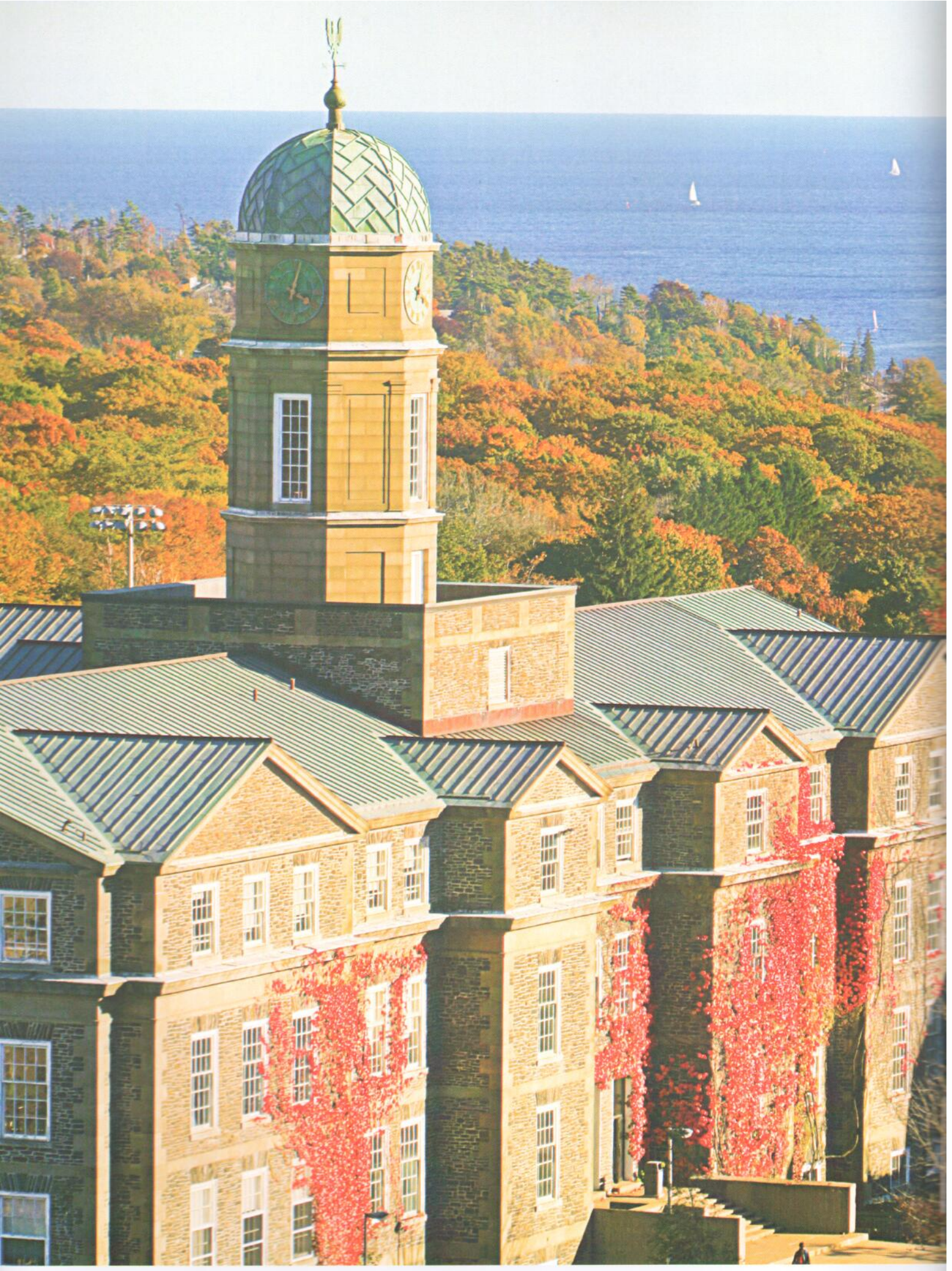
Ocean Science

at Dalhousie University

DALHOUSIE UNIVERSITY

Inspiring Minds

Faculty of Science



Dalhousie: Canada's oceans university

From the top floor of Dalhousie's Life Sciences Centre, you can see the ocean. Minutes from campus, you can stand on the shore. Fittingly, Dalhousie University is Canada's leader in oceans research and education.

Halifax, Nova Scotia is home to the largest concentration of ocean scientists in Canada and one of the largest concentrations in the world. This makes Dalhousie's Faculty of Science a breeding ground for oceans education, innovation, and international research collaborations such as the Ocean Tracking Network (OTN) and the Marine Environmental Observation, Prediction and Response (MEOPAR) network. Alumni from the oceans programs of Dalhousie's Faculty of Science are located at research facilities and universities on every continent, creating a world-wide network of experts.

This booklet outlines the full suite of oceans-related academic programs offered by Dalhousie's Faculty of Science, along with highlights of our strengths in oceans research, a sampling of the national and international collaborations we have with other universities, governments, and industry, and a glimpse of our plans for investing in the future of oceans research and education.

If you want to work on high-profile research and network with top oceans experts, Dalhousie University's Faculty of Science is the place to be.

Academic programs

Dalhousie's Faculty of Science offers several oceans education programs at undergraduate and graduate levels including:

- BSc in Marine Biology
- BSc in Ocean Sciences
- MSc and PhD in Biology
- MSc and PhD in Oceanography
- Master of Marine Management

How long is my flight?

