

THE PROMOTER

2016

ALUMNI MAGAZINE

DEPARTMENT OF BIOLOGICAL SCIENCES
AT CARNEGIE MELLON UNIVERSITY

Issue 18

Strategic Evolution

Research and education adapting to our future

Teaching by Doing

How innovation and change is pushing the undergraduate labs, classrooms, and organizations to new heights



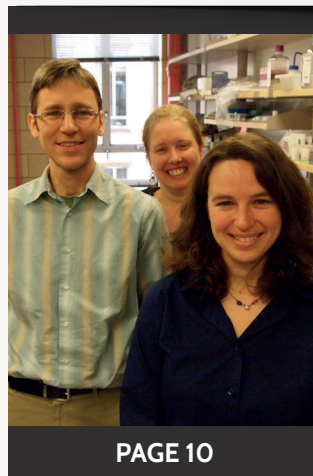
CONTENTS

WELCOME A letter from the Department Head		1
CMU PRESIDENTIAL FELLOWS Four Ph.D. students part of inaugural fellowships		2
FORWARD THINKING Brief conversations with undergraduate alumni		4
A NEW CHAPTER & THE RIGHT FIT A new role for Maggie Braun and welcoming Becki Campanaro		18
DEPARTMENTAL HIGHLIGHTS Celebrating the awards and honors of our faculty and students		20
ALUMNI PROFILES Recent Ph.D. graduates Ezgi Kunttas-Tatli and Jigar Desai		24
ALUMNI:ALUMNI CONNECTION A new position for recent alumna Tingting Xu		25
A MODERN CHANGE Updates in the Modern Biology course		27
ALUMNI UPDATES News and briefings from some of our distinguished alumni		28



ERIC GROTZINGER

Bids adieu as Associate Dean of MCS and leaves a lasting legacy



STRATEGIC EVOLUTION

Research and education adapting to our future



TEACHING BY DOING

How innovation and change is pushing the undergraduate labs, classrooms, and organizations to new heights



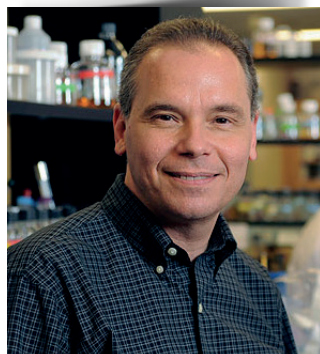
QATAR CAMPUS GROWING

New in town - new labs and new faculty

The Promoter is an annual alumni magazine created and distributed by the Department of Biological Sciences at Carnegie Mellon University. All rights reserved © 2016 | Available online at www.cmu.edu/bio/resources/promoter

Editors: Matthew Salyers and Shoba Subramanian | **Design & Layout:** Matthew Salyers | **Writers & Contributors:** Maggie Braun, Sharon Briggs, Becki Campanaro, Jigar Desai, Sarah Gaffen, David Hill, Ken Hovis, Karen Kormuth, Ezgi Kunttas-Tatli, Tara Primiero, Matthew Salyers, Shoba Subramanian and Tingting Xu | **Promoter Committee:** Maggie Braun, Becki Campanaro, Aaron Mitchell, Matthew Salyers and Shoba Subramanian

WELCOME



It is a sincere pleasure and honor to write to you, our Biological Sciences community, for the second time as Department Head. The theme of this issue of *The Promoter* is “Evolution,” an exceptionally apt descriptor for the past year in our department, college, and university.

At the university level, Dr. Suresh has unveiled the strategic plan that will shape the next 10 years of this institution. The plan embodies three broad themes: Individual Experience, University Community, and Societal Impact. I am proud to report that the goals and outcomes of the Department of Biological Sciences are well aligned with all three themes.

Over the last year, our department has strengthened the Individual Experience of both undergraduate and graduate students in several ways. For undergraduates, the Biological Sciences curriculum has undergone several changes, both as part of the MCS core curriculum revision and as part of our own re-thinking of the program. For example, Genetics has been re-engineered to be a sophomore course, with the goal of harnessing the strong mathematics training that engages students in their first year here. Meanwhile, we have moved Biochemistry into later semesters to allow students to absorb and digest organic chemistry that they learn as sophomores. The new MCS core curriculum helps to connect broad biological questions to all of the scientific disciplines, and provides structured guidance for students to improve their communication skills. The new MCS core also integrates students more effectively into the MCS community, and some exciting signs of success have already emerged. We look forward to continuing to graduate Biological Sciences majors who are equipped to work at and extend the leading edge of professional accomplishment.

At the graduate level, the Master’s in Computational Biology program, jointly offered with the Computational Biology Department at the School of Computer Science, has embraced the strong departmental tradition of individual advising. Student advising takes into account the student’s overall training, both within and beyond the classroom, and connects skills and interests to professional opportunities. Our training and advising have yielded outstanding results in high success rates for immediate

job placement or matriculation into advanced professional educational programs.

I have personally been involved in building upon the strong curriculum of our Biological Sciences Ph.D. program in order to tailor the framework to match the research diversity of the department. We have also continued to develop our emphasis on career and professional development of Ph.D. students, with a spectrum of visiting speakers and other opportunities designed to reveal to our students the many professional options that are available, and to recognize their own distinctive strengths that will support their success in the direction they choose.

In alignment with the strategic plan theme of University Community, we have also worked to strengthen our department’s educational imprint across the campus. For example, we will offer variations of our introductory courses that will make biological sciences more tangible and relevant to our diverse student audience. Modern Biology, our flagship introductory course with a combined enrollment of 400-500 students across all sections, will be offered this fall with focuses on mainstream topics such as genetic disease, genomics and personalized medicine, stem cell biology, and cancer cell biology.

Finally, as we look toward Societal Impact, our revitalized educational programs are complemented by our scientific research mission. Much of our research is inherently or deliberately collaborative in nature, allowing us to extend our thinking and vision beyond the traditional boundaries of Biological Sciences. Faculty members routinely publish their findings in world-class peer-reviewed journals and present their work at national and international conferences. Recent funding to support research groups in our department has come from a variety of government funding bodies including the NIH, NSF, IARPA, and QNRF (Qatari government) as well as from philanthropies such as the Kaufman Foundation and the Curci Foundation. Funding from the R.K. Mellon Foundation and committed funds from our well wishers, including Glen de Vries, have been rolled into larger university-wide Presidential Fellowships to support graduate students.

The horizon for our department has never been brighter! I am sure that you will appreciate as you peruse this issue of *The Promoter* that our evolution has indeed allowed us to adapt to the changing landscape of research and education, and to maintain our place in the foreground of both. I invite you to connect with us to share your comments, ideas, and reflections.

A handwritten signature in black ink, appearing to read 'Aaron Mitchell'.

Aaron Mitchell, Ph.D.
Department Head

THE INAUGURAL CLASS OF CMU PRESIDENTIAL FELLOWS

WRITTEN BY
MATTHEW SALYERS

Four Biological Sciences Ph.D. Students Awarded Fellowships



Presidential Fellows (from left) Ting Liu, Lydia Perkins, Amanda Willard, and Lina Song

Four Biological Sciences graduate students – Lina Song, Amanda Willard, Lydia Perkins, and Ting Liu – have been named Presidential Fellows in the inaugural class of Carnegie Mellon University Presidential Fellowships and Scholarships recipients.

The Presidential Fellowship program, launched by CMU President Subra Suresh in 2014, is intended to provide important financial support to recruit and retain outstanding graduate students, giving students and their faculty mentors the financial security to develop impactful research.

“An endowment of more than \$150 million has been established through a variety of mechanisms to support this and future classes of Presidential Fellows and Scholars across all seven of CMU’s colleges and schools,” said Suresh in an email announcement to the campus community.

Amanda Willard, a fourth-year Ph.D. candidate in the Gittis lab, was awarded the Richard King Mellon Foundation Presidential Fellowship in the Life Sciences. In the Gittis lab, Willard is looking at how an area of the brain called the basal ganglia, which is important for motor control, adapts during periods of dysfunction.

“I am using a slow dopamine depletion paradigm that I developed to investigate plasticity in the basal ganglia that occurs under conditions of low dopamine, as might arise in patients with Parkinson’s disease,” Willard said. “The goal is to understand the progression of changes within the basal ganglia that ultimately result in motor dysfunction.”

Lina Song, a fourth-year Ph.D. candidate in the Linstedt lab, was named the Glen de Vries Presidential Fellow for Biological Sciences. Song has been working in the Linstedt lab on the identification of the first inhibitors of O-glycosylation.

Many viruses depend on O-glycosylation (sugar modification) by the host cells they infect for their replication and to evade recognition by the host immune system. Thus, O-glycosylation inhibitors might aid patients infected with viruses ranging from the common cold to the deadly Ebola virus.

“Our hope is that the inhibitors will be useful as therapeutic agents,” said Song. “O-glycosylation inhibitors are expected to be anti-metastatic because the invasive behavior of many cancers depends on upregulated O-glycosylation.”

Lydia Perkins, a third-year Ph.D. candidate in the Bruchez lab, was awarded the Richard King Mellon Foundation Presidential

Fellowship in the Life Sciences. Her research in the lab uses fluorogen activating protein technology to discover new gene targets for synergistic cystic fibrosis therapies.

“Our goal is to enhance $\Delta F508$ -Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) trafficking to the cell surface beyond that achievable with corrector alone,” Perkins said.

“To identify gene targets that promote CFTR trafficking, a library was screened to knock down specific targets, and the library screen has presented an exciting list of candidates,” said Perkins. “This fellowship will help assist with the validation of these targets.”

“The Presidential Fellowship gives me a precious opportunity to complete this difficult research.”

Ting Liu, a sixth-year Ph.D. candidate in the Evilevitch lab, was named the Bruce McWilliams Presidential Fellow in the Mellon College of Science. Liu’s work in the Evilevitch lab focuses on understanding how physical properties of viral genomes control the infection process associated with genome release and subsequent packaging back into the virus.

“My major current project is to investigate how cellular osmotic pressure regulates the release of DNA from a human Herpesvirus (HVS-1),” Liu said.

“Studies of human virus replication inside cells are particularly challenging,” Liu continues, “and the Presidential Fellowship gives me a precious opportunity to complete this difficult research with the funding, and therefore the time, required for these experiments.”

