DEPARTMENT OF

BIOLOGY

Summer Newsletter 2016

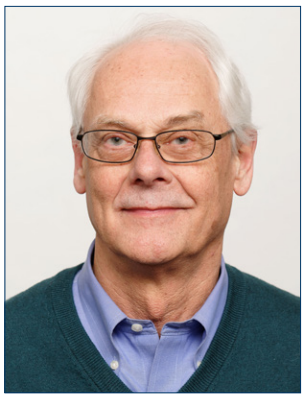
Outreach Program

serves diverse demographics in Rochester community

IN THIS ISSUE: Message from the Chair · Community Outreach · Graduating Student Profiles · New Faculty · Tony Olek Retires · Faculty Headlines · Graduate Student News · Alumni Updates · United Way Award · Support Our Specimen Collection

SCHOOL OF ARTS & SCIENCES
UNIVERSITY of ROCHESTER

MESSAGE FROM THE CHAIR



John Jaenike

Dear Biology Alumni and Friends,

First of all, I would like to congratulate the class of 2016, whose recent graduation marks both our recognition of their academic achievements here at Rochester and the beginning (commencement) of one of the major transitions in life. We welcome you to the community of Rochester alumni and wish you well on your journey forward in life. I also want to acknowledge and thank the parents and other family members who have supported our graduating seniors in so many ways.

This year, 201 students graduated with degrees in areas covered by the Undergraduate Program in Biology and Medicine (UPBM), including the BA in biology and BS degrees in molecular genetics, cellular and developmental biology, ecology and evolutionary biology, microbiology, neuroscience, and biochemistry. The senior class included 49 double majors, 18 Take 5 students, and 5 Key Scholars in 2015–16.

Slightly more than half (102) of this year's graduating UPBM majors have carried out independent research. This high percentage illustrates the commitment of both students and faculty to research and the importance of this discipline to understanding current biology. As a department, we are particularly gratified that we can offer our students the opportunity to conduct research firsthand in world-class laboratories. It is a wonderful experience not only for our undergraduates but also for our graduate students, who often mentor their junior colleagues, and for the faculty members. Working one on one with undergraduates is one of the most satisfying experiences in academia.

Dan Bergstralh joined the department as an assistant professor in July 2016. He obtained his PhD at the University of North Carolina at Chapel Hill and did postdoctoral work at UNC and the University of Cambridge, where he held a Marshall Sherfield Fellowship, a Marie Skłodowska-Curie (European Commission) Fellowship, and a Research Fellowship at Clare Hall College. Dan's scientific background ranges from medical-oriented biology in mammalian tissue culture cells to imaging-based cell biology using the fruit fly *Drosophila melanogaster.* His lab will combine these approaches to study the biology of epithelia, the most common type of tissue in the human body. Specifically, he is interested in how epithelial cells divide and then adhere to one another. By exploring the relationship between division and adhesion, the lab will aim to understand how epithelial tissues are built during development and maintained over the lifespan of the organism. Dan enjoys playing jazz guitar, and he's looking forward to partaking in the Rochester music scene.

In other departmental news, Daven Presgraves was appointed as Dean's University Professor for his exceptional work in evolutionary genetics. Amanda Larracuente was part of a team whose proposal to sequence the firefly genome was a finalist in the PacBio competition to explore the world's most interesting genomes. Dragony Fu was awarded a five-year NSF CAREER Award, the National Science Foundation's most prestigious award for early career faculty members. Dragony does research on how a set of enzymes acts on RNA molecules to regulate how those molecules function in fundamental cellular processes, affecting such things as cancer, degenerative diseases, and aging. Sina Ghaemmaghami won recognition from Thermo Fisher Scientific for the outstanding innovation and impact of his research in proteomics. Finally, congratulations to Debbie Lawrence, who won the United Way Shining Star Award for her leadership in managing the United Way campaign in our department.

A year ago New York State approved our proposal for a new BS major in computational biology, which came online in academic year 2015–16. The new major is being overseen by faculty member Amanda Larracuente, and we already have 6 or 7 students who have declared this as their major.