Flying times to Halifax from:

Vancouver – 6.5 hours
Toronto – 2 hours
New York – 2 hours
London – 6 hours
Panama City – 6 hours
Hong Kong – 17 hours

BSc in Marine Biology

Gain a solid understanding of marine life through the Marine Biology Bachelor of Science. Courses take place in classrooms, labs and on the open water. Students run their own underwater experiments, track the movements of fishes and assess the diversity of marine birds. Arm yourself with the skills and knowledge to be a fully prepared marine scientist.

Sample classes:

Marine Ecology*

- Explore the patterns and processes at the organismal, population and community levels that determine the diversity and distribution of life in the sea.

Aquaculture*

- Through lectures, laboratories, and field trips, this class gives an introduction to aquaculture—the culturing of aquatic plants and animals.

Conservation Biology*

- Students learn how biodiversity is assessed and what tools are used to prevent the extinction of species and disruption of ecosystems.

Career opportunities

Bachelor of Marine Biology students gain the foundation to begin a career in science or to further their studies through a graduate program. Marine Biology graduates have gone on to pursue exciting careers such as:

- Marine biologist
- Endangered species researcher
- Veterinarian
- Forensic biologist

Find out more at: http://www.dal.ca/academics/programs/undergraduate/marinebio.html

**Note: classes are subject to change at any time. The classes listed here reflect current offerings.*

BSc in Ocean Sciences

With the need to better understand the effects of pollution, marine resource exploitation and global warming, ocean science is an increasingly important scientific discipline. Gain a thorough understanding of the ocean through study of physical, chemical, biological, and geological oceanography in this program, the first of its kind in Canada. You will also use a range of ocean science methodologies and expose yourself to ocean technologies and their applications.

Sample classes:

The Blue Planet*

- Develop an understanding of the ocean and the science of oceanography. Learn about the geological, chemical, physical and biological processes at work in the sea and consider how humans impact the ocean.

Communication in Ocean Sciences*

- Engage with working ocean scientists about their research, its relevance, and how to communicate science to different audiences. In addition to regular writing exercises that include journaling, blogging, and lab reporting, students compose a research paper and follow it through the process of submission and peer-review for an in-class journal.

Tools and Concepts in Ocean Sciences*

- Students gain applications-based insights into ocean science concepts through hands-on experience with data acquisition and analysis, instrumentation, and wet-lab experiments. Quantitative skills are developed and applied to ocean examples. Topics include determining the age of the earth, seawater chemistry, acidification, water mass variation, waves and tides.

Career opportunities

Graduates of the Ocean Sciences program will have a thorough understanding of the ocean, its inhabitants and the relationship between people and the seas. Grads leave well positioned for many science careers including:

- Marine manager
- Oceanographer
- Environmental consultant
- Climate change researcher
- Oil and gas consultant

Find out more at http://www.dal.ca/oceansciences

**Note: classes are subject to change at any time. The classes listed here reflect current offerings.*

Graduate Studies in Biology

Research what you're passionate about under the supervision of internationally renowned biologists. The Master of Science (MSc) and Doctor of Philosophy (PhD) in Biology are flexible programs with a strong emphasis on research-related activities. Students have conducted research all over the world and on every biological scale.

Sample supervisors and research interests

Hal Whitehead

- Behaviour, ecology, population biology and conservation of sperm whales in the eastern Pacific and Atlantic and northern bottlenose whales off the coast of Nova Scotia
- Movements, social systems and cultures of whales

Boris Worm:

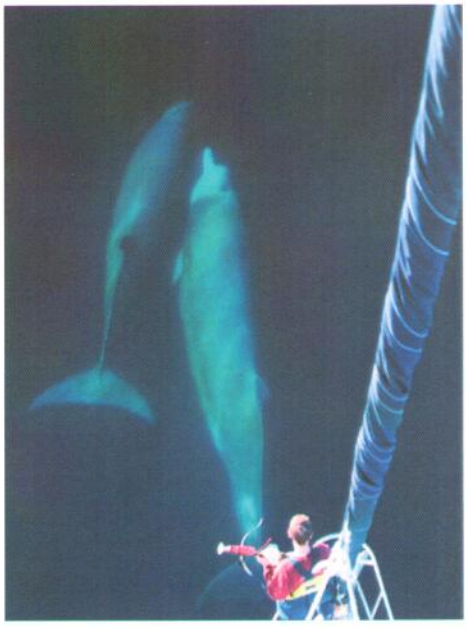
- Causes and consequences of changes in marine biodiversity
- Marine biodiversity conservation on a global scale

Sara Iverson

- Understanding the role of lipids in the evolution of energetic and reproductive strategies in marine mammals
- The use of "fatty acid signatures" as a tool to examine the diets and foraging ecology of marine and terrestrial vertebrates

Jeff Hutchings

- Causes and consequences of population collapses in marine fish
- Factors influencing the recovery of collapsed marine fish populations



Career opportunities:

Biology graduate students gain a solid foundation in biology and are well prepared for a variety of science careers. Some examples of careers biology graduates have gone on to include:

- Marine biologist
- Endangered species researcher
- Veterinarian
- Forensic biologist
- Professor

Find out more at http://biology.dal.ca/Graduate

Graduate Studies in Oceanography

Dig into complex science questions alongside world-renowned professors. Deeply understand how the world's oceans work through a Master of Science (MSc) or Doctor of Philosophy (PhD) in Oceanography.

Graduate programs in oceanography enhance students' science knowledge and prepare them to do research with real-world results: from moving shipping lanes in the Bay of Fundy to protect endangered right whales, to collecting valuable data from the ocean so scientists can better understand climate change and predict weather.