The inaugural class of Presidential Fellows and Scholars consists of 90 undergraduate scholars and 55 graduate fellows across all of CMU’s seven colleges and schools.

FORWARD THINKING

INTERVIEWED BY
BECKI CAMPANARO

Brief conversations with undergraduate alumni David Hill, Sarah Gaffen, and Sharon Briggs



David A. Hill, M.D., Ph.D.
(MCS '05)

Fellow Physician
Division of Allergy and Immunology
The Children's Hospital of Philadelphia

What has been your career path and decision making process that guided you from CMU to your current position?

After graduating from CMU I worked with my CMU adviser to choose a path that would lead to my goal of becoming a physician-scientist. I applied for and took a position as a post-bac IRTA at the NIH for one year, during which I applied to M.D., Ph.D. programs and ultimately attended the University of Pennsylvania. After that, having interests in pediatrics, I completed my residency at the Children's Hospital of Philadelphia (CHOP). I am currently a first year Allergy and Immunology fellow at CHOP.

What is the nature of your current job?

As a Fellow Physician, I have both clinical and research responsibilities. I see allergy and immunology patients in the clinic and the hospital a few days per month. The majority of my time is spent working on basic, translational, and clinical research projects.

Have your career goals and trajectory changed since you left Carnegie Mellon?

I have always wanted to be a physician-scientist. I would say that my specific interests in pediatrics and inflammatory disease processes have become more refined.

How did your CMU training influence/strengthen your career choice?

My CMU education taught me how to think critically. This is essential to many career paths including those in both medicine and science. I felt very prepared for my graduate training, having completed my undergraduate education at CMU. The most influential and useful extracurricular activity that I was involved in at CMU was my time working in a basic-science research lab. I felt that this opportunity gave me a significant head start on my research career compared with my graduate student colleagues. It also helped me with my critical thinking skills, which are essential to successful medical training.

How do you use skills that you obtained during your CMU training in your current position?

As I mentioned, beyond the factual knowledge I learned at CMU, my CMU education taught me how to think critically, a skill which I refined during graduate school and I continue to use daily as a physician-scientist.

Any advice for our current students who may be considering following in your footsteps?

Get some experience working in both a hospital clinical setting and a research laboratory. Try to refine in your mind what aspects of each experience you enjoy. In the research lab, try to work on a project long enough to understand the fundamentals of why the project is important, the methods that you used, and the implications of your results. The specific topic of the research is not the most important thing (though it helps to be interested!), rather, mastering the scientific method and how to overcome setbacks should be the goal. You will have the opportunity to refine your interests and move your work towards those areas at various stages during your career.



Sarah L. Gaffen, Ph.D
(MCS '88)

Gerald P. Rodnan Professor of Medicine
University of Pittsburgh
Division of Rheumatology &
Clinical Immunology

What has been your career path and decision making process that guided you from CMU to your current position?

I remained in academic research. I did my Ph.D. at UC Berkeley, postdoctoral work at UCSan Francisco, and my first faculty position was at the University at Buffalo. Although I am not originally from Pittsburgh, I fell in love with the city during my undergrad years, and I was happy to return in 2008 (just in time for my 20th reunion!) to take a position at the University of Pittsburgh. I am now the Gerald P. Rodnan Professor of Medicine at the University of Pittsburgh Division of Rheumatology and Clinical Immunology.

What is the nature of your current job?

I run a research lab with 8 people (mix of graduate students, undergrads, postdocs, and staff), and I do some classroom teaching to medical students and graduate students. My lab studies the molecular basis for immune regulation, particularly the role of immune “hormones” (termed cytokines) and how they protect against fungal infections.

Have your career goals and trajectory changed since you left Carnegie Mellon?

My goals and trajectory stayed pretty much the same actually, though the specific nature of my research (immunology of fungal infections) was not something I anticipated working on back as an undergraduate.

How did your CMU training influence/strengthen your career choice?

CMU training prepared me very well for graduate school, both didactically and in terms of lab experiences. The level of coursework at CMU was on par with the advanced graduate classes I took at Berkeley, where I struggled far less than most of my peers (even those from very good universities). I was one of the few who had written grant proposals before going to grad school, which

helped me earn an NSF fellowship to support my graduate work and to pass my Ph.D. qualifying exams easily. The undergraduate research that I did also helped prepare me for graduate school - particularly the challenges when experiments didn't work. Finally, “Linda's Lab” (taught by Linda Kauffman) was the ultimate in lab-based courses, and in all my discussions with others in science I have not heard of its equal.

How do you use skills that you obtained during your CMU training in your current position?

One of the real strengths in CMU's teaching (especially the biology curriculum) was in learning how to interpret data and how to plan experiments, rather than memorizing facts. This approach laid the foundation for what I do now, since most of the “facts” I learned as an undergrad are really out of date.

Any advice for our current students who may be considering following in your footsteps?

I have three pieces of advice. The first is to do undergraduate research (summer and school year) in several different labs in different research areas, so you get a feel for what doing research is really like - it's not for everyone! Also, every lab is different, so even if you have one bad experience you will realize it can be better somewhere else. Consider “SURP” programs (summer undergraduate research programs); for example, Pitt has an excellent one. Secondly, take a year or two off before going to graduate (or med) school - be a technician, travel the world, try out something exciting, and ultimately grow up a bit. This will not hurt you in terms of getting into school, and almost certainly will help. More importantly, it will help confirm your decision (or save you from wasting time if the decision is a wrong one). Lastly, take the time during undergraduate years to explore a bit; take classes in something fun (music, drama, art, a language, whatever floats your boat) and join a club or other organization to enjoy these years. In many ways it really is the best time of your life.

DID YOU KNOW?

16 undergraduate alumni have been selected as NSF Graduate Fellows or received an honorable mention in the last three cycles of the award.



Sharon Briggs, Ph.D.
(MCS '10)

Scientist
Applied Genomics
Helix

What has been your career path and decision making process that guided you from CMU to your current position?

I always knew I wanted to study genetics - it was the reason I decided on CMU for college - and when I was finishing I wasn't exactly sure what I wanted to do. After learning about stem cell biology, and with the support and encouragement of my undergraduate research advisor, I decided to pursue a Ph.D. in genetics at Stanford. Without going into the nitty gritty details of my five years of graduate school, when I finished I was looking for a career that would value my scientific background and would also allow me to branch out of a typical scientist role. Helix, a consumer genetics platform company, was the absolute perfect fit for me.

What is the nature of your current job?

At Helix, I am a scientist on the applied genomics team. My role covers two main areas. The first is setting up standards for scientific curation of our partners so we can ensure the quality of products on the Helix ecosystem. The second is working with our business development team to pitch the addition of genetics to current consumer products. That means when our team goes out to find partners to build for the Helix platform, I research the science behind their products, create product integrations that include a genetic component, and am the scientific expert in the room for partner meetings!

Have your career goals and trajectory changed since you left Carnegie Mellon?

My career goals have definitely changed since CMU. I left CMU planning on a academic research career, but throughout grad school I learned a lot more about the options for Ph.D.'s outside of academia. I was really excited by the opportunities in industry for applied genetics/genomics and the rise of the personalized medicine initiative. It became clear to me in the last years of graduate school that I was set on a career outside of academia.

How did your CMU training influence/strengthen your career choice?

My CMU training really set me up well for my Ph.D. training and beyond. After CMU, graduate school was a breeze. I was well trained not only in the research and subject matter aspects of grad school, but also in terms of independence, ability to take initiative, intellectual curiosity, among many others. Being able to balance lots of competing priorities at CMU has helped me prioritize at work and is certainly a major factor in my success.

How do you use skills that you obtained during your CMU training in your current position?

One thing I learned at CMU is to always ask questions and never worry what other people think. It's something I've kept with me through grad school and into my new job. I'm constantly learning new things and asked to do things I've never done before. Being able to ask questions has made me much more effective at work.

Any advice for our current students who may be considering following in your footsteps?

Figure out what you're passionate about and pursue it wholeheartedly. I enjoyed grad school and my job immensely, almost certainly because I love what I'm doing. I hope as I move through my career that I can always remember to stay true to things that matter to me!

DID YOU KNOW?



Undergraduate alumni have gone on to continue their education at other world-renowned universities such as Yale, Columbia, Harvard, Duke, MIT, Princeton, Oxford, Johns Hopkins University, Stanford, UCLA, and Cornell.

Alumni have also gone on to health professions at the University of Pennsylvania, Brown Medical School, Vanderbilt, Johns Hopkins University, Harvard, and Stanford - to name a few.

ERIC GROTZINGER

Bids Adieu as Associate Dean of MCS and Leaves a Lasting Legacy



In a conversation with Eric Grotzinger, who is halfway around the world visiting his son's family in Singapore, I ask if it is true that he has had students stay in his home when other accommodations were not available. Grotzinger chuckles and says, "Why, yes!" and continues to talk about how he and his wife have also enjoyed inviting many students for Thanksgiving meals and has even given them rides during holidays. Helping students on all fronts, not confined to the campus perimeter and academic setting, is what Grotzinger has done marvelously. His 37-year legacy has a long-lasting impact on Carnegie Mellon University, particularly the Mellon College of Science and the Department of Biological Sciences.

In 1979, CMU President Richard Cyert hired Chien Ho, professor of biological sciences, to serve as the department head for the Department of Biological Sciences. Ho's charge was to help grow the department, and he hired Eric Grotzinger to be assistant department head. In this capacity, Grotzinger was to serve as a mentor and advisor for graduate and undergraduate students and to handle the day-to-day undertakings of all department activities, in addition to larger operations from student recruiting to making sure the laboratory dishwashers and autoclaves remained serviced and functional. With Grotzinger's support for daily affairs of the department, Ho could focus his energy on faculty recruitment and expanding the research and educational programs.

"Eric turned out to be one of the best recruitments during my seven years as department head," says Ho. "By all measures, Eric did a fantastic job in the department, at the college and at the university."

John Woolford, professor of biological sciences, who was hired the same year as Grotzinger, said, “When I started, the department had five new faculty and a new department head; Eric was the glue that kept the department together. Eric was always upbeat and he was the person you went to with a problem and you left with a smile. Eric got along with all kinds of people.”

