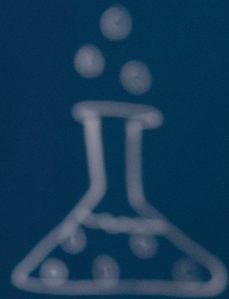


THE PROMOTER



Biology



Chrystal Thomas

Schwarzman Scholar & Commencement Speaker | Pg. 19

2017

ALUMNI MAGAZINE

DEPARTMENT OF BIOLOGICAL SCIENCES
AT CARNEGIE MELLON UNIVERSITY

Issue 19

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ALUMNI PROFILE

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HAVE CLINIC, WILL TRAVEL

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A WARM WELCOME

Carnegie Mellon University welcomes the 7th dean of the Mellon College of Science, Rebecca W. Doerge



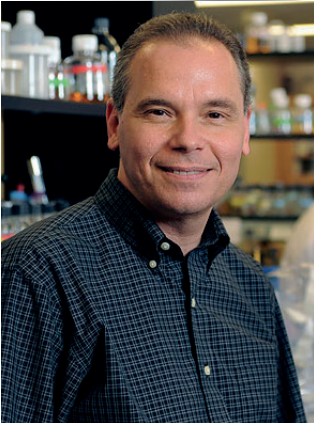
THE LABS @ CMU-QATAR

Tracking the growth and evolution of CMU-Q's Biological Sciences labs

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Editors: Matthew Salyers and Shoba Subramanian | Design & Layout: Matthew Salyers | Writers & Contributors: Jason D'Antonio, Jocelyn Duffy, Aaron Mitchell, Frederick Mun, Amy Pavlak Laird, Matthew Salyers, Shoba Subramanian, Annette Vincent, and Amanda Willard | Promoter Committee: Becki Campanaro, Aaron Mitchell, Matthew Salyers and Shoba Subramanian

WELCOME



It is an honor and pleasure to write to you at the close of the first year of my term as department head. It has been an exciting year on many fronts. We have welcomed a new Dean of the Mellon College of Science, Rebecca Doerge, who has helped us to revise and refine our vision for the future through structured college-wide strategic planning. We continued to strengthen our undergraduate education program both through new offerings and through revisions of some time-honored classics. We have implemented plans to increase the breadth of our graduate training with the goal of recruiting M.S. and Ph.D. students with a broader range of Biological Sciences interests. Finally, we have begun to recruit new faculty to broaden and strengthen our research and educational missions.

You can read about our new Dean on page 4 of this issue of the Promoter, so let me mention a few points that you cannot read there. First, the recruitment of a new Dean underscores a broader commitment to and investment in Mellon College by the university. We have benefited from that investment already in the form of start-up and renovation funds for new Biological Sciences faculty.

Second, the Dean has prompted us to develop strategic plans for each department and for the college as a whole. Specifically, she brought in a superb consultant, Nicholas Fisher of Valometrics, to lead each department through a week of “total immersion” planning discussions. We now have a consensus-derived document in which we have articulated and prioritized objectives for the next five years and have mapped out activities that will allow us to achieve those objectives.

Our undergraduate curriculum is evolving to reflect the ongoing growth of biological and biomedical research, to integrate more effectively with the new Mellon College Core curriculum, and improve the experiences of non-majors who enroll in our courses. To build upon the elite education that we provide for our majors, we have offered new courses at both entry and upper levels. To strengthen the impact of and appreciation for biological and biomedical science across the campus, we are implementing new plans to reduce section sizes for our introductory Modern Biology course. We also now offer Modern Biology sections that focus on specific subtopics of compelling interest, including Cancer Biology, Stem Cells, and Personal Genomics, thus enabling our faculty to share their passion with students who may have had limited or suboptimal exposure to the life sciences previously.

Our graduate curriculum is also evolving to reflect the breadth of interests of our faculty, and to train students effectively for both traditional and nontraditional careers. We have eliminated specific course requirements for our Ph.D. program, providing time for students to explore programming, computational biology, and additional interests. We are also excited about the maiden voyage in fall 2017 of our quantitative analysis course, which the Graduate Advisory Committee developed in response to widespread student interest. For our M.S. students, we have worked with program co-directors in the Department of Computational Biology to strengthen the training our students receive in both Biological Sciences and Computational Biology. We seek to provide academically challenging M.S. and Ph.D. student coursework that is commensurate with the outstanding quality and potential of our students.

Faculty recruitment is the issue that is nearest and dearest to my heart. We continue to lose faculty due to the usual forces of nature. Yet in recent years, we had only maintained our teaching faculty positions and had not filled new tenure stream positions since 2012. I am extremely happy to report that a new Assistant Professor of Biological Sciences will join us in fall 2017, and a second candidate is considering our offer at this time. These talented young scientists will provide an infusion of new ideas and energy that will extend our reach in both research and education. You will read about our new colleagues in the 2018 issue of the Promoter, but for those of you who cannot stand the suspense, rumor has it that our website may provide some information about them in the coming months. My point for today is that it was our Dean and Provost who secured and provided the funding for these positions, and my colleagues and I are exceptionally grateful for this critical investment in the future of the Department of Biological Sciences.

I very much hope that you enjoy this issue of the Promoter. Please feel free to stop in to say hello whenever life takes you to the 15213 zip code.

A handwritten signature in black ink, appearing to read 'A. Mitchell', with a long horizontal flourish extending to the right.

Aaron P. Mitchell, Ph.D.

Dr. Frederick A. Schwertz Distinguished Professor of Life Sciences
Professor & Head, Dept. of Biological Sciences

ALUMNI PROFILE

WRITTEN BY
AMANDA WILLARD

Ken Hovis's journey from Pittsburgh to Qatar and back again



Ken Hovis had already typed out his acceptance letter to another university's neuroscience graduate program when he got the opportunity to interview for Carnegie Mellon's Biological Sciences Ph.D. program. Wanting to be thorough and confident in his choice, he decided to take a chance and see what CMU had to offer. "I was only there for a couple of hours before I knew that this was where I was going to be," states Hovis. "It was really instantaneous. Right from the beginning, the interactions with the faculty, it felt like a family."

Hovis joined Nathan Urban's lab where he studied the neural circuitry of the olfactory bulb in the brain. While he loved research, it wasn't long before he discovered he also had a passion for teaching. Hovis served as a grader for Amy Burkert and led recitations for Gordon Rule as part of the program's Teaching Assistant requirement.

He cites the opportunity to give a lecture in Rule's course as a turning point for him. He said, "It was stressful and I was really nervous about it, but I loved it. I really enjoyed it, I felt like it was a good fit for me. Looking back, I think that was the moment that I realized this was something I could see myself doing." Hovis was eager for more opportunities to explore his love of teaching, and this led to him teaming up with other students to create the Sciences Teaching Club.

was the only biology faculty at the Qatar campus at the time, so he was quickly tasked with multiple administrative roles: ordering lab equipment, advising students and eventually serving as the director of the program. Somehow, while juggling his new teaching and administrative responsibilities, Hovis also founded the Biotechnology Explorer Outreach Program and co-founded the Life Sciences Educators Network. He credits the connections and strong relationships that he developed during his Ph.D. program as key components of his success at CMU-Q.