Sample supervisors and research interests:

Anna Metaxas

- Larval ecology of marine benthic invertebrates including invasive species
- Larval production, dispersal and recruitment of invertebrates at hydrothermal vents and other deep-sea habitats
- Structure of macro- and megabenthos associated with assemblages of deep sea corals

Christopher Beaumont

- Formation and subsidence of rifted margin and foreland basins
- Surface processes, geomorphology and sediment transport
- Thermal histories of sedimentary basins and the use of geochemical reactions and fission track dating as thermochronometers

Tetjana Ross

- Acoustic remote sensing of turbulent and double-diffusive microstructure in the ocean
- Small-scale bio-physical interactions in the marine environment
- Distinguishing acoustic scatter from biotic and physical sources

Helmuth Thomas

- Aquaculture-environment interactions
- Marine carbon cycle
- Coastal biogeochemistry

Career opportunities:

Oceanography alumni work all over the world uncovering and sharing information about the sea.
Graduates' careers include:

- Marine manager
- Water quality specialist
- Environmental consultant
- Climate change researcher
- Oil and gas consultant
- Professor

Find out more at http://oceanography.dal.ca/graduate

Master of Marine Management (MMM)

The Master of Marine Management (MMM) program combines marine, social, management, and political sciences. New to the Faculty of Science, the MMM gives a theoretical and practical basis for understanding coastal and ocean development, planning and regulatory issues affecting the maritime industries and the sustainable use of the sea's resources. The degree is a professional, non-thesis and interdisciplinary program.

Ultimately, the MMM teaches students to answer marine management questions through the application of various sciences. Subject areas addressed include but are not limited to coastal zone management, sea use planning, ecosystem based management, climate change adaptability, fisheries management, marine law and policy, maritime transport, development of non-living resources, protection and preservation of the coastal and marine environment, coastal tourism, marine enforcement and conflict management.

Sample supervisors and research interests:

Claudio Aporta

- Articulate Inuit understandings of Arctic coastal and maritime environments
- Indigenous land use, Indigenous geographic knowledge, Cartographic representations, Arctic anthropology, Inuit and sea ice, Northwest Passage history, anthropology of technology and anthropology of the environment

Lucia Fanning

- Roles of policy networks in influencing marine policy decisions; the assessment and effectiveness of evolving oceans governance regimes in managing marine uses;
- The use of ecosystem-based approaches to the management of coastal and marine space and use.

Career opportunities:

Graduates of the MMM have gone on to careers in the public, private and not-for-profit sectors. Some examples of those careers are:

- Fisheries officer
- Community development worker
- Seafarer
- Policy officer

For more information, visit
http://marineaffairsprogram.dal.ca/

Research

Ocean research in Dalhousie's Faculty of Science covers a variety of topics, but climate change and ecosystem impacts are central themes spanning the disciplines. Students and faculty work in labs and the field to deepen the science community's understanding of these themes and apply knowledge to tackle the complex challenges they present.

Research Spotlight

Ocean Tracking Network (OTN)

The Ocean Tracking Network (OTN), a $168-million global conservation project headquartered at Dalhousie, is putting an end to knowledge voids in science including why the oceans are warming and how marine animals move throughout the seas.

OTN is working to track thousands of marine animals around the world and at the same time is building a record of climate change — data that can be analyzed and applied.

OTN unites leading ocean scientists to conduct the world's most comprehensive examination of marine life and ocean conditions, as well as how they are changing as the earth warms. OTN data will lead to a global standard for ocean management in a way never before possible.

Because oceans are so vast and relatively inaccessible, they have often been managed with a poor understanding of how conditions and species are affected by human activities. OTN provides researchers with the technology and a global infrastructure to gather unprecedented knowledge of the world's coastal and ocean ecosystems for better governance and conservation practices.

Funding from the Canada Foundation for Innovation (CFI) and the Natural Sciences and Engineering Research Council of Canada (NSERC) allows for ocean tracking and monitoring technology deployment in the world's five oceans. It also supports the research hub of OTN Canada, which operates principally in Canada's three oceans, but includes international outreach to help build global leadership. Presently, over 200 international researchers from 15 countries are partners in tracking fishes such as sharks, sturgeon, eels, tuna, salmon and cod, as well as other marine species including squid, sea turtles and marine mammals.

For more information, visit http://oceantrackingnetwork.org/

Research Spotlight

Marine Environmental Observation, Prediction and Response (MEOPAR) Network

MEOPAR brings together a team of outstanding, Canadian natural and social scientists working to reduce our vulnerability to marine hazards and emergencies. Presently, over 50 MEOPAR researchers from 12 universities and 4 federal departments are collaborating on 7 research projects—with the network and projects continuing to grow.

Creating international connections by partnering with the university of Bergen and the Plymouth Marine Laboratory, the $25-million research network has the potential to transform the way the world deals with, operates in, uses and enjoys the oceans. We are developing new ways to share expertise, data, infrastructure, and approaches to anticipating and effectively responding to marine emergencies. MEOPAR is also training students and post-docs; helping them acquire academic and career skills that will meet the needs of their potential future employers.

Through research and observation, MEOPAR is working to help reduce Canada's vulnerability and exposure to hazards and decrease response time when marine emergencies occur.

For more information, visit http://meopar.ca

Research Spotlight

Transatlantic Ocean System Science and Technology (TOSST) Research School

TOSST is a joint, transatlantic graduate research school linking two major centres of ocean research on opposite sides of the Atlantic Ocean, in Maritime Canada and northern Germany. TOSST complements the existing Helmholtz Research Ocean System Science and Technology (HOSST). Research addresses key issues facing the North Atlantic: ecosystem hotspots, seafloor structures and ocean dynamics.

Students will travel between the countries, collaborate online, take part in overseas internships and come together once a year for an intense, two-week collaborative training and professional development conference.