Grotzinger received his undergraduate degree from Gettysburg College and his Ph.D. in biochemistry from the University of Pittsburgh. As a lecturer at CMU, Grotzinger co-taught Introductory Biology with the late Beth Jones, and team-taught Biochemistry with the now Professor Emeritus, Will McClure. Jones and McClure had high standards for teaching and high expectations of their students, and Grotzinger considered it a great fortune to get to work with them. He was also able to hold more than the average number of office hours to help ease students into the subject matter and provide them with the needed learning tools.

With an understanding of students’ strength in scientific matters and his knowledge, from an advisor’s perspective, of student personalities and their extracurricular strengths outside the classroom, Grotzinger pushed towards nominating more deserving students for awards. To name a few, he has nominated or written recommendation letters for several successful NSF Graduate Research Fellowship, Goldwater Scholarship, Rhodes Scholarship, and Gates Cambridge Scholarship awardees. These awards have enhanced not only the students’ portfolios but also elevated the overall departmental and university portfolios.

Grotzinger did not limit his roles to advising and teaching but was also instrumental in obtaining major funding for both graduate and undergraduate training programs in the department. Grotzinger’s contributions were instrumental for obtaining a National Institutes of Health (NIH) training grant for the Ph.D. program in Biological

Sciences. In addition, he worked closely with Susan Henry, former head of the Department of Biological Sciences and former dean of the Mellon College of Science to obtain the first of many Howard Hughes Medical Institute (HHMI) undergraduate research grants that have supported a large number of students during both the academic year and summer months to conduct primary research. Dean Henry identified Grotzinger as an asset in being a relentless advocate for science students within and outside CMU and recognized his spectacular leadership skills.

Grotzinger soon became the founding Associate Dean for Undergraduate Affairs at the Mellon College of Science under Dean Henry. This was concomitant with first-year MCS advising starting to be administered out of Grotzinger’s office, which was previously done from the College of Engineering - also known as Carnegie Institute of Technology (CIT). Grotzinger brought his personal touch and a customized approach to the MCS first-year experience, thus making 18-year-old students, who are out of their homes for the first time after high school, get a sense of comfort. He was the sounding board and go-to person they trusted to get advise from and reached out to for solving academic and non-academic issues.

“Dr. Grotzinger’s ability to build strong relationships with students and help them recognize their talent is unparalleled. The mere fact that it has been 8 years since I graduated from Carnegie Mellon and I still interact with him regularly is a testament to his dedication, enthusiasm and passion for his students. I feel that he contributed immensely to my overall growth as an undergraduate and development into a technical leader,” said Betty Mbom (MCS ’08). Since graduating from CMU, Mbom received her Ph.D. from Stanford and is currently working in a leadership role at a major biomedical company. Mbom, with help from Grotzinger, founded COMPASS, which stands for Coaching Minority Progress and



Academic Success in Science, a mentoring program for first-year minority students. COMPASS continues to do amazing work in supporting minority students on campus.

When asked about his advising, Grotzinger said, "I believe in the philosophy of 'the more you give, the more you receive.' In return I've learned so much from my students, and I have even taken some of the lessons I learned to my own parenting."

Grotzinger also firmly believes in the mantra of "Be inclusive not exclusive." While being inclusive is his primary goal, he is wary of not coddling students too much. He pushes them in the right direction during difficult situations and makes them figure things out for themselves without spoon-feeding. This approach to advising has helped many students who lacked confidence in their ability to get through seemingly impossible tasks become sure of themselves.

The success he has brought to the university using this approach has increased MCS students successfully moving from freshmen to sophomore year from 80% to 95% and has enhanced the 6-year graduation rate to 88%. This statistic, which is largely due to Grotzinger's tireless efforts, was so compelling that when Grotzinger decided to step down from his position as MCS Associate Dean for Undergraduate Affairs to begin the next phase of his life, CMU wished to retain him for a part-time position to serve as a senior advisor to Campus Affairs for their "Persistence Initiative." The goal of this initiative is to enhance the number of students who enroll at CMU to persist toward finishing all their degree requirements successfully. Of course, there is no better person to serve as an advisor for such an initiative than Grotzinger.

In recognition of all that he has done for CMU, Grotzinger is this year's recipient of the Robert E. Doherty Award for Sustained Contributions to Excellence in Education which is awarded to an extraordinary individual for their outstanding service in several aspects of the university's educational mission. Grotzinger has served as the Faculty Athletic Representative to the NCAA in addition to being a faculty figure at the University Athletic Association, and served on a variety of committees at the college and university level.

"CMU is in my DNA," Grotzinger said. "This is not just a job, but a lifestyle for me."

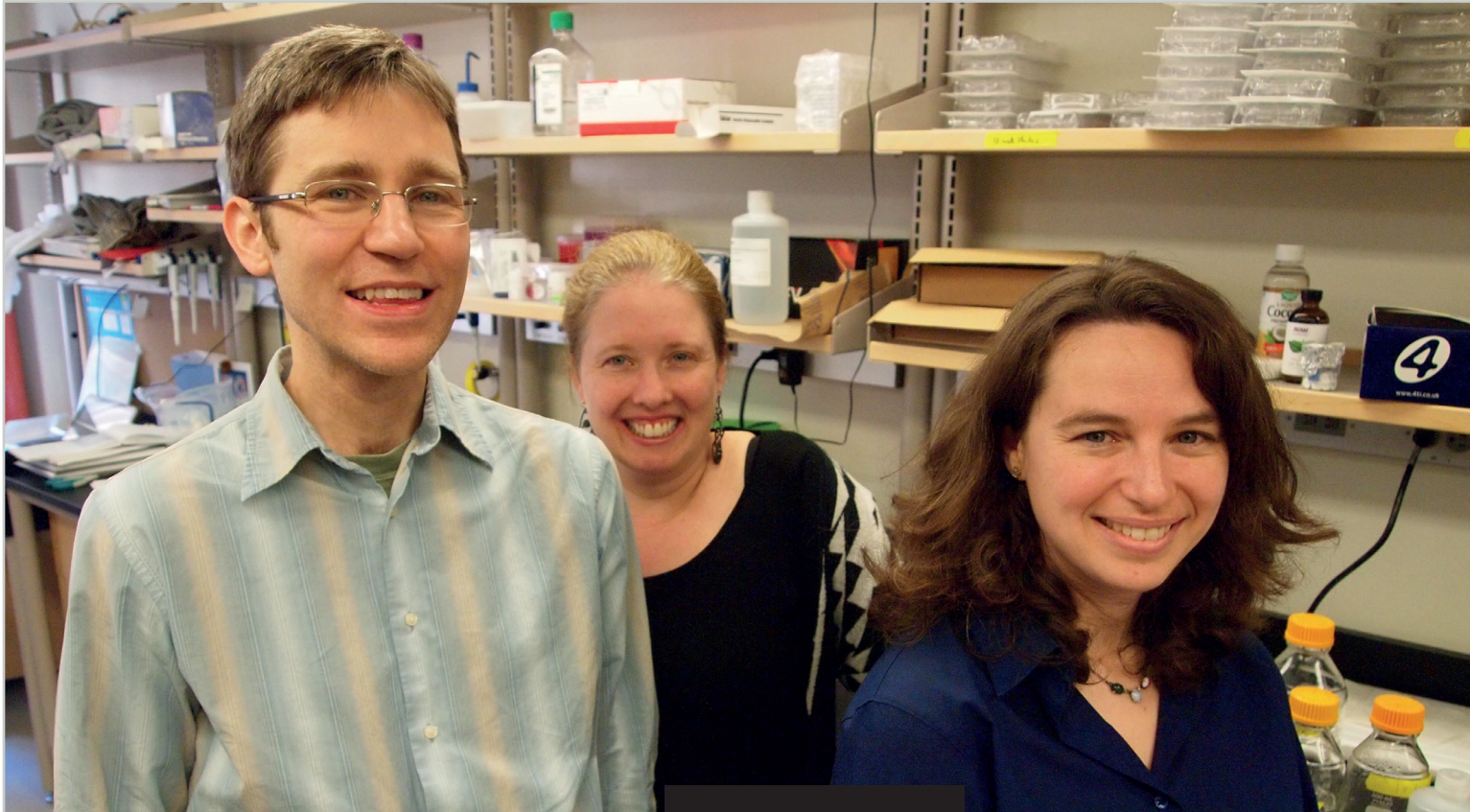
This final statement from Grotzinger sums it all, and therefore saying "he will be missed!" is a huge understatement.

CAREER HIGHLIGHTS

- 1969 Graduated from Gettysburg College with B.A. in Chemistry
- 1974 Ph.D. thesis, Metabolism of *Lawsome Impatiens balsamina*, at the University of Pittsburgh
- 1974 Began teaching career in Chemistry at Muskingum College
- 1976 Appointed Associate Director of Admissions at Muskingum
- 1979 Named Assistant Department Head in Biological Sciences at CMU
- 1983 Began teaching at PA Governor's School for the Sciences at CMU
- 1983 Promoted to Associate Department Head in Biological Sciences at CMU
- 1991 Founding Associate Dean for Undergraduate Affairs for the Mellon College of Science at CMU
- 1993 Received CMU Undergraduate Advising Award
- 1994 Named co-chair of the MCS Curriculum Committee
- 1997 Received NSF Recognition Award for the Integration of Research and Education for the development of first-year seminars
- 2003 Began four-year term as President of Phi Kappa Phi Honor Society at CMU
- 2005 Presented talk, "Forever Young", at CMU Last Lecture Series
- 2007 Began as advisor to the Coaching Minority Progress and Success in Science (COMPASS) program
- 2014 Presented "Creating a 21st Century Core Curriculum" at the AAU STEM Conference in Washington, D.C.
- 2016 Received CMU Robert E. Doherty Award
- 2016 Named Professor Emeritus
- 2016 Began serving as senior advisor to Campus Affairs for the "Persistence Initiative"

STRATEGIC EVOLUTION

WRITTEN BY
KAREN KORMUTH



Research and Education Adapting to Our Future

In November 2015, Carnegie Mellon University President Subra Suresh initiated a university-wide strategic plan aimed at advancing the impact and culture of our school so that we are better prepared to understand and meet the needs of our changing world. This initiative, spearheaded by Suresh, is focused on development of the university from three essential tenets: Individual Experience, University Community, and Societal Impact. Together with the university as a whole, the Department of Biological Sciences has and will continue to evolve over time to align itself with and contribute to this strategic plan.

