



Iacocca Hall, B217  
111 Research Drive  
Bethlehem, PA 18015

Tel: (610) 758-3680 | Fax: (610) 758-4004  
Email: [inbios@lehigh.edu](mailto:inbios@lehigh.edu)  
Web: [www.lehigh.edu/~inbios](http://www.lehigh.edu/~inbios)



## Greetings!

Back in September, none of us could have guessed. Our lives are upside down. Some feel constantly in danger, maybe because they work treating patients with Covid-19 in a pandemic that threatens us all. Others may have lost jobs, or worry that they will. As I write this in late March 2020, I can tell you that the Biological Sciences Department at Lehigh is continuing to do at least some of what we do best – find ways to educate our students to become scientists. Sadly for most of us, this is all at a distance right now, but we stay connected by electronics. Most of us would love nothing more than to also be doing research, but few of us can do that in the traditional ways. Other than continuing to care for research animals, we feel stymied. We find ourselves reading more articles, spending more time analyzing the data we have already collected, thinking about next steps in our research programs, all the while we are cooped up in our individual homes.

I am not really a Pollyanna, but I do believe there are reasons to be optimistic. There are many potential drugs (already approved for human use) being investigated, others are already beginning to test vaccines, and everywhere people are stepping up to help in ways they can. Dr. Cassimeris recently reminded faculty that we have all contributed to basic science bringing us to the place we are today. We have knowledge of how to go about dealing with the pandemic, not overnight, but more rapidly than our ancestors who dealt with diseases from the Bubonic plague to the Spanish flu could ever have imagined. I find myself finding relevance in what I am teaching, and working harder than ever to share that with students. I know that is the same for many others.

The Washington Post reminded us of something we might have read in scientific history books – Isaac Newton (before he was “Sir”) retreated from society during the plague. He found these times away to be among the most productive of his life. Maybe that will happen for a few of us also. We can hope for glimpses of silver linings. Those of us who are scientists can be committed to working harder than ever (using our heads rather than our hands in the lab) to do the basic research and the teaching that will lead to the next discoveries of which we can now only dream.

For the moment, enjoy the contents of the newsletter. Read about what has been happening most of the year. And, send us your news!



Linda Lowe-Krentz, Ph.D.  
Professor and Chair

## Biological Sciences

### 2019 - the department at a glance ...

- 25 faculty members
- 11 post-doctoral / research scientists
- 9 technical and 3 administrative staff
- 42 Ph.D.-level graduate students
- 24 Master's-level graduate students
- 262 Undergraduate majors:
  - 119 Biology
  - 36 Biochemistry
  - 30 Molecular Biology
  - 77 Behavioral Neuroscience

### Faculty receive awards

#### *Ware named a Fellow by the ASCB*

In December, Professor Vassie Ware was honored by the American Society for Cell Biology (ASCB) by being named a Fellow. This is an honor bestowed upon ASCB members by their peers. Fellows are recognized for their meritorious efforts to advance cell biology and/or its applications and for their service to the American Society for Cell Biology.



#### *Wonpil Im receives Dean's Faculty Award*

Professor Wonpil Im was honored by the College of Arts and Sciences by receiving the Dean's Faculty Award for Research, Scholarship and Creative Activity.



### Department Faculty

Explore our website: [www.lehigh.edu/~inbios](http://www.lehigh.edu/~inbios)

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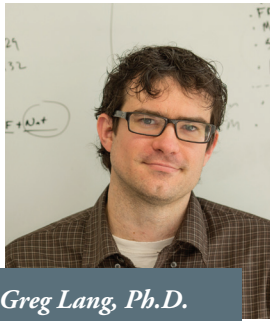
- Daniel Babcock • Michael Behe • R. Michael Burger • Lynne Cassimeris • David Cundall • Matthias Falk • Ann Fink • Julie Haas • Santiago Herrera • Katie Holick • Wonpil Im • M. Kathryn Iovine • Murray Itzkowitz • Michael Kuchka • Gregory Lang • Michael Layden • Linda Lowe-Krentz, Chair • Julie Miwa • Amber Rice • Jill Schneider • Neal Simon • Robert Skibbens • Jennifer Swann • Lawrence Tartaglia • Vassie Ware • David Zappulla •

## Board of Trustees promote three faculty members in department

*The following members of the biological sciences faculty were promoted to associate professor with tenure by the Lehigh University Board of Trustees in May, 2019.*

### **Greg Lang, Ph.D.**

was awarded a B.S. in Molecular Biology from Millersville University of Pennsylvania and went on to earn his doctoral degree from Harvard University. Prior to his arrival at Lehigh, Lang spent six years as a post-doctoral fellow in David Botstein's laboratory at Princeton University. Dr. Lang's research is aimed at understanding the molecular basis of evolution. The Lang laboratory is using yeast to address fundamental questions in microbial evolution: (1) How does selection shape the genome? (2) How does the structure of the genome constrain evolution? (3) Are evolutionary outcomes reproducible? (4) What role do chance and determinism play in evolution?"



*Greg Lang, Ph.D.*

### **Julie Miwa, Ph.D.**

received her undergraduate degree in Neurobiology from UC Berkeley and her Ph.D. from The Rockefeller Univ. in Neuroscience. She did postdoctoral work at Rockefeller Univ. and trained at Yale Univ. in the Psychiatry Department. Her research focus is on understanding how the lynx1 gene suppresses learning potential on a cellular level. This work is valuable in studying the loss of brain activity (e.g. stroke, traumatic brain injury), in cases of memory problems (e.g. Alzheimer's disease and other dementias), and neurodevelopmental disorders when correct circuit development in the brain was disrupted. Her work encompasses molecular biology and genetics, as well as behavioral research.