Remember, you can follow the latest news as well as coverage of ongoing research projects and other departmental activities at the department's website at www.rochester.edu/College/BIO/. As always, we'd be delighted to hear from you and would like to pass on your news to friends, classmates, and fellow alumni.

This will be my final note to you as department chair—Michael Welte is the new department chair. The department will definitely be in good hands under Michael's leadership. It has been a great pleasure working with the faculty and staff in our department and getting to know so many of our students. I have also really enjoyed hearing from department alumni and friends for the past three years, so let's stay in touch.

NEW DEPARTMENT CHAIR

Michael Welte

The Department of Biology at the University of Rochester is a very special place: It is full of smart and interesting people, from bright students to dedicated staff to brilliant faculty. Together we pursue our dual mission of cutting-edge scholarship and excellence in education. I still remember my first visit to the department in 2006, and how impressed I was by its vibrancy and collegiality. I joined the faculty as an associate professor in 2007, and since then, my admiration and respect for the department have grown ever stronger; it truly has become my academic home. I am therefore delighted and honored to serve as the next department chair. I hope to emulate John Jaenike's steady and thoughtful guidance of the department and would like to express my gratitude to John for his many years of exceptional service. Always willing to listen and provide advice, he has been, and continues to be, a tremendous asset for the department. I am looking forward to working with past, current, and future members of the department on the journey ahead.

WANT TO GET INVOLVED?

Supporting the Department of Biology is easy! Watch for opportunities in this issue!

Gifts to the biology department help create academic and research opportunities for students and faculty that will have a profound effect on human health. ***Read Biology's Meliora Challenge Campaign summary for more information.***

To make your gift or discuss opportunities to support the department, please contact

David Richardson '10E
Assistant Director of Advancement
(585) 276-7423, david.richardson@rochester.edu

Outreach Engages
with the Greater Rochester Community


Science Café attendees listen to a talk on gravitational waves.

The Department of Biology's outreach program serves diverse demographics in our community. Departmental personnel contribute on a completely volunteer basis. Our goal is to share our fascination with biology and motivate students and adults to engage with and incorporate science into their daily lives. For the eighth year, Tuesday evening Science Cafés brought together researchers from the University of Rochester and RIT and a largely regular group of community members. This coming fall, we are expanding the Science Café program with a new Saturday afternoon series, when families will be more likely to attend. The Science Café schedule is listed with seminars on the Department of Biology's website.

The primary focus of our outreach committee is to support and enhance STEM education in the Rochester City School District. The challenges of effecting change in this district and not just providing one-off activities and events is exceedingly difficult. We aim to create programs that encourage middle and high school students to not only achieve but to believe they can excel and continue their studies and feel comfortable at top colleges and universities. To this end, we are working with schools to make sure we see cohorts of students every year through graduation, using both group encounters as well as personal mentoring, and, critically, involving their parents and guardians. Through the Summer Horizons and Upward Bound programs, we worked with Rochester City School kids between the ages of 7 and 18. These kids and young adults came to the University and interacted in laboratory settings with our undergraduates, graduate students, postdocs, faculty, and staff. Graduate student Jenna Lentini taught a lab on food biochemistry to our young Horizons students. "It was definitely a rewarding experience not only for the kids who hopefully came away with a better appreciation for the scientific method and the importance of a balanced diet, but also for me as I was able to find purpose in teaching youngsters," Lentini said. Postdoctoral research associate Anusha Naganathan taught a Horizons section on growth and division. "Pretending to be a scientist (wearing goggles, using test tubes, and plating bacteria and seeing colonies form) made the kids very excited. I learned they were curious about what I actually do with the bacteria, where I get them, and where they live in the lab. These were questions I did not expect," she said.


Rochester undergraduates work with school kids to explore fossils.

Anusha Naganathan engages a Horizons student with a creative and fun approach to learning about cell division.