Advancement within the Department of Biological Sciences has been a collaborative effort, requiring the combined skills and creativity of all its members. Along with intradepartmental development, these advancements have included inter-college collaborations with researchers in other departments at CMU beyond the Mellon College of Science (MCS), expanding our interdisciplinary approaches to solving problems.

The aftereffects of these efforts have impacted the entire department, but have particularly augmented the Ph.D. program, enhancing the experience of our graduate student members. Our department has maintained its unique status as a diverse and inclusive community, bringing together researchers from nearly all aspects of biology. We have also grown such that our graduate students have access to mechanisms that promote personal development and expand ties with the university and regional communities, in addition to top-level research.

RESEARCH LABS

Evidence for these transformations can be found within individual research labs, as well as the research centers anchored in the department. Three of our current faculty, who are among the department's most recent members: Joel McManus, assistant professor of biological sciences, Aryn Gittis, assistant professor of biological sciences, and Luisa Hiller, assistant professor of biological sciences, have provided their personal insights into the impact of departmental evolution on their research pursuits as well as their students.

gene expression. The connections between human sequence variation and translational regulation are not yet established. We approach this problem using the yeast model system, which shares the same translational mechanisms as humans, but is a much more feasible system to work with in the lab.

Aryn Gittis: We study neural circuit dysfunction in Parkinson's disease using a mouse model system. Our goals are to figure out the cell types and pathways within the basal ganglia that are involved with this disease in order to find new potential targets for better treatments. Our work has allowed us to develop a new model of Parkinson's explaining how the brain adapts over time to the progression of this chronic disease.

Luisa Hiller: We are interested in how pathogens interact with their hosts to colonize and/or cause disease. Specifically, we are interested in *Streptococcus pneumoniae*, a species of bacteria that infects the upper respiratory tract. These bacteria have a worldwide impact, resulting in 1 million deaths in children each year, as well as pneumonia, which is a leading cause of death in elderly people in hospitals. Despite the development of effective antibiotics and vaccines, these bacteria have quickly evolved resistance. We study this problem from two perspectives. First, we want to understand how/why the bacterial genome has evolved so quickly and why certain strains are more successful than others at developing resistance. Secondly, we also study chronic middle ear infections, which are maintained through biofilm formation, and how bacteria within the biofilm use molecules to communicate with each other. We have set ourselves apart as a research group by focusing our studies on clinical strains directly from patients, which reflect the status of the population now, rather than the model strains commonly used in the field. We also study how



“Students here are able to integrate themselves into their fields very early in their careers.”

Question: Please describe the research currently taking place within your lab and how you perceive the potential societal impact of that work.

Joel McManus: We study how gene regulation has evolved, specifically how variations in genome sequence contribute to variations in gene expression. Little is known about how translational regulation, a key step in response to stress, affects

these strains grow and evolve in conditions that mimic the disease state, such as animal models and biofilms, rather than an artificial, test tube environment.

Q: How has becoming a faculty member at CMU influenced your research perspective?

JM: One of the vital features of CMU is that it is a student-

centered university, which promotes the development of research strategies that are accessible to students. Additionally, access to interdepartmental resources has expanded our research and allowed us to approach questions that we previously would not have been able to consider. Specifically, the Molecular Biosensor and Imaging Center (MBIC) has allowed us to test the functions of hundreds to thousands of translational regulatory elements using flow cytometry. We have also developed collaborations with computational biologists to test single cell translation rates.

AG: Working at CMU has allowed us to develop a computational aspect to our research, expanding the complexity of the questions we can answer.

LH: The interdisciplinary nature of the department and the Mellon College of Science has allowed us to initiate projects with collaborators that I would not have considered possible before coming here. Specifically, we now have projects exploring in vivo transcription with Aaron Mitchell, phylogenetics with Dannie Durand, new diagnostic tools with Marcel Bruchez and Newell Washburn, and the use of polymer-based therapies with Alan Russell.

Q: How has your research benefitted from inter-college collaborations within CMU?

JM: We are collaborating with Robert Murphy (MCS/SCS), as well as Carl Kingsford and Andreas Pfenning (both at the School of Computer Science), who are helping to expand our capability to analyze data and approach bigger questions.

AG: Our collaboration with Valerie Ventura (Dietrich College of Humanities and Social Sciences) is allowing us to expand our studies of adaptation of neural patterns. Additionally, we are collaborating with Burak Ozdoganlar and Gary Fedder (both at the College of Engineering) to design better electrodes that can more stably record neural activity over time. Together with Steve Chase (College of Engineering) and Sandra Kuhlman (MCS), we are also working to develop a brain/computer interface platform to study learning in mice.

LH: We have established a collaboration with Radu Marculescu (College of Engineering) to apply graph theory to study biofilm growth. This collaboration will help us to understand the organizational network in the bacterial community, and eventually identify drugs that are able to target communications between cells, rather than kill them. Development of resistance to such drugs has a lower fitness advantage for the bacteria, therefore, we will create testable models of how resistance might spread within a bacterial community.

Q: How do you view the evolution of the Ph.D. program in Biological Sciences and how does this directly benefit your students?

JM: The graduate students here get more direct attention from their PIs and conversely, the PIs here rely on their students more than they would at larger universities. Apart from research, students receive significant training in communications, including presentation of their own work and the work of others. The Eberly Center also provides unique opportunities for specialized training in teaching. In general, our department provides a friendly environment for students to build collaborations and find help with their research questions.

AG: My students are able to tackle bigger questions, especially due to the computational components of our research, which have been fostered through our collaborations here.

LH: Students here are able to integrate themselves into their fields very early in their careers, especially through the attendance of local and international meetings. The communications training



Nicole Matamala, junior biological sciences major, at the DNAZone Camera Obscura Event organized by the Children's Museum of Pittsburgh.



Biological Sciences sophomore Hannah Nourie at the DNAZone Moving 4th in Science outreach program. Students are building spectrometers to demonstrate light absorption.

developed within the department, specifically presenting at Journal Club and the Elizabeth Jones Annual Retreat, has promoted the success of my students, including acquisition of speaker and poster awards at international conferences.

RESEARCH CENTERS

Graduate student education in our department is not limited to the individual lab groups, and is augmented through involvement with interdepartmental networks that promote expansion of research and creativity. The centers grounded within our department, for example, enhance the experience of our graduate students within and beyond the university community, in addition to accommodating major research hubs.

The Center for Nucleic Acids Science and Technology (CNASt), which is co-directed by John Woolford, professor of biological sciences, and Bruce Armitage, professor of chemistry, provides a unique opportunity for students to engage with the DNAZone outreach program and increase their impact on the regional community.

CNASt was initiated as an organization meant to bring together researchers with different skills and goals to do unique things. CNASt is unique in that it incorporates researchers from across the campus and the city, and is grounded in the ability of synthetic chemists to make molecules able to monitor and manipulate nucleic acids in unconventional ways. CNASt was also designed to support young scientists' careers by providing young faculty with

unrestricted funds, maintaining an interdisciplinary post-doctoral fellowship, and supporting graduate students.

Along with its research initiatives, CNASt has expanded its DNAZone outreach program. DNAZone, which has been beautifully organized by Catalina Achim, professor of chemistry, has had far-reaching and repeated impacts on local students and teachers. In 2015, DNAZone averaged four outreach events per month, which is a testament to the dedication of CNASt members to this program.

While DNAZone functions to make science accessible to students now and into the future, it also provides opportunities for personal development for the graduate students involved in this program. Specifically, graduate students can act as mentors and convey their excitement about science to the students. From these experiences, graduate students are able to investigate whether they enjoy the outreach/teaching components of science as a potential career, and also learn the value of commitment to the local community.

The recent and continued evolution of the Department of Biological Sciences has truly strengthened the Ph.D. program, including mechanisms for the development of leadership, communication, and interpersonal skills in our graduate students. Along with the initiation and maintenance of inter-college collaborations, these advancements will serve to drive our department forward into the future together with the university as a whole.

WRITTEN BY
MATTHEW SALYERS

TEACHING BY DOING

How Innovation and Change is Pushing the Undergraduate Labs, Classrooms, and Organizations to New Heights

The department, like the university as a whole, has always been at the forefront of innovation and change. As the graduate research labs and programs evolve into their 21st-century settings, the undergraduate side of the department has been making similar strides that benefit the modern student.

The undergraduate labs have transformed into a major hub of research-based undergraduate training, offering numerous courses in experimentation. In thinking of the goals of the modern student, the Mellon College of Science revamped its core curriculum to enhance scientific education, while organizations like NeuroSAC and places like the Minden lab offer new ways for the student body to interact with biology.

UNDERGRADUATE LABS

Home to the Experimental Genetics, Experimental Biochemistry, Experimental Neuroscience, and Experimental Cell and Molecular Biology lab courses, the undergraduate labs provide students with experience in scientific benchwork as they plan, design, implement, and perform independent investigations. Most graduate programs want students that have done their own experimental research, and our undergraduate students have many opportunities to hone their skills through these labs, which are run by Carrie Doonan, director of undergraduate laboratories and teaching professor of biological sciences, and Emily Drill, assistant teaching professor in biological sciences.

On top of formal lab reports, undergraduate students have the chance to present their findings during poster sessions and seminar presentations.

Biological Sciences undergraduate Brandon Rogowski leading an experiment with local high school students during a 2016 outreach program



“The lab courses have evolved towards inquiry-based experience with multiple opportunities to carry out research projects,” said Doonan. “Lab modules are continually added to the curriculum in all lab courses to cover current topics and technology.”

In the spring lab courses, all students learn how to perform cell culture and carry out research. This progresses to projects covering the biotechnology of genetic modifications and the labeling of neurons using a gene gun.

“Our labs started with students doing benchwork such as an individual western blot or ELISA,” continued Doonan. “We’ve grown to not only cover the basics but also to perform modules such as one on the uses of antibodies in research. Students in all courses work together to concurrently use immunohistochemistry to visualize protein expression in a chick embryo and determine the protein degradation rate using western blots. They then compare the applications and principles of these techniques, and



their usefulness to analyze problems.”

The prevalence of technology in the classroom has also led to advancements in how undergraduate students in the labs share their research and interact with their findings. In the fall of 2015, students produced videos to demonstrate techniques learned in the genetics course, writing, recording, and editing their own projects.

This method of “teaching by doing” plays a large role in the annual outreach programs that the labs put together for local area high schools. Undergraduate students have the opportunity to take on the role of instructor by leading a team of high school students through an experiment.