*Julie Miwa, Ph.D.*

### **Amber Rice, Ph.D.**

received her undergraduate degree in Biology from the College of Wooster in 2001 and her Ph.D. from the University of North Carolina in 2008. She then served as a postdoctoral researcher at Uppsala University in Sweden. Dr. Rice moved back to North Carolina for a short postdoc before moving to Bethlehem to join the faculty at Lehigh in 2011. Rice is an evolutionary biologist. Her research focuses on the roles of species interactions, such as competition and hybridization, in speciation. Dr. Rice uses a combination of ecological field studies and genetic analyses in her work. Her current projects focus is on speciation in local populations of chickadees.



*Amber Rice, Ph.D.*

## Lehigh Graduate Wins International Award for Undergraduate Research

*written by Kelly Hochbein  
University Communications*

Tuan Pham '18 was awarded the Brains for Brains Young Researcher Award from the Bernstein Network Computational Neuroscience for his undergraduate work in the lab of Dr. Julie Haas.

When Tuan Pham '18 arrived at Lehigh, he thought he might study psychology. But then he studied a chapter about neurons and the biological roots of psychology, and he was hooked. Recognizing his desire to study computational neuroscience before he knew what the term meant, he says, he found his place in the lab of Julie Haas, associate professor of neuroscience in the Department of Biological Sciences. He continued his work there through the summer after he graduated from Lehigh with a degree in behavioral neuroscience and minors in computer science and electrical engineering.

Now a doctoral student in computational neuroscience at the University of Chicago, Pham has been recognized by the Bernstein Network Computational Neuroscience, one of the top international organizations for computational neuroscience, for research he conducted as an undergraduate.

The Brains for Brains Young Researcher Award, which is presented on a biennial basis, "recognizes the special achievements of young scientists who have shown their outstanding potential already at a very early career stage—even before starting their doctoral studies." Awardees receive a grant for a one-week trip to Germany for the award ceremony during the international Bernstein Conference in Berlin and visits to up to two German research institutions in computational neuroscience. Pham is the ninth recipient of the award.

"The award is an elite marker of promise for young researchers, and the competition is international and quite strong," says Haas, who recommended Pham for the award.

"Tuan was always so inquisitive and interested in whatever he could learn," says Haas. "He took many courses, hard courses that weren't in his course requirements, just because he was interested in that topic. He has an unending appetite for new information."

Haas also noted, "Witnessing what a student achieves, knowing that I mentored and developed someone to that point, is a different stage in my career." says Haas. "Tuan's papers aren't my direct work, but rather my work in him... and those connections stay present for the rest of our lives."

*The Haas lab is funded by the Brain and Behavior Foundation, the Whitehall Foundation and the National Science Foundation.*



*Tuan Pham '18 and Professor Julie Haas*

*There does not exist a category of science to which one can give the name "applied science." There are science and the applications of science, bound together as the fruit of the tree which bears it. Louis Pasteur*



## Graduate Student Spotlight

*Dylan Faltine-Gonzalez is a Ph.D. Candidate in the Integrative Biology program*

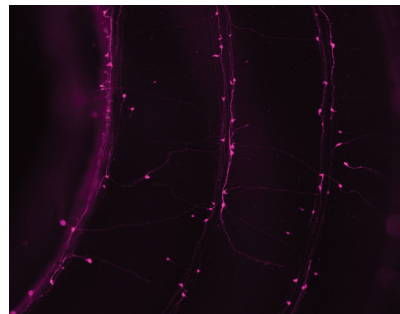
Dylan received his Bachelor of Science in marine biology at the University of Hawaii at Manoa. He then joined Dr. Mark Martindale's lab where he characterized opsin expression patterns within *Nematostella vectensis*. It was here that he was first introduced to developmental biology, *Nematostella* as a model species, and his future PI, Dr. Michael Layden. Dylan further pursued his interest in developmental biology as a member of the society for developmental biology's CHOOSE development program which allowed him to work in Dr. Alex Joyner's lab. There he studied how the long bones of mice were able to regulate their growth so that they end up symmetric in length. It was after these experiences that he decided to go to graduate school. Dr. Layden contacted Dylan informing him that he has a lab at Lehigh University looking at the evolution of central nervous systems, and Dylan joined the Layden lab at Lehigh University in 2015.

The Layden lab is broadly interested in understanding nervous system evolution using the cnidarian model, *Nematostella vectensis*. One question they are investigating is how did bilaterians evolve complex central nervous systems? Cnidarians (jellyfish, sea anemones, corals, etc.) all possess a nerve net like nervous system, and they are the sister taxa to the bilaterians (mammals, insects, worms, etc.). It is classically believed that the cnidarian-bilaterian ancestor likely possessed a nerve net like nervous system similar to those found in cnidarians. By investigating how *Nematostella* forms its nerve net the Layden lab can identify conserved and unique patterning programs present in cnidarians and bilaterians. If both cnidarians and bilaterians possess these patterning mechanisms then researchers can hypothesize that the cnidarian-bilaterian also possessed these same patterning mechanisms. This allows researchers to build a hypothetical ancestor, which allows researchers to better understand what

unique patterning mechanisms must have evolved in bilaterians and therefore potentially contributed to central nervous system evolution.