During the 2015–16 academic year, we lectured and ran wet labs in several city schools and brought eighth- and ninth-grade classes to the University for full-day schedules. Each visit was designed in consultation with their teachers; the goal being to support their curricula.

One week we sent a team to School 58 and gave DNA gel electrophoresis labs to six different classes. Graduate student Alexis Stein coordinated this program and reported, "Continuing to develop this partnership with World of Inquiry School 58 is important because we can very easily enrich their classroom experience by providing not only equipment and expertise but also providing students with an environment where their own curiosity is encouraged and they can ask their own questions about biology and science."

Another day, we visited an eighth grade class at Eugenio Maria de Hostos Charter School and presented a section on genetically modified crops (GMOs). In her thank you note, one of the students wrote, "I'm going to go to college and get my PhD. I learned way more information about GMOs."

A highlight of the year was a visit by Cebrahil Gurler-Carrasquillo's East High ninth-grade living environment class. Cebrahil was a 2014 University of Rochester graduate.

East High students work with Bob Minckley to study fruit fly cold tolerance.

The visit included an evolutionary biology laboratory on cold adaptation among fruit fly species. The students discovered that flies that were adapted to cooler climates recovered from cold faster than those from warmer environments. An innovative aspect of the lab was a virtual fly collecting expedition using the spectacular Vista Collaboratory in Carlson Library, which we had used before but sought to integrate more fully into the lab experience. Using this curved 20 ft. x 8 ft. high-resolution video screen, the students navigated the globe with Google Earth. The students traveled to fruit fly collecting sites in Iceland, France, and Africa, taking time off to visit tourist sites like the Eiffel Tower and a soccer game at the Mandela National Stadium in Uganda. As we "took off" from Rochester International Airport, one student reported feeling airsick!

Working with Rochester city schools is both important and extremely challenging. Many of these students live in poverty, or English is a second language, and/or they would be the first in their families to attend college. Convincing these bright and engaging kids that they belong at a university is one of our top priorities. We continue to work with various stakeholders to create a sustainable multiyear STEM outreach program aimed at identifying promising but underserved young students and working with them through their college admissions process. Ideally, we want to bring successful students back into the schools to serve as role models and student mentors.

Please consider making a tax-deductible contribution to the Department of Biology's "U-ROC" (University of Rochester Outreach Committee) fund. All contributions will be used to enhance our expanding programs.

To donate, please make your check out to the University of Rochester and mail it to Kathy Giardina, Box 270211, Rochester, New York 14627. Please feel free to contact **Brenna Rybak** for more information.

Graduating Student Profiles

Morgan Albert '16
Cell and Developmental Biology

One of the things I have learned while studying at the University of Rochester is the value of staying current in my education by reading papers on the latest research and having opportunities to participate in research myself. Having those options available to me as an undergraduate and having them so accessible is a remarkable aspect of this institution and I am so grateful that I have been able to have these experiences as a part of my education.

I have also learned to appreciate the freedom of choosing courses that align with my interests. With the unique curriculum here at the University of Rochester, I have been able to tailor my education to my specific interests and excel while learning about subjects I am passionate about. Having the freedom within the biology major to hand pick my coursework has been extremely beneficial in preparing me for my next steps!

I believe that my undergraduate education has been quite rigorous during my four years, and I am extremely confident that I will be prepared for my next steps as I pursue a career in medicine. The biology department has been so fantastic to work with, and I couldn't have asked for a more supportive, knowledgeable group of instructors and administrators to help me through my journey here at the University of Rochester.

To students pursing biology majors, my best advice is to love what you are learning. Over my four years I have grown so much and really have a passion for what I am learning, and I do not believe my experience would have been the same if I didn't love it. Being passionate and having an excitement for your studies makes your time here so worthwhile that these truly will be some of the best years of your life.