"I like CMU because people are able to celebrate each other's successes. It's the type of work environment that you want to be in."

Hovis has now returned to CMU's Pittsburgh campus to serve as the assistant dean for educational initiatives for the Mellon College of Science (MCS). In this role, he oversees the MCS Core Education and serves as a liaison between MCS and CMU-Q. While it was a hard decision to leave CMU-Q, he is excited to continue building connections between CMU-Q and MCS and to help provide undergraduates with the skills and experiences they need to succeed.

When asked why he continues to choose CMU after all these years, Hovis said, "I like CMU because people are able to celebrate each other's successes. It's the type of work environment that you want to be in. People are trying to help you to be successful. There have been people behind the scenes who have been advocates for me and have supported me and wrote letters for me because they wanted to see me succeed and to stay at CMU. I love that and I want to help be that for other people. It's like this chain of individuals who have been successful here and who love working here and bleed CMU and they see talent in you and they want to mentor you and see you succeed. This office that I'm sitting in now, I used to lead recitations for biochemistry in here as a graduate student. It's neat to have those kinds of connections. You work for the very people you used to grade for and they've seen you progress and they've seen you grow. They've been there every step of the way to help cheer you on and to help make you successful and give you advice. That's something that's unique when you stay at a place for a long time. I can't really see myself working anywhere else than CMU."

EXPERIENCE AT-A-GLANCE

- 2016 MCS Assistant Dean for Educational Initiatives, CMU
Associate Teaching Professor, Biological Sciences, CMU
- 2011 Director and Academic Advisor, Biological Sciences, CMU-Q
Assistant Teaching Professor, CMU-Q
- 2011 Ph.D., Biological Sciences, Carnegie Mellon University
Advisor: Nathan Urban, Ph.D.
- 2005 B.S., Biochemistry, Mount Union College

During the last few years of his Ph.D. program, he served as an adjunct instructor at Robert Morris University where he developed and taught an entire introductory neuroscience course using the skills he acquired through his involvement with the Eberly Center.

While Hovis was completing a short post-doc and teaching at CMU, Urban approached him with an opportunity to teach science electives to non-majors at CMU's Qatar (CMU-Q) campus. Only a few months after Hovis had signed on, CMU-Q wanted to expand and offer an entire bachelor's program in biology. He

WRITTEN BY
AMY PAVLAK LAIRD

A WARM WELCOME

Carnegie Mellon University welcomes the 7th dean of the Mellon College of Science, Rebecca W. Doerge

Rebecca W. Doerge is a Statistical Bioinformatician; she joined the Mellon College of Science on August 1, 2016 as its seventh dean. Previously the Trent and Judith Anderson Distinguished Professor of Statistics at Purdue University, Doerge served as head of Purdue's Department of Statistics from 2010-2015 and oversaw its growth into one of the largest statistics departments in the country. She brings a career-long commitment to collaborating across disciplinary borders and supporting basic science research to MCS.

As an undergraduate at the University of Utah in the 1980s, Doerge pursued a degree in pure Mathematics, a field that she absolutely loved. Her desire to use her skills to make an impact in the world landed her in the lab of Ryk Ward, a human geneticist, where she worked on a mathematical problem having to do with information content in human pedigree data. That project in human genetics was the basis of her master's thesis in Mathematics. So started Doerge's career as an interdisciplinary researcher, something that was almost unheard of at the time.

Doerge completed a Ph.D. in statistics at North Carolina State University with a focus on agricultural genetics and a postdoctoral fellowship at Cornell University in the Department of Biometry and Plant Breeding. When she applied for a faculty position at Purdue University, the university embraced her unique background and offered her a joint appointment in Statistics, which was in the College of Science, and Agronomy, which was in the College of Agriculture. At Purdue, she built a research program focusing on understanding new biotechnologies that produce data that require computationally-based novel analytic approaches. The Doerge



research group developed novel statistical methods that, with the help of sophisticated computing, solve the big data problems found in biotech, human cancer, and global food issues.

Doerge holds a joint appointment in Biological Sciences (Mellon College of Science) and Statistics (Dietrich College of Humanities and Social Sciences) at Carnegie Mellon. She was attracted to CMU because of its strengths in foundational science and the reputation that CMU has for embracing transdisciplinary teams working on hard problems. At a ceremony on October 6th, marking her official installation as seventh Dean of MCS, Doerge wrapped up by saying: "As we prepare to celebrate the 50th anniversary of the merger of the Mellon Institute with the Carnegie Institute of Technology, it is an honor to lead the Mellon College of Science into the next 50 years of history."

WRITTEN BY
MATTHEW SALYERS

MICROBES AND HOST BEHAVIOR

Scott Keith awarded NSF Graduate Research Fellowship

Scott Keith, a second-year Ph.D. candidate in Associate Professor Brooke McCartney's lab, was recently announced as a recipient of a Graduate Research Fellowship from the National Science Foundation (NSF). Keith's proposed research focuses on symbiotic relationships between animals and microbes, and how these relationships can impact host health, physiology, and behavior.

"While the importance of animal associations with beneficial, resident microbes, particularly those occupying the gut, are now well known, the mechanisms by which these microbes impact host biology are poorly understood," Keith said. "I specifically aim to discover molecular mechanisms linking the activities of microorganisms in the metazoan gut to animal brain function and behavior, using *Drosophila melanogaster* as a model."

His plan is to approach this question from the perspective of both the microbe and the host, simultaneously. Using a combination of culture-dependent and culture-independent techniques to investigate the community architecture of the fly gut microbiota,

Keith will determine how bacteria-bacteria and bacteria-host cell interactions affect *Drosophila* physiology. He will also take advantage of the genetic tractability and the wealth of genetic tools available in *Drosophila*, coupled with transcriptomic approaches, to identify gene expression changes in the fly central nervous system that result from perturbations to the microbiota.

"The identities of these microbiota-regulated genes will generate hypotheses about novel host physiological and behavioral phenotypes shaped by interactions with microbial commensals," said Keith. "Studying the relatively simple symbiosis between *Drosophila* and its microbiota will provide insights that help us understand more complex systems, including the human microbiome."

In addition to his proposed research, Keith is also excited to use his scientific skills to further engage in community outreach and work with students to encourage participation in biological research.



“Being originally from Pittsburgh, I have previously helped high school and undergraduate students in the area gain early research experiences, and I aim to use the new resources available and connections I’ve made so far at Carnegie Mellon to continue participating in science outreach and education,” Keith said. “Fruit flies, particularly, are easy to grow and take care of, and therefore have huge potential as a teaching tool. During graduate school, I hope to use *Drosophila* and my research to develop new ways to get the broader Carnegie Mellon and Pittsburgh communities aware of and involved in biology.”

