

Bio-logue Fall 2018 Alumni Newsletter



UNIVERSITY OF COLORADO DENVER
DEPARTMENT OF INTEGRATIVE BIOLOGY



Dear Alumni and Friends

The 2018 Fall Semester was a busy one for the Department. Our department continues to advance the research mission of CU Denver. Our faculty and graduate students traveled nationally and internationally to speak at conferences and present their research. We are saying farewell to Dr. Charles Ferguson, and have set up a new Fund in his honor. You can read about this new fund in this newsletter. We'd like to share all the details of the Fall Semester with you below and we'd also like to hear from you, your professional accomplishments and milestones and share these in future newsletters. If you have news to share please email, jacki.craig@ucdenver.edu

All my best,
John Swallow, Ph.D.
Professor and Chair
CLAS.UCDENVER.EDU/BIOLOGY

Faculty News

Charlesworth receives NIH funding for new research

Amanda Charlesworth, Associate Professor in the Department of Integrative Biology, received an R15 award from National Institute of Child Health and Human Development, National Institutes of Health for 3 years to study "Maternal control of zygotic genome activation by the RNA-binding proteins, Zar1 and Zar2". After fertilization, the embryo does not use its own DNA, instead the embryo uses temporary genetic material that was donated to the egg by the mother. Charlesworth, along with graduate and undergraduate students, will investigate how that temporary genetic material is used to switch on the embryo's own DNA using frog eggs and embryos as a model system.

Phiel Lab discovers new facet of stem cell biology

New research from Integrative Biology Associate Professor Christopher Phiel (and colleagues) "Glycogen synthase kinase-3 (GSK-3) activity regulates mRNA methylation in mouse embryonic stem cells" describes an intersection between these components in the regulation

of m6 A by GSK-3. The research found that protein levels for the RNA demethylase, FTO (fat mass and obesity– associated protein), are elevated in Gsk-3-deficient mouse embryonic stem cells (ESCs). In addition, Phiel’s lab was recently highlighted in The CRISPR Journal (Issue 1, volume 2) for its excellence in undergraduate education, student-centered practices, and student-focused research opportunities resulting in enhanced biology education and comprehension.

Buma publishes on soil carbon stocks

Brian Buma, Assistant Professor of Integrated Biology, and colleagues recently published “Large, climate-sensitive soil carbon stocks mapped with pedology-informed machine learning in the North Pacific coastal temperate rainforests” in Environmental Research Letters. This international work spanned Alaska and Canada, covering the most biomass-dense ecosystem on the continent at an unprecedented resolution and extent. In it, the team maps soil carbon at a very fine grain and explore controls on where carbon accumulates, as well as compare estimates to global products used in climate modeling - and find ways to improve them.



Tomback on wolf reintroduction in Colorado

Integrative Biology Professor Diana Tomback said, “There are compelling practical reasons for restoring the gray wolf to Colorado. The ‘balance of nature’ is not just a poetic catch phrase, it refers to a real ecological state.” She spoke at the Durango Wolf Symposium at Fort Lewis College in November. The event provided diverse perspectives on wolf ecology.

Can we learn to live with wolves again?

The Durango Herald, Nov 12

Buma publishes on linking paleo and contemporary ecology studies

Brian Buma, Assistant Professor of Integrated Biology, and colleagues recently published “The value of linking short and long-term perspectives to understand spatially-explicit ecosystem resilience.” in Landscape Ecology (Buma B, Harvey B, Gavin D, Kelly R, Loboda T, McNeil B, Marlon J, Meddens AJH, Morris JL, Raffa K, Shuman B, Smithwick E, McLauchlan K). Traditional ecology is quite adept at determining mechanisms and explaining phenomena, but not well suited to thinking about non-contemporary climate situations or looking across

really long time scales (1000 years +). Linking with paleo ecologists is a good way to alleviate those shortcomings. In this paper, the team suggests various ways for those links to be made intentionally and proactively and ways to push interdisciplinary partnerships.

Climate change threatens iconic alpine conifer, new genetic markers offer hope

A University of Colorado Denver-led research team for the first time developed reliable genetic markers known as nuclear microsatellites for the whitebark pine, a discovery that could improve the tree's prospects for survival. The whitebark pine is declining rapidly nearly range-wide as a result of climate change, which is why it is a candidate for listing under the Endangered Species Act.

Diana Tomback, PhD, in the field studying the whitebark pine

According to a research article published in the academic journal PLOS ONE, "[Development of nuclear microsatellite loci for *Pinus albicaulis* Engelm. \(Pinaceae\), a conifer of conservation concern](#)," the new genetic markers represent a useful and low-cost method for screening whitebark pine trees for levels of genetic variation.

Prior attempts to find these genetic markers were unsuccessful, thwarted by the complex, large and highly repetitive whitebark pine species genome, which is nearly nine times larger than the human genome. "With this breakthrough, scientists can begin screening whitebark pines for disease resistance traits, for strategic seed collection and other conservation and climate change mitigation efforts," said [Diana Tomback](#), PhD, a professor in the [Department of Integrative Biology](#) at CU Denver. "Genetic screening using microsatellites is a fast, affordable tool with multiple research and restoration applications for protecting this special tree, which plays a significant ecological role in high-mountain ecosystems."

