THE UNIVERSITY OF VERMONT
COLLEGE OF ARTS AND SCIENCES

DEPARTMENT OF BIOLOGY

NEWSLETTER SUMMER 2020

Dear UVM Biology friends and alumni,

I hope you are all staying safe and well in this unprecedentedly uncertain time. I presume that for many of you, the last few months have brought unexpected new challenges, as many aspects of our daily lives that we took for granted were suddenly revealed to be a lot more tenuous than we had realized. In the midst of all that, something like the Biology newsletter might seem pretty unimportant. But, I'd argue that the quiet work being done to keep our institutions functioning well, contributing in the small ways that we can to solve problems and train the next generation of scientists, is something we do need to acknowledge and value so they do not end up accidentally lost when our focus is turned away by crisis.

And thus, I hope you can take a few minutes to check out what our students, faculty, staff, and alumni have been doing over the last year. As befitting our Teacher-Scholar mission, our faculty have been exceptionally active in research, from uncovering the basis of retinal diseases to testing for adaptation to climate change. We are proud to have two faculty members who have received prestigious National Science Foundation CAREER grants for junior faculty, Drs. Brent Lockwood and Melissa Pespeni. Students have been involved in every aspect of these projects, leading to student-authored articles, fabulous theses, and entry into professional schools and laboratory positions. I want to especially note the amazing mentorship of Lecturer Laura May-Collado, who with a dedicated cadre of undergraduates has developed a thriving research program on marine mammal conservation using bioacoustic monitoring. Her efforts in research, teaching and service were recognized this year at the highest level, as the recipient of the 2020 UVM President's Distinguished Lecturer award.

At the same time, our educational mission has had to adapt at lightning-speed to the covid-19 crisis. Somehow, over two weeks in mid-March, we managed to shift everything remote, including laboratory courses. This process reminded us that the skills we use as active scientists are not limited to bench techniques, and you can learn just as much hands-on science analyzing images of experimental cells or corn plants, investigating gene sequences of ants or sea urchins, or statistically analyzing datasets large and small. In fact, quantitative skills are becoming absolutely essential in every field of biology and medicine, and I suspect that what we are doing now, spurred on by the pandemic, will become an integral part of our curriculum and lead to better-prepared, more computationally literate graduates.

Finally, we have been engaging in serious self-reflection as instructors and as a department in light of the nationwide movement for Black Lives following the murder of George Floyd. It is all too easy to hide behind a claim of objectivity in science, but in fact being "colorblind" fails to acknowledge that bias and inequality have produced the composition of students, teachers, colleagues and even research topics that we see in front of us, and keeping that status quo perpetuates bias into the next generation. It is time for action, in every discipline. This has been a focus of some of our faculty for some time, with a redesigned course in Forensic Biology that now tackles racial bias in the criminal justice system, and the QuEST graduate training program that centers diversity, inclusion and equity at the heart of its curriculum. We are also highlighting the incredible contributions of Black scientists and those in other under-represented groups in our courses and seminars, which we hope will start to shift the landscape toward a biology community that truly reflects the diversity of our society.

In a week, the new academic year will be upon us, and we will be navigating the new reality of a socially-distant campus. Making it a success is going to take both preparation and flexibility to deal with the unknown, with a shared commitment by faculty and students. A challenge, but definitely doable, and hopefully I'll have lots of good news to share in my next newsletter message to all of you!

All the best,
Sara

Best wishes on retirement to Senior Lecturer John Mitchell

After a whopping 39-year career at UVM as post-doctoral Associate, Research Faculty, Lecturer and Senior Lecturer, Professor John Mitchell has decided to retire from his position in Biology. John has taught literally thousands of students during his time here, conveying his expertise in cell biology and human physiology in courses across the curriculum with stories, humor, and a good dose of academic rigor. His reach has been far and wide – he is the most common professor mentioned to me by name when I tell people my home department, and many a former student has told me that they discovered a love of biomedicine through taking one of his courses in Human Biology. Although he is stepping down from his full-time position, John will be continuing to teach Human Biology as a part-time instructor, as he makes plans for his retirement years with his wife (and a Biology alum herself) Janet Woodcock-Mitchell. We wish them good health and lots of fun adventures to come!

Paul Black wins education award

UVM Biology alumnus and former recipient of our Accomplished Alumni Award was recognized as the 2020 recipient of the American Society for Biochemistry and Molecular Biology Award for Exemplary Contributions to Education. As described on the ASBMB's website, the award "recognizes an individual who encourages effective teaching and learning of biochemistry and molecular biology through his or her own teaching, leadership in education, writing, educational research, mentoring or public engagement.

"The award was instituted in 2005 and is given annually by the ASBMB Education and Professional Development Committee.

"The award consists of an honorarium of $3,000 and the opportunity to present a plenary symposium lecture at the ASBMB annual meeting."

Dr. Black was profiled by contributor Mohor B. Sengupta, which can be found at: https://www.asbmb.org/asbmb-today/people/110119/blacks-career-balances-teaching-and-research.

For additional news stories and the goings-on of the Department of Biology, please check out our website at uvm.edu/cas/biology!

Alum Spotlight: Marion Weir

After graduation from the Department of Biology in Spring 2016, I worked as a Product Scientist at Cell Signaling Technology in Beverly, Massachusetts. In my role as a Product Scientist I worked on the development, evaluation, and characterization of new antibody lots. I recently relocated to the Denver, Colorado area and accepted a Research Associate position at the University of Colorado Anschutz Medical Campus. My research focuses on Obesity and Diabetes, and understanding the potential links to cancer.

Dr. Weir earned her PhD in Biology in 2016, completing her research in the Ballif lab.