*Ph.D. Candidate, Dylan Faltine-Gonzalez*



*A transgenic line showing different neuronal cell types in an adult *Nematostella polyp*.*

Bilaterians use multiple mechanisms to pattern their central nervous system. Two of these are the utilization of specific progenitors that give rise to a subset of neuronal subtypes and the other is utilizing spatial patterning genes to pattern spatially restricted neuronal subtypes. The combination of these two patterning mechanisms allows bilaterians to control the number, type, and location of specific neuronal subtypes during development. Dylan's research focuses on identifying these two bilaterian mechanisms of neuronal patterning found within cnidarians. Dylan uses genetic techniques such as microinjection of shRNA and mRNA to manipulate genes of interest coupled with molecular techniques such as in situ hybridization and qPCR to analyze the resulting changes in gene expression.

Dylan was the president of the Biological Organization of Graduate Students (BOGS). During his term as president he, along with his fellow executive members, organized monthly department workshops demonstrating the skill sets of the department faculty and postdocs specifically in areas that are not covered in their graduate education. He also attempts to make his research accessible to undergraduates and has mentored several students during his time in the Layden lab.

During Dylan's free time he enjoys hiking with his dog, board games, exploring restaurants and bars around the Lehigh Valley, as well as cooking and baking.

*Research in the Layden Lab is funded by grants from the National Science Foundation and the National Institutes of Health*

## 2019 Selected Research Publications

Bold = Faculty  
**Bold+Italics** = Graduate Student  
*Italics* = Undergraduate Student  
\* = Former Student

**Behe, Michael J.** 2019. Darwin Devolves: the new science about DNA that challenges evolution. New York, NY: HarperOne.

**J.C. Leung** and **L. Cassimeris**. 2019. Reorganization of paclitaxel-stabilized microtubule arrays at mitotic entry: roles of depolymerizing kinesins and severing proteins. *Cancer Biology & Therapy*. 20: 1337-1347. doi: 10.1080/15384047.2019.1638678

**Cundall, D.** 2019. A few puzzles in the evolution of feeding mechanisms in snakes. *Herpetologica* 75:99-107.

Thamma, U., Kowal, T.J.\*, **Falk, M.M.**, Jain, H. 2019. Influence of nanoporosity on the nature of hydroxyapatite formed on bioactive calcium silicate model glass. *J Biomed Mater Res B Appl Biomater*. May;107(4):886-899. doi: 10.1002/jbm.b.34184.

Aizenberg, M., Rolón-Martínez, S., Pham, T\*, Rao, W., **Haas, J.**, Geffen, M. 2019. Projection from the amygdala to the thalamic reticular nucleus amplifies cortical sound responses. *Cell Reports*.

Park, S. and **Im, W.** 2019. Analysis of Lipid Order States and Domains in Lipid Bilayer Simulations. *J. Chem. Theory Comput*. <https://doi.org/10.1021/acs.jctc.8b00828>

**Fisher, K.**, Kryazhimskiy, S., **Lang, G.** 2019. Detecting genetic interactions using parallel evolution in experimental populations. *Philos Trans R Soc Lond B Biol Sci*. 2019 Jul 22;374(1777):20180237. doi: 10.1098/rstb.2018.0237

**Lang, G., Rice, A.** 2019. Evolution unscathed: Darwin Devolves argues on weak reasoning that unguided evolution is a destructive force, incapable of innovation. *International Journal of Organic Evolution*. <https://doi.org/10.1111/evo.13710>

**Li, Y., Talotta-Altenburg, L., Silimperi, K., Ciabattini, G., Lowe-Krentz, L.** 2019. Endothelial Nitric Oxide Synthase activation is required for heparin receptor effects on vascular smooth muscle cells. *American Journal of Physiology—Cell Physiology*. <https://doi.org/10.1152/ajpcell.00284.2018>

**Miwa, JM, Anderson, KR, and Hoffman K.** (2019) Lynx Prototoxins: The Roles of endogenous Mammalian Neurotoxin-like Proteins in Modulating nAChR Function and Complex Nicotinic-dependent Processes, *Frontiers in Pharmacology*, 10:343. doi: 10.3389/fphar.2019.00343 Topic: From Peptide and Protein Toxins to Ion Channel Structure/Function and Drug Design.

**Swann J., Hall E.** (2020) Internal Clocks. In: Vonk J., Shackelford T. (eds) *Encyclopedia of Animal Cognition and Behavior*. Springer, Cham

Agee CM\*, **Ware VC.** Specialized eRpL22 paralogue-specific ribosomes regulate specific mRNA translation in spermatogenesis in *Drosophila melanogaster*. *Mol Biol Cell*. 2019 Aug 1;30(17):2240-2253. doi: 10.1091/mbc.E19-02-0086. Epub 2019 Jun 12.

# Genetics: More than just the color of your eyes

Most individuals think of genetics as some characteristic inherited from their parents, such as hair or eye color, height, weight or whether their ear lobe is connected to their cheek or hanging loosely. But in today's world of medicine, genetics is crucial when treating cancer, or heart disease, or whether a child will be born with a devastating disease or syndrome passed on by generations past.

All students who declare a major in one of the Department of Biological Sciences programs are required to take two of our core classes: Cell and Molecular Biology and Genetics. Our students learn very quickly how important the subject of genetics is in so many aspects of our lives.