The NSF Graduate Research Fellowship Program (GFRP) is a highly competitive program that supports outstanding graduate students with exceptional promise, not only as future researchers but also as individuals with an ability to broadly extend the impact of their research. Keith’s fellowship award continues the Department of Biological Sciences’ strong track record of students being awarded or receiving an honorable mention for the GFRP.

DID YOU KNOW?



NSF began providing fellowships to graduate students in 1952, and since 2010, NSF has awarded 2,000 fellowships each year.

Individuals are selected early in their graduate careers based on their demonstrated potential for significant achievements in science and engineering.

WRITTEN BY
FREDERICK MUN

HAVE CLINIC, WILL TRAVEL

CMU's Global Medical Brigades chapter travels to Nicaragua to set up medical clinics in Guacucal and Los Encuentros de San Gabriel



CMU's chapter of Global Medical Brigades during their trip to Nicaragua

This past spring break, 24 students from Carnegie Mellon's chapter of Global Medical Brigades (GMB) traveled to Guacucal and Los Encuentros de San Gabriel in Nicaragua to set up a medical clinic and to complete a public health project. Led by Frederick Mun and Sarah Cook, junior biological sciences majors and co-presidents of the CMU chapter, GMB successfully completed its largest medical clinic to date.

Medical Brigades is part of the greater Global Brigades, the world's largest student-led global sustainability movement. Global Brigades is composed of many different sectors that tackle various aspects of a developing community, including public health, business, water, and engineering. Carnegie Mellon's Medical Brigade focuses specifically on providing affordable health care to communities in need, and ensuring sustainable health practices through education about dental and personal hygiene, sexual health, and nutrition.

In preparation for the trip, students conducted weekly medication drives at Rite Aid Pharmacy and collected over \$50,000 worth of medications to distribute in Nicaragua. Students also collaborated with UPMC's Eye and Ear Institute to process over 1,000 pairs of glasses. Bringing a large number of glasses to the clinic is essential because a larger inventory increases the likelihood of finding a matching pair of glasses for a patient.

”I think this is beneficial on both sides of the exchange – the kids get to play and get comfortable with us and we get to educate and show that we care about them. That is a pretty powerful thing.”

In addition to collecting medications, medical supplies, and glasses, students immersed themselves in weekly Spanish language and culture workshops which were led by Aliya Saffran, a sophomore biological sciences major.

“Education throughout the year reinforces its importance and provides a chance to practice Spanish beyond the basic medical terms we need for clinic. Learning Spanish and a bit about the culture before going to the country helps us create a more personal environment, where we can form more meaningful connections with community members,” says Saffran.

Once in the clinic, students worked in triage, where they took down family histories, symptoms, blood pressure, and temperature of each of the patients. Many, including Engineering senior and fundraising chair Maya Holay, also had the opportunity to work in dental charlas (lectures), where she helped administer fluoride treatments for 90 children, and lead educational talks on dental hygiene.

“The charlas were incredible and unique because it was a direct interaction with the community. No translators or doctors, just us and the kids,” says Holay. “I think this is beneficial on both sides of the exchange – the kids get to play and get comfortable with us and we get to educate and show that we care about them. That is a pretty powerful thing.”

After coming back to the United States, students are more cognizant of the long road ahead for alleviating global health disparities, which often inspires members to pursue lives dedicated to health care and service.

“When you've lived in urban areas your whole life, it's easy to have the impression that healthcare is all about treating illnesses. GMB has allowed me to gain a refreshing perspective; when you see every patient needing medications, you think about the lack of resources that causes people to struggle with health problems we never see in the U.S.,” says Jennifer Huang, a four-year GMB member and senior biological sciences major. “It reminds me of why I want to be a health care professional in the first place - not just to cure patients, but to give the gift of health so that others can lead the best quality of life possible.”

PRE-HEALTH PREPARATION

WRITTEN BY
JASON D'ANTONIO

The Health Professions Program (HPP) at Carnegie Mellon University provides advising and resources for all students and alumni who are interested in pursuing a career in the health professions. These careers include, but are not limited to, medicine, dental medicine, veterinary medicine, pharmacy, PA school, podiatric medicine, and optometry. Additionally, the HPP works with students interested in continuing their education at the doctorate level in biomedical sciences.

I took over the leadership as Director of the HPP nearly four years ago. Since then the program has been revitalized to offer the highest quality of consistently reliable advising to students and alumni. During the academic year, we have created numerous information sessions, targeting students at all stages of their pre-health careers. A large information session each fall is open to every pre-health student on campus, with a special focus on incoming freshmen. This session provides a comprehensive introduction of “being pre-health” at CMU and describes resources available to students. The program also reviews the roles of the advisor, how the HPP assists students in seeking experience in clinical arenas, and how the HPP educates students about the application process. Student leaders of all the pre-health societies make themselves available during this information session to present information about how their programs enhance students’ competitiveness for health professions schools. These groups include Doctors of Carnegie Society, Minority Association of Pre-health Students, Global Medical Brigades, Global Public Health Brigades, and Alpha Epsilon Delta.

Many student-centered activities are throughout the year. For example, in April of each year, an advising session brings together successful applicants from the current application cycle to offer advice and guidance to students aspiring to apply in the upcoming cycle. A round table panel discussion, where prospective applicants are able to directly engage current applicants, is the main highlight. Using this platform, students who plan to apply to health programs in the future ask questions about many aspects of the application process, including primary and secondary applications, number of schools to apply to, interview style questions, how and when to send update letters or letters of interest/intent, pitfalls and other



Jason D'Antonio

**Director of the
Health Professions
Program and Assistant
Teaching Professor**

issues to look out for during interviews. This type of resource is new to the CMU HPP and has been a huge success, drawing nearly 30-35 of the roughly 45 prospective applicants. This also serves to establish working connections between these two cohorts, setting up long-lasting mentoring relationships throughout the next application cycle.

Two other key elements of the CMU pre-health experience are the committee interview and committee letter writing process. Starting in late April and lasting through June, HPP coordinates several faculty members, who conduct a 75-90 minute practice interview for each prospective student applicant. In doing so, we engage the student on various aspects of their application, asking them about their motivations for pursuing a career in health care, asking them to describe their research and leadership experiences, as well as their service commitments. We provide constructive feedback and critiques during the interview, assisting students in improving their application. These interviews have consistently proved to be effective in preparing students for the eventual “real” interview because of the rigor and depth of evaluation. For students who need extra assistance, there are chances for re-practicing their interview for further experience.

In speaking with other non-CMU applicants about their application processes, we have heard about how thorough and comprehensive the HPP experience at CMU is and how the advising resources and committee interview processes is among the best they know. It is an exciting time to part of this incredible service at CMU!