Alumni reunite at Sanofi

Dr. Judith Keller graduated from the Biology Department during the Winter of 2019 after studying Chagas disease and using protein mass spectrometry to discover what the insect vectors that transmit Chagas disease are feeding on. Working with Dr. Bryan Ballif and Dr. Lori Stevens, Judith accomplished this by developing an innovative approach to studying insect vector blood meals using protein mass spectrometry. The final chapter of Judith's dissertation titled "Protein mass spectrometry detects multiple bloodmeals for enhanced Chagas disease vector ecology" was published this past summer in *Infection, Genetics and Evolution* and highlights the application of this new mass spectrometry-based method for Chagas disease. More recently, Judith started a new position at Sanofi Genzyme, which focuses on treatments for rare diseases, rare blood disorders, multiple sclerosis, oncology, and immunology. Coincidentally, Judith and a fellow UVM Biology alumnus, Dr. Tyler Picariello (Winter 2015 graduate) began working at Sanofi within a month of each other. While Tyler's expertise is within the Rare Renal and Musculoskeletal Disease division, Judith's current role as a Quality Control Scientist focuses on method development, qualification and verification.

Alum Spotlight: Samantha Alger

Recent UVM Biology graduate Dr. Samantha Alger has joined VHB—an engineering/architecture/consulting firm with thirteen offices on the east coast including South Burlington, Vermont. How exactly does an ecologist specializing in bee conservation join an engineering firm? Recent documented declines of both managed and wild bee species have brought pollinator conservation to the forefront of public interest and a growing momentum for "pollinator-friendly" initiatives in the state, federal, and private sectors. Samantha will play a vital role on projects such as improving habitat for pollinators along roadways and in solar fields, mitigating impact to vulnerable and endangered species, and assessing pesticide risk to bees in agricultural landscapes. In addition to her position at VHB, Samantha is continuing her research and outreach in all things pollinators as a research affiliate in UVM's Plant and Soil Science Department.

Attention Alumni!

Have news to share in our semi-annual department newsletter? Send stories and photos to us at biology@uvm.edu with the subject line "Newsletter Submission." Stories are accepted year-round!

Grad alum Allison Neal earns major award for academic contributions

Norwich University Assistant Professor of Biology Allison Neal has been named the 2019 winner of Vermont Women in Higher Education's (VWHE) Peggy R. Williams Emerging Professional Award. Neal was awarded her Ph.D. from UVM in 2014, working in the Department of Biology on the evolutionary ecology of malaria parasites.

The Peggy R. Williams Emerging Professional Award, named for the former Lyndon State and Ithaca College president, is presented to a woman who is in the early stages of her career, demonstrates excellence in her contributions to students, colleagues, and/or her institution (in such areas as service, innovative programs, teaching, research, etc.), and shows promise and potential for future contributions.

In her four years at Norwich University, Neal has become a respected educator and has mentored 16 students in multiple research projects, one of whom gained national attention at the prestigious Posters on the Hill in Washington, D.C. She is also the co-director of the statewide Science, Technology, Engineering and Mathematics (STEM) Fair.

At the statewide level, Neal helped coordinate a thematic Disease Ecology Research Group through the Vermont Genetics Network (VGN). This group has held two conferences bringing together VGN-funded faculty and students from several undergraduate institutions in Vermont to discuss their research on parasites in the state.

Neal said she became inspired at a summit for women in STEM in which the advice for encouraging more women into the male-dominated field was to build supportive communities.

"When I looked at the list of amazing women who have won this award in the past, what struck me most was how many of them I already know. I have already been supported so much by so many amazing women in higher education, both people who have won this award in previous years and people whose contributions have been recognized in other ways," Neal said. "I am truly honored to have been selected for this award and deeply grateful to all of the people who are so supportive of me. I hope that I can help continue to strengthen this amazing community."

The award was presented at VWHE's Fall Awards Dinner last November at the Silver Pavilion at the University of Vermont Alumni House in Burlington, Vermont.

The Department of Biology congratulates Allison on this important honor. While a student with us, Allison was awarded three important grants for graduate students by the National Science Foundation and published a series of major papers on malaria parasites in the finest scientific journals.

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*James Grant was named the winner of the department's annual **Art of Biology Photo Contest** with this photograph of a bottlenose dolphin breaking the surface. It was taken during research in the summer of 2019 on the behavior and distribution of bottlenose dolphins in Bocas del Toro, Panama, working with Dr. May-Collado and the Smithsonian Tropical Research Institute. The photograph was taken while standing at the front of a boat for photo ID, where photographs of dolphin's fins are taken to later identify them. This dolphin surfaced just in front of the boat, and he was lucky enough to be able to capture the moment.*

Forensic science in times of Black Lives Matter

By Linden Higgins

In 2018, the Biology department asked me to take over the non-majors Forensic Biology class designed by another faculty member. As a long-time advocate for teaching science through "wicked tough" societal problems, I recognized that this class presented the opportunity to delve very deeply into not only the science behind "true crime" shows like CSI, but to do so through the lens of social justice.

Forensic scientists, prosecutors, and defense lawyers have long recognized the problematic impact of the "CSI effect." The general public, represented in juries, expects crime scene investigations to produce quick and unambiguous outcomes. The National Academies of Science had published a consensus report on the state of forensic science that worked through the major failings of common types of evidence, from eye-witness identification through blood spatter to DNA profile matching. Only DNA profile matching met their rigorous scientific standards of reliability.

One of the major causes for lack of scientific reliability of other types of evidence was the ease with which "mind set" biases influenced analysis, even of the most practiced investigators and laboratory technicians. When a criminal investigator has a working hypothesis (expected culprit) from the beginning of the investigation, they will tend to ignore or discount evidence that exculpates that person. Mind set biases include not only bias against people with prior records, but also biases against Blacks. The more heinous the crime, the greater the pressure to solve it, and the more influential these biases become. The result is a large number of false convictions for rape and homicide, the majority of them Black-identifying people of color.

This then set the stage for my course design. I use a case-study approach, where we talk about common types of biologically-related evidence in the context of Constitutional requirements for admissibility and scientific requirements for rigor and reliability. Through analysis of cases from the National Registry of Exonerations, combined with background readings about the reliability and validity of each type of evidence, we analyze how the system failed, searching for patterns of error. As the frontiers of forensic science move, the content shifts to include cutting edge technologies like facial recognition and trace DNA matching, always with a focus on how unconscious biases could influence the implementation of the methods in particular cases.