**Erica (Bauerlein) Blouch** ('05, B.S. Molecular Biology) took this important understanding of genetics to a whole new level. Erica earned her Master's in Genetic Counseling at Brandeis University. She has worked at the Massachusetts General Hospital (MGH) Cancer Center for almost ten years and is one of the senior members of the staff. Erica is also a member of the faculty of the MGH Institute of Health Professions and teaches a course on Cancer Genetic Counseling.

The role of a genetic counselor is well-suited for someone with a solid interest and understanding of molecular genetics, as well as the ability to translate this complex information into language that patients, doctors, and lay people can understand. The field is rapidly growing with more job openings than masters-trained students who graduate each year. Let's learn more about Erica's path to being a genetic counselor.

**Why did you decide to enroll at Lehigh?**  
*My college goals included being challenged academically, exposure to various extra-curricular activities, and a campus that was both independent as well as connected to the community. Lehigh checked all those boxes for me and gave me the opportunity to keep engaged in many of my interests, including music, sports, theater, and of course, academics.*

**Who were your favorite professors at Lehigh?**

*I see that they are both emeritus faculty now, but I have fond memories of both Dr. Sands and Dr. Krawiec. The virology course taught by Dr. Sands was one of those that really bridged basic/molecular biology as well as application to health and medicine, and I will always remember his enthusiasm for the material! Dr. Krawiec was also a very engaging and passionate instructor and I have to assume that his love of molecular biology has stayed with me over the last 15 years!*



Erica (Bauerlein) Blouch is proud to report that she and her husband, Drew Blouch ('05, B.S. Mech. Eng.) are the parents of their own genetic experiment: 6 year old identical twin boys. As Ms. Blouch explains:

*Most sets of twins are fraternal, meaning two eggs are fertilized by two sperm. These siblings will share approximately 50% of the DNA, just as any siblings would. However, identical twins are more rare than fraternal, and happen when a fertilized egg splits early in gestation, creating two embryos with the same DNA. This occurs in 3 of every 1000 births and is generally independent of factors like family history, assisted reproductive technology, or parental age. Although identical twins have the same DNA, they certainly don't grow and develop exactly the same. It has been fun to watch "nature versus nurture" in action!*

## Tell us about your educational path after graduating from Lehigh.

*While studying at Lehigh, I was most captivated by the biology classes that were relevant to medicine. And although many of my friends were pre-med, that had never been in my career plans. The Interdisciplinary Biomedical Sciences (IBMS) program at UNC-Chapel Hill was a first-year PhD program that allowed students to explore different paths to biomedical sciences and seemed like a great fit for someone that was undecided like myself. However, throughout the year, rather than choosing a specialty, I came to realize just how long and rocky the path in academia can be. It was a hard decision to leave the IBMS program, but looking back, was one of the best decisions I made.*

*While at UNC, I had a cancer genetic counselor as a guest lecturer in one of my classes, and I was immediately captivated by the profession. It is almost cliché in the genetic counseling community, but the combination of basic molecular biology and interaction with patients was very appealing. After leaving UNC, I was lucky enough to shadow some genetic counselors while living and working in Boston and was able to see them working in various areas of medicine. These experiences solidified my decision to get my MS in Genetic Counseling from Brandeis University.*

## Can you explain genetic counseling?

*Genetic counseling is the process of helping a patient understand their inherited risk for disease. This can apply to both children and adults, for a wide range of diseases, such as birth defects and congenital disorders, developmental diseases in childhood, adult and pediatric cancers, cardiovascular disorders, and many more. Genetic counselors can work in hospitals or doctors' offices, genetic testing laboratories, medical research facilities, or in the public health capacity. If anyone is interested, the National Society of Genetic Counselors has a website for prospective students to learn more about the profession.*

<https://www.nsgc.org/page/frequently-asked-questions-students>

## Help our readers understand your work at Massachusetts General Hospital.

*At Mass General Cancer Center, I work with cancer patients and their families to identify which families have an inherited risk for cancers or tumors. Most cancers are not hereditary, so I evaluate their family history and interpret genetic testing results to help patients understand their personalized risk of developing cancer. I see patients that have breast, ovarian, or gastrointestinal cancers and I have an expertise in familial endocrine tumor syndromes.*

*As of the 2019-2020 school year, I have also started teaching cancer genetic counseling at the Mass General Institute of Health Professions (IHP) in the Genetic Counseling program. It has been a great experience to help train the next generation of genetic counselors. With so many advances in genetics and genomics, these students are training for almost a different career than the one that I started in 10 years ago.*

## Looking back at your time at Lehigh and the career decisions you made, is there any advice you can give to today's generation of Lehigh students?

*Students in the biological sciences have so many career options to consider and explore. It is a helpful reminder that not every biology major will end up with a "doctor" in their title. Before pursuing genetic counseling, I ultimately explored many other areas of allied and health sciences, as well as public health and health policy. A strong undergraduate degree in biology would be a great starting point for any of these careers.*



Erica Bauerlein and Drew Blouch, '05



Erica (Bauerlein) Blouch, M.S.



