

## Department of Ocean Sciences: 2020 Vision and Goals

### *Executive Summary*

*The Department of Ocean Sciences (DOS) embraces the opportunity to take a leadership role in helping bring Memorial University to the forefront of Canada's ocean research and training and establish it as an international leader in oceans academia, and Canada's Ocean University.*

*This ambitious goal can be achieved by developing a world class undergraduate program that conjoins experiential learning about the ocean with a rigorous and engaging curriculum that builds on an already strong graduate program in ocean sciences. Integrating DOS expertise across disciplines through complementary undergraduate and graduate offerings with other academic units will facilitate the Department to become a national leader in collaborative research initiatives within and beyond Memorial. In order to achieve these goals, Memorial University must increase teaching and training facilities on the Ocean Campus at Logy Bay to take advantage of our unique environmental setting and to provide a graduate and undergraduate training and research experience unlike any other in the world.*

*Specifically, despite its relative proximity to St. John's, Logy Bay offers ready access to the ocean and clean seawater unequalled by any university in Canada. No other university in Canada offers oceanfront training on a year round basis in immediate proximity to a full campus and vibrant city. These attributes are currently undervalued. The Ocean Campus at Logy Bay offers abundant space for expansion of teaching and research infrastructure. It offers excellence in the future delivery of undergraduate and graduate ocean science programs. In order to help Memorial become Canada's Ocean University by 2020, DOS urgently requires the development of dedicated lecture and laboratory teaching space as well as the phased hiring of 5 faculty members in strategic target areas. These additions, together with the infrastructure already on site, provide the foundation for Memorial to enhance its strengths at an international level, by attracting adventurous and talented students, innovative faculty, and collaborators from around the world to what Memorial could "Become" uniquely in Canada with its Ocean Campus.*

The strategic importance of oceans and ocean resources to Canada, and more specifically to the province of Newfoundland and Labrador, demands a comprehensive and integrated national leadership role for Memorial University. Memorial University's 2007 Strategic Plan identifies oceans and renewable resources as priority needs for the province and the university. Ocean ecosystems have played a central role in Newfoundland's history, culture, and economy. Today, climate change, overfishing, and resource development add human pressures that threaten ocean sustainability. Memorial has ocean technology facilities as good as any in the world. It also has the expertise, distributed among its many faculties, to become "Canada's Ocean University" by building on its success in interdisciplinary research.

The newly created Department of Ocean Sciences (DOS) evolved from a non-academic unit focused almost entirely on high level research, to a new department expected to continue its historic research mandate but also expand on already significant contributions to both undergraduate and graduate training. DOS faculty embrace the opportunity to play a leadership role in bringing Memorial

University from a contributor to ocean science to a leader of Canada's ocean research and training. Current faculty members encompass a wide range of expertise in ocean sciences, under the theme of *sustainable oceans*. This broad theme fosters collaboration with ocean experts across faculties at Memorial. It promotes partnerships with government agencies provincially (e.g. Department of Fisheries and Aquaculture), and federally (e.g. Fisheries and Oceans Canada, Natural Resources Canada), and it provides opportunities to apply new technologies in ocean sciences to address complex questions. The sustainable oceans theme cuts across the four major ocean research needs identified by a recent expert panel of the Canadian Council of Academies: improving fundamental scientific understanding; monitoring, data, and information management; understanding impacts of human activities; and informing management and governance. DOS is well positioned to address many of the expert panel's priority questions. *What will be the impacts of climate change and ocean acidification on marine ecosystems, biodiversity, resource management, and coastal communities? How will changes in water quality, as a result of hypoxia, eutrophication, land-sea coupling, pathogens, contaminants, particles, and acidification, affect marine organisms associated with fisheries and aquaculture, especially sensitive life stages? What are the patterns and drivers of the temporal and spatial dynamics of biological diversity and marine genetic resources, especially poorly sampled taxa and areas? How are the movements and survival of marine organisms, including invasive species, being affected by environmental change, and what are the socio-ecological impacts? How will changes in biodiversity affect the functioning of ocean ecosystems?*

Because the ocean is a complex and dynamic system, leadership in ocean sciences requires an interdisciplinary foundation. Specifically, we propose that DOS form the core of the strongest Ocean Sciences group in Canada through collaboration with faculty members in the various departments in the Faculty of Science with oceans interests (e.g., Biochemistry, Biology, Chemistry, Earth Sciences, Physics and Physical Oceanography, and Psychology) and by building on links with faculty in Engineering, the Marine Institute, and the Faculty of Arts (Economics, Geography, History, and Sociology) with sustainable oceans foci. This initiative will strengthen Memorial's undergraduate offerings in the form of new ocean sciences curriculum, including a **new oceans** minor we believe will attract students at a national and international level, and also serve undergraduates from all departments with ocean interests at Memorial and externally. The combination of oceanfront location, internationally recognized facilities and leaders, and low tuition, will attract students from across Canada and beyond. For similar reasons, at the graduate level, the new Ocean Sciences MSc and PhD program will position the department to expand the Ocean Sciences graduate student body well beyond the 50+ students who are currently supervised by DOS faculty through other departments, and attract the best young scientists from around the world. These programs and interactions will catalyze new research directions for Memorial, enable new technologies and approaches to sustainable oceans, and establish DOS as a leader in the comprehensive training of Canada's next generation of ocean scientists.

The **broad strategic goal** for DOS is to establish Memorial University as a national and international leader in oceans academia, and *Canada's Ocean University*, by:

(1) developing a world class undergraduate program that conjoins experiential learning about the ocean with a rigorous and engaging curriculum;

- (2) building on an already strong graduate program in ocean sciences by integrating DOS expertise across disciplines through complementary graduate offerings with other academic units;
- (3) becoming a national leader in collaborative research initiatives within and beyond Memorial

We propose **three strategic objectives** to achieve these goals:

- (1) The immediate establishment of an undergraduate minor and a cluster of ocean sciences courses that complement existing offerings from other departments. This program could attract the best young people to marine science and establish Memorial University as THE university for undergraduate studies in ocean sciences. Current courses in this area that are taught by DOS faculty (e.g. Biological Oceanography) are already well subscribed, typically attracting 30 students per course. Coordinating course offerings across departments will likely increase these numbers. This minor could evolve into an interdisciplinary major that combines course offerings across a wide range of topics, from biological, physical, and chemical oceanography, to marine geology, to the ethology of marine organisms and to fisheries sociology.
- (2) Double the ~50 graduate students DOS faculty currently supervise by the year 2020 through targeted faculty hires and the addition of appropriate infrastructure. Other programs will also grow as collaborations raise Memorial's profile and attract graduate students in different ocean science disciplines attracted to the challenges of research that addresses ocean sustainability.
- (3) Targeted hiring in critical foundation areas for student training will strengthen the department in key emerging areas of ocean science research that cut across disciplines. New technologies in ocean research (e.g., genetic tools, ocean observatories, *in situ* sensors) offer potential for major research advances and leadership in tackling complex environmental problems in collaboration with other ocean experts at Memorial across departments, linking to St. John's emerging ocean technology sector.