For more information, visit
http://www.geomar.de/studieren/phd-hosst/

Research Spotlight

Canada Excellence Research Chair (CERC) in Ocean Science and Technology, Doug Wallace

The CERC Ocean Science and Technology Chair, worth over $34 million, is supported in part by a $10 million award from the Government of Canada.

Chair Doug Wallace leads a research team working to help predict and prepare for unprecedented changes in the world's ocean systems, from rising sea levels and overfishing to habitat destruction and ongoing increases in the acidity of ocean water. The team does this by examining the causes and consequences of recent changes and building tools to detect and address them.

The tools are containerized biogeochemical observation instruments to be stationed on research and commercial container ships around the globe. More sensitive than current observation methods, these instruments will gather information about the fundamental transformations happening in the ocean, including illuminating exchanges of carbon dioxide and other greenhouse gases with the atmosphere.

Then, working with other Dalhousie investigators, Wallace will develop computer models to predict future changes in the exchange of carbon dioxide and other greenhouse gases between sea and air.

Wallace spent more than a decade working as a scientist at the Brookhaven National Laboratory in the United States. He also made significant scientific contributions to his field through the Intergovernmental Panel on Climate Change, and the US Department of Energy, where he developed the first survey to measure the global distribution of fossil-fuel carbon in the oceans.

Wallace is also the Science Director of the Institute for Ocean Research Enterprise (IORE) and the Marine Environmental Observation Prediction and Response Network (MEOPAR).

For more information, visit http://www.cerc.gc.ca/chairholders-titulaires/wallace-eng.shtml

Spotlight

Canada Research Chairs

Dalhousie has more Canada Research Chairs doing oceans-related work than any other university in Canada. Unique facilities like the Aquatron (Canada's largest university aquatic research facility) and the Marine Gene Probe Lab (a top-quality molecular ecology research facility) make Dalhousie the 'go to' research institution for students and faculty, as well as private industry and government.

Researcher Spotlight:

Julie Laroche, Canada Research Chair in Marine Microbial Genomics and Biogeochemistry

Dr. Laroche's research seeks to help maintain human and environment health in the face of unprecedented global change. Her research involves building improved detection systems to monitor the overall diversity and function of microbial communities in the oceans.

LaRoche obtained her Ph.D. in biology from Dalhousie University, Nova Scotia, Canada. She has worked as a biological oceanographer at Brookhaven National Laboratory, Upton, New York, USA, for 11 years before moving to Institute for Marine Research in Kiel, Germany.

After spending 14 years in Germany working in the area of marine biogeochemistry, LaRoche has been awarded a Canada Research Chair Tier 1 in marine biogeochemistry and microbial genomics in the Department of Biology at Dalhousie University. Here at Dalhousie she continues and expands her work on marine phytoplankton, nitrogen fixation and the nitrogen cycle, combining marine genomics and stable isotope tracer studies.

For more information, visit http://www.researchgate.net/profile/Julie_Laroche2/

Researcher Spotlight:

Keith R. Thompson, Canada Research Chair in Marine Prediction and Environmental Statistics

Thompson's research seeks to improve marine environment models and assess the impact of environmental change.

His research involves four key projects:

- Participating in the Global Ocean Data Assimilation Experiment (GODAE), an international program to demonstrate the feasibility of conducting routine ocean forecasts on a global scale.
- Developing statistical models to predict and identify new physical mechanisms and hypotheses of ocean and atmospheric circulation for enhanced climate forecasting.
- Building a sea-level observing system that can be relocated to various locations to improve daily and seasonal predictions of sea level and sea shelf variability.
- Introducing a new statistical model to better assess flooding risk from storm surges.

For more information, visit http://www.phys.ocean.dal.ca/people/po/Thompson/Thompson_Keith.html

Spotlight

Institute For Ocean Research Enterprise (IORE)

We are a founding member of the Institute for Ocean Research Enterprise (IORE), formerly known as the Halifax Marine Research Institute (HMRI), which encourages bold undertakings and facilitates collaborative ocean research projects involving universities and colleges, government laboratories and private companies.

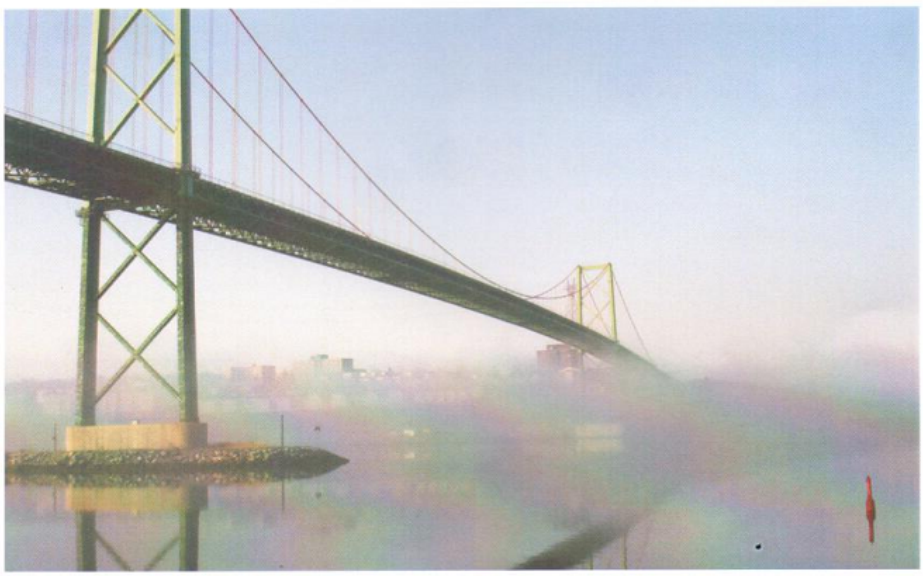
Uniting academics and government researchers, the institute bridges the marine research community, the private sector and policy-makers, and plays an integral role in joint projects with other nations. It also provides Canada with the best tools and scientific information available for making informed decisions about our oceans.