## Introducing this year's Epstein Scholars ...

*Through a generous gift, Michael Epstein, Esq. ('75, B.A. Bio) established the Epstein Family Endowment for the purpose of supporting undergraduate research. Michael Epstein was featured in the 2011 edition of the department newsletter ("The Law of Nature, pages 4-5). He and his wife, Lisa, have three children: Jesse, Emily and Eric.*

We are proud to introduce the newest recipients of the Epstein Family Endowment for undergraduate research. All of this year's recipients are members of the department's honors class and will be receiving their degree in 2020.

- **Aubrey Beck** (Biology) - Aubrey's research advisor is Professor Amber Rice. "Reproductive Isolation across the Chickadee Hybrid Zone" is the subject of her research.
- **Nicole Kirven** (Molecular Biology) - Nicole's research proposal is titled, "Eco1's Role in Birth Defect Maladies." Dr. Skibbens is her research advisor.
- **Minuet Laessig** (IDEAS) - Min is doing research in the Lowe-Krentz Lab. Her research is titled "Investigating Mechano-Sensing Properties of TME-M184A."

Beck, Kirven and Laessig received funding for materials and supplies to complete their research. They have been busy presenting their research in the Honors Class, led by Professor Michael Kuchka.



*2019-2020 Epstein Scholars*

*(l-r) Michael Kuchka, Ph.D., Honors Class Instructor, Aubrey Beck, Minuet Laessig, Nicole Kirven*

## and, this year's Langer-Simon endowed researchers

*The Department of Biological Sciences announced the following students were this year's recipients of the Langer-Simon Endowed Fund for Bioscience Research. Each student has been awarded support for research supplies and/or travel to professional meetings.*



*2019-2020 Langer-Simon Scholars*

*(front row, l-r) Grace Ciabattoni, Alyssa Shrestha  
(back row, l-r) Caroline Pritchard, Iman Mosley, Nicole Kirven,  
Griffin Jones*

**Grace Ciabattoni** (Molecular Biology) is an undergraduate researcher in the Lowe-Krentz Lab. Her research focus is "Investigations into a Potential Link between TMEM184A and HSPGs in a Junctional Mechanotransduction Complex."

**Griffin Jones** (Molecular Biology) is a member of the Miwa Lab. Griffin's research title is "Lynx1 and Lynx2: A Study in Binding Affinity to Nicotinic Receptors and the Effects of Functional Mutations."

**Nicole Kirven** (Molecular Biology) Nicole's research is "Eco1's Role in Birth Defect Maladies" and she is working in the Skibbens Lab.

**Iman Mosely** (Behavioral Neuroscience) is a member of the Simon Lab and is studying, "Traumatic Brain Injury: Methods for Assessment of Drug Candidates."

**Caroline Pritchard** (Molecular Biology) is studying "FluoroGAN: Leveraging generative networks to map changes in protein expression." Her research advisor is Professor Vassie Ware.

**Alyssa Shrestha** (Biology) works in the Burger Lab. Her research is on "Examining the Effects of Bmp7 on the Morphology of Hair Cells and Auditory Neurons in the Nucleus Magnocellularis of the Embryonic Chick."

*Robert & Laura Langer established the Langer-Simon Endowed Fund for Bioscience Research through a generous gift in 2012. The purpose is to support research experiences for undergraduate students in the biological sciences. The fund supports student research projects with an emphasis on lab activities that integrate multiple disciplines and perspectives.*

## Let us know what you're doing!

**Submit your information online:**

[Click here](#) to submit your information - it is fast and easy!

**Send us an e-mail:**

Send your information to [inbios@lehigh.edu](mailto:inbios@lehigh.edu). Please include your name, year of graduation, degree, and the information you would like to share.

**Call us:**

Call the department office (610-758-3680) and give your information to Judy.

**Send us a note:**

Biological Sciences  
attn: Alumni Updates  
111 Research Dr., B217  
Bethlehem, PA 18015

## Do birds have a sense of smell? According to new research from Amber Rice, chickadees do, and odor might play a role in mate selection among naturally hybridizing songbirds.

Chickadees can smell! That is the news from a study by Amber Rice, the first to document naturally hybridizing songbirds' preference for the scent of their own species.

Rice, an associate professor of evolutionary biology at Lehigh, studies natural hybridization when separate species come into contact and mate to better understand how species originate and how existing species are maintained. The two species that make up the hybridized population she studies are the black-capped chickadee and its relative, the Carolina chickadee.

Rice and Ph.D. student Alex Van Huynh set out to test the potential for scent to act as a mate choice cue, contributing to reproductive isolation between the black-capped and Carolina chickadees who live in the "hybrid zone" in the eastern Pennsylvania region where Lehigh is located.

Huynh and Rice found that both black-capped and Carolina chickadees produce chemically distinct natural oils. Testing both males and females of both chickadee species, they found that males and females prefer the smell of their own species over the smell of the opposite species. These preferences could be impacting hybridization. Their results have been published in an article titled "Conspecific olfactory preferences and interspecific divergence in odor cues in a chickadee hybrid zone" in the journal *Ecology and Evolution*.

"The sense of smell has been very understudied in birds, particularly songbirds, because they frequently have such impressive plumage and song variation," says Rice. "Some other recent work has documented that species of songbird can smell and prefer their species' odors, but this is the first example in currently hybridizing species that we know of."

"Our results show that not only can odor cues be used by songbirds, potentially as a mate choice cue, but that they can have ecological and evolutionary consequences for songbird species," adds Huynh.