Some of the extracurricular activities that I participated in were the Charles Drew Pre-Health Society, shadowing in a pediatric cardiology clinic, hospice volunteering, volunteering in the pediatric in-patient department with hematology/oncology patients, and doing cardiac myocyte research at the Medical Center. There are so many ways to get involved on campus, which cultivates an environment rich in diverse opportunities. I have thoroughly enjoyed my time here at Rochester, and I couldn't have asked for a better place to spend my past four years!

Fatima Bawany '16
Biology/Religion

Although studying biology here has given me a strong theoretical foundation in the sciences, the most important lesson that I learned was about the practice of scientific research. Although I had volunteered in labs previously, at the University of Rochester, I was able to take on an independent research project for the first time. By taking complete ownership of a project, I realized the level of problem solving and patience that goes into the process of scientific discovery.

As part of the Rochester Early Medical Scholars (REMS) program at Rochester, I came into college knowing that I wanted to pursue a career in medicine. Through the biology program, I was able to explore subjects including biochemistry, genetics, and microbiology, which will allow me to better understand my course material in medical school as well as clinical cases that I encounter.

Biology majors at the University have a variety of elective courses they can choose from. I would recommend that students take at least one course that does not directly relate to their career path. Although I was a pre-med student, one of my

favorite courses was Animal Behavior. I found it fascinating to learn about the behavioral patterns in different animal species and am sure future students will also enjoy exploring new areas of study.

I pursued a biology major as well as a religion major but found plenty of time to get involved in extra-curricular activities. I volunteered with resettled refugees in Rochester and received the Davis Projects for Peace grant through the University to further my work with refugees. I was also able to spend time abroad. I took a gap year after my junior year to study Arabic in Oman, and this summer I will continue my Arabic studies in Morocco.

Marcia Des Jardin '16
Molecular Genetics

The most important thing I have learned is to not expect that you'll have all of the answers. I was able to succeed when I began utilizing the resources that were surrounding me: professors, other students, friends, and people who took the class before. These resources can give you pointers on the topic you're learning, as well as opening your eyes to new ways to learn the material.

This program helped me prepare for medical school because it taught me to think and work hard. I was never handed an easy grade, and I felt very accomplished when it was all over.

When classes are hard, it can be easy to become discouraged and overwhelmed with the material. Take a step back and find a friend in the class with whom you can study and get through the class together.

I think it is very important to balance classes with activities that you enjoy. In my time at Rochester, I was involved in Chi Omega sorority, Mariachi Meliora, the Panhellenic recruitment team, *Journal of Undergraduate Research,* and Order of Omega; I volunteered at Chili Volunteer Ambulance Services and Patient Discharge and the Emergency Department at Strong Memorial Hospital, and I work at a Pediatric Nephrology office at Golisano Children's Hospital.

Amy Elias '16
Molecular Genetics

In the fall, I will be pursuing a PhD at Brown University in molecular and cell biology and biochemistry. While studying biology at the University of Rochester, I learned that science is not just about sitting in a classroom and learning from professors, but it's about taking your own initiative to ask questions and solve problems that interest you, so you may learn from yourself in addition to learning from professors.

Being involved in undergraduate research has helped me to transform from a student who did not know how to hold a pipette into a student conducting her own independent research and formulating her own experiments with HIV+ latently infected cells. Research teaches creativity, responsibility, and patience. With the knowledge I have gained from conducting research in the Maggirwar Laboratory and the insight gained from professors inside and outside of class, I am ready to begin my next stage of life as a graduate student with excitement rather than nervousness.

Erin Finnerty '16
Molecular Genetics

The most important thing I learned studying biology at the University of Rochester is that there is so much knowledge out there to be discovered. We have learned and studied so many topics, but there is still an abundance of information that we don't know yet. It is really exciting when you think of all the opportunities for discovery there still are.

I will be attending medical school in the fall, and I feel that I am very prepared to succeed there. I have learned so much from all of the classes I have taken in this department. In the upper-level biology courses, especially, I had to understand how certain things worked in the context of the lecture material and how they could be modified to work similarly under different circumstances. The act of thinking about what we know and how we should approach a problem will continue to be a helpful skill as I move forward in my education.