OFF THE BEATEN CAREER PATH

INTERVIEWED BY
SHOBA SUBRAMANIAN

Brief conversations with graduate alumni
Madhumitha Ramesh and Brett Benedetti



MADHUMITHA RAMESH (Ph.D. '16)

Associate Consultant, Consulting Service, QuintilesIMS
Ph.D., Biological Sciences, Carnegie Mellon University
Advisor: John Woolford, Ph.D.
B.Tech., Industrial Biotechnology, Anna University

LEADERSHIP & ACTIVITIES

3-Minute Thesis Finalist at CMU, 2015
Founding Member of MellonFIT at CMU, 2014
President of SPICMACAY, 2013

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

I came to CMU with a curious mind because of my diverse undergraduate research experiences ranging from neuroscience to cellular oncology. The breadth of research at CMU enabled me to rotate in three amazing labs in very distinct research areas – neuroscience, cell biology, and molecular biology. I ended up choosing molecular biology, even though I had no prior experience in it. I remember telling my thesis advisor John Woolford: “I have never streaked out yeast on a plate before but I am taking a leap of faith and embarking on doing a Ph.D. thesis with them!”

During my Ph.D. training, I was keen on developing my innate interest in the business applications of life sciences, and I did that by pursuing experiences in management consulting using many CMU resources, including those at Tepper School and Heinz College. One thing led to another and post Ph.D., I ended up choosing to work in a very unique strategy role in pharma. With a desire to experience the industry more broadly, I now work at a leading life sciences consulting firm.

What is the nature of your current job?

I am an Associate Consultant in the San Francisco office of QuintilesIMS Consulting Services, which is a firm focused exclusively on life sciences. My colleagues and I help our clients make critical business decisions, build commercial excellence, and grow their business as they navigate an increasingly complex global health care landscape. It is exciting that I get to work on diverse therapy areas and business problems with some really smart and personable people.

When you started in the Ph.D. program did you have a strong sense for what career you wanted? Did your career choice change by the end of your Ph.D.?

While I enjoy bench science immensely, I have always had a strong inclination towards the business dimensions of the life sciences industry. That said, during my graduate school days, I was actively exploring this area while keeping an open mind to other career choices. I am a believer in preparing oneself for multiple career paths - I've personally experienced the cross-fertilization such preparation lends to overall professional development. This approach is also helpful because career goals often times are (and can very well be) fluid as one navigates grad school. Also, pragmatically speaking, when you are competing for certain jobs with very low acceptance rates, it is important to have a plan B.

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

In my experience, graduate students can define their own career trajectories while at CMU. The training environment at CMU is conducive toward pursuing nonacademic career paths. My experience strengthened my confidence to solve problems in a structured manner, independent of context. Over time, I was less apprehensive about stepping out of my comfort zone. Further, I benefitted immensely by talking to a couple of very helpful alumni that my mentors at CMU directed me to. These conversations really shaped my career choice.

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

The most important skill I learned at CMU was solving complex problems in an analytical manner - often in the face of uncertainty and limited, ambiguous data. This skill can be applied in very different contexts, be it a ribosome biogenesis question or a business problem. In addition, the department puts a lot of emphasis on developing core communication skills through focused workshops, journal clubs, lab meetings, encouragement to participate in broad competitions like the 3-Minute Thesis championships, among others. This training in communication is useful in many aspects of my current career.

The department also provides a fertile ground to hone one's teaching and mentoring skills. This is perfectly complemented by resources such as the Eberly Center. While I chose not to pursue a teaching career, the experience I gained as a TA remains invaluable to my work every day, such as synthesizing complex concepts into concise themes and delivering it effectively to a naïve audience. In addition, while at CMU, you're surrounded by people with diverse thoughts, backgrounds, and expertise. The small size of the department provides greater opportunities to constantly interact with these people. Not only did this polish my interpersonal and leadership skills in the work environment, I think it contributed to my overall personal growth as well!

Do you have any words of wisdom for current students looking for jobs outside of academia?

Yes, I have a few thoughts! First, I recommend students explore career options thoroughly and keep an open mind when evaluating different careers. In addition, starting early is important - it takes a lot of time to explore and understand various career options while not compromising on your Ph.D. research progression, but it is worth the time investment. Second, it is crucial to cultivate soft skills and be diligent about honing them. Using opportunities in grad school to learn clear communication skills and people management skills is also of pivotal importance. They really can make or break a career. Third, students should "learn" to network - it is a skill. Informational interviews followed by self-introspection were useful to me in solidifying my interests and goals. Finally, I would like graduate students to always remember that it is a big, wide world brimming with opportunities, even though it may not always seem that way!



BRETT BENEDETTI (Ph.D. '10)

Associate Editor, *Nature Medicine*

Postdoctoral Fellowship, New York University Medical Center
Advisor: Gordon Fishell, Ph.D.

Ph.D., Biological Sciences, Carnegie Mellon University
Advisor: Alison Barth, Ph.D.

AWARDS & HONORS

NIH Predoctoral Training Grant in Basic Neuroscience, 2005

Allegheny College Alden Scholar, 2003

Allegheny College Trustee Scholarship, 2000

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

I was fortunate enough to have been able to indulge in my biology interests at an early age through programs at my public high school and Allegheny College, which I subsequently attended. At college, I majored in biology and minored in English, which in retrospect turned out to be an ideal combination for my current position (I did not plan this though!). During a summer undergraduate research appointment, I worked in a Plant Pathogens lab at the Ohio Agricultural Research and Development Center in Wooster, Ohio, which confirmed my desire to pursue a Ph.D. in biological research. I joined CMU in the summer of 2004 and began lab rotations. The next year, I joined Alison Barth's lab for my thesis work. With a desire to continue my research training in an academic lab after my Ph.D., I soon started as a postdoctoral fellow in Gordon Fishell's lab at the NYU Medical Center.

In the fall of 2012, two years into my post-doc, Hurricane Sandy hit the New York-New Jersey metro area and caused serious damage to the NYU medical center animal facilities, resulting in the loss of virtually all of the transgenic mouse lines required to

continue work on my projects. The recovery process after Sandy was particularly slow for me, and after a difficult 18 months I faced the harsh realization that I had lost interest in continuing my post-doc. After a couple of long discussions, my postdoc mentor recommended that I look for a position in the editorial field. At the end of 2014 I accepted a position at Nature Medicine.

What is the nature of your current job?

Currently I am an associate editor at the research journal *Nature Medicine*. I am one of six scientific (manuscripts) editors at the journal, where we each focus on a particular research domain. My area of focus is Neurobiology. In this position, scientific editors perform both 'editorial' and 'strategic' duties. The editorial part of the job comprises reading and critically evaluating newly-submitted research manuscripts, managing peer review of research manuscripts, editing accepted studies prior to publication, and communicating with authors and referees. The strategy portion of the job requires attending and organizing scientific conferences and meetings to identify emerging areas of interest and to recruit submissions, analyzing competitor publication data, and setting/ updating strategic agendas for the journal.

When you started in the Ph.D. program did you have a strong sense for what career you wanted? Did your career choice change by the end of your Ph.D.?