The black-capped and Carolina chickadees interbreed with one another, but their hybrid offspring suffer fitness costs. For example, the



Amber Rice, Ph.D.  
Associate Professor

Range map of the black-capped chickadee, Carolina chickadee, and approximate location of their hybrid zone.



interbred chickadees are less likely to hatch from their eggs, and they have lower cognitive abilities than pure-species birds.

Interestingly, the researchers found that the chickadees they studied do not actively avoid the smell of the other species. "This fact may be coincident with the observation that hybridization still does indeed take place," says Huynh. "We know the hybrid zone is very small and its width is stable over time. In other words, the geographic area of hybridization is not growing or shrinking."

Huynh and Rice caught wild birds from hybrid zone populations in Pennsylvania. They used gas-chromatography mass-spectrometry to analyze differences between the species in the natural oils the birds produce from their uropygial glands (also known as the preen glands). They tested for the species' odor preference using a Y-maze, measuring the amount of time a bird spends with a particular smell.

The experiments indicated a clear preference for same-species whole-body odors in both species of chickadees. These preferences were present in both male and female birds. The results, the team says, are consistent

with a possible role for olfactory signaling in premating reproductive isolation in chickadees.

"Within the hybrid zone, the two species show differences in their uropygial oil chemistry as well as significant preferences for their own species over those of the other species," says Rice.

The team believes that researchers in the fields of animal behavior and chemical ecology will find their study particularly interesting. Investigating odor in future studies of songbird behavior such as mate choice, predation risk assessment or competitive interactions are some promising avenues for future inquiry.

*The research was supported by Lehigh University and the National Science Foundation, as well as research grants from the Society for the Study of Evolution (The Rosemary Grant Award) and the Animal Behavior Society.*

## We receive letters

Dear Dr. Swann,

I just had the honor of graduating medical school and am currently on my way to Thomas Jefferson University Hospital in Philadelphia to start my Internal Medicine residency. Not only did I want to share the amazing news, I wanted to take this opportunity to thank you for all your help over the years in helping me achieve my dreams and reach new heights. My experience in the Swann lab helped set me up for academic success in medical school and beyond. I've taken the lessons I learned over the two years I spent working with you and applied them to my own research endeavors.

I can't thank you enough for your investment in me all those years ago, and I hope to inspire students of my own to pursue research in the future just as you did for me!

Sincerely,  
Steven Manobianco '14



Dear Dr. Lowe-Krentz,

I want to thank you again for helping me to become the scientist I am today. You taught me so much during those four years at Lehigh about science and how to approach questions. Thanks for being the scientific role model I needed to make it this far.

Erin Kennedy '13



*The freshman Congresswoman received an overview of the biological sciences department and diversity programs at Lehigh, and also toured four different labs.*

On a day that was a departure from the norm of working on legislation or voting on bills in Washington D.C., U.S. Rep. Susan Wild Thursday morning visited Lehigh in April 2019, donned a white lab coat and peered into microscopes as she toured four different labs in Iacocca Hall.

With Congress away from Capitol Hill on recess, the freshman Congresswoman, a Democrat, was back home in Pennsylvania's 7th congressional district and spent a little over an hour on campus meeting with faculty and student researchers.

Wild's visit began with a brief meeting with Kristin Anderson, a Ph.D. candidate in neuroscience who was instrumental in arranging the visit, and a few other faculty members, who shared with Wild information about the biological sciences department and diversity programs. They also discussed the significance of government funding in regard to the Lehigh research that Wild saw firsthand.

Anderson, who said she learned from her research advisor, Associate Professor Julie Miwa, about the importance of communicating her scientific research, has been trained on science communication and advocacy through the Society for Neuroscience. Inviting Wild to Lehigh and explaining some of the work that's being done here is not only important when it comes to federal grants, Anderson said, but it's also about relationship building. Anderson worked with Lehigh's Office of Government Relations to ensure a successful visit.

"Because we're dependent on NIH and NSF—these are federally funded programs—we should be communicating what we're doing and why it's so important," Anderson said. "Medical science is not controversial... Nobody is going to say they don't support it, but unless you're there all the time and saying, 'This is why it's important,' unless you show up every year, you're not going to get the funding.

"And that hurts everyone at Lehigh from the principal investigators to the undergraduates that are interested in something. So I think forming this working relationship with your congressional leaders is very important."

Starting with the Burger Lab, Wild learned from R. Michael Burger, associate professor of neuroscience, how the brain processes information about its sensory environment. She moved on to the Lowe-Krentz Lab where Linda Lowe-Krentz, professor of biochemistry, and her students are focusing on

an improved understanding of the mechanisms by which heparin—an anticoagulant—alters the physiology of endothelial and vascular smooth muscle cells. Next up was a quick stop in the Miwa Lab, which investigates complex neurobiological process such as learning and anxiety responses.

Wild said she was impressed by the research she saw and enjoyed learning about some of the work being done within her district.

"I love knowing this is here," she said, walking out of the Miwa Lab.

As Wild was given overviews of the work taking place in each of the labs she visited, she recognized that while it's likely easy to communicate among scientists, it must be tough trying to explain their work to others.

Anderson, who spends time in Washington, D.C. with the Society for Neuroscience for the purpose of science communication, said that's something that needs to be a part of the job, especially since they are using taxpayer money. "That's always the challenge," Wild said. "There's always requests for funding of all kinds of things but the more people can understand the end result without having to be scientists is really important."