One of the best decisions of my college career was joining a lab. My lab mates are some of my best friends, and they have helped me grow as a person and a scientist in the two short years I've known them. They have also been incredibly helpful in my coursework. Grad students are great at editing papers and helping me understand a concept that I am struggling with. We support each other in the lab and with our outside activities, and it has been a fantastic environment for me. I would highly recommend future students look for the opportunity to become a part of a research lab on campus.

I was a member of the varsity swim team at the University of Rochester for my four years, and I specialized in distance freestyle, including the 200, 500, and 1650 freestyle.

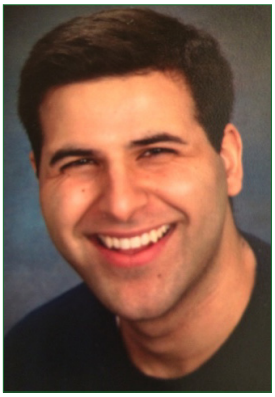
Emily Fitzgerald '16

Microbiology/ Epidemiology

The University of Rochester's biology department taught me that knowledge is not obtained easily, and scientific advances only come through carefully constructed experimentation and motivated investigators. The biology department demonstrated that memorizing a wide range of facts is not sufficient to truly understand the material. Synthesizing ideas, analyzing the methods used to bring about theories, and debating your own perception of the facts with peers are all important steps in truly mastering the subject. Through studying microbiology, I learned a new way to question and process material, which I feel will help me as I begin medical school in August.

My advice to students in biology is to form study groups in which you can feel comfortable sharing ideas and receiving constructive criticism. Additionally, when you have questions your peers cannot answer or are struggling in a class, approach your professors—they are an excellent resource for you and are more than happy to help a student in need.

Biology is a time-consuming major. However, I still found ways to pursue outside interests. I pursued a second major in epidemiology, served two terms as director of training for the Medical Emergency Response Team on campus, volunteered for an outside EMS agency, was a member of a sorority on campus, and conducted extensive research in the Caserta Pediatric Infectious Diseases Laboratory. The biology department has opened many doors for me, and I leave the department with fond memories and a sense of gratitude for the strong education it provided me with.



Ali Khan '16

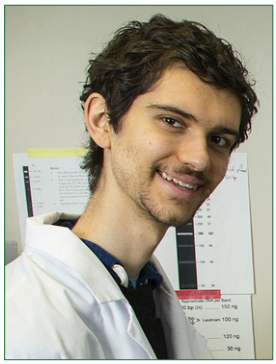
Biochemistry/English

Studying at the University of Rochester, I have learned to be resourceful and to take advantage of all of my resources because there are so many resources at the University of Rochester.

The program of study I followed (BBC) involved taking many graduate-level courses. This will not only strengthen my more specific interests in the subject but also has allowed me to have a competency in the theory as well as the application of biochemistry.

I would advise prospective biology majors to begin internships and research opportunities right away. We might know we want a bio major, but that is a huge umbrella term. What do you want to do with your bio major? The best way to find out is to complete an internship.

In addition, I held 2 or 3 jobs every semester at the University. I taught a lot, and I want to follow an education pathway for MDs like the one at Rochester, whereby I can be a translational science communicator—an educator for future physicians. Therein, my method of teaching will involve technological innovation, social integration, and a translation so as to make the basic sciences more accessible.

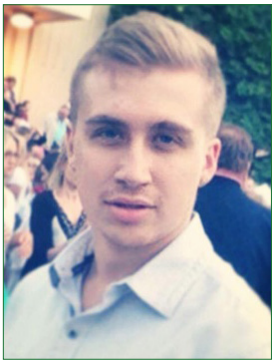


Roy Moger-Reischer '16 Ecology and Evolutionary Biology

At the University of Rochester, I was immediately confronted with the idea that science is ceaselessly morphing and improving. Even in freshman BIO 111, students were required to read scholarly journal articles for class. This ignited my curiosity. I realized that I had the best access to knowledge, yet how could I stay so well informed? Thanks to sudden immersion in the scientific community (and thanks to the University's VPN), I now keep up with new literature in my field, even at home or on vacation.