When I began my Ph.D., I was thinking of two career possibilities (neither of which involved editorial work): academic research or teaching at a small college. Back then it was quite typical of individuals pursuing a Ph.D. to specifically aim for heading their own academic lab. As we now know, however, the number of academic jobs is much smaller than the number of scientists seeking those jobs. By the end of my Ph.D. I had received enough encouragement to continue planning for a career in academic science. This was the major driving force for moving on to my post-doctoral appointment.

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

Upon completion of my Ph.D., I didn't choose to move into publishing or editorial work, so training at CMU didn't directly influence my choice to accept the position that I am currently in. However, my CMU training had a lot to do with my choice to move on to a post-doc. I enjoyed planning and performing experiments during my Ph.D. research, and also loved discussing results and publications with my neuroscience colleagues in the neighboring labs. Based on the strengths of my Ph.D. training and

with the encouragement of my colleagues, I was able to secure a post-doc in a well-regarded neuroscience lab with a track record of successfully training post-docs for independent careers in academic research. At the time, I felt that joining Gord's lab gave me a reasonably good shot at landing an assistant faculty position.

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

The most important skills that I honed during my doctoral training that have contributed to my development as a successful editor are: a) critical evaluation and b) effective communication. The majority of my time as an editor is spent reading and critically evaluating the rationale, findings, presentation, and interpretation of unpublished biomedical research. This approach of actively engaging with scientific research is one that was developed through lab meetings, journal clubs, manuscript preparations, participating in peer review, and other activities like a mock study section in which we critique each other's grant proposals. This same set of activities requires clear and effective communication of sometimes difficult concepts, and so I think that these two skills go hand in hand.

Do you have any words of wisdom for current students looking for jobs outside of academia?

Firstly, I recommend students to be open-minded. There are a lot of different career avenues that one can explore outside of academia. An easy way to start is by looking through job listings or to read about non-academic careers. A number of scientific journals and scientific societies have dedicated career and jobs portals. Secondly, it is important to find good mentors. I have benefited greatly from my mentors, Alison Barth (Ph.D. advisor) and Gord Fishell (post-doctoral advisor). They were both not only very supportive and open-minded but were able to help me identify the things that I was good at, and that I enjoyed doing, but wasn't actually aware of. If needed, I would recommend finding a couple of other mentors (including other colleagues, administrative directors, etc.) that you get along with and whose opinion you value. In my case, there were 2-3 such faculty at NYU (ranging from junior hires to very senior faculty) that I also discussed my options with and who were able to give me some honest and objective advice.

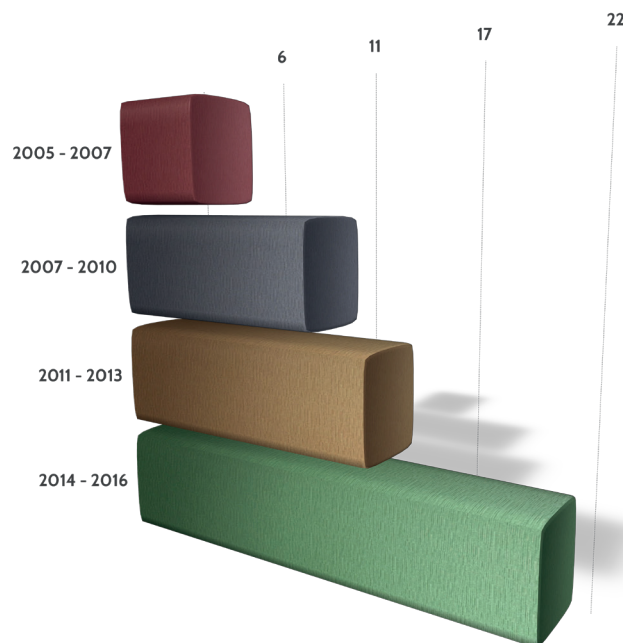
MASTER'S PROGRAM GROWTH

WRITTEN BY SHOBA SUBRAMANIAN
AND MATTHEW SALYERS

Jointly administered by the School of Computer Science and Mellon College of Science, the Master's Program in Computational Biology has seen sustained growth as measured by program size and student success

Biology is extraordinarily complex, with innumerable interactions among molecules, cells, tissues, and organisms in ecosystems. This complexity is pivotal to the adaptability and diversity of life on earth – both of which are key contributors to evolution. In the past two decades, many powerful technologies and cool widgets have been developed to sequence genomes, measure gene expression in transcriptomes and proteomes, assay metabolic activity through the metabolome, and study <insert favorite biological variable>-omes. These technologies have become both mainstay and commonplace to many laboratories that previously studied single events or a small subset of events in isolation. This increase in throughput enables researchers to understand the interactions that shape biological complexity. In the process, these technologies generate massive amounts of data, creating demand for scientists with the skills and knowledge needed to tackle large-scale computational challenges in biological research.

The Master's Program in Computational Biology (MSCB) at Carnegie Mellon trains young minds to harness the power of large datasets to solve biological problems. The recently revised MSCB curriculum includes advanced graduate courses in cutting-edge high-throughput biology, genomics, and modeling of biological systems. The program's success is striking, as MSCB graduates secure plum positions in academia and industry. As a result, enrollment in the program has increased almost 4-fold over the past decade.



Our revamped curriculum empowers our students to understand and analyze large scale data in a systematic manner. Such rigorous training positions our graduates to be successful not only in industry, but also in pursuing a Ph.D.

The average student enrollment in the MSCB program has grown by leaps and bounds over the last decade.

M.S. in Computational Biology Students. (Front row): Han Xie, Na Tan, Xiaojun Wu, Shefali Umrana, Jacob West-Roberts, Aiyappa Parvangada, Long Wang, Sumin Wang, Lu Tian, and Xianting Wang (Back row): Akash Ramachandran, Tianqi Tang, Murtaza Saif, Benjamin Kaufman, Muhammad-Sharif Moustafa, and Weihua Wang



TIM MAJARIAN

(M.S. '17)



“The MSCB program at CMU teaches its students the fundamental knowledge at the root of current computational and biological methods and facilitates collaboration with – and mentorship from – outstanding scientists from diverse fields who are pushing the boundaries of computational approaches to biological problems. As a member of Bob Murphy’s lab, my research aims to understand the spatial organization and dynamic interactions of cellular components through statistical modeling of microscopy image data with a focus on machine learning methods.”



SHEFALI UMRANIA

(M.S. '18)

“Being a part of the MSCB program at CMU has made me realize what it truly means to have “my heart in the work.” As part of my research in Tai Sing Lee’s group (Center for the Neural Basis of Cognition), I work on building machine learning models that are able to predict neural responses in the visual cortex.”



MYLES MAO

(M.S. '17)

“For me, the MSCB program is intense but rewarding. I really enjoy the interdisciplinary environment where computer scientists and biologists come together to brew up brilliant ideas for the future. My research in the McManus lab focuses on upstream open reading frames (uORF) and how these uncharacterized sequences regulate gene expression, and the technologies that enable us to address thousands of uORFs in one experiment.”