Wild wrapped up her visit watching the students of Daniel Babcock, assistant professor of neuroscience, dissect fruit flies and use them to study neurodegenerative diseases such as Parkinson's and Alzheimer's disease in the Babcock Lab.

Following the visit, Wild submitted formal funding requests for several federal programs that support university research programs, including those that fund research at Lehigh. The House passed most of the annual appropriations bills that fund university research in June.

Congresswoman Susan Wild visits four labs in the Department of Biological Sciences: (clockwise from top left) Prof. Mike Burger, Kristin Anderson, Rep. Wild and Ph.D. Candidate Lashaka Jones; Kristin Anderson, Mark Crenshaw, Prof. Julie Miwa and Rep. Wild; Rep. Wild, undergraduate student Daniel Weaver and Kristin Anderson; Graduate student Leanna Altenburg, undergraduate student Grace Ciabattoni, Prof. Linda Lowe-Krentz, and Rep. Wild



## SEA PHAGES class submits genome sequence

The SEA PHAGES class, led by instructors Vassie Ware and Margaret Kenna, have once again submitted a genome sequence for their work on mycobacteriophages. SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) is a two-semester, discovery-based undergraduate research course that begins with simple digging in the soil to find new viruses, but progresses through a variety of microbiology techniques and eventually to complex genome annotation and bioinformatic analyses. SEA-PHAGES is jointly administered by Graham Hatfull's group at the University of Pittsburgh and the Howard Hughes Medical Institute's Science Education division.

Caratenuto RA, III, Ciabattoni GO, DesGranges NJ, Drost CL, Gao L, Gipson B, Kahler NC, Kirven NA, Melehani JC, Patel K, Rokes AB, Seth RA, West MC, Alhout AA, Akoto FF, Capogna N, Cudkevich N, Graham LH, Grapel MS, Haleem MM, Korenberg JB, Lichak BP, McKinley LN, Mendello KR, Murphy CE, Pyfer LM, Ramirez WA, Reisner JR, Swope RH, Thoorkuzhy MJ, Vargas LA, Veliz CA, Volpe KR, Zhang KD, Faltine-Gonzalez DZ, Zuilkoski CM, Mageoney CM, Mohammed HT, Kenna MA, Ware VC. 2019. Genome sequences of six cluster N mycobacteriophages, Kevin1, Nenae, Parmesanjohn, ShrimpFriedEgg, Smurph, and SpongeBob isolated on *M. smegmatis* mc2155. *Microbiol Resour Announc* 8:e00399-19. <https://doi.org/10.1128/MRA.00399-19>

**Robert Varnum '65** (BA, Bio) – Robert went on to earn his MD degree. He then did a pulmonary fellowship and practiced hospital-based pulmonary medicine. He is now semi-retired and has ten grandchildren!

**Bruce Coull '66, '68** (MS, Ph.D. Biology) – Bruce was a member of the faculty at the Univ. of South Carolina from 1973 to 2006, where he retired after a long and successful career, including serving as dean of the School of the Environment for ten years. He then was the director of the Center for Humans & Nature in South Carolina until 2010. From 1998 to 2006 Bruce was the leader of six trips to Chernobyl, Ukraine for faculty researchers.

**Paul Shackatano '68** (BA, Bio) – Paul practiced dentistry in Forest Hills, Queens, NY for 40 years and has been retired for four years.

**Robert Hill '75** (BA, Bio) – Robert just retired after 34 years practicing Emergency Medicine. “Thanks to Lehigh for a great education. My favorite professors were Dr. Malsberger and Dr. Krawiec.”

**Jay Clymer '78** (MS, PhD Bio) – Jay retired last year after teaching biology and environmental science for 40 years at Marywood University. Some of his students have received graduate degrees at Lehigh. At Marywood, Jay served in many capacities, including president of the faculty senate. He continues to serve as chairman of the board of the Lackawanna County Conservation District. “I still remain involved in local environmental projects and stream ecology. I enjoyed my years at Lehigh and the Wetlands Institute, where I got a fine education, and worked with great faculty.”

**Carter Fields '94** (BA, Bio) - After having spent nearly all of his post-Lehigh professional career in the laboratory as a molecular & cellular biologist, Carter hung up the lab coat for good in 2016 to explore opportunities on the commercial side of Genentech. Last year he accepted an offer to join the Medical Affairs division of Genentech. He is part of a team that helps design clinical trials for the company's oncology drugs. “I credit Lehigh's Biological Sciences department as well as the Journalism class I was required to take in the B.A. track for my success thus far. Thank you!”

**Bart Liguori '97** (BS, Mol Bio) – Bart earned a PhD from Cornell in Sociology in 2011 and completed a Strategic Data Project Fellowship at Harvard University in 2013. Bart is currently working at the Kentucky Legislative Research Commission, Office of Education Accountability, as the research division manager.

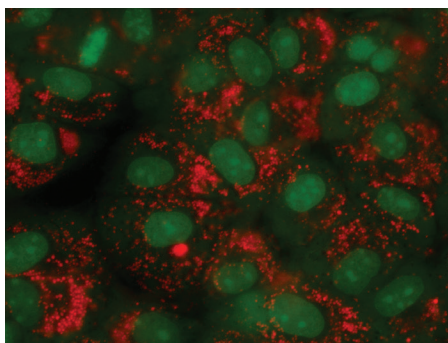
**Oona Lihyani O'Neill '97** (BA, Mol Bio) – is an assistant professor at Wake Forest Baptist Health, in the Department of Obstetrics & Gynecology.