“The high school students benefit by their mentoring, and look to meet up with their CMU teaching assistant when they return for the next experiment,” Doonan said. “Our students improve their

communication skills through these interactions and also gain a deeper level of understanding of the material when they have to explain it to the participants.”

MCS CORE CURRICULUM

This past fall, the Mellon College of Science launched its new Core Education curriculum. The new Core Education fosters student growth in four dimensions – scholar, professional, citizen, and person. This innovative approach in science focuses on holistic and outcome-driven education.

“Employers are looking for graduates who are really great technically but who are also prepared for the workplace of today and tomorrow,” said Maggie Braun, MCS associate dean for undergraduate affairs and associate teaching professor of biological sciences.



The Proteomics Platoon team with Professor Jon Minden and graduate students from the Minden lab

The new curriculum expands on the exceptional education already provided in the MCS majors, offering a broadened course list for requirements outside of each chosen major. Courses built around self-directed experiences have also been added to further enhance a student's knowledge of the arts and community engagement.

"Hopefully now that students have more options and get to choose more of what interests them, they will be taking courses that they are excited about, taking them earlier on, and potentially spurring interest in the different areas of MCS," Braun said.

A new first-year seminar, EUREKA!, opens the door to incoming

students with enthusiasm. Students get to hear from faculty and alumni about the life of a scientist and talk to other students about their research and everyday life. Interdisciplinary work is built into the new system at its core, fostering extended mentorships and collaborations with students from all MCS majors.

MINDEN LAB

In the Minden lab, undergraduates have an innovative way to participate in the lab's research. Dubbed the "Proteomics Platoon", students (there are currently 12 undergraduates in the lab) work in pairs with the assistance of a graduate student mentor. Each pair consists of an upper class and lower class undergraduate, which gives training experience to the upper class student while they are all trained in the proper methods of running experiments.

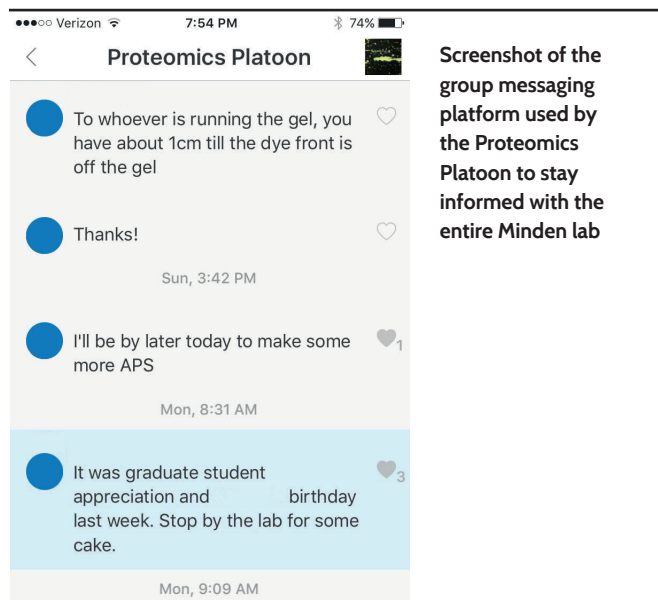
Jon Minden, professor of biological sciences, sees the collaborative nature of his lab and the roles of its undergraduates as beneficial to everyone involved. Graduate students gain vital practice in training the members of the platoon, and the lower class undergraduates eventually rotate into upper class roles to keep the cycle fluid and the participants growing.

Now in its fourth year, the platoon uses numerous communication platforms to keep its researchers on the same page and always informed. A group messaging app connects all members of the lab in a text message chain, so if something in the lab is not running properly or if a student is out of a certain material, it can be quickly remedied. A shared calendar and online experimental notes also keep everyone up-to-date with the latest results of experiments and the schedules of the lab, which is consistently booked solid.

“Many of our undergraduates have received summer scholarships and fellowships as a result of their work in the lab,” said Minden.

This structured freedom in research gives undergraduates an opportunity to work more lab experience into their busy schedules. Out of the twelve current undergraduates in the lab, five are also varsity athletes. Many students are in the lab on weekends and late into the night, showing a dedication gained from a higher involvement in the culture of the lab.

“By the time they graduate,” Minden continued, “all have also had their name on a published paper.”



Screenshot of the group messaging platform used by the Proteomics Platoon to stay informed with the entire Minden lab

Beginning with a small ProSEED Crosswalk grant from the university and support from Biological Sciences, Psychology and the Center for the Neural Basis of Cognition, NeuroSAC was established in the summer of 2014 as an outreach organization aimed at raising the awareness of neuroscience in the Pittsburgh community. The group, led by faculty advisor and Assistant Teaching Professor in Biological Sciences DJ Brasier, holds several on and off campus events each year, targeting activities and information to audiences of elementary school children all the way up to college students.

On campus, NeuroSAC sets up demonstration tables in the University Center each semester to offer onlookers a chance to see brain signaling in action with projects like the Hacker Hand. This robotic hand controlled by servomotors helps demonstrate the process of decoding neurological signals to the muscles in the hand and forearm.

Traveling around the area, NeuroSAC also annually visits McKnight Elementary, Winchester-Thurston School, and the Sci Tech Days at Carnegie Science Center. The outreach at these events spark interest in many high school students about the possibility of majoring in neuroscience in the future.

“One high school sophomore turned to his friend while working on the Hacker Hand device and said that he was totally going to major in neuroscience,” said Brasier in describing a recent Sci Tech Day event.

“Another high school junior wanted to discuss biology and expressed interest in molecular biology and genetics,” Brasier continued. “I told her that these are areas in which our department is especially strong and gave her my own contact information.”

Beyond community outreach, NeuroSAC has been expanding its collaborative nature with a partnership as a reviewer training site with Impulse, a new undergraduate neuroscience journal started at Appalachian State University. Reviewers from NeuroSAC offer feedback that helps the authors improve their manuscripts for publication.

“Over the next few years, I hope to see this grow as it allows CMU to participate with an international group of colleges,” said Brasier, “and provides our students with valuable experience in critically reading and discussing scientific studies.”

WRITTEN BY
TARA PRIMIERO

A NEW CHAPTER

Maggie Braun, Ph.D.
Associate Dean for
Undergraduate Affairs

Maggie Braun should be a familiar face to most MCS students, having worked in two different offices both adjacent to the Dean's Office of Undergraduate Affairs in Doherty.

First she served the college as the assistant department head for biological sciences beginning in 2008, during which time she advised all of the department's undergraduate majors, minors, and potential transfers before serving the entire college as the Director of MCS Core Education beginning in January 2015. Then, in 2016, as most were ringing in the new year in traditional style, Eric Grotzinger passed the Associate Dean for Undergraduate Affairs torch to his esteemed colleague (and friend), Maggie Braun.

With only a few short and hectic months under her belt as the new Associate Dean, Braun beams, "Students in our college are amazing in their efforts to share their passion for science and math!"

Their engagement with the community and excitement for their work is inspiring to her and the outcomes (jobs, grad schools, etc.) for them are incredibly impressive.

To better prepare our current undergraduates for successes beyond graduation, she looks forward to continue building partnerships with alumni. The enthusiasm and momentum will only continue as she collaborates more closely with advisors, staff, and faculty across the college.

"My colleagues in MCS are amazing and truly care about each and every student," said Braun. "They further inspire me to raise my game every day to keep up with their brilliance and thoughtfulness."



Looking ahead, Braun is excited to play an integral role in preparing students to be well positioned for successes in the 21st century. She sees this coming to fruition by continuing a rich tradition of undergraduate research and expanded depth of scholarship opportunities. She looks forward to unfolding the next phase of the New MCS Core Education to develop students into life-long scholars, professionals, citizens, and overall well-rounded persons.

Braun also seeks to develop a network of alumni to engage current students as both mentors and collaborators on projects and for in-class activities. She is excited to sharpen the MCS profile among the nation's high school students through increased outreach in an effort to attract the best incoming class of first-year students.

Braun is extremely passionate about helping each student find their own recipe for success. She continues to have an open door policy in her new role and looks forward to getting to know all of the MCS students better in the coming months.

Suggested talking points (beyond academics and campus life) to get to know her better yourself include: **Sports** (she is an avid sports fan, especially for Pittsburgh's Steelers and Penguins, and an athlete, who played basketball, softball, and ultimate frisbee), **Music** (a true music fanatic, she wrote her 2015 bio commencement speech by seamlessly weaving lyrics from all genres in with her own words to send off our graduates with an empowering message of hope and inspiration), and **Family** (she and her husband have 2 future Tartans, three-year-old Drew and one-year-old Jake, keeping them busy off-campus and on-campus when they come to celebrate our amazing students).

WRITTEN BY
MAGGIE BRAUN

THE RIGHT FIT

Becki Campanaro, Ph.D. Assistant Department Head for Undergraduate Affairs

Coming to campus with a great deal of enthusiasm and energy, accompanied by her passion for science, Becki Campanaro has been serving as assistant department head and advisor to Biological Sciences majors since August 2015.

Becki's professional background as a student-athlete and scientist prepared her very well for this multi-faceted position, which requires impeccable time-management and organizational skills to balance student appointments, administrative coordination, and curriculum development for the departmental undergraduate program. Becki caught up to "CMU speed" very quickly and is eager to continue to grow and develop along with the undergraduate program.

Becki's first impressions were those of excitement: "Everyday as I walk across campus from my car to my office, I look around at all of the truly amazing things going on here. I get to interact on a daily basis with some of the most intelligent, creative, and promising young people in the world. I am surrounded by colleagues who love their jobs as much as I do and who are passionate about developing our students to their full potential so that they can lead us into a bright future."