Ever-changing literature epitomizes what I find so enticing about science: I. Must. Learn. All. The. Things. And since there's always more to learn, I have a perennial source of pleasure. Joking aside, the triumphs in my biology career are due to sincere curiosity and love of learning. Superficial understanding never suffices; immersion-until-mastery brings success, delight, and new questions. And because I now thoroughly understand the topic, I can hone my questions to be useful and precise.

Wielding brand-new, as-yet-unanswerable questions, one's only recourse is first-person research. Get started NOW. Here's why: (1) Displaying the word "research" on your résumé is disturbingly efficacious. If your application is a male Xiphophorus, "research" is a Brobdingnagian sword, exploiting the application-reader's ancestral female sensory bias for a colossal gonopodium. (2) You must know for yourself whether research is fulfilling to YOU. Is the creative joy of unlocking new knowledge commensurate with the pain of 12-hour days counting grass tillers in the desert or failing yet another set of multiplex PCRs? (3) You'll meet people. Some are responsible scientists with whom you'll be excited to network. Some are scientifically imprudent or slothful, and you'll try to avoid associating with individuals of that phenotype in the future. My advice: Take a statistics class. Then you'll know how biologists know we know what we know.



Alexander Neary '16 Biochemistry/ Psychology

I reflect back on my time as a biochemistry major, grateful for the intellectual and critical thinking skills that the biology department has helped me foster. The transition from high school to the introductory-level biology classes can be difficult, moving away from stereotypically fact-based, multiple choice questions to conceptual short answer questions. This transition from rote memorization to critical thinking allows students, including myself, to intellectually mature, providing the skills necessary for graduate school, medical school, and life in general.

Certainly, in any academic discipline, understanding facts is important, but even more important is the ability to analyze and interpret new information, as well as familiar information in unfamiliar situations. As a premed student, as many (but not all) biology majors are, I feel confident in my ability to succeed on both the MCAT and, hopefully, medical school, thanks to the factual content and critical thinking skills I have learned as a biochemistry major at the University of Rochester.

To those hoping to pursue or are currently pursuing a biology major, I encourage you to become versed in reading primary literature. Though the first two years of the majors are largely

textbook-driven, the key upper- level classes turn to the scientific literature, necessitating strong reading and critical thinking skills. While these papers can be challenging, they provide the backbone of the biological field. Learning the structure of DNA or the cell is exciting, but learning how this knowledge was accumulated is even more fruitful.

Jennifer Selland '16
Biochemistry

The most important thing that I learned from studying biochemistry is that you always have to keep a flexible and open mind. Facts that you learn from a textbook may be the result of decades of research, but the field is constantly growing and you can't take anything you learn as absolutely true. Also, from personal experience, research can take many failed experiments before any successful outcome, and it's important to always be open to new suggestions and deviations.

I feel that the biochemistry program has prepared me extremely well for my post-graduation plans, which are applying to and (hopefully) attending medical school. I have had the opportunity to pursue research while also learning so much in my classes, both lab and lecture based. While the core curriculum for biology majors can seem strenuous, it is an important foundation to have moving forward in academia.

Be open to changing your intended biology major after the first year of classes. I came in thinking I would be a neuroscience major, then a chemistry major, and finally, I declared biochemistry spring of my sophomore year and had no problem finishing the required classes.

While lab courses are time consuming, I definitely had a lot of spare time! I was on the Equestrian Team, a member of Sigma Delta Tau, a member of GlobeMed, and worked in the Department of Pediatrics at Strong. I also enjoyed running along the Genesee and was able to train for my first half marathon this past spring. Explore Rochester all you can!

