



UNIVERSITY OF TORONTO
FACULTY OF ARTS & SCIENCE

398 Y RESEARCH EXCURSION PROGRAM

In an effort to provide as many opportunities as possible, priority will be given to those who have not already received funding for a Faculty of Arts & Science international opportunity including 398 REP, ICM, or DFIII – formerly known as DIIF – (Some exceptions may apply, please inquire for details). All proposals involving undergraduate student travel must include the full participation of a faculty member with a continuous undergraduate appointment to the Faculty of Arts & Science (St. George). All student participants must be current Arts & Science (St. George) undergraduate students in good standing and be enrolled in an academic program at the time the proposed activity takes place

PART I – Applicant information

Applicant(s) (for correspondence and notification)		
Last Name: Wittnich	First Name: Carin	Title: Professor
Sponsoring department: Physiology	Email Address: c.wittnich@utoronto.ca	
Project title or summary (for REP, please provide course code, weight (H or Y) and title: PSL398H -REP - Effects of climate change on marine animal physiology in the Bay of Fundy		
Total number of students participating: 6		
Location of activity (city and country): Comeauville, Nova Scotia, Canada		
Dates of activity: May 28- June 29, 2018	Dates off-campus (if different): June 4-19, 2018	

Part II – Proposed Activity

1) The proposed project can be described primarily as:

Student research opportunity (students work on a faculty or researcher's existing project)

3) Please describe the role of the Arts & Science faculty supervisor for this project and how they are involved in the proposed project (for undergraduate student supervision faculty must hold a continuous undergraduate appointment to the Faculty of Arts and Science, St. George).

Dr. Wittnich is funded through a 5 year renewable program grant (2016-2021) to study contaminant levels and effects in marine species found in the Bay of Fundy region. The research program, in which Dr. Wittnich annually conducts off campus field research work in Nova Scotia each summer, investigates whether climate change and the concentration and types of contaminants is increasing within natural marine environment (Bay of Fundy, Nova Scotia) physiologically how this affects aquatic animals in that area. The Bay of Fundy is a large body of water which is rich in marine life, of huge economical importance to the local economy, and an important food source for marine apex predators as well as many local communities. Numerous reports have stated that climate change may increase both the concentration and types of contaminants entering this important natural environment which could potentially affect the health of communities that have a high dependence on these

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numerous species that they consume. The economic value of the fishery in this area also raises additional concerns as to the possible impact of these changes on aquatic species growth and development. Because of the unexpected mass strandings of young herring in December 2016/January 2017 in the region, last summer stranded herring collected at that time, as well as a related species mackerel (normal fishery caught) were thoroughly examined by undergraduate students participating in an excursion course. Unique findings in the stranded herring have formed a portion of a report to be submitted to the Department of Fisheries and Oceans (DFO).

This proposed REP forms a specific portion of the continued progress in the program grant area, where in the summer of 2018, with the full participation of the students enrolled in PSL398REP, Dr. Wittnich will explore the prey species which will become more relied on commercially (such as hake, halibut, herring - commercially caught not stranded, flounder) consumed by both humans and apex marine animal predators (seals, cetaceans, sharks) found in this region. The focus for this REP in 2018 will return to the growth and development correlated with age in key organ systems and heavy metal concentrations in prey species that will be consumed more by both humans and apex predators of the region. The species that will form the basis for the work during this course, are easily available as they are routinely caught by local fishers often as bycatch and readily available for this course from numerous (5 -7) processing plants and local fishers along St Mary's Bay that Dr. Wittnich works with each summer.

During this field excursion, under Dr. Wittnich's guidance and supervision, **the students will do the following:** 1) perform general morphometric assessments (measurement of size/weight) of the various prey species and their organs (heart, liver, kidney, reproductive); as well as determine their age (otolith assessment technique) - to quantify baseline values, note any changes in growth and development vs age and conduct gross examination of the organs, 2) take tissue biopsies to measure the amounts of contaminants in relevant organs and tissues (after preparation, samples assayed at government certified laboratory), 3) conduct basic cytology, using locally available equipment, to see if there are any changes within the tissues. Each student selects a specific species of fish to study, and will conduct the full examination of their species and perform the above listed measurements.