DEPARTMENTAL HIGHLIGHTS

Dan Ackerman (Ph.D. '20)

was awarded the Richard King Mellon Foundation Presidential Fellowship in the Life Sciences.

Surya Aggarwal (Ph.D. '20)

received the People's Choice Award and 2nd Place at the CMU 3-Minute Thesis Competition, was awarded the Stupakoff Scientific Achievement Award, and was elected to serve on the 2017 Board of Directors for the National Association for Graduate-Professional Students.

Nick Audette (Ph.D. '18)

was named the Henry L. Hillman Presidential Fellow.

Alison Barth (Faculty)

received two collaborative BrainHub ProSEED grants.

Malachi Blundon (Ph.D. '18)

was awarded the Richard King Mellon Foundation Presidential Fellowship in the Life Sciences.

Marcel Bruchez (Faculty)

received NIH and DARPA grants and had a patent granted.

Aryn Gittis (Faculty)

received a grant from the Disruptive Healthcare Technology Institute (DHTI).

Luisa Hiller (Faculty)

received the Samuel and Emma Winters Fellowship and was funded by the Indian Institute of Technology, Bombay.

Veronica Hinman (Faculty)

became Co-Director of Echinobase, began teaching an embryology course at the Marine Biological Laboratory in Massachusetts, and received funding from the NSF and Binational Science Foundation.

Chien Ho (Faculty)

received a grant from the DHTI and had a patent approved.

Ken Hovis (Faculty)

was named MCS Assistant Dean for Educational Initiatives

Jonathan Jarvik (Faculty)

received funding from DARPA.

Anagha Kadam (Ph.D. '18)

received the Glen de Vries Presidential Fellowship Award and was selected to participate in the Clinical & Translational Research Course at the NIH Clinical Center.

Scott Keith (Ph.D. '21)

was awarded an NSF Graduate Research Fellowship.

Katie Lagree (Ph.D. '19)

was awarded the Stupakoff Scientific Achievement Award.

Aaron Mitchell (Faculty)

received a grant from the NIH.

Robert Murphy (Faculty)

received the 2016 Distinguished Service Award from the Int'l Society for Advancement of Cytometry and received an NSF grant.

Manoj Puthenveedu (Faculty)

received a grant from the Dana Foundation and has a patent pending.

Russell Schwartz (Faculty)

received funding from the Center for Machine Learning and Health (CMLH) as well as an NIH grant.

Emily Simon (Ph.D. '19)

was a finalist at the 2017 CMU 3-Minute Thesis Competition.

Alan Waggoner (Faculty)

was a 2016 Alumni Achievement Award Recipient from the University of Oregon.

Andrew Wolf (Ph.D. '20)

received a student poster prize at the Midwest Society for Developmental Biology.

DEPARTMENTAL AWARDS

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 2016-2017:

Stephanie Biedka
Vinitha Ganesan
Katie Lagree
Ceren Tuzmen

Zara Weinberg
Amanda Willard
Andrew Wolff
Minyan Zheng

Elizabeth W. Jones Award

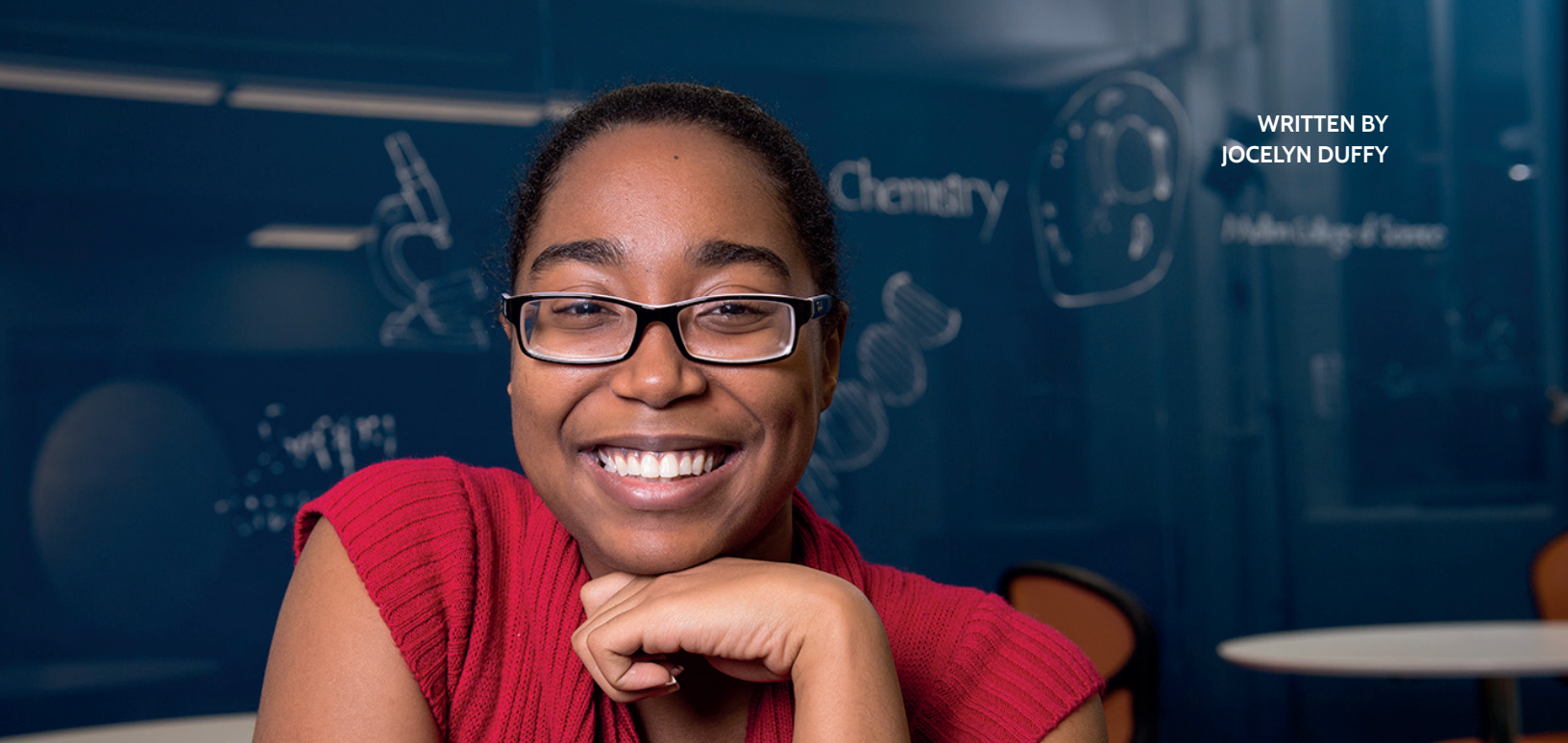
To honor her commitment to undergraduate research, the Elizabeth W. Jones Award for Excellence in Undergraduate Research in Experimental or Computational Biology was created in 2009. This award is given to honor the research efforts of a talented and dedicated undergraduate over their years at Carnegie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

The following student was awarded the Elizabeth W. Jones Award for 2016:

Michelle Yu



Faculty and graduate students at the 2016 annual Elizabeth Jones Biological Sciences Department Retreat at Hidden Valley Resort



BIOLOGICAL SCIENCES MAJOR CHRYSTAL THOMAS NAMED SCHWARZMAN SCHOLAR

Chrystal Thomas, a senior majoring in biological sciences at Carnegie Mellon University's Mellon College of Science, has been named to this year's class of Schwarzman Scholars. The highly selective scholarship program will fully fund Thomas as she completes a master of global affairs with a concentration in public policy at Tsinghua University in Beijing.