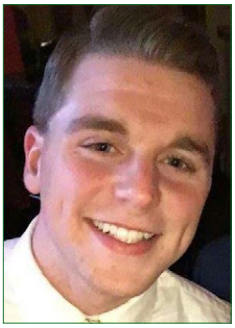
Victor Wang '16
Molecular Genetics

While at the University, I have learned to always keep the big picture in mind when studying biology. Sometimes when taking a class, it can be easy to focus on the details and forget how it all actually fits together. I have applied this mentality to the research lab as well and always try to think back to the big picture when I come up with new questions to answer. In doing so, my experiments can fit together to help tell a story, contributing a little piece to the field.

The program has prepared me well for medical school through the challenging curriculums that the courses provide. Many of the upper-level biology courses I took were alongside graduate students, allowing me to feel comfortable going into my courses next year. The biology courses, especially the upper-level courses, really emphasize modern techniques and problem solving, making it easy to apply what I learn in the classroom to real-world research.

Don't be afraid to put yourself out there and get involved with things that you may not have otherwise considered doing. Teaching was something I never had the opportunity to do prior to college, but being a teaching assistant and workshop leader for numerous chemistry and biology courses here, I have really discovered a passion for it.

Aside from TAing classes, I was also very involved with research in the immunology lab of Jennifer Anolik, MD, and volunteering with Strong Memorial Hospital. In my free time, I enjoyed fencing with the fencing club, jogging, and helping organize health awareness events with Charles Drew Pre-Health Society.



Eric Wilson '16
Molecular Genetics

Although I've learned about the structure and function of DNA, memorized numerous biochemical pathways, and studied an array of molecular biology techniques, I wouldn't consider these the most important pieces of information that I came to know while studying biology. In fact, I wouldn't consider any single piece of factual information to be the most significant aspect of my education. The most valuable skill that I obtained while studying biology was the ability to critically examine any given problem. I loved workshop questions that asked us to design experiments or challenged us to use our knowledge of biology to explain experimental outcomes. I have no doubt that exercises in critical thinking like these, as well as the time I spent conducting independent research, have helped prepare me to succeed as a Postbaccalaureate IRTA fellow at the National Institutes of Health.

If you want to pursue a major in biology, you need to have a passion for the field. Succeeding will require hard work and dedication, and it's always easier to commit to something that truly excites you. Also, take advantage of the many research and teaching opportunities that the biology department has to offer. Being a teaching assistant for the department was an incredibly rewarding experience that enabled me to make meaningful connections with my professors. My time working in a lab at the Medical Center allowed me to gain technical skills and showed me what the day-to-day life of a scientist was like.

In addition to working as a teaching assistant and undergraduate researcher, I was also a peer advisor for the biology department, and I served on the executive boards of the Society of Undergraduate Biology Students (SUBS), Order of Omega Honor Society, and Delta Upsilon during my time at the University of Rochester.

Wesley Yon '16
Cell and Developmental Biology

The most important thing that I've learned studying biology is that it is an ever-developing field. With technology, scientists are now able to test theories that were too expensive or impossible to test in the past. Those new discoveries may support or radically change previously accepted ideas.

At the University of Rochester, the accessibility to research has been extremely beneficial in terms of learning how to "talk science" through interactions with faculty and graduate students.

My advice to students pursuing a biology major is to not pigeonhole yourself. This University offers an array of different biology tracks, and the school gives you the flexibility to study cell biology, microbiology, neuroscience, developmental biology, and more. Take a class in as many of these areas as you can and see what you like the most before committing to one. It is much easier to learn about something that you thoroughly enjoy than to trudge along in courses that you don't find interesting.

I also suggest joining a club if you can. I joined Club Tennis during my freshman year, and it has been the single greatest decision I've made so far. I was able to find a great group of friends and a family away from home.

Christine Ziegler '16
Molecular Genetics/ Chemistry

I am so grateful to the biology department for providing me with endless opportunities. I joined a biochemistry lab as a freshman and conducted research there for the next three years. This experience (in addition to several summer research opportunities) taught me more than just biochemistry techniques and theory; it showed me that research is my true passion.