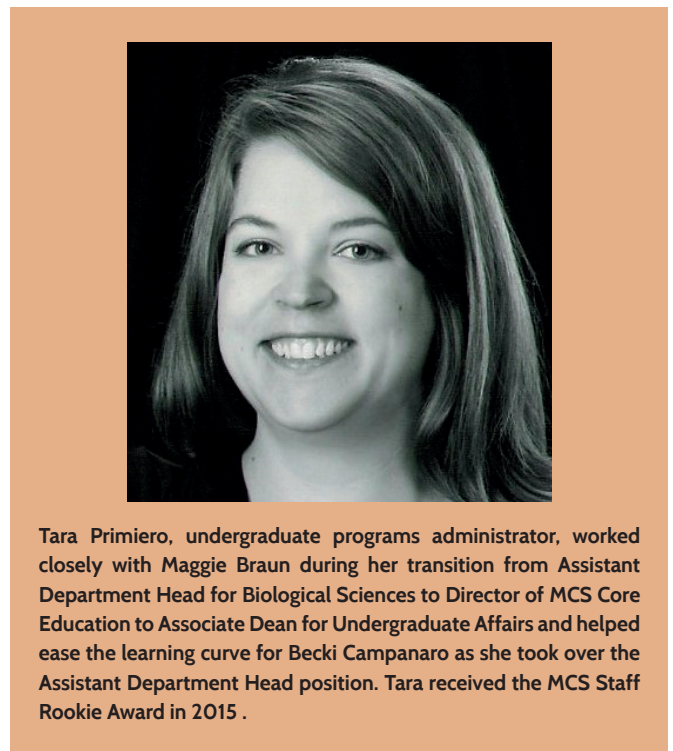
She came to Carnegie Mellon from the University of Pittsburgh, where her postdoctoral research used human embryonic stem cells to understand the molecular effects of prenatal nicotine exposure on lung development.

She is excited to share her applied biological background with incoming students in a section of Modern Biology in the fall 2016 semester that will focus on stem cells and cancer as applications of the basic biological material discussed in the course.



Looking forward, Becki is excited about growth in the department's majors and course offerings. She anticipates that new offerings in introductory lab courses (similar to the Phage Genomics course) and lecture courses for non-majors (similar to Brooke McCartney's Basic Science to Modern Medicine course) will engage all students to "pursue a broad education such that they are capable of making informed decisions where science (biology) is involved in their lives".

When not in the office, Becki is a mom to two energetic little boys who have taught her "how to think on her feet and remind her to not take herself too seriously".



Tara Primiero, undergraduate programs administrator, worked closely with Maggie Braun during her transition from Assistant Department Head for Biological Sciences to Director of MCS Core Education to Associate Dean for Undergraduate Affairs and helped ease the learning curve for Becki Campanaro as she took over the Assistant Department Head position. Tara received the MCS Staff Rookie Award in 2015 .

DEPARTMENTAL HIGHLIGHTS

Nick Audette (Ph.D. '18)

was awarded a 2015 Carnegie Brain and Mind Sciences Graduate Fellowship from the Carnegie Corporation.

Alison Barth (Faculty)

was named Interim Director of CMU's BrainHub and received an NIH grant.

Maggie Braun (Faculty)

was promoted to MCS Associate Dean for Undergraduate Affairs.

Marcel Bruchez (Faculty)

received two grants from the NIH in addition to patent approvals.

Becki Campanaro (Faculty)

was appointed as Assistant Department Head for Undergraduate Affairs.

Claire Cheetham (Faculty)

was appointed as Assistant Research Professor.

Stephanie Crilly (Ph.D. '21)

received an NSF Graduate Research Fellowship.

Aryn Gittis (Faculty)

was awarded the Eberly Family Early Career Development Professorship, obtained grants from the NIH, the NSF, and the Curci Foundation.

Vinitha Ganesan (Ph.D. '18)

was a finalist at the 2016 CMU 3-Minute Thesis Competition.

Eric Grotzinger (Professor Emeritus)

received CMU's Doherty Award for Sustained Contributions to Excellence in Education

N. Luisa Hiller (Faculty)

was funded from the Kaufman Foundation.

Ken Hovis (Faculty)

was promoted to Associate Teaching Professor.

Anagha Kadam (Ph.D. '18)

won first prize in the oral presentation category at the 12th European Meeting on Molecular Biology of Pneumococcus.

Scott Keith (Ph.D. '21)

received an honorable mention for the NSF Graduate Research Fellowship.

Salini Konikkat (Ph.D. '16)

received a Best Poster Award at the 2015 Rustbelt RNA Meeting.

Sandra Kuhlman (Faculty)

received awards from IARPA and the Curci Foundation.

Katie Lagree (Ph.D. '19)

received a travel grant for the ASM Biofilms Conference and a full tuition waiver for the Molecular Mycology course.

Ting Liu (Ph.D. '16)

was named the Bruce McWilliams Presidential Fellow in the Mellon College of Science.

Brooke McCartney (Faculty)

received the MCS Richard Moore Education Award and a grant from the Kaufman Foundation (Luisa Hiller and Jon Minden are Co-PIs).

Joel McManus (Faculty)

was awarded the Eberly Family Early Career Development Professorship.

Jon Minden (Faculty)

received an NSF award, a grant from the Kaufman Foundation, and funding from the CMU CIT-MCS Seed fund.

Lydia Perkins (Ph.D. '19)

received a Richard King Mellon Foundation Presidential Fellowship in the Life Sciences.

Manoj Puthenveedu (Faculty)

received grants from the NSF and the NIH. He also received grant funding from the Curci Foundation, the Winters Foundation, CMU's ProSEED BrainHub and has a patent pending.

Gordon Rule (Faculty)

Received a grant from the Qatar National Research Fund (QNRF) as well as a grant from the NIH.

Russell Schwartz (Faculty)

received an award from the Commonwealth Universal Research Enhancement (CURE) Program.

Dan Shiwarski (Ph.D. '17)

was a finalist at the 2016 CMU 3-Minute Thesis Competition.

Lina Song (Ph.D. '18)

received the Glen de Vries Presidential Fellowship for Biological Sciences.

Amanda Willard (Ph.D. '18)

received a Richard King Mellon Foundation Presidential Fellowship in the Life Sciences as well as a Predoctoral Ruth L. Kirschstein National Research Service Award (NRSA) from the National Institute of Neurological Disorders and Stroke.

John Woolford (Faculty)

was named Associate Editor of the journal RNA.

Ihab Younis (Faculty)

was appointed as Assistant Teaching Professor, Biological Sciences, CMU-Qatar.

DEPARTMENTAL AWARDS

Graduate Student Service Award

This award is given to a Biological Sciences graduate student for their service within and outside the department.

The following student was awarded the Graduate Student Service Award for 2016:

Zachary Weinberg

Graduate Student Teaching Award

This award is given to a Biological Sciences graduate student for their service to the department with regards to teaching.

The following student was awarded the Graduate Student Teaching Award for 2016:

Amanda Willard

Dr. Margaret Carver Travel Award

Each year, a group of Biological Sciences doctoral students are granted travel awards by the department for attending conferences or furthering their research at an external location. The travel awards are made possible through the generous contributions of the late Margaret Carver, M.D. (MM '43).

The following students were recipients of the Dr. Margaret Carver Travel Award for 2015-2016:

**Nick Audette
Vinitha Ganesan
Tanvi Shashikant**

**Lina Song
Zhongling Sun
Amanda Willard**

Elizabeth W. Jones Award

To honor her commitment to undergraduate research, the Elizabeth W. Jones Award for Excellence in Undergraduate Research in Experimental or Computational Biology was created in 2009. This award is given to honor the research efforts of a talented and dedicated undergraduate over their years at Carnegie Mellon.

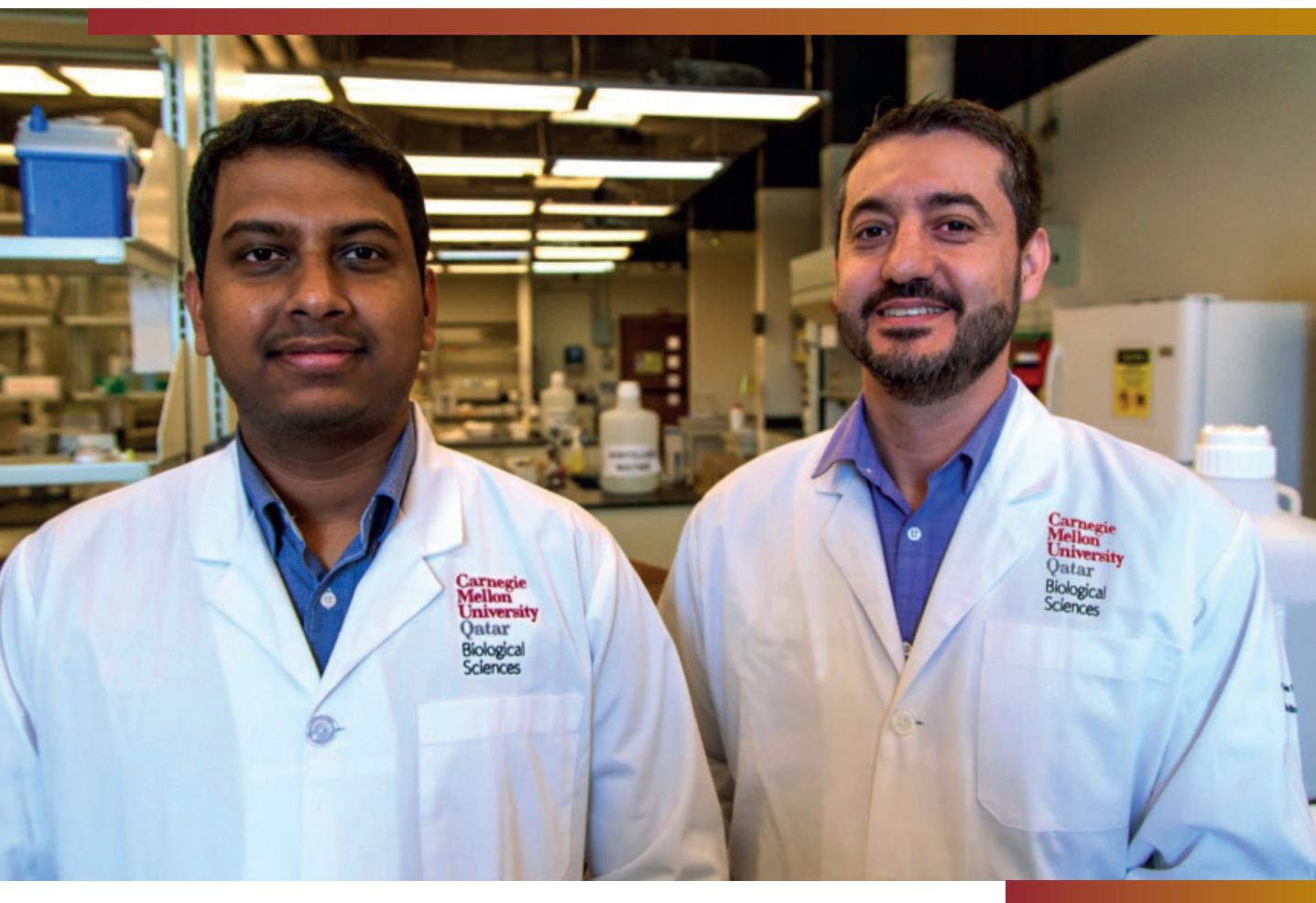
The following student was awarded the Elizabeth W. Jones Award for 2014-2015:

Anthony Spadaro

QATAR CAMPUS CONTINUES TO GROW

WRITTEN BY
KEN HOVIS

New in Town - New Labs and New Faculty



The Biological Sciences program was added to the Qatar campus in the fall of 2011, and since then, the program has grown to more than 50 students. In the spring of 2016, two new faculty members joined the ranks: Ravichandra Bachu, assistant teaching professor of chemistry, and Ihab Younis, assistant teaching professor of biological sciences.