IORE applies world-leading science to economic, social and environmental challenges for the Atlantic region, Canada and the world's oceans.

IORE concentrates its research and development efforts on seven themes:

- Marine observation, prediction and response
- Marine living resource conservation, biodiversity and risk assessment
- Marine security
- Marine energy solutions
- Renewable fuels from marine algae
- Global marine governance and management
- Marine technology

For more information, visit http://iore.ca/



Industry and government connections

Dalhousie has long-standing relationships with industry and government. These relationships foster collaborations to advance research, oceans education and the careers of students.

Government collaborators include:

- Bedford Institute of Oceanography (home of Fisheries and Oceans Canada and Geological Survey of Canada)
- Defense Research Development Canada – Atlantic
- Institute for Marine Biosciences of the National Research Council
- Meteorological Service of Canada (Environment Canada)

Industry collaborators include:

- Vemco (collaborates with Dalhousie on the development of new technology for marine biology research)
- Ocean Nutrition Canada, the world's largest supplier of marine nutritional resources
- Immunovaccine (emerged from Dalhousie research on the prevention of seal worm infestation)
- Satlantic, an advanced ocean technology company that develops aquatic optical sensors (a spin-off from research in Dalhousie's Department of Oceanography)

International ocean science institution collaborators include:

- University of Kiel, Germany
- Woods Hole Oceanographic Institution, USA
- The Lloyd's Register Educational Trust, UK
- Qingdao University, China
- Sydney Institute of Marine Science, Australia
- University of Haifa, Israel
- Ben-Guiron University, Israel
- Helmholtz Association

Dalhousie often hosts international scientists and policy-makers.

Angela Merkel, Chancellor of Germany, visited Dalhousie on August 16, 2012 to witness the signing of a Memorandum of Understanding between the Halifax Marine Research Institute and Berlin's Helmholtz Association. While here she met with several of our ocean science researchers and graduate students to discuss research priorities and opportunities.

Investing in the future of ocean research and education

Ocean research and education feature prominently in the fundraising priorities of Dalhousie's Faculty of Science. Scholarships, bursaries, fellowships, experiential learning funds, labs and equipment operate in large part thanks to the generosity of Dalhousie friends and alumni.

Dalhousie-Bermuda Institute of Ocean Sciences Experiential Learning Fund

This fund will establish permanent internships for Dalhousie undergraduate and graduate students to conduct research at the Bermuda Institute of Ocean Sciences (BIOS). The fund will also help finance faculty exchanges.

Many Dalhousie science students and faculty have researched at BIOS over the years through work terms and exchanges. This fund will support long-term collaborations between BIOS and Dalhousie and ensure this relationship continues.

Sobey Fund for Oceans

The goal of the Sobey Fund for Oceans is to inspire innovative multi-disciplinary approaches for creating healthy oceans and sustainable economies. The Sobey Fund for Oceans provides resources to support scholarships, work placements, and student-led events and conferences to help tomorrow's leaders see "beneath the surface" of our oceans' problems to find lasting solutions.

For more information:
http://dal.ca/academics/programs/graduate/mmm/funding---support/sobey-fund-for-oceans.html

Dalhousie Ocean Sciences Building

In June of 2013, the $41.5 million Dalhousie Ocean Sciences Building opened. This 68,000 sq. ft. complex houses labs and offices for Canada Excellence Research Chair Doug Wallace and his research group. It also provides space for the Ocean Tracking Network, the Marine Affairs Program, the Marine Environmental Observation Prediction and Response Network, and the Institute for Ocean Research Enterprise. The Dalhousie Ocean Sciences Building expands the tank capacity of Dalhousie's Aquatron facility and includes space for future oceans research expansion.

For more information:
http://www.dal.ca/dept/facilities/campus-development/projects/oceans-excellence-centre.html

Fund For Ocean Exploration

This fund supports undergraduate and graduate student research, support for young faculty and special designated ocean discovery opportunities.

Why study in Canada? Start with natural beauty and sophisticated, safe cities. Add in that Canada is one of the world's best-educated nations, with a well-developed university system. What's more, we're one of the world's most multicultural societies. Little wonder more than 96,000 international students come here annually.

Halifax

A lively coastal city of almost 400,000, Halifax is the perfect size – offering a blend of everything you want in an urban setting with a friendly, small town feel. The city's youthful spirit, rich history and scenic waterfront all combine with our legendary Maritime Canadian charm.

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INTERNATIONAL

CONNECTIONS

The Regulation of Continental Shelf Development: Rethinking International Standards

Halifax, Nova Scotia

Partnering with the Center for Oceans Law and Policy, University of Virginia School of Law

Polar Oceans Governance Workshop

Sydney, Australia

Partnering with the Australian-Canadian Oceans Research Network (ACORN)

Sino-Canadian Workshop(s) on the Arctic

Beijing, China & Halifax, Nova Scotia

Partnering with the China Institute for Marine Affairs (CIMA)

CONNECT WITH US

We thrive as a community that brings people and ideas together.