**Lusia Yi '99** (BS, Mol Bio) – Lusia went on to earn an MS Microbiology, and a DO. She is board certified and a partner dermatologist at Alliance Dermatology Associates.

**Natasha Schuh-Nuhfer '02** (BS, Mol Bio) - After seven years as the Director of the Teacher Enrichment Program at the Center for Excellence in

Education, Natasha joined NOVA SySTEMic, Northern Virginia Community College's STEM outreach program, as a regional STEM Education Coordinator. She leads the STEM teacher professional development for the region's eight school divisions, serves as the local school division contact for classroom support, and helps facilitate the program's outreach efforts through STEM days, robotics competitions, and summer camps.

**Chris Jewell '03** (BS, Mol Bio) – Chris was elected as a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) for innovative research to understand the interactions between biomaterials and immune tissues, and for developing nanotechnologies enabling more selective immunotherapies.



*TNRK (normal rat kidney) epithelial cells stained with Acridine Orange. The dye fluoresces red by itself and the cargo vesicles that took up the dye are visible in red in the cytoplasm of the cells. The dye fluoresces green when bound to double-stranded nucleic acid and one can see the nuclei of the cells (ovals) containing the chromatin and the nucleoli inside the nuclei (brighter) fluorescing in green.  
Image: Prof. Falk and his 2020 Spring BioS368 students*

**Seetha Chandrasekhara '09** (BS, BNS) - Seetha earned her MD degree from Temple University, and has completed her residency in general psychiatry. During her residency, Seetha also completed a M.A. in Urban Bioethics, and was chief resident her fourth year. She then attended the Univ. of Pennsylvania and completed fellowship training in geriatric psychiatry. Seetha has joined the faculty at the Lewis Katz School of Medicine at Temple University as an Assistant Professor in Clinical Psychiatry and Behavioral Science in the psychiatry department.

**Daniel Torino '09** (BS, Bio) – Daniel attended Ross University for MD, completed two years of General Surgery at UPENN, and is now at Geisinger Medical Center as a Orthopedic Surgery Resident.

**Hillary Stires '10** (BS, BNS) – Hillary was selected to be a AAAS Science and Technology Policy Executive Branch fellow for the 2019-2020 cohort. Her placement is at the office of science and technology policy at the White House.

**Randi Ackerman '11** (BA, BNS and Psychology) – Randi received his Master's in Healthcare Administration in 2016 and started as a Clinical Research Supervisor at Memorial Sloan Kettering in 2018.

**Brandon Bensel '13** (BS, Mol Bio) – Brandon successfully defended his dissertation research at Rensselaer Polytechnic Institute. He is now a post-doc at the University of Vermont. His research focus is on understanding the role of cytoskeletal organization in regulating intracellular transport, using myosin-5-driven transport of synthetic liposomes along actin filaments in 3-dimensions as a model system.

**Maxwell Fayans '13** (BS, Bio) - After graduating, Maxwell completed his MBA in healthcare management in NY. He is now a Global Product Manager for a rapid point of care diagnostics company called Chembio Diagnostic Systems and his focus is on HIV rapid diagnostics.

**Zachary Gow '13** (BA, BNS and Physics) – Zachary received an MS in Computer Science from Georgia Tech and started a machine learning research and data science consulting company.

**Erin Kennedy '13** (BS, Mol Bio) -Erin successfully defended her PhD thesis at Brown University in 2019. Her research focused on DNA repair in the context of packaged DNA and studied how DNA glycosylases initiate base excision repair in nucleosome core particles. “I would like to thank the professors in the Biological Sciences department for helping to prepare me for success in graduate school. I would especially like to thank Dr. Lowe-Krentz for being a great advisor and for helping to lay the foundation of making me the scientist who I am today.”

**Alexandra Slenker '13** (BA, Bio) – Alexandra works in healthcare strategy on the Enterprise Strategy team of CVS Health/Aetna.

**Aislinn Rowan-Nash '14** (BS, Bio) successfully defended her Ph.D. dissertation at Brown University. She is now a research scientist at Finch Therapeutics in Boston.

**Roberto Solis '15** (BA, Bio) - Graduated with an MD in May 2019 from Texas Tech University Health Sciences Center El Paso. Roberto began his residency in Otolaryngology - Head and Neck Surgery - at the University of California, Davis in July.

**Joanna Warren '15** (BA, Bio & Int. Relations) – Joanna successfully defended her Ph.D. research in Immunology at the Univ. of North Carolina at Chapel Hill. “I have Lehigh, in particular the Department of Biological Sciences, to thank for inspiring me to pursue a life in science! Thank you!”

**Marina Grossi '17** (BS Biochem) – Marina is currently a Ph.D. candidate in Biochemistry at the University of Delaware.

**Sabina Gudmundsson '17** (BS, Bio) – Worked at the National Institutes of Health for as a postbac fellow and in the fall began her studies to earn a masters degree in genetic counseling.

**Meredith Stifter '17** (B.A., BNS) - Meredith graduated from UC Berkeley's School of Public Health in May with an MPH in Health & Social Behavior and a certificate in Multicultural Health.

**Rachel Margraf '18** (BS, Mol Bio and BS, Physics) – Rachel is currently pursuing a Ph.D. at Stanford University in Applied Physics. She is studying particle accelerator physics at SLAC National Laboratory.