This deep dive into the error-prone nature of forensic science embedded in the US criminal justice system can leave all of us feeling hopeless. To provide students with a sense of hope, I ask them in their final assignment to identify a practice or policy that, if changed, would reduce the frequency of false convictions and the impact of implicit racial bias. Students have to build an evidence-based argument including both narratives from cases we have studied (or that they have identified on their own) and evidence from the tests of reliability and validity. Reading these final essays has always been a highlight of my academic year, as the students reveal their increased understanding of the flaws in our system and of their responsibility to support change.

Dr. Linden Higgins is a Lecturer and Research Affiliate in the Department of Biology.

Undergrads publish article

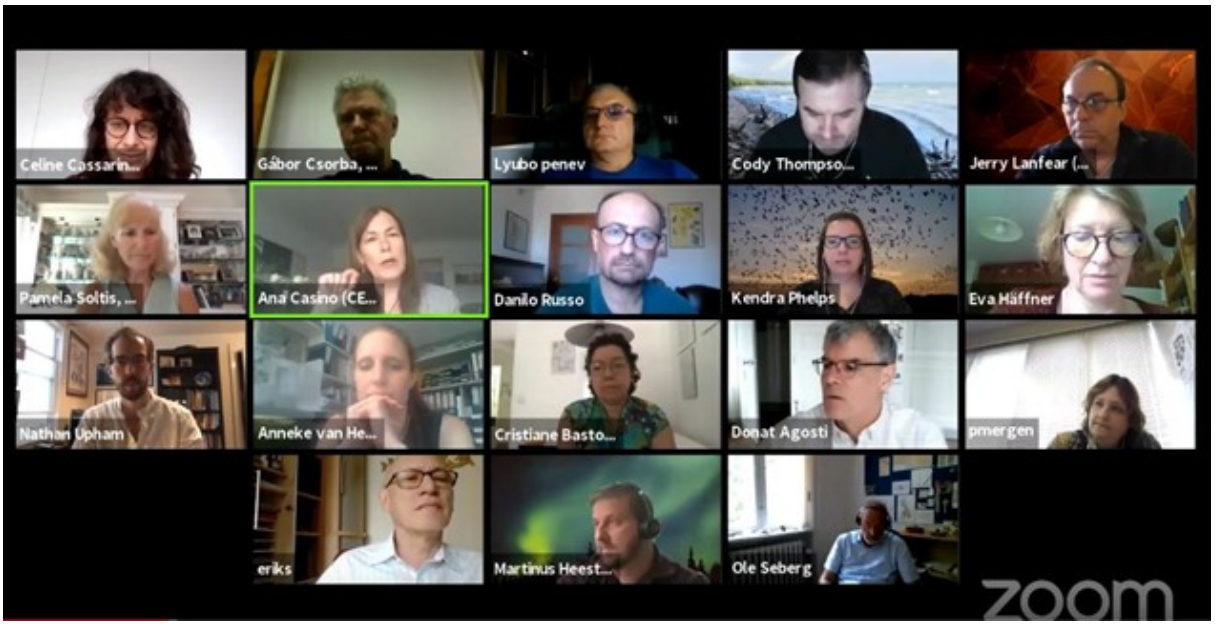
In December, lecturer Laura May-Collado published a paper with several undergraduate students titled "Song structure and singing activity of two separate humpback whales populations wintering off the coast of Caño Island in Costa Rica." Student authors included Emma Chereskin, Lucas Beck, Alex R. Chase, Brian M. Coven, Noah W. McManus, Alyssa P. Neuhaus, Riley A. O Halloran and Sasha G. Rosen, with contributions from Mónica P. Gamboa-Poveda, José D. Palacios-Alfaro, Ronald Monge-Arias, and Ana Gloria Guzmán.

The paper can be found at: https://asa.scitation.org/doi/10.1121/1.5139205.

Lecturer's 'passive house' featured in local newspaper

Sarah Wittman, a lecturer in Biology, and Arthur Chukhman were featured in a December issue of local newspaper *Seven Days* for their home's contributions to combating climate change. The house in Burlington's Old North End is Vermont's first certified passive house. Read the article and see the house at https://www.sevendaysvt.com/vermont/a-burlington-couple-lives-lighter-on-the-planet-with-a-passive-house/Content?oid_29106836.

Professor emeritus joins worldwide COVID-19 task force

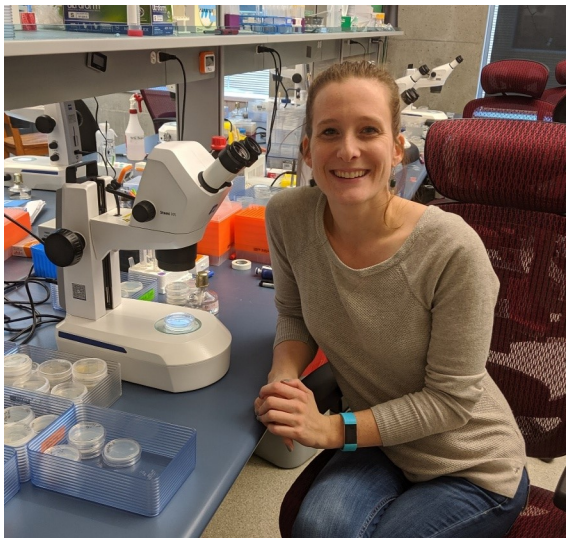


In April, the Consortium of European Taxonomic Facilities (CETAF) and the Distributed System of Scientific Collections (DiSSCo) started a COVID-19 Task Force with experts from all over the world, brought together to contribute a science-based response to the pandemic and to work towards the prevention of the occurrence and propagation of a potential future health crisis such as the one originated by SARS-CoV-2.a. The Task Force, made up of over 60 participants, has been gathering every Friday since then to share their expertise and knowledge built on top of Natural Science Collections. One such participant is UVM Biology's professor emeritus C. William Kilpatrick.

Researchers and experts from collection-linked organizations from all over the world joined forces around the COVID-19 Task Force and are contributing to give a scientifically-led response to the pandemic with a two-fold objective: (1) to identify the areas and topics in which we can contribute in order to find the treatments, drugs, and vaccines necessary, both quicker and more effectively; and (2) to anticipate and prevent the occurrence and propagation of a health crisis such as the one our world is currently facing.