Bachu comes to CMU-Q from Columbia University where he was doing post-doctoral work after receiving his Ph.D. in Chemistry

**New CMU-Q Faculty (from left)
Ravichandra Bachu, Assistant
Teaching Professor of Chemistry,
and Ihab Younis, Assistant Teaching
Professor of Biological Sciences**

Renovated teaching laboratories on the third floor of the CMU-Q building



from City University of New York. His lab will continue to investigate the contribution of structural elements in untranslated regions of mRNA transcripts to regulate gene expression. As a model system, his lab will study the mRNAs of BReast CAncer genes 1 and 2 (BRCA1 and BRCA2) and the structural perturbations in BRCA mRNAs caused by Single Nucleotide Polymorphisms (SNPs) in the 5' UTR and how those relate the perturbations to biological function in vivo.

Younis received a Ph.D. in Molecular, Cellular and Developmental Biology from Ohio State University, later working as a senior research investigator at the University of Pennsylvania in the lab of Gideon Dreyfuss. His lab is interested in the few hundred genes in humans that contain “minor” introns that are spliced out by a specialized spliceosome. Younis will use high throughput screening methodologies to discover factors and pathways that regulate major and minor intron splicing and to examine if introns act as molecular switches that provide a novel means of post-transcriptional gene expression.

Both professors join the program at a time when laboratory renovations on the third floor of the CMU-Q building are close to completion. These renovations include a 200-square-meter teaching laboratory, which will offer the courses Phage Genomics Research, Experimental Biochemistry, and Experimental Techniques in Molecular Biology. In addition, a 100-square-meter faculty research lab space is nearing completion, which includes a BSL-2 space for tissue culture and viral work, as well as general faculty research space.

“Both professors join the program at a time when laboratory renovations on the third floor of the CMU-Q building are close to completion. These renovations include a 200-square-meter teaching laboratory, which will offer the courses Phage Genomics Research, Experimental Biochemistry and Experimental Techniques in Molecular Biology.”



GRADUATE ALUMNI PROFILES



Ezgi Kunttas-Tatli

Ph.D. '14

Advisor: Brooke McCartney, Ph.D.

NRSA Postdoctoral Fellow
Division of Biology and Biological Engineering
California Institute of Technology
Advisor: Marianne Bronner, Ph.D.

Jigar Desai

Ph.D. '14

Advisors: Fred Lanni, Ph.D. and Aaron Mitchell, Ph.D.

Postdoctoral Fellow
Fungal Pathogenesis Unit
National Institutes of Health
Advisor: Michail Lionakis, M.D., Sc.D.

Ph.D. Research

Studied the role of colon cancer tumor suppressor Adenomatous Polyposis Coli (APC) using fruit flies as a model. During this process, learned how to be an efficient multitasker.



Ph.D. Research

Studied the genetic control of the fungal pathogen *Candida albicans* in drug-resistant biofilm formation on surfaces of implanted medical devices.

Postdoctoral Research

Understanding human disease such as cancer metastasis by studying the role of JAK/STAT signaling during neural crest migration in vivo by using zebrafish and chicken as model organisms.



Postdoctoral Research

Identifying host immune factors that influence mucosal and systemic fungal infections using relevant mouse models.

Ph.D. – Postdoc Connection

Well-rounded Ph.D. training has made it easier to adapt to new systems within the realm of cancer biology.



Ph.D. – Postdoc Connection

Strong training in microscopy during Ph.D. years offered preparation for advanced imaging techniques, including two-photon intravital microscopy.

Student life vs Postdoc life

Enjoys the independence of postdoc life, and at the same time, is excited for personal life choices, such as starting a family.



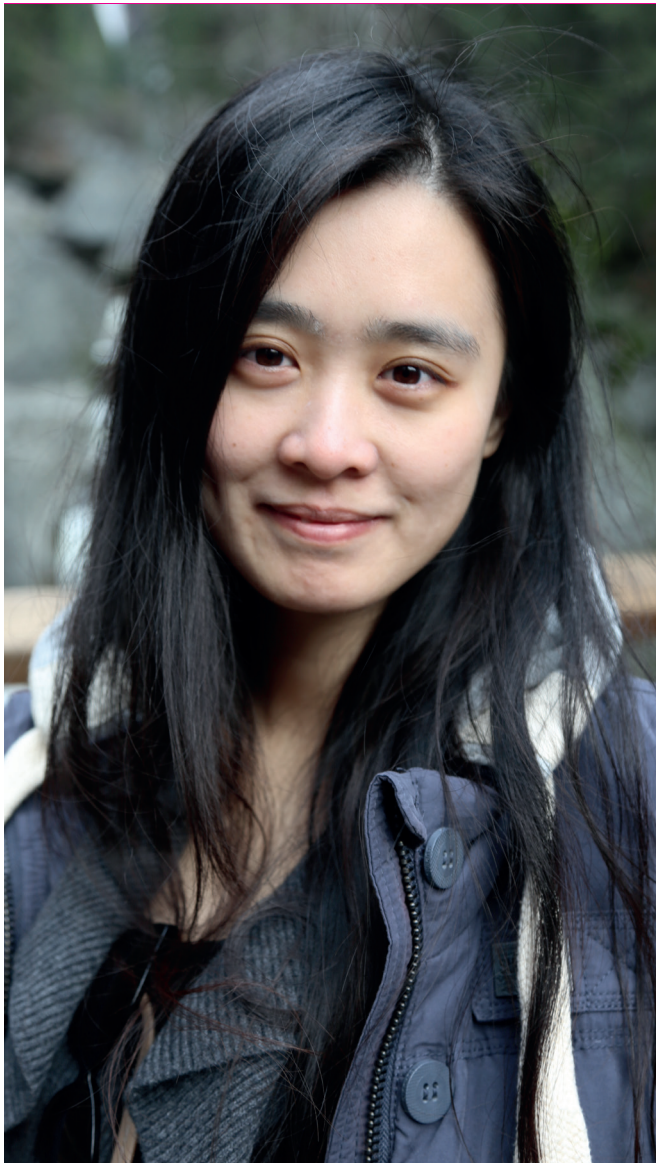
Student life vs Postdoc life

Smooth transition into postdoc life, owed to the strong training and mentorship received while at CMU that included bench skills as well as soft skills.

ALUMNI : ALUMNI CONNECTION

WRITTEN BY
SHOBA SUBRAMANIAN

A Look at Recent Alumna Tingting Xu's New Position with Emerald Therapeutics



Personalized medicine, targeted gene therapy, custom drug design, large-scale genome and transcriptome analysis, proteome and microbiome-based studies of human disease, and new biomedical imaging platforms are among the most promising new paradigms in health care and medicine. The Master of Science in Computational Biology program (MSCB) at Carnegie Mellon University, run cooperatively between the Department of Biological Sciences in the Mellon College of Science and the Computational Biology Department at the School of Computer Science, gives students interdisciplinary training in biology, mathematics, and computer science.

In addition to theoretical concepts, MSCB students learn practical skills, working on individual and group projects to create new algorithms and software packages to analyze real biological or clinical data. Almost 70 percent of our students engage in hands-on research under the mentorship of a CMU faculty member. Many of our students also gain experience in the biotechnology and pharmaceutical industries through summer internships. Students strengthen their oral and written communication skills through a two-semester-long professional development course unique to our program. As a result, MSCB students have been extremely successful in a variety of careers, ranging from biological data collection and analysis to software building and database management. Featured in this issue of *The Promoter* is a recent alumna from this program, Tingting (Alice) Xu (MS '15).

Tingting Xu loves mathematics and biology. She obtained her undergraduate degree in mathematics from Shanghai Jiao Tong University, which equipped her with the essential quantitative toolkit for further study in other fields of science. Following Xu's undergraduate degree, she obtained a Master's degree focused in Biomathematics from the University of Helsinki. At the end

of this Master's degree, Xu was quite eager to work on practical problems. CMU's MSCB program seemed like the right place for Xu to explore her interest in practical biological problems and build mathematical models and simulations to better understand and solve real life challenges.

At the time when Xu enrolled in the MSCB program, she was not clear about the exact direction to explore for her future - both pursuing a Ph.D. as well as getting a full-time industry position were equally weighted on her list of options. The variety of course content and research projects that she was exposed to in the MSCB program resulted in her interest in multiple topics. Moreover, it was seemingly hard for her to decide which specific subfield to choose for a Ph.D. program.

Fortunately, during Xu's second semester at CMU, she attended a recruiting talk delivered by CMU alumnus DJ Kleinbaum (B.S. Biological Sciences '05, Ph.D. Stanford University '10), who started a biotechnology company in collaboration with another CMU alumnus, Brian Frezza (B.S. Computational Biology '05, Ph.D. Scripps Research Institute '10). Xu was enamored by the strong scientific approach of their company, Emerald Therapeutics, in its computing process. Xu attributes her research work, which includes her work in Russell Schwartz's group, and her overall training and enthusiasm in the field of computational biology as key factors that earned her a position in Emerald Therapeutics' scientific computing group. Xu is extremely excited to work at this creative company where her role is that of a Scientific Computing Engineer.

