



UNIVERSITY OF TORONTO
FACULTY OF ARTS & SCIENCE

398 Y Research Excursion Program
Summer 2019

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, CFHU or DIIIF – (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

Last Name: **Mahler**

First Name: **D. Luke**

Sponsoring department or program:
Ecology & Evolutionary Biology

UTOR Email Address:
luke.mahler@utoronto.ca

Part II – Project Summary

Project title: The Evolution of Ecological Diversity Across Neotropical Lizard Communities

EEB 398Y0Y L0301

Undergraduate participants will travel with Prof. Mahler to several sites in four regions across Ecuador to conduct intensive ecological surveys of Anolis lizard communities. Lizards will be surveyed using mark-resample techniques, and resulting census data will be used to (1) compare the structure of mainland tropical communities to those found on tropical islands (data collected during REP projects in 2017 and 2018), and (2) to investigate how conversion of forest to agriculture affects the structure of local animal communities across elevation gradients, a question of great importance for biodiversity conservation in the Anthropocene.

Student Responsibilities and Evaluation Procedures:

Students will participate as full members of our research team, and will contribute to a diverse range of research activities in the field and lab, as well as basic logistical and domestic activities necessary for successful expeditionary fieldwork (e.g., shopping, cooking, cleaning, and organizing). Each student will also be responsible for analysis of one aspect of the project, and will prepare a report (in the format of a scientific publication) describing the data collection, analysis, and interpretation associated with this part of the project. Students will be graded according to the following marking scheme:

Participation	35%
Quality of data collection and analysis	35%
Quality of the final report	30%

OFFICE OF THE DEAN

Suite 2005, Sidney Smith Hall, 100 St. George Street, Toronto, ON M5S 3G3 Canada

Tel: +1 416 946-5509 • Fax: +1 416 978-3887 • mp.stevens@utoronto.ca • www.artsci.utoronto.ca/international-programs

Total number of undergraduate students participating: 4

Location of activity (city and country): Ecuador (many locations)

Dates of activity: June 6 – Aug. 22,

Dates off-campus (if different): June 20 – Aug. 9, 2019

Role of faculty supervisor:

Please describe the role of the A&S faculty supervisor for this project and how they are involved.

Assistant Professor D. Luke Mahler (EEB) will supervise this project with the assistance of a senior member of his laboratory (most likely PhD student Ken Toyama, who is from Peru and has deep experience in this region). Prof. Mahler conceived this research project and obtained funding for equipment to be used for this work. Mahler's PhD trainee Toyama will take a leadership role with this research under Prof. Mahler's guidance. Together, Mahler and Toyama will supervise student participation in this work, both in the field and in the laboratory.

PART III – Details of Proposed Activity

Description of proposed activity:

Please provide a brief description that is student-facing and can be used in A&S promotional materials. Approved REP course descriptions will be listed on the website for students to read.

Adaptive radiations of neotropical *Anolis* have played a central role in the study of niche evolution. However, we still know very little about the stability of *Anolis* community structure across geographic space, or how total ecological diversity is partitioned within, versus between, local communities. Further, we have little understanding of how human impacts intersect with ancient evolutionary processes, by potentially favouring or disfavoring particular phenotypes that have driven adaptive radiations. Understanding how local species richness and ecological diversity shifts across tropical landscapes and across gradients in human land-use will shed light on the relative importance of biogeographic versus community ecological factors in generating adaptive diversity through evolutionary time, and in maintaining this diversity in a human-dominated era.

This summer, I will lead my lab to survey community composition of anole lizards across elevational gradients in Ecuador. Over the course of a ~5-week field season we will use mark-recapture techniques to estimate the richness and absolute abundances of *Anolis* lizard species at 24 field locations across 4 focal regions. To understand the ecological drivers that shape lizard communities we will employ temperature data loggers and thermal imaging to characterize diversity of the thermal environment through space and time within natural and anthropogenic habitats. To understand how ecological diversity shifts along environmental gradients we will pair community data with morphological data obtained by scanning museum specimens in a CT scanner to quantify morphological characteristics of the *Anolis* species encountered in the field. We will then examine how morphological diversity of entire communities shifts between geographic regions and habitats. Following fieldwork, data will be analyzed in my laboratory at the University of Toronto.

Planned academic outcomes:

How does this project relate to the academic goals of the applicant, unit and Faculty?

Students will help collect data for a long-term community survey across the New World tropics. Students

will learn several core techniques used in the practice of ecology, including (1) study design, (2) establishing standardized field plots, (3) collecting environmental data, (4) identifying species, (5) mark-recapture methodology, (6) data organization and analysis, and (7) scientific writing. They will also learn to use both traditional and cutting edge methods to obtain environmental data temperature data by deploying temperature loggers and by taking thermal imaging data in the field. The data that the students collect and analyse will constitute a core component of several research projects in the lab.

How will students be selected to participate in the proposed project?

Students will be selected based on their motivation, with preference given to EEB majors. Degree of experience with outdoor activities such as hiking, camping, or backpacking, and comfort working in nature will be considered as well.

Indigenous Consultation: N/A

For proposals involving Indigenous communities, explain your process of engaging with Indigenous partners. If you have questions regarding consultation, please contact Brenda Wastasecoot: brenda.wastasecoot@utoronto.ca.

How does this project meet the requirements of the REP Program?

This project, which builds on highly successful REPs conducted in 2017, 2018, conforms to all requirements listed at the hyperlink referenced above (requirements 1 through 8).

More generally, the project will help students develop a global perspective. Students will be immersed in Ecuadorian culture for most of the research experience, and will interact with local people while in the field. Further, they will experience tropical biodiversity first-hand, which helps foster a global understanding of biodiversity.

This project provides four students the opportunity to develop key scientific skills in ecology while working on a faculty-led project in Ecuador. It will provide a rare training opportunity for conducting integrative biological research in diverse settings (field as well as laboratory) and across international boundaries.

Does this project require ethics approval? X yes

If yes, please provide REB approval **REB protocol number:** AP#: 20011469

All undergraduate students, graduate students, and faculty taking part in international opportunities must meet the UofT Safety Aboard guidelines as noted on the Safety Abroad website:

<http://www.studentlife.utoronto.ca/cie/safety-abroad> in order to participate. Support will be provided by the Professional and International Programs (PIP) office at Woodsworth College to ensure safety abroad requirements are met.

PART IV – Itinerary

Dates	Location	Activity
June 6-20	Toronto	Assemble field gear, and pre-field work training
June 20-21	Quito, Ecuador	In country field work preparation with colleagues at Pontificia Universidad
June 22 – July 22	1 study region in Pacific lowland rainforest, 1 region in Amazon rainforest, 1 region in mid-elevation Andean	<u>Field surveys at each location</u> Day 1: Establish field plots, and take/set up environmental data measurements. Day 2-4: Mark-recapture of Anolis communities.

	<i>rainforest, 1 region in high elevation Andean cloudforest</i>	<i>Day 5: Travel to new region.</i>
<i>July 23-25</i>	<i>Quito, Ecuador</i>	<i>In country wrap-up, and depart for Toronto</i>