The undertaken action plan covers four areas of expertise: (1) post-COVID prioritization of research foci on animal virus carriers, (2) develop guidelines for the preservation of viral evidence in deposited biological specimens and samples, (3) develop a biodiversity-related knowledge hub on COVID-19, and (4) create improved metadata registering practices on genetic material deposition.

Riley St. Clair earns her PhD in Neuroscience



Riley St. Clair recently earned her Neuroscience PhD from Dr. Bryan Ballif's lab. In collaboration with Dr. Alicia Ebert, her dissertation investigated the cellular and molecular processes crucial for visual system development, using zebrafish as a model. One of her dissertation chapters, entitled "PKC induces release of a functional ectodomain of the guidance cue semaphorin6A" was published in *FEBS Letters*. She also started her postdoctoral fellowship last summer in the lab of Dr. Kota Mizumoto in the Department of Zoology at the University of British Columbia. There, she is working with the nematode *C. elegans* to study how nervous system cells make connections with neighboring cells. This process, called synaptogenesis, is critical to form a functional nervous system. She is using genetic techniques and microscopy to understand the in vivo cellular events that occur during this process. So far, she has been excited to learn new techniques and the *C. elegans* model organism.

Class of 2020 graduates recognized in virtual awards ceremony

The Department of Biology recognizes outstanding seniors each year with departmental awards. The five awards are named for distinguished scholars who were either members of the Department (both very recent and many years ago), or in one case, George Perkins Marsh, a founder of the environmental movement. We congratulate the following awardees.

Benjamin Recchia
George M. Happ Award in Biology

This award is presented to a student with outstanding academic performance in Biology. Dr. Happ arrived at the University of Vermont as a Professor and Chair of the Department of Zoology in 1978. Dr. Happ was instrumental in transforming the faculty to a teacher-scholar model and prioritized obtaining funding to stimulate research. His research interest focused on the physiology and immunology of dogs, and he has collaborated with the University of Alaska on prions in moose and caribou and avian disease.

Benjamin plans to research education and conservation in zoos and aquariums while pursuing a Masters of Science in Zoo Conservation at the University of Plymouth, UK. His honors thesis was titled "Strategies for Enhancing Zoological Best Practices."

Ben's research advisor, Dr. Deborah Blom, offered the following comments: "When approaching his last semester in college, Ben had nearly exhausted the zoology-related courses at UVM, and, in talking to him about his aspirations, I suggested he undertake some different experiences to expand upon what he learned in the classroom. He decided to develop his teaching skills further through a series of teaching assistantships and further explore his future career goal to be a zoo professional through independent study. For his independent study, Ben first explored the idea of visiting professionals at zoos and aquariums to learn about ways they are enhancing their best practices.

"After determining that his original project idea would usurp too much of the zoos' and aquariums' resources, Ben designed an independent study in which he dove deeply into the literature around zoo best practices and completed over 75 professional development courses available through the World Association of Zoos and Aquariums. Equally remarkable, for his final project, he synthesized all that he learned into a series of dense briefs which cited the principal literature on management, stewardship, husbandry, conservation, and education in zoos and aquariums. To continue on his trajectory towards a career as and zoological professional, Ben will attend a Master of Science program in zoo conservation biology at the University of Plymouth (UK) and the Paignton Zoo (a member of the Wild Planet Trust) beginning in September."

Jessica Crooker
George Perkins Marsh Award in Ecology Evolution

George Perkins Marsh is regarded as the founder of the environmental movement with his 1864 publication of *Man and Nature*, which is still in print. The book influenced many important scientific and political figures, including Theodore Roosevelt, and some argue that it was this influence that led President Roosevelt to establish the National Park system. The Marsh farm was a model for sustained agriculture and was later purchased by Frederick Billings, who set out to test Marsh's ideas. The Marsh-Billings Farm is now a national park, the first and only in Vermont. Marsh was also a diplomat, holding the record for longest service to our nation, and was the primary designer of the Washington Monument. The Marsh Life Science building is named in his honor.

Jessica's honors thesis was titled "Stage and Population Specific Salinity Tolerance in *Acartia tonsa* Copepods." She plans to continue in research in biology and living systems, and to pursue graduate level studies in this area. She has interests in genetics and microbiology, and she hopes to be able to continue to use the skills and knowledge gained doing population genomics and ecological research throughout her career.

"I am delighted that Jessica Crooker has been selected to receive our prestigious George Perkins Marsh Award this year," writes research advisor Dr. Melissa Pespeni. "George Perkins Marsh warned about climate change, describing the impacts of deforestation on weather systems, decades before the beginnings of the conservation movement in this country. 170 years later, Jessica, in the Department of Biology at the University of Vermont, designed her honors thesis research to better understand how an ecologically foundational species will weather the storms that have become increasingly frequent and intense in the global conditions Marsh foretold. Using the coastal copepod, *Acartia tonsa*, Jessica took meticulous care to collaboratively develop a new, low-salinity tolerance assay. She designed her studies to integrate her interests in genetics, physiology, development, and evolution and test hypotheses about variation

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Senior honors (continued)

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in low salinity tolerance among populations along a broad latitudinal gradient and across life-history stages of the copepod. She found that populations from Florida, the area with greatest storm intensities and frequencies, survived at much lower salinities than populations from New York and Maine. Surprisingly, she also uncovered that the juvenile life stage was most sensitive to low salinity, relative to babies and adults, particularly in the northern populations. As all good research does, Jessica's work turned answers into more questions and revealed lessons in resilience along the way. Jessica's experiment certainly didn't work the first time, the second time, or even the third time. But with thoughtful determination, she refined her approaches and questions to yield new insights into genetic and developmental variation in these critical adaptive traits present in natural, understudied populations.