[University Communications](#)

October 18, 2018

Student News

Mastin publishes in Botany

Integrated Biology alum Jared Mastin (BS 2013, MS 2017) has published "[Climatic Niche Modeling Reveals Divergence between Cytotypes in *Eutrema edwardsii* \(Brassicaceae\)](#)" in the journal *Botany*. Mastin and co-authors [Leo P Bruederle](#) (Professor Emeritus, Integrative Biology) and Peter Anthamatten (Associate Professor, Geography and Environmental Sciences) provide evidence supporting the hypothesis of niche divergence among tetraploid and hexaploid cytotypes in this species. Niche expansion was also revealed among hexaploids, which are expected to have a broader tolerance of environmental conditions.

Two Masters Degree student candidates pass their thesis defense.

Sara St. Onge and Nicholas Bard successfully defended their thesis defense to complete their Masters Degree.

Sara St. Onge: Long Term Urban Wildlife Research Potential Through Course-based Undergraduate Research

Urbanization is increasing rapidly worldwide, leading to highly fragmented habitats which have been shown to be the leading cause of local wildlife species endangerment. Urban wildlife monitoring has the potential to support land and wildlife management decisions, wildlife and habitat conservation, zoonotic disease monitoring, help with human-wildlife conflicts, and educate the community about urban ecological issues. Long term monitoring can be

perpetuated by creating a course-based research experience around it. Incorporating relevant, local, and authentic research into introductory undergraduate courses has been shown to have positive impacts on student interest, engagement, and retention. This thesis will present the implementation of a long term urban wildlife monitoring program in Denver, analysis of preliminary urban wildlife data, and the creation and assessment of a Course-based Undergraduate Research Experience (CURE) for a General Biology laboratory course using the long-term monitoring of urban wildlife as a context.

Nicholas Bard: Population Genomics and Soil Niche Assessment of a Rare Edaphic Endemic Range-limited rare endemic species are threatened by loss of genetic diversity, which may lead to extirpation and extinction. *Carex scirpoidea* Michx. subsp. *convoluta* (Kük.) Dunlop (Cyperaceae) has a narrow geographic distribution — limited to disjunct, fragmented habitats on the Northeastern shores of Lake Huron. The majority of populations grow in alvar habitats, characterized by thin soils on limestone bedrock. Conversely, *C. scirpoidea* subsp. *scirpoidea* is distributed on diverse habitats and soil types across Northern North America, and Greenland, with few populations in Norway and Russia. Though an apparent edaphic (soil) endemic, it is unclear whether subsp. *convoluta* has differentiated genetically from subsp. *scirpoidea*. We used double digest restriction-associated DNA sequencing to measure genetic differentiation, and test whether subsp. *convoluta* harbors lower genetic diversity than subsp. *scirpoidea*. Overall, subsp. *convoluta* exhibits higher genetic diversity than its conspecific—likely due to nearly-obligate outcrossing. Subsp. *convoluta* shows little genetic differentiation from Eastern North American populations of subsp. *scirpoidea*, suggesting that, if occurring, speciation is at an early stage. In another study, we measured chemical and physical properties of the soil for each taxon to test whether subsp. *convoluta* exhibited a distinct, narrow niche compared to the widespread subsp. *scirpoidea*. When multiple parameters were considered, neither taxon exhibited an affinity for a distinct edaphic niche. Populations in both taxa were shown to inhabit adverse soil types, including saline and calcareous soils. Further research will investigate whether local genomic adaptation has facilitated the inhabitation of unique soil types in both taxa.

Smilodon Integrative Biology Outstanding Student Scholarship

We are very grateful to an extremely generous anonymous donor for recently creating an endowment in Integrative Biology to fund two \$250 student scholarships for deserving undergraduate Biology students each semester.

Note: This is our first Biology scholarship endowment. We have hundreds of deserving Biology majors, many supporting families and working their way through school. Scholarship support for undergraduate and graduate students is one of the most important ways that you can help make our program better.

The 2018 Fall awardees of the Smilodon Outstanding Students are:

Olivia Bonney – Outstanding Undergraduate Student nominated by Dr. Laurel Beck

Ashley Lundstford – Outstanding Graduate Student nominated by Dr. Annika Mosier

NEW!!!! – Charles Ferguson Scholarship Fund

Charles Ferguson, Professor of Integrative Biology, is retiring this academic year. Dr. Ferguson's legacy is the Health Careers Advising Center that he advocated for and build from scratch. Through his efforts in Health Careers Advising he has impacted the lives of countless students going into health professions. To honor Dr. Ferguson, his friend and colleagues started the Charles Ferguson Scholarship Fund, to provide undergraduate scholarship support

for students enrolled in pre-health programs at the University of Colorado Denver. If \$25,000 is raised within five years, the fund will be administered as a permanent endowment. Dr. Ferguson was overwhelmed that his friends and colleagues wanted to do this for him.

For information about donating, please go to:
<https://giving.cu.edu/about-us/university-colorado-foundation> and designate your gift for scholarships,
Department of Integrative Biology, CU Denver.