Dr Wittnich's field research is based at the Comeauville Marine Institute (CMI), a local field research station located on the Bay of Fundy, she has used for over 6 years in the conduct of her grant funded research work. This facility has a fully operational laboratory with capacity for tissue histology, biochemistry as well as walk in freezers and autopsy facilities to accommodate even large marine species. This permits the morphometric and basic laboratory portions of the work which cannot be done in the field, to be done there. They also employ a full time PhD marine biologist with expertise in this area and have linkages with local Department of Fisheries and Oceans (DFO) and other researchers. The CMI has hosted other local school and college groups. As well, they hosted the PSL398REP students in 2017 as a resounding success, confirming this environment is perfectly suited for the Research Excursion students.

PART III – Details of proposed activity

1) Please provide a brief description of the proposed activity for recruitment and promotional purposes (for REP, this description will be listed on the website for students to read).

The students will spend the first week in Toronto during which they will have meetings/lectures where

orientations will take place including: course outline and requirements and marking scheme; project assignments given and explained. Specifically, the students will design their projects, perform the necessary literature review, and meet with Dr. Wittnich to review and solidify their projects. This will then be followed by the field excursion to rural Nova Scotia via air and ferry to where they will assist Dr. Wittnich in the conduct of her field research on the health of fish in the Bay of Fundy (Comeauville). There, group living style accommodations with local cuisine are provided; as such significant dietary restrictions cannot be accommodated. In addition, daily field work could involve mild inclement weather.

2) What are the planned academic outcomes for this activity? How will they be achieved through the proposed project?

The planned academic outcomes for this activity are for the students to gain practical field research experience and the skills necessary in not only completing this course but to also realize what is involved with future graduate work that would have a field excursion component. The students will become skillful in:

- setting up and preparing for their project (rational/hypothesis generation, literature review, equipment preparation)
- gathering tissue and data in the field (the pitfalls of working in the field, working as a team, etc)
- basic laboratory techniques to collect morphometric data, aging of fish; simple tissue prep and staining for histology
- analyzing their data (proper analysis, essentials of gathering the right data, limitations of work, etc)
- learning the physiological effects of climate change (temp, pH, salinity etc) from the cellular level to the complete organ
- the importance of being able to communicate their findings in a logical well understood manner (students all prepare and present posters at the FAS undergraduate research forum in March at the university)
- self directed learning

3) How do these outcomes benefit the applicant, their unit and the Faculty?

Students participating in this REP will have the opportunity to benefit from valuable experiences such as:

- 1) in the field hands-on gathering of organs/tissue, 2) developing a research project and data collection, 3) analyzing and presenting their data, 4) performing basic field laboratory techniques in preparation of tissue for examination including fish aging. Their unit benefits since the student's didactic learning is supplemented with hands on applied use of such knowledge and the Faculty benefits by have students in their programs who are motivated to continue learning and become more career oriented.

4) How will students be selected to participate in the proposed project (for REP please list any pre-requisites, specific conditions or other relevant information)?

Applicants with relevant courses (biology/physiology, environment, ecology); + interviews

5) How will this project help students develop a global perspective?

Students are immersed in the local culture and also learn about the local values and economy which is very different from what they experience in Toronto.

6) Please consult the International Programs website for available funding options. How does this project meet

the goals of the program(s) that you are applying for?

This project involves the full daily participation of the 6 students in the research project, collection of critical data in the field.

PART IV – Itinerary

Dates	Location	Activity
<i>May 28-June 1</i>	<i>Toronto</i>	<i>Orientation, project assignment, literature review, prep for field work</i>
<i>June 4</i>	<i>Toronto</i>	<i>Depart Toronto via air to Saint John NB, ferry to Digby NS, arriving at Comeauville facility (CMI) via shuttle. - welcome & brief orientation</i>
<i>June 5</i>	<i>Maviellette Beach, NS</i>	<i>Intro to laboratory & Research staff, safety & rules of facility; field excursion</i>
<i>June 6-14</i>	<i>Claire municipality NS</i>	<i>Daily field excursions for collection of specimens, morphometrics etc</i>
<i>June 15-18</i>	<i>Field station CMI NS</i>	<i>Work on tissue prep for assays, cytology lab work etc</i>
<i>June 19</i>	<i>Comeauville, NS</i>	<i>Departing Comeauville via shuttle for Digby ferry to Saint John NB, Saint John airport flight to Toronto,</i>
<i>June 20-29</i>	<i>Toronto</i>	<i>Presentations, handing in of required field data books; final report</i>

Marking Scheme:

30% - field data book (quality of data recorded)

25% - hands on field work

25% - presentations topic related research

10% - summary manuscript

10% - participation