"Jessica's membership in my lab group over the last year and half yielded more than important research results; she built friendships, shared knowledge through training other students, and cultivated happy copepods and more data through her collaborations and willingness to assist in animal care and experiments for several other ongoing projects in the lab. She was a delight to have in lab meetings, not only for her delicious baked goods, but also for her thoughtful contributions to paper discussions, practice presentations, and brainstorming sessions. I am excited to see what answers and questions she turns over next in her pursuits of a PhD and MD."

Kate Ziegler
Joan M. Herbers Award in Biology

Joan M. Herbers arrived at UVM in 1979 as the first tenure-track female Professor in the history of the Department of Biology, which is one of the oldest departments on campus, and quickly rose to full Professor, the highest rank for a faculty member. Her exciting classes drew wide praise from students, and Dr. Herbers mentored many undergraduate and graduate students in her laboratory and at field sites. Dr. Herbers has been for many years one of the world s most important researchers in animal behavior, especially the social behavior of ants. Her landmark studies examine the factors driving the sex ratio, foraging behavior, and social organization within colonies. Her work has appeared in many publications. Dr. Herbers was named a Fellow of the American Association for the Advancement of Science, one of the highest honors for an American scientist. She left UVM in 1993 to take a position of Chair of Biology at Colorado State University and subsequently as Dean of Arts and Sciences at Ohio State University, where she remains as Professor of Biology. Professor Herbers has remained a close friend of the UVM Department of Biology to this day.

Kate, whose honors thesis was titled "Singing Activity and Song Evolution of Southern Hemisphere Humpback Whales Wintering off the Gulf of Chiriquí, Panama," developed a love of research during her time at UVM. While her focus was on the acoustic behavior of humpback whales, she is interested in the marine sciences in general and has a passion for environmental research that contributes to conservation and management efforts. In the future, she hopes to do field work researching whales or sharks. A little further down the road, she is thinking about applying to medical schools or going back to school for a teaching degree.

Dr. Laura May-Collado was Kate's research mentor. She joyfully writes, "Congratulations Kate in receiving the Joan Herbers Award! Kate has dedicated two years of her undergraduate studies to the analysis of over 42,000 minutes of passive acoustic monitoring data to study the song structure of humpback whales wintering off the coast of Panama. Her work was presented last year at World Marine Mammal Conference in Barcelona and at UVM's Student Research Conference, and she is currently working a manuscript for publication. Throughout my time working with Kate I have enjoyed seeing her developing her resilience, passion, perseverance, and consistency, all key traits of a promising young scientist. I can't wait to see where your passion for science will take you next."

Emily MacDonald
Bernd Heinrich Award in Physiology or Evolution

Bernd Heinrich, Emeritus Professor of Biology, has been a member of the Biology Department since 1980. He has a long career in science in ecological physiology, animal behavior, and evolutionary ecology. Dr. Heinrich is a popular teacher, and he still teaches the famous "Winter Ecology" course each years at his estate in the wilds of Maine. Dr. Heinrich has produced hundreds of publications in the best journals and is often regarded as one of the world's foremost ecologists and naturalists. He has also written many award-winning books, including classics such as *Bumblebee Economics* and *Ravens in Winter*. His biography of his family and his remarkable

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Senior honors (continued)

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life, *The Snoring Bird*, is one of the best accounts of why children grow up to be biologists. He is a member of the American Academy of Arts Sciences.

Emily's research interests lie in the field of vascular physiology and its associated pharmacological interventions. Her honors thesis, "Establishing the Pharmacophore of Novel Synthetic Peptide Activators of cGMP-Dependent Protein Kinase," examined the function of novel activators of PKG, an enzyme involved in blood vessel dilation. She looks forward to pursuing her academic interests through both laboratory and clinical research. She plans to matriculate into medical school in 2021, where she hopes to specialize in anesthesiology.

Dr. Wolfgang Dostmann was Emily's research advisor. He notes that she "provided critical evidence for the development of First-In-Class cGMP-dependent protein kinase (PKG)-targeted therapies for the treatment of hypertension. There remains a significant unmet need for novel antihypertensive agents with improved efficacy and fewer side effects. None of the existing hypertension drugs target PKG, an enzyme critically responsible for mediating arterial dilation. A PKG-targeted therapy would establish a novel treatment for patients with uncontrolled blood pressure and may provide a clinically relevant alternative to the existing repertoire of antihypertensive therapies. Emily's honors thesis project contributed significant conceptual information to our understanding of the molecular features of these novel lead compounds."

Riley O'Halloran

Kurt Milton Pickett Award in Biology

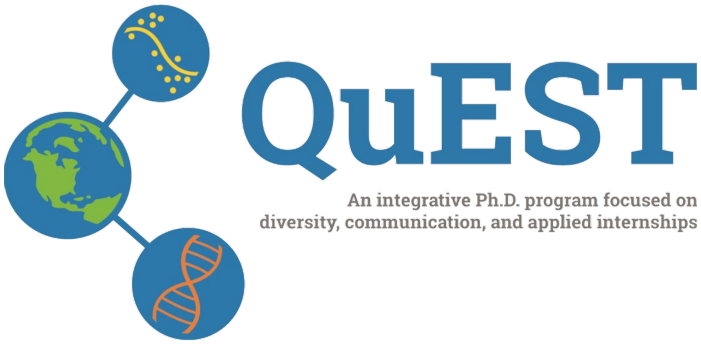
Kurt Milton Pickett arrived in the Biology Department as an Assistant Professor in 2007 and was promoted to Associate Professor shortly before his death in 2011 after a seven-year courageous struggle with cancer. Dr. Pickett was one of the world's foremost experts in the systematics of wasps and the evolution of social behavior in insects, and traveled extensively to collect and observe wasps in a wide variety of habitats. His research combined the time-honored discipline of taxonomy with modern computationally-based molecular phylogenetics methods. During his too-short time at UVM he became highly respected for his probing intellect, dedication to science and teaching, and wonderful sense of life and humor. Dr. Pickett's natural affection for his students at both the undergraduate and graduate level garnered him respect and admiration.