Additionally, serving as a teaching assistant for several biology courses showed me that teaching scientific concepts and recent discoveries is almost as wonderful as the research itself! Because of this, I want to pursue a career in academia.

Throughout my four years, I was also on the executive board of the Society of Undergraduate Biology Students (SUBS) and was president during my senior year. We held fundraisers to raise money and awareness for stem cell research, hosted student lunches with professors, and played volleyball with professors to share our love of biology with the rest of the school and Rochester. These experiences at the University of Rochester combined with my incredible mentors prepared me more than I could have ever dreamed for a PhD program in biochemistry.

As a former biology peer advisor, the greatest advice I can give to incoming students is not only to take advantage of the opportunities presented to you, but to also seek them out. Additionally, make sure to reach out to older students and professors. The sky is the limit when you have a team of skilled mentors and colleagues to help you succeed in your field.

Interested in our Grads?

Click here for a list of our recent graduates and to read the *Undergraduate Program in Biology and Medicine* e-Newsletter.

WAYS TO HELP

Interested in directly affecting the experience of our undergrads?

Help move the **lab experience** to the next level by providing resources to support people and state-of-the-art equipment and facilities.

Or contribute funds to enhance the **innovative workshop program** that enables peer-to-peer learning and one-to-one interactions for students, teaching assistants, and professors—even in large lecture classes.

Or help to fund the department's **community outreach program** or **essential instrumentation** that makes computational biology and bioinformatics possible and keeps Rochester competitive within the rapidly growing field of data science.

Profiling New Faculty: Daniel Bergstralh

by Michael Welte, PhD

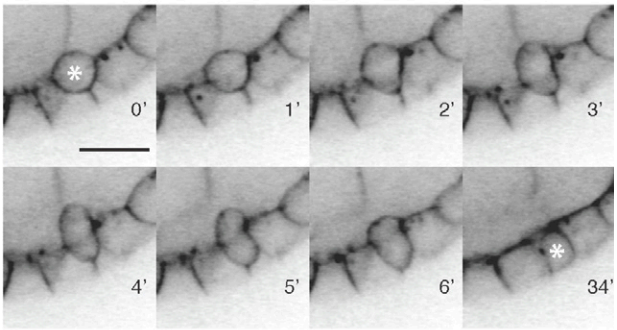
Our newest faculty arrival is Dan Bergstralh, who joined the Department of Biology this July. He is so new that his future laboratory space is still being renovated, and he—and close to four hundred strains of fruit flies—have temporarily set up shop in John Jaenike's lab. Dan is a cell biologist studying the properties of epithelia, one of the fundamental types of animal tissues. Epithelia are cell sheets that cover external and internal surfaces of the body. Dan is particularly interested in how epithelial cells divide and in how they adhere to one another. By exploring the relationship between division and adhesion, his lab will aim to understand how epithelial tissues are built during development and maintained over the lifespan of the organism. He studies this fundamental biological problem using the fruit fly *Drosophila melanogaster* as well as mammalian cultured cells.

Dan has two dominant passions in his life—science and music. They reflect the legacy of his parents—his father was an astronomer and his mother was a choral musician. The family spent the first 13 years of his life in California and then moved to Maryland, where Dan attended high school and college. In part because both his father and grandfather were physicists, Dan assumed that he would follow in their footsteps, presumably becoming some kind of astrophysicist. But at his high school, fate intervened in the guise of a fantastic biology teacher, Anne George. George was so full of energy and radiated such enthusiasm for the subject that Dan fell in love with biology. By the time he went to college, it was a no-brainer that he would study biology. He attended the University of Maryland at College Park and graduated with a BS in cell biology and molecular genetics.

For Dan, one of the advantages of living in Maryland was that the National Institutes of Health (NIH) were easily accessible, located in between where his parents lived and where he went to college. The NIH campus is teaming with research laboratories and thus presents a great opportunity for budding biologists to get involved in research. During college, Dan helped run surveys at an NIH psychology laboratory, and after graduation, he worked for two years with Paul Roche at the National Cancer Institute, