepares undergraduate and postgraduate courses at the Vancouver Island University.

Rosemary Martin

Sustainability Reporting (In-Class)

Ms. Martin has 20 years' experience identifying environmental opportunities and risks, developing environmental strategies and implementing environmental programs in the steel, chemical, R & D, financial, real estate and consulting sectors. She is a Vice-President and the Chief Sustainability Officer at First Capital Realty Inc. She wrote the first Global Reporting Initiative (GRI)-compliant, externally assured, Corporate Responsibility and Sustainability (CRS) Report in the Canadian real estate sector.

Aaron Schroeder

Climate Change Policy and Practice Certificate Program (DE and In-Class courses)

Mr. Schroeder has eleven years of professional experience analyzing, quantifying and auditing greenhouse gas emissions in North America. Prior to forming Brightspot Climate Inc. in 2015, Aaron worked for several years leading a team of greenhouse gas verification and policy analysts across Canada. His verification experience exceeds 150 greenhouse gas project and facility verifications.

David Sider

Environmental Management and Water Resources Management certificate programs (DE)

Dr. Sider is a DE instructor in the undergraduate program at the School. He received his PhD in Geography and Environmental Studies from U of T and did his doctoral research in India, investigating community-based environmental management in low-income urban settlements. He has worked with environmental organizations in Nicaragua, Malaysia and Canada.

Ian Sinclair

Terrestrial Energy Systems (DE and In-Class courses)

Ian has worked in the energy and water management field since immigrating to Canada from the UK in 1997, focusing on the built environment. He has worked on a full range of building types: industrial to commercial, campus-wide to multi-residential, in a wide range of service types. These have included energy and water audits, building retrofits, recommissioning, renewable energy studies, measurement and verification, green certification, engineering and project management.

Lucy Sportza

Environmental Management, Renewable Energy, and Water Resource Management Certificate Programs (DE)

Dr. Sportza is a DE instructor who also teaches in the online environment and undergraduate program at the University of Guelph. She has an MA and PhD in Planning from the University of Waterloo. Her current interests focus on the use of parks and protected areas as part of urban sustainability.

Dr. Jennifer Murphy (Professor of Chemistry) teaches in ENV 316 Laboratory and Field Methods in Environmental Science. Photo: William Suarez

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Cover photos:

TOP (L-R): Turtle from ecological life-history study in Algonquin Park (Photo: Njal Rollinson). Draft floor plan for Sustainability in an Imaginary World installation (Image: Obi Vattanawong). Sphagnum mosses and other bog plants on a peatland surface, Attawapiskat River Watershed, Hudson Bay Lowlands, Northern Ontario (Photo: Sarah Finkelstein).

BOTTOM: Fish sampling in the Humber River with ENV 316 field course, September 25, 2015 (Photo: Andrew Drake).