Riley's research mentors were Dr. Ingi Agnarsson and Dr. Laura May-Collado. Dr. May-Collado writes, "I met Riley in my BCOR12 course during her first year at UVM. Soon after that, she was one of the first undergraduate researchers joining the CURE lab where she dedicated her time to studying humpback whale songs. Last year as part of a large collaboration, Riley presented her work at the World Marine Mammal Conference and was also a co-author in a publication (*see page 5*). Riley is studying the song structure of humpback whales that migrate from Oregon, Washington, and California to reproduced in Central American waters. She is a hard working and passionate young scientist deserving of this recognition."

Lisa Chamberland named GTA of the Year in Biology

The graduate program in Biology is very proud of the effort and dedication of our graduate teaching assistants. Biology courses present a big intellectual challenge to our students, who simultaneously have to learn lots of specialized content while employing their quantitative and reasoning skills to solve problems. The winner of the Department's Graduate Teaching Assistant of the Year Award is Lisa Chamberland.

Lisa is a PhD student advised by Dr. Ingi Agnarsson, who writes that "aside from being an excellent lab TA, Lisa has gone far and beyond both in the Field Zoology course and in advising undergraduate students in the lab. Lisa absolutely loves teaching and, for example, was happy to take over the lecture part of the course mid-semester in 2018. Not only was she able to successfully complete the course; the students raved about her performance as a teacher. Lisa also supervises undergraduate researchers in the lab, regularly four or more on a given semester. She trains them in *imagin* and DNA protocols and helps them with their research. She has, for example, contributed in major ways to three ongoing graduate projects, and will eventually co-author publications on all three. Taken together, Lisa is already a model (fledgling) teacher-scholar, and I believe she truly merits recognition for all her work and selfless devotion to UVM undergraduate education."



The Quantitative and Evolutionary STEM Traning (QuEST) Program is an interdisciplinary graduate traineeship entering its fourth year with a total of 29 graduate trainees enrolled from six academic units. The program provides doctoral students with the skills, knowledge, and competencies needed to solve environmental and global health problems in an ever-changing workforce and research environment.

Please join us in welcoming the third cohort of QuEST trainees! First year trainees register in the Foundations of Quantitative Reasoning course and participate in a weekly seminar to learn how to bridge communication and research interests through collaboration across the sciences.

The QuEST Leadership Team and Participating Faculty are excited to engage and support community building, peer-to-peer mentoring, and interest group networks (IGNs) where all trainees will collaborate, identified IGNs research areas, and work together in hosting guest speakers virtually to conduct 90-minute workshops and lectures.

Finally, an orientation session for first years as well as a community building activity with all trainees is being held on Thursday, August 27, 2020. QuEST's Annual Retreat and Diversity Workshop will take place on Friday, August, 28, 2020 for all trainees, participating faculty, and leadership team. Programming will be online via remote instruction with shorter increments; further details and agenda to follow. For questions contact April Berteau, Program Coordinator, via email (April.Berteau@uvm.edu) or by phone, (802) 735-7844.

Meet the first year QuEST Trainees:

Gavin Briske: B.Sc. 2019, Texas A M, Forestry and Ecological Restoration. Gavin is pursuing a Natural Resources Ph.D. in the Rubenstein School of Environment and Natural Resources (RSENR). Advisor: Carol Adair, Associate Professor; Co-advisors: Professors, Aimée Classen and Anthony D'Amato.

Zachary Buell: B.Sc. 2015, Lawrence Univeristy, Biology. Zak is pursuing a Plant and Soil Science Master's degree in the College of Agriculture and Life Sciences (CALS). Advisor: Eric Bishop-von Wettberg, Associate Professor.

Bailey Kretzler: M.Sc. 2019, Lancaster University, Plant Science. Bailey is pursuing a Plant and Soil Science Ph.D. in the College of Agriculture and Life Sciences (CALS). Advisor: Eric Bishop-von Wettberg, Associate Professor.

Sarah Morris: M.Sc. 2018, Queen Mary University of London, Plant Taxonomy. Sarah is pursuing a Plant Biology Ph.D. in the College of Agriculture and Life Sciences (CALS). Advisor: Michael Sundue, Research Assistant Professor.

Elizabeth Morse: B.A. 2015, Grinnell College, Biology Spanish. Liza is pursuing a Natural Resources Ph.D. in the Rubenstein School of Environment and Natural Resources (RSENR). Advisor: Brendan Fisher, Associate Professor.

Paulina Murray: B.Sc. 2019, Siena College, Environmental Science. Paulina is pursuing a Natural Resources Ph.D. in the Rubenstein School of Environment and Natural Resources (RSENR). Advisor: Carol Adair, Associate Professor; Co-advisors: Professors, Aimée Classen and Anthony D'Amato.

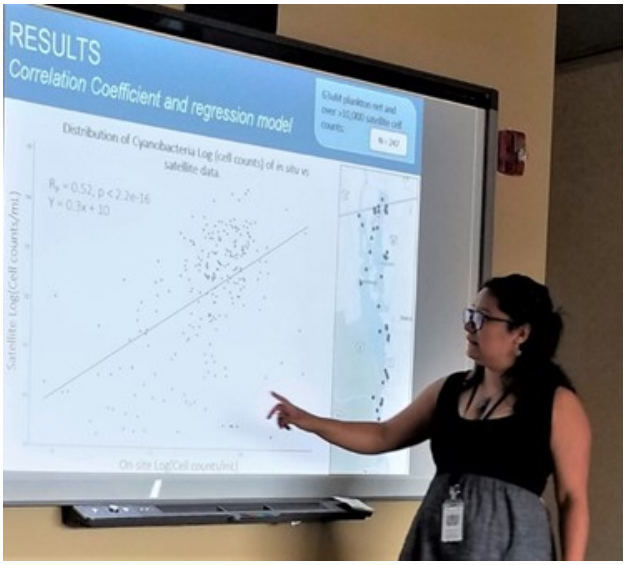
George Ni: B.Sc. 2020, University of North Carolina at Chapel Hill, Environmental Science. George is pursuing a Biology Ph.D. in the College of Arts and Sciences (CAS). Advisor: Nicholas Gotelli, Professor.