We invite you to:

- Study with us as a JD or postgraduate student
- Spend time with us as a visiting research scholar
- Visit us as a national delegation
- Collaborate with us on international research and exchange opportunities
- Attend our free public lectures and programs

MARINE & ENVIRONMENTAL LAW INSTITUTE

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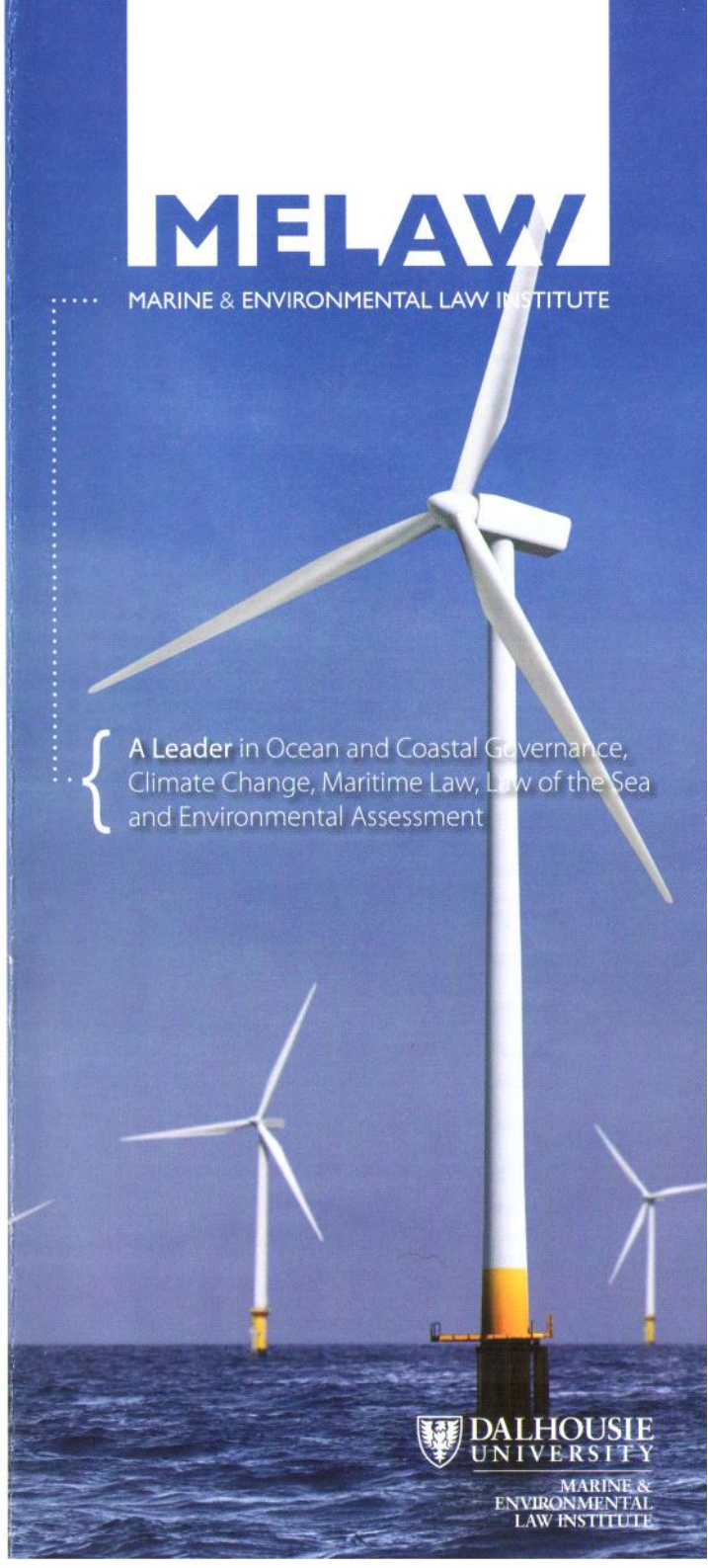
A Leader in Ocean and Coastal Governance, Climate Change, Maritime Law, Law of the Sea and Environmental Assessment



DALHOUSIE UNIVERSITY
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IMPACTS

We offer world-class expertise in legal and policy issues on projects carrying international impact. We provide independent advisory services, capacity-building research and consultancy to agencies of the UN, international NGOs, and many levels of government and private sector institutions in Canada and overseas.

RECENT PROJECTS

- Regional policy work: Atlantic, Arctic, Caribbean, Southeast Asia
- Environmental assessment of the Lower Churchill hydroelectric generation project: Labrador, Newfoundland
- Local integrated coastal zone management and capacity building: Southeast Cuba, Universidad de Oriente and Universidad de Guantánamo
- Legal review of submission to define ocean limits of continental shelf in the Indian Ocean, including legal requirements under the UN Convention on the Law of the Sea: Pakistan
- Legal review of draft legislation for compliance and harmonization with the UN Convention on the Law of the Sea: Nigeria
- Governance of Arctic shipping, Arctic Marine Shipping Assessment: Transport Canada and Arctic Council

INSIGHTS

We are a leading global centre of excellence for research, education and outreach in oceans and environment law and policy. We contribute to the development of the international agenda on issues of critical importance and foster strong institutional, international and interdisciplinary networks.

RECENT ACTIVITIES

- Marine and environmental law outreach and advocacy on continental shelf and offshore hydrocarbon development, environmental and species impact studies, tidal energy, Arctic tourism, and coastal and ocean governance
- Legislating Integrated Coastal Zone Management: Trends and strategies for coastal law-making: SSHRCC-funded research
- Understanding and Strengthening European Union-Canada Relations in Law of the Sea and Ocean Governance: Arctic Centre
- Tracking and Protecting Marine Species at Risk: Canadian Foundation for Innovation, NSERC, Ocean Tracking Network
- International and Domestic Legal and Regulatory Framework for Carbon Management: Carbon Management Canada Inc, Universities of Calgary, British Columbia and Dalhousie
- Comparing Canadian and Russian Approaches/Challenges in Arctic Ocean Governance: Donner Foundation

SCHOLARSHIP

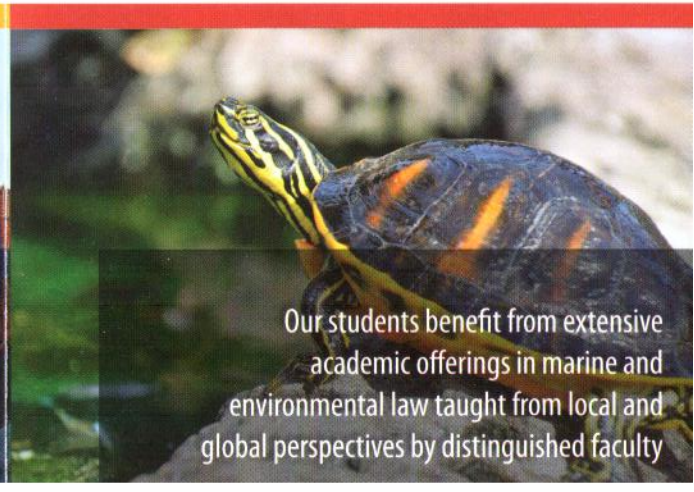
We are known for teaching and research excellence and we offer some of the world's most extensive course offerings in marine and environmental law. Our JD and postgraduate students learn from faculty whose leading-edge research and scholarship are widely cited internationally.

RECENT PUBLICATIONS

- A Chircop, N Letalik, T McDorman and S Rolston, *The Regulation of International Shipping: International and Comparative Perspectives*, Essays in Honor of Edgar Gold (Martinus Nijhoff, 2012)
- J Brunnée, M Doelle and L Rajamani (eds), *Promoting Compliance in an Evolving Climate Regime* (Cambridge University Press, 2012)
- M McConnell et al, *The Maritime Labour Convention, 2006: A Legal Primer to an Emerging International Regime* (Martinus Nijhoff, 2011)
- D Russell and D VanderZwaag (eds), *Recasting Transboundary Fisheries Management Arrangements in Light of Sustainability Principles: Canadian and International Perspectives* (Martinus Nijhoff, 2010)
- A Chircop, T McDorman and S Rolston (eds), *The Future of Ocean Regime-Building: Essays in Tribute to Douglas M Johnston* (Martinus Nijhoff, 2009)
- H Kindred, P Saunders et al, *International Law: Chiefly as Interpreted and Applied in Canada*, 7th ed (Emond Montgomery, 2006)

Thinning Arctic ice opens opportunities for global shipping and resource development – and for leadership on shipping regulation, ocean governance and biodiversity protection

Offshore development, ocean boundary management, environmental sustainability, international convention implementation – our expertise navigates complex legal waters



Our students benefit from extensive academic offerings in marine and environmental law taught from local and global perspectives by distinguished faculty

MARINE & ENVIRONM

{ IMPACTS } { INSIGH

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Ocean & Coastal Governance, Climate Change, Maritime Law, Law of the Sea, Environmental Assessment

The Schulich School of Law at Dalhousie University, with its location in the vibrant port city of Halifax, is internationally recognized for excellence in marine and environmental law teaching and research.

Teaching

Our flagship program, the **Marine & Environmental Law Program (MELP)** is celebrating its 40th anniversary this year. It has provided JD and post graduate students (LLM and PhD) with one of the most extensive academic course offerings in these two fields in the world since 1974. With 14 full and part-time faculty members currently teaching in the Program, students have a unique opportunity to learn about public and private law practice in marine (including shipping) and environmental law taught from domestic and international perspectives. Students wishing to specialize in these fields have the option of obtaining a **certificate of specialization** in either **Marine** or **Environmental Law** or both, while completing the three year JD degree. The MELP specializations are directed by the MELP Director, Dr. Aldo Chircop.

The Schulich School of Law also hosts two other research institutes, the Health Law Institute and the Law & Technology Institute, and offers concentrations in the fields of international law, business law and public law. In addition to the required courses in the MELP specialization, students are also encouraged to undertake research/courses in these and other fields in the JD curriculum. This allows students to engage with emerging and cross-cutting topics such as biotechnology, environment and health, ethics, indigenous rights, animal rights, international trade law and human rights.

Research

The long history of **research excellence** at the Schulich School of Law MELP faculty was formally recognized by the Dalhousie Board of Governors in 2004 with the creation of the **Marine & Environmental Law Institute (MELAW).** The Institute, which is housed in the Law School, carries out research capacity-building and consultancy activities and also directs the MELP academic specialization. The current Director is Dr. Meinhard Doelle. In addition to their scholarly research and publication activities, MELAW faculty and associates carry out research projects and provide advisory services to agencies of the United Nations, international non-governmental organizations, and regional organizations as well as assisting government departments, private sector institutions and non-governmental organizations in Canada and overseas.

MELAW is also the editorial office of the ***Ocean Yearbook*** **(OYB)** and the ***Journal of Environmental Law & Practice*** **(JELP).** The OYB is a major international interdisciplinary annual, devoted to ocean affairs published in collaboration with the International Ocean Institute (IOI). Schulich law students have the chance to gain experience working as research assistants on the Institute's research projects and workshops, and assisting with editing the OYB. JELP has served as the premier refereed legal periodical in Canadian environmental law and policy.

Collaboration and Community

MELAW supports student collaboration in addressing environmental issues through the Environmental Law Students' Society and the East Coast Environmental Law Association (ecelaw), a non-governmental organization dedicated to environmental law education and law reform. MELAW encourages interdisciplinary collaborations within the Dalhousie University community including the School for Resource and Environmental Studies (SRES), the Marine Affairs Program (MAP), the College of Sustainability, the International Development Studies Program (IDS), the Centre for Foreign Policy Studies, the Ocean Tracking Network (OTN) led by the Department of Oceanography and the Institute for Ocean Research Enterprise (IORE). MELAW also participates in national collaborations such as, Coastal Zone Canada. International linkages include: the Global Forum on Oceans, the IUCN Academy of Environmental Law, the Australia Canada Ocean Research Network (ACORN) as well as numerous other partner institutions in Asia, the Caribbean, Europe, South America and the United States.

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Members of the Marine & Environmental Law Institute

Director: Meinhard Doelle, BSc, LLB, LLM, JSD, Associate Dean, Research – envtl law, climate change, energy law

Associate Director (MELP Director): Aldo Chircop, NP, LLD, LLM, JSD, Co-editor *OYB* – coastal and ocean law & policy, maritime law, law of the sea, international environmental law, coastal management, marine protected areas, Arctic law & policy

Canada Research Chair (Tier 1) in Ocean Law & Governance: David VanderZwaag, BA, MDiv, JD, LLM, PhD – Arctic governance, aquaculture law & policy, law of the sea, international environmental law, international fisheries law

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Dawn Russell, BA, LLB, LLM – law of the sea, maritime boundaries, high seas fishing, international fisheries law and policy, international law, corporate law *(on leave)*

Phillip Saunders, BA, MA, LLB – law of the sea, maritime boundaries, fisheries, high seas natural resources

Teaching Associates

Jamie Baxter, BA Sc, MA, JD, LLM, JSD – property, land use, Aboriginal law, law and society, professional responsibility

Marc Dunning, BEng, PEng, LLM – envtl energy and natural resources law, contaminated sites, regulatory law

Lucia Fanning, BSc. (Hons.), MMM, PhD – regional ocean governance, integrated coastal and ocean management, adaptive co-management, marine piracy

Sean Forman, LLB, BES (Hons.) – natural resources law and environmental energy

David Henley, BBA, LLB, LLM – fisheries law, maritime law

Jessie Irving, BSc, LLB – energy, regulatory, property, envtl & natural resources law

Michael Simms, BA, LLB – oil & gas

Jamie Simpson, BSc, MSc, JD, ED ecelaw– forest ecology, forestry mgmt, climate change, envtl law, and Aboriginal law

Honorary Fellows

Bill Charles, QC, BA, LLB, LLM, Professor Emeritus – environmental area

Brian Flemming, CM, QC, DCL, BSc, LLB, LLM, Dip. Intl Law – public international law of the sea, fisheries law and policy

Edgar Gold, CM, AM, QC, BA, LLB, PhD, FNI, Master Mariner, Adjunct Professor – law of the sea, maritime law

Arthur J. Hanson, OC, BSc, MSc, PhD – fisheries, oceans and sustainable dev.

Hugh Kindred, LLB, LLM, Professor Emeritus – maritime law, carriage of goods, international law

Christian Wiktor, LLM, MSLS, Professor Emeritus – Editor *Marine Affairs Bibliography*

Research Associates

Jay Batongbacal, BA, LLB, MMM, JSD – maritime boundaries, integrated coastal mgmt, marine envtl law, shipping seafaring

Marie-Ann Bowden, BA (Hons.), LLB, LLM, Professor Emeritus – envtl law, water law, aboriginal envtl issues & resource dev.

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Howard Epstein, BA, LLB – land use planning

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Ted McDorman, BA, LLB, LLM – Law of the Sea, Arctic and Southeast Asia

Robert Miedema, LLM – environmental law

Lisa Mitchell, BA, LLB, MES – public interest environmental law

William Moreira, BB, LLB – energy regulatory law and marine transportation

Tony Puthucherril, LLM, MPhil, PhD - climate change adaptation and sea level rise, integrated coastal zone management, water law, environmental law, nuclear law

Susan Rolston, BA (Hons.), MA, Seawinds Consulting Services – marine affairs

Wendell Sanford, BA, BEd, LLB, MPP – oceans law, maritime boundaries, Arctic

Wylie Spicer, QC, BA – maritime law

Ronda Vanderhoek, BA, LLB – regulatory law

Hugh Williamson, BSc, BEd, LLB, MBA – law of the sea, maritime security, piracy

Gilbert Winham, BA, Dip Intl Law, PhD, Professor Emeritus– international trade law

MELP Specialization Certificates

Marine Law

Required:

- Law of the Sea
- Maritime Law and Practice

Elective:

- Carriage of Goods by Sea
- Coastal Zone Management
- Fisheries Law
- Marine Environmental Protection Law
- Ocean Law & Policy
- Oil & Gas Law

Environmental Law

Required:

- Environmental Law I
- International Environmental Law

Elective:

- Business and Environmental Law
- Coastal Zone Management
- Energy Law
- Environmental Law II-Interdisciplinary Perspectives on Climate Change
- Environmental Law Placement
- Fisheries Law
- Marine Environmental Protection Law
- Oil & Gas Law
- Planning Law
- Regulatory Systems in Environmental and Health Laws
- Willms & Shier Environmental Law Moot

NOTE: not all electives are offered each year

To earn a certificate, students must take two mandatory courses plus two others from the electives list. Students may apply to the MELP Director to have a paper, which will be written in another relevant course, approved for the purpose of one of the electives in a MELP Certificate.

Examples of relevant courses are:

- Aboriginal Peoples
- Animals and the Law
- Health Care Ethics and the Law
- Health Systems: Law and Policy
- International Trade Law

Courses in MELP are taught by a combination of full and part-time faculty members, marine and environmental law and policy practitioners and visiting scholars. The extent of involvement in MELP courses by particular MELP faculty members varies each year depending on the course offerings and graduate thesis supervision needs.

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