When asked about her overall training at CMU, Xu said, "On one hand, I have gained a lot of programming and algorithm experience both from coursework and research work. Apart from coding, the simulation skills for biological models also benefited me a lot. On the other hand, I have been greatly influenced by people around me. Professors not only teach us knowledge but also share their experience with us. My classmates are all brilliant, from whom I have learnt a lot. Furthermore, there is a very strong connection between alumni and current students. Alumni, especially from the same program, help bring us lots of opportunities."

She added, "First, the curriculum is set to be flexible while making sure that everyone receives adequate training in computer science, mathematics, and biology. Second, it is not difficult to find a research position of our own interest. I was lucky to have worked in the Schwartz lab for a year. Here I engaged directly in a big research project, and my summer internship was very valuable.

My internship stint at Amyris, a biotech company, enabled me to make a direct comparison between campus research life and an industry-style job."

Xu's words of wisdom for future and current students are to find a clear direction and know what you are working hard for.

"MSCB is definitely a great program," Xu said. "Enjoy and make full use of every single day. I believe everyone can make his/her dreams come true."

DID YOU KNOW?



In the last 3 years, MSCB graduates have accepted positions at the following companies, organizations, and universities:

- **Broad Institute of MIT and Harvard**
- **Amyris Biotechnologies**
- **Affymetrix**
- **Ancestry.com**
- **DNAexus**
- **Transcriptic**
- **LinkedIn**
- **QIAGEN**
- **Galaxy Project**
- **Center for Data Intensive Science - University of Chicago**
- **Philips Research**
- **Aetna**
- **BNY Mellon**

(Students have also gone on to enroll in Ph.D programs, which are not listed)

A MODERN CHANGE

The earliest iterations of Modern Biology were first offered in the late 1970s. Since that time thousands of students have been introduced to the basic concepts of molecular and cellular biology through the course. Over the past 30 years, the field of biology has witnessed an explosion in scientific discovery that has impacted basic, translational as well as clinical aspects of research. Inspired by the tenets of the university's new strategic plan and the rise of prominent issues at the intersection of biology and human health, members of the Biological Sciences faculty have revolutionized our approach to teaching Modern Biology. Instructors Becki Campanaro, Jason D'Antonio, and Javier Lopez have partnered to re-envision how introductory biology concepts are taught.

In the fall of 2016, two sections of Modern Biology (03-121) will be offered that approach basic yet fundamental biological concepts in relation to biomedically relevant topics. Each professor has chosen a topic based on her or his own research background, about which they are personally passionate, to provide a framework for students to apply their understanding of key biological concepts. Lopez's section will highlight modern human genetics, personal genomics and their role in the development of precision medicine. Campanaro and D'Antonio will co-teach a section that applies foundational biological knowledge to help students understand advanced concepts in stem cell and cancer cell biology. Importantly, both courses will continue to provide students with a strong foundational understanding of critical molecular and cellular biology concepts that serves as the basis for advanced studies in developmental biology, biochemistry, cell biology, genetics, microbiology, immunology, and molecular biology.

In light of the many exciting discoveries in biomedical science in recent years, a series of Modern Biology courses were designed that are intended to excite and inspire all students, majors and non-majors alike, to engage in and learn about molecular and cellular biology in the context of medically and socially relevant topics. The impact of genetics and genomics, for example in personalized medicine or population health, demands a deeper understanding of inheritance and how it interacts with environmental factors to influence risk for cancer and complex disease traits like diabetes, hypertension or cognitive disorders, as well as how it influences responses to therapeutic alternatives. At the same time this exploding area of biology raises ethical, social and practical questions, which require a basic understanding of the underlying science to successfully navigate.

Nearly 15 years after human embryonic stem cells were first approved for use in research funded by the NIH, stem cell biology still remains a controversial topic on many levels. However, ongoing research provides evidence of their application in understanding and treating various human illnesses and thus demands further discussion of their utility. Cancer affects nearly one in three humans; as we live longer, a need to better understand tumorigenesis and tumor progression to metastatic disease is of critical importance. Genetics, epigenetics, and the environment all play a role in cancer. Ultimately, the vision is that these new "applied" courses will not only excite students to study biology, but also engage them in discussing current biomedically relevant issues that affect everyone in one way or another.

ALUMNI UPDATES

TITAS BANERJEE (B.S. '13) is currently a medical student at Stony Brook University Health Sciences Center School of Medicine.

MOLLY BERNSTEN (B.S. '14) is currently a food access fellow at DC Greens, an organization that supports food education, access, and policy in Washington, D.C.

YANG CHOO (M.S. '15) is currently a bioengineer with the startup Transcriptic, which supplies its clients with a cloud-based cell and molecular biology laboratory.

SONIA CHOTHANI (M.S. '13) is currently a bioinformatician at the Genome Institute of Singapore, working in population genetics to link sequencing data to the history of population migration.

DAGNEY COOKE (B.S. '15) is currently working at OpenTrons in Brooklyn, New York, a biotech start-up that builds personal lab robots.

ALLYSON DILL (B.S. '14) is currently a graduate student at the University of Wisconsin - Madison and received an honorable mention for the NSF Graduate Research Fellowship.

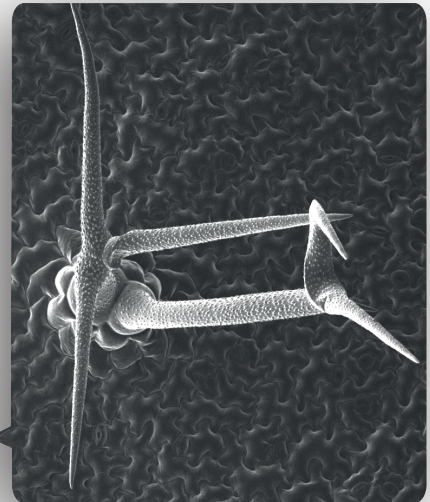
ANMOL GROVER (Ph.D. '13) is currently working as a life sciences consultant at Putnam Associates in Boston, MA.

TAYLOR HERSCH (B.S. '14) received an honorable mention for the NSF Graduate Research Fellowship.

FILIP ISTVANIC (B.S. '15) is currently in the Physician Scientist Training Program at the University of Pittsburgh School of Medicine.

JOHN LARKIN (Ph.D. '85) and coworkers recently published a paper from his lab at Louisiana State University in *Plant Cell* describing their NSF-funded work on the molecular function and evolution of the Siamese-Related (SMR) family of cyclin-dependent kinase inhibitors. This family of plant-specific cell cycle regulators, discovered in the Larkin lab, plays roles in cell differentiation, leaf development, cell cycle arrest in response to DNA damage and defense against pathogens.

ANDREW McCOY (B.S. '13) is currently a second-year medical student at Drexel University College of Medicine.



KRISHNAN PADMANABHAN (Ph.D. '08) has recently started as assistant professor at the University of Rochester School of Medicine. His lab, which will be up and running in the fall, will use experimental and theoretical methods to dissect the structure and function of neuronal circuits.

GORDON PHERRIBO (B.S. '15) received an NSF Graduate Research Fellowship and is currently a graduate student at the University of California - Berkeley.

JAGOREE ROY (Ph.D. '95) has been a researcher at Stanford University for 12 years, working to systemically identify calcineurin substrates and develop a signaling network for this phosphatase, which will be the first of its kind for a phosphatase.

JEFFERY SCHLOSS (Ph.D. '79) is currently the Director of the Division of Genome Sciences at the National Human Genome

Research Institute. He received the U.S. Department of Health and Human Services Career Achievement Award, presented by HHS Secretary Sylvia Mathews Burwell, in 2015 for his work in genome sequencing technology.

PHU VAN (Ph.D. '14) is now a systems analyst at the Fred Hutchinson Cancer Research Center in the Vaccine and Infectious Disease Division. He is also

mentoring local fifth graders in Seattle, WA for their annual science fairs and recently published an illustrated children's book, *The Prince*, that was funded through Kickstarter.

FRANK ZHOU (Ph.D. '10) has recently transitioned to a career as a financial service professional with MassMutual Financial Group in San Francisco, CA, where he lives with his wife and two-

year-old son. His change in fields reminded him of words told to him by our late department head, Dr. Beth Jones - "Be professional and be adaptive to changes."

SERENA ZHOU (B.S. '14) is now an engineer at the biotechnology company Shire in Boston, MA, after completing her Master's of Science degree in Biomedical Engineering at CMU.

CURRENT STUDENTS AWARDED PRESTIGIOUS FELLOWSHIP AND SCHOLARSHIP



First-year Ph.D. candidate Stephanie Crilly was recently announced as a recipient of this year's Graduate Research Fellowship from the National Science Foundation (NSF).

Crilly, who came to the program with a B.S. in Microbiology from Penn State University and was

part of their Schreyer Honors College, is excited and honored to continue her graduate education and begin her own research with the opportunities provided by this fellowship.

"The fellowship provides a good foundation for my graduate career by providing me with both the freedom and responsibility of pursuing my own scientific questions," said Crilly. "The emphasis that the NSF places on the broader impacts of your research serves as a great reminder that what we do extends beyond the lab," Crilly continued, "and I hope to find ways to share my research with the broader CMU and Pittsburgh community."



Senior biological sciences major Jillian Jaycox received a 2016 Churchill Scholarship, one of the most prestigious awards for study abroad in the United Kingdom.

Jaycox is the 12th CMU student to receive the scholarship, which funds a year of postgraduate study at the University of Cambridge.

Jaycox will pursue a Master of Philosophy in Medical Science as a member of Dr. Ken Smith's research group at Cambridge's Department of Medicine, which is investigating a new prognostic biomarker for autoimmune diseases.

"This work will increase our ability to study and guide treatment for certain autoimmune diseases, such as lupus, which are complex and heterogeneous. Two patients with the same diagnosis can have two very different outcomes, and it is important to understand exactly why this occurs and how we can predict it," Jaycox said.

Carnegie Mellon University

Biological Sciences

4400 Fifth Avenue

Pittsburgh, PA 15213

Nonprofit Org.
US Postage
PAID
Pittsburgh, PA
Permit No. 251

FOLLOW US

cmu.edu/bio

facebook.com/CMUBiologicalSciences

twitter.com/CMU_Bio

linkedin.com/groups?home=&gid=3968474

youtube.com/user/cmubiosci

© 2016. Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The annual security and fire safety report is also available online at www.cmu.edu/police/annual reports.