During the 2019-20 academic year, the Department of Biology welcomed several new faculty and staff members: Rachel Plouffe, Lecturer (formerly a lab instructor with the department); Kinsey Hallinger, First Year Advisor; Emma Lightizer, Administrative and Financial Assistant; Beck Powers, Lab Technician; and Gabriela Salazar-Lopez, Lab Technician (who joined us in spring 2019).

Graduate student from the University of Guatemala researches at UVM

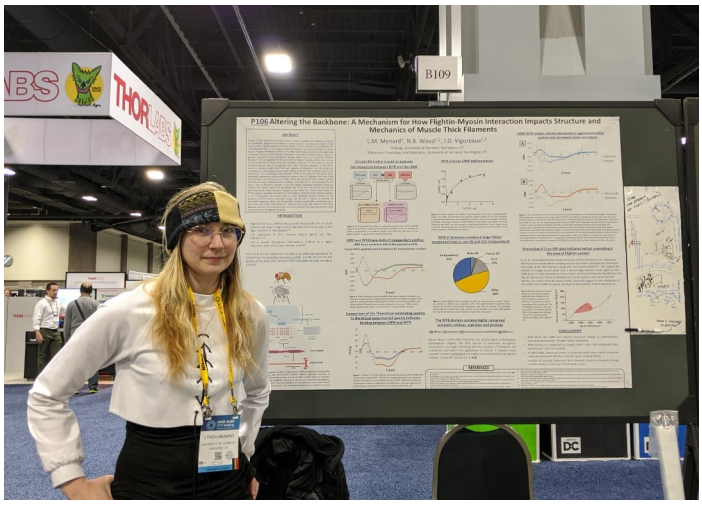
Ana Elisa Laparra Ruiz, a graduate from the Biology department of University of San Carlos of Guatemala, started working in the control of Chagas disease in 2017. Previously she helped with the maintenance of the Chagas vector (also known as kissing bugs) collection and used PCR to identify blood sources in *Triatoma dimidiata*, the principal vector of Chagas disease in Guatemala. Now she is working with Dr. Carlota Monroy on the project "Alianzas para el control de Chagas en Centroménica", an integrated control effort that includes household survey data, collecting insect vectors, collecting endemic seeds for reforestation, and helping in the organization of leadership and gender equality courses for Ministry of Health workers. In October and November 2019, she worked with Dr. Lori Stevens at University of Vermont, using protein mass spectrometry to detect blood sources in insect vectors collected from 11 villages in Guatemala. She also using genomic data to study the importance of the microbiome of *Triatoma dimidiata* in the transmission of the parasite.

Lima interns at VT Dept. of Health



As ambassador and part of the first cohort of the Quantitative and Evolutionary STEM Training (QuEST) program, Raquel Lima completed her applied internship at the Vermont Department of Health (VDH) during the summer of 2019. Her research focused on evaluating the effectiveness of satellite remote data using CyAN, a joint EPS, NOAA, NASA and USGS assessment project for Lake Champlain. Her project was the first study on a local scale of using remote sensing images as complementary tools to monitor freshwater bodies to help understand cyanobacteria blooms.

Menard presents in DC

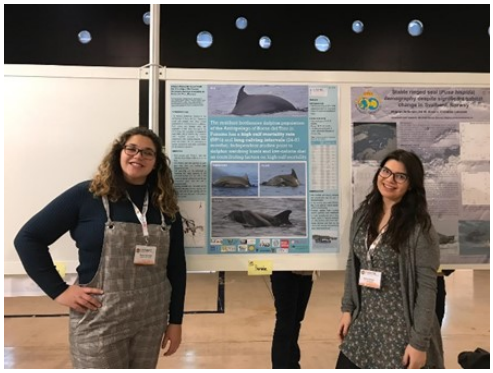


Graduate student Lynda Menard attended the ASCB/EMBO Conference in Washington, DC in December 2019. She received an ASCB travel award to attend the conference and present a poster titled "Altering the Backbone: A Mechanism for How Flightin-myosin Interaction Impacts Structure and Mechanics of Muscle Thick Filament."

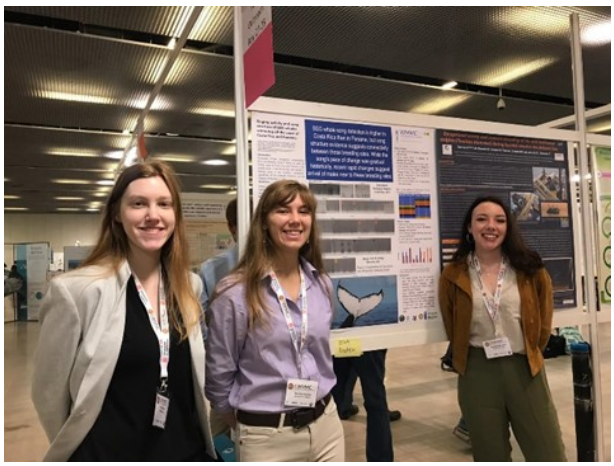
CURE 2018 students at the WWMMC19!

Last year, eight CURE students from various years attended to the largest World Marine Mammal Conference (WMMC19) with Dr. May-Collado. The conference took place in Barcelona, Spain (Dec.9-13) and was organized by the Society of Marine Mammalogy the European Cetacean Society. These amazing young scientists presented research ranging from humpback whale and dolphin acoustic behavior to dolphin calf mortality.

Kahlia Gonzales and Natalia Swack presented their work on dolphin calf mortality rate at the WMCC19. Their work is based on 15 years of capture-recapture data from a resident population of bottlenose dolphins in Bocas del Toro, Panama. Their work earned them the best regional student award! A huge surprise given the magnitude of the conference which consisted of 2640 participants, 1636 presentations, and hundreds of students competing for this award. Kahlia also had the opportunity to meet several marine mammal veterinarians, a career she wants to pursue. One of the scientists invited her to apply to an internship in Hawaii to help vaccinate the critically endangered monk seals. Note: part of this project is Kahlia's Honor thesis which was also presented at the International Whaling Commission meeting last year May, 2019 in Africa.

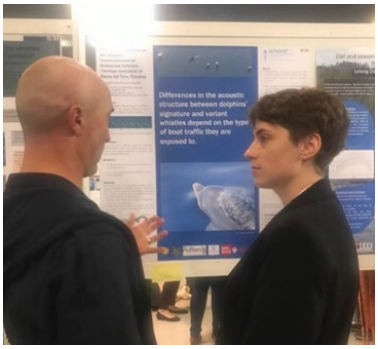


Rebeca Daw presented her work on the impact of boat noise on the acoustic communication of bottlenose dolphins using data from 2004-2017. Becky started her research project back in Fall 2017 during Mammalogy, which she continued in the Animal Communication and CURE courses. Becky is now preparing the manuscript to be submitted to the Journal of Acoustical Society of America.



Danielle, Emma, Shelby, and Kate presented their collaborative work on southern hemisphere humpback whale song structure and diel singing activity in Costa Rica and Panama. Between the 4 of them they have analyzed over 1600 hours of recordings! Part of this project has been accepted for publication at JASA-EL. The humpback whale project has provided the opportunity to Emma Cherenski and Kate Ziegler to develop their Honor's thesis.

The "CURE" course has had many formats and topics since 2015. Students from these courses are off participating on several exciting projects. We had the chance to meet two of them, Sarah Weiss and Emma Chereskin, at the WMMC19. Sarah participated in the first UVM marine mammal field course back in 2015; upon graduating she worked at the New England Aquarium, and then spend two years working with NOAA. Sarah just started a M.Sc. program at Syracuse University to work with Dr. Susan Parks, a renowned whale bioacoustician. Emma Chereskin was also at the conference. Emma was part of the first versions of the Soundscape CURE and was at the conference to present her honor's thesis, and to be interviewed for a M.Sc. position at Bristol University to work with Dr. Stephanie King a world expert in bottlenose dolphin social behavior.



Using natural history collections to better understand VT's ecosystems

By Spencer Hardy (Vermont Center for Ecostudies) and Zoe Albion (UVM Zadock Thompson Invertibrate Collection)

By now you've probably heard of "unnoticed insect apocalypse" which documents staggering population declines due mainly to pesticide use, deforestation, and development. You also likely know that one of the at-risk groups of insects is bees, whose absence would change life as we know it. There's no denying the media hype, but there is also significantly less information than it might seem. There is an international shortage of entomologists and arthropod-related research, and even if an abundance of data was collected now, that does little to compare modern and historical populations. So how can we support the claim that bees are in trouble? In most cases the best data we have is preserved specimens like those in the Zadock Thompson Zoological Collection at UVM.

Last spring, the Vermont Center for Ecostudies launched an ambitious project to document the status of all bee species in the state of Vermont. This excludes *Apis melifera*, the Western Honey Bee, which is mainly agricultural and has been studied extensively by other groups such as the UVM bee lab. Prior to this project, the few experts able to make guesses placed the number of bee species in Vermont at 275. After combining data from preserved specimens and a full season of collecting, the tally is 350 and counting. The UVM collection contains roughly 1,500 bumblebees and another 1,500 solitary (asocial) bees, many of which were collected by students.

There is still a lot of work to do. Once each bee is identified, georeferenced, and databased, we can start looking for trends over time and identify species of greatest conservation need. Already a few noteworthy observations are apparent. The ZTZC contains 11 *Osmia lignaria*, a large blue bee that is important for the pollination of many spring fruit crops. This species is considered common and is found in other collections from the state, but out of the approximately 9,000 specimens from 2019, there are only 2 *Osmia lignaria*, both from the same location and date. This coming season we plan to revisit sites where this species was previously collected to assess its current status and hopefully identify areas where it is persisting. Another *Osmia* of note in the ZTZC collection is *O. texanus* found July 7, 1979 in Centennial Woods by G. Tenwilliger. This is primarily a western species that specializes on thistles. It is rare anywhere in the east, and this specimen is the first and so far the only record for all of New England! While there has been a lot of collecting in Centennial Woods, most of it has been done by students in September, so perhaps with some targeted midsummer surveys, a population of this species could be found.

Without collections like the ZTZC, there would be no way to know which bees have been present in Vermont historically, or how healthy our pollinator communities currently are. Earlier work by the Vermont Center for Ecostudies and the Gund Institute used this collection to show that the bumblebee community had changed drastically in the past 100 years, which helped lead to the federal endangered species status of *Bombus affinis* - the Rusty-patched Bumblebee. These specimens have been cared for over decades, over generations; some are 200 years old. Vermont's landscape has changed indelibly in that time, and there is so much we can learn from a single bee or beetle who was there, then. Invertebrate collections are not just history boxed up, they are history waiting to be revitalized. And there are hundreds of thousands of other insects patiently waiting in their drawers to be discovered.

Further Reading:

Cardoso, P. (2020). Scientists warn humanity about worldwide insect decline, and sug-gest ways to rec-ognise and avert its con-equences. University of Helinski, Sustainability News. Retrieved from: helsinki.fi/en/news/life-science-news/scientists-warn-humanity-about-worldwide-insect-decline-and-suggest-ways-to-recognise-and-avert-its-consequences.

Wagner, D. L. (2020). Insect Declines in the Anthropocene. Annual Review of Entomology, 65(1), 457–480. doi: 10.1146/annurev-ento-011019-025151.

Richardson, L.L., McFarland, K.P., Zahendra, S. et al. (2019). Bumble bee (*Bombus*) distribution and diversity in Vermont, USA: a century of change. Journal of Insect Conservation, 23, 45–62. https://doi.org/10.1007/s10841-018-0113-5.

2020 Virtual Commencement

As we were unable to meet in person for Commencement in May, the Department of Biology has set up a webpage honoring our graduates. Check it out at uvm.edu/cas/biology/department-biology-class-2020.

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Lon Gary Sherman, M.D.
Wendy S. Wollish

Fun in the Biology Department!

Left: The Biology staff celebrates warm weather with bocci and root beer floats on the Andrew Harris Commons. Right: Grads Jessica Cole and Emily Beasley are the winners of the annual Biology egg toss!