Thomas is one of 129 students from 30 countries and 75 universities chosen as Schwarzman Scholars. Each of the scholars will pursue a master's degree at Tsinghua University in 2017. Founded by Blackstone Chairman, CEO and Co-Founder Stephen A. Schwarzman, the program is quickly becoming the premier training ground for future leaders. The program, which is in its second year, focuses on educating and preparing the world's most exceptional students to confront the challenges of the coming century and provide them with the opportunity to develop an understanding of China.

"Chrystal is one of the top students that I have known in my 38 years at Carnegie Mellon. She has great intellectual ability, is highly

motivated, is a leader, and has a strong vision on how she will create policies and programs to benefit people around the world. She will become a world leader in the area of public health," said Eric Grotzinger, emeritus associate dean for undergraduate affairs at the Mellon College of Science.

Thomas first became interested in public health and policy during a Leadership Alliance Summer Undergraduate Research Internship at the University of Pennsylvania where she participated in a conference aimed at resolving conflicts of interest between academia and industry. There, she discovered a passion for facilitating dialogues between communities to create positive results. During an internship at the National Institute of Arthritis and Musculoskeletal and Skin Disease the following summer, Thomas' interest in the field was cemented when she attended a keynote speech on public health.

"I think there are a lot of people who want to get things done, but because they don't effectively communicate with teammates who hold different perspectives from them, progress towards their

vision gets hindered. With the Schwarzman Scholarship, I'm really hoping to work on my own communication and decision-making skills so that I can help as many people as possible," said Thomas.

Thomas was drawn to the program in part by the opportunity to study abroad. The daughter of a Haitian immigrant, Thomas is interested in barriers to health care faced by immigrant families. One-third of the immigrants moving to the United States are from China, and she hopes that she will be able to learn more about the Chinese health care system while she is in Beijing and apply what she learned to her future work.

"Authentic and inspiring, Chrystal exemplifies the leadership qualities that the Schwarzman Scholar Program seeks. She is deeply committed to advancing the discourse on equity and inclusion at all levels and has a track record on campus and in the community that speaks to these interests. Chrystal's academic and leadership experiences at Carnegie Mellon provide an important foundation for meaningful engagement with other Schwarzman Scholars and her host community at Tsinghua University," said Joanna Dickert, assistant director of undergraduate research and national fellowships in Carnegie Mellon's Fellowships and Scholarships Office (FSO). The FSO guided Thomas through the Schwarzman Scholar application and interview process.

Thomas is an active member of the Carnegie Mellon community, especially in activities focused on fostering diversity at the University. She founded and is president of Colors@CMU, a student organization that promotes open conversations on race and diversity. She served as one of the inaugural members of the Diversity and Inclusion Roundtable, which provides counsel to Provost Farnam Jahanian and other senior leadership on diversity initiatives for the university. She is also a mentor in the Coaching Minority Progress and Success in Science (COMPASS) program.

Thomas has received a number of awards and recognitions for her work in and out of the classroom. In 2013, she received a Gates Millennium Scholarship from the Bill and Melinda Gates Foundation. This fall, she was named an Andrew Carnegie Society Scholar, a distinction bestowed upon only 40 graduating seniors. After completing her master's at Tsinghua University, Thomas plans to attend medical school to pursue an M.D./M.P.H. degree.

DID YOU KNOW?



The Schwarzman Scholars Program was inspired by the Rhodes Scholarship, which was founded in 1902 to promote international understanding and peace, and is designed to meet the challenges of the 21st century and beyond.

Blackstone Co-Founder Stephen A. Schwarzman personally contributed \$100 million to the program and is leading a fundraising campaign to raise an additional \$350 million from private sources to endow the program in perpetuity. The \$450 million endowment will support up to 200 scholars annually from the U.S., China, and around the world for a one-year Master's Degree program at Tsinghua University in Beijing, one of China's most prestigious universities and an indispensable base for the country's scientific and technological research.

Scholars chosen for this highly selective program will live in Beijing for a year of study and cultural immersion, attending lectures, traveling, and developing a better understanding of China. Admissions opened in the fall of 2015, with the first class of students in residence in 2016.

Chrystal Thomas has also been named student speaker at Carnegie Mellon University's 120th Commencement on May 21, 2017. More than 5,000 bachelor's, master's and doctoral degrees will be conferred at Carnegie Mellon's main commencement ceremony. The ceremony will be webcast live at www.cmu.edu/commencement.

THE LABS @ CMU-QATAR

WRITTEN BY
ANNETTE VINCENT



Annette Vincent, assistant teaching professor of biological sciences, in the renovated teaching laboratory on the third floor of the CMU-Q building

In fall 2011, the Biological Sciences undergraduate program was added to the existing repertoire of undergraduate degrees at Carnegie Mellon University in Doha, Qatar (CMU-Q). While CMU-Q is set on a collaborative campus called Education City, when the CMU-Q building was originally designed, a Biological Sciences degree was not offered. In 2011, the first cohort of the CMU-Q Biological Sciences program were six transfer students from Weill Cornell Medical College in Qatar, who entered CMU in their junior year.

To fulfill their degree requirements, these students traveled to the Pittsburgh campus in summer of 2012 to complete the first of two required lab courses. Carrie Doonan, teaching professor and director of undergraduate labs in Biological Sciences led

this summer course with extensive support from Emily Drill and Annette Vincent, assistant teaching professors of biological sciences. During fall 2012, an existing lab space in CMU-Q was equipped to offer the second lab in sequence and enable a timely graduation without compromising rigor of training and learning experience. Despite starting with a set of fluctuating and evolving resources, it is impressive that the first bacteriophage (viruses that infect bacteria) in the Qatari sand was discovered in this very lab space at the CMU-Q building not so long after.

Over the last 5 years, additions to laboratory space as well as recruitment of new faculty members have not only enhanced the scope of inquiry-based lab courses but have also provided many opportunities for students to build their critical thinking skills via experimental design and analysis.

Currently, biology laboratory courses available at CMU-Q include the freshman-level bacteriophage genomics courses and the junior-level courses in molecular biology and genetics and in biochemistry. The phage genomics research course (a two semester course sequence) provides students the opportunity to discover bacteriophages from environmental samples in Qatar. This innovative lab course is modeled after a successful course in CMU Pittsburgh as well as in many other leading universities across the USA. The course exploits the diversity and ease of availability of yet-to-be-discovered bacteriophages all over the world in order to get students excited about primary research.

Having worked with DNA sequence data from the Pittsburgh campus' course samples for a semester, in 2015, CMU-Q students started working on sand samples within Qatar leading to the first discovery of sand phages in the local desert biome. Ummkulthum Umlai, a CMU-Q Biological Sciences undergraduate student, isolated and identified a novel bacteriophage from sand just outside the campus at CMU-Q. Under the guidance of Annette Vincent, phage DNA was purified, sequenced, and analyzed leading to this new discovery. Umlai's work was awarded the first prize for student presentation at the Annual Research Conference in Qatar.

The purchase of an Ion Torrent next generation DNA sequencer now allows for isolated phage genomes to be sequenced in-house. This empowers students to understand first-hand the process of generating and exploring high throughput DNA sequence data. Using cutting edge computational biology tools, under the mentorship of Valentin Ilyin, associate teaching professor of computational biology, the newly discovered aforementioned

Qatari phage was predicted to infect the bacterium *Bacillus cereus*. Electron microscopy imaging services provided by Joseph Suhan in CMU Pittsburgh enabled visualization of the bacteriophages under high resolution. Subsequently, research presentations from students at the annual Meeting of the Minds symposium won several accolades including the Best Poster award. In Fall 2017, students will continue working on isolating bacteriophages from the soil samples from the Al Khor mangrove swamps, located in the northeast of Qatar. As of now least 5 different bacteriophages have been identified from the swamp samples.

The upper level laboratory courses are executed in close collaboration with the parallel courses on the Pittsburgh campus. The main highlight that distinguishes CMU's lab courses from other "recipe-based" courses are the independent research final projects that students work on for several weeks during the semester. Students spearhead their own projects from design to execution and troubleshooting. For example, as part of the final project in the Experimental Biochemistry course, students worked on testing the effect of food additives on mammalian kidney cells. The advantage of a small class size is that students have to take charge of big tasks as well as routine small tasks such as maintenance and passaging of their cells. This trains them in essential skills of organization and lab and time management. In the final project, students used a variety of cell-based assays to test the effects of additives, including cell viability assays, fluorescence microscopy tools, and reactive oxygen species generation assays. This enabled them to approach the same problem from many vantage points and to corroborate their results in multiple ways. In spring 2017, under the leadership Mohamed Bouaouina, assistant teaching professor of biological sciences, students for the first time used flow cytometry as a measurement tool for oxidative stress using fluorescent probes.

Next semester, the biology teaching labs are relocating to their new home on the third floor of the CMU-Q building. The lab space has been renovated to hold 25 students and is equipped with the state of the art facilities that will help accommodate teaching in a laboratory environment. This dedicated new laboratory space will support the program in offering other new laboratory courses to majors and non-majors on the CMU-Q campus.

ALUMNI UPDATES

VIVEK ABRAHAM (Ph.D. '99) is currently a Principal Research Scientist in Oncology Discovery at AbbVie in Chicago.

LAURA ANDERSON-LEHMAN (B.S. '16) recently began her career as a Clinical Laboratory Scientist at PerkinElmer Genetics in Bridgeville, PA.

CHARLENE BRISBANE (B.S. '88) is currently the Director of Drug Product Development & Operations, Biologics CMC at Teva Pharmaceuticals.

YILEI CAI (M.S. '15) is currently a software engineer at Yahoo.

GLEN de VRIES (B.S. '94) was chosen to receive the 2017 CMU Alumni Achievement Award.

MICHAEL GAMALINDA (Ph.D. '14) began his new job in 2016 as a scientist in the Pharmaceuticals Division of Bayer AG in Cologne, Germany.

LINGLIN HUANG (M.S. '16) is currently a Ph.D. student in the biostatistics program at Harvard University.

ELMER KER (Ph.D. '12) is currently a postdoctoral fellow at Stanford University studying deer antlers and working on the creation of biomaterials for bone-tendon tissue engineering.

KIMBERLY PARKS (B.S. '08) is finishing her general psychiatry residency at the Los Angeles County and University of

Southern California Medical Center as Chief Resident. She will be starting a fellowship in addiction psychiatry at Baylor College of Medicine in July 2017.

JOSH PLOTNIK (B.S. '11) completed a Ph.D. in November 2016 from Indiana University. He is currently working as a postdoctoral fellow in Translational Oncology and Precision Medicine at AbbVie in Chicago.

JULIA POLAT (B.S. '05) is currently working as an attending ophthalmologist at UPMC and the Pittsburgh Veterans Affairs Healthcare System.

EASWARAN RAMAMURTHY (M.S. '15) spent one year as a software engineer at Ancestry DNA and is now a Ph.D. student in the joint CMU and University of Pittsburgh Ph.D. Program in Computational Biology (CPCB) in the Pfenning lab.

JEREMY SCHONHORN (B.S. '86) is currently Principal Scientist at Jana Care developing point of care diagnostics to detect and manage chronic diseases.

AMIT SRIVASTAVA (Ph.D. '99) recently joined Pfizer Vaccines as lead for the North America region, responsible for medical development, scientific and clinical affairs for the portfolio of meningococcal vaccines at Pfizer. Prior to this Srivastava spent nearly 3 years at the Bill & Melinda Gates Foundation as the lead for global pneumococcal vaccine development programs.

JEREMY STARK (B.S. '93) was promoted to Professor in the Department of Cancer Genetics and Epigenetics at the City of Hope, and appointed as a member of the Radiation Therapeutics and Biology Study Section at NIH.

NATHANIEL J. SZEWCZYK (B.S. '93) was promoted to the role of Professor at the University of Nottingham School of Medicine MRC/Arthritis Research UK Centre for Musculoskeletal Ageing Research & National Centre for Sport and Exercise Medicine.

QI WAN (M.S. '15) is a Scientific Computing Engineer at Emerald Cloud Lab in San Francisco. Prior to this, Wan worked at Affymetrix in the Bay area.

CINDY ZHU (B.S. '12) completed an M.S. in Environmental Policy & Sustainability from The New School. She is currently working at the US Department of Energy, Office of Energy Efficiency & Renewable Energy, helping to increase energy efficiency technologies and proliferate clean energy into the built environment.

FRANK ZHOU (Ph.D. '10) was appointed part-time lab manager at the Ye lab in the Department of Radiation Oncology at Stanford School of Medicine in 2016. The lab focuses on the crossroad of cancer metabolism and epigenetics. In addition, Zhou is a full-time financial advisor with MassMutual Financial Group.

Carnegie Mellon University

Biological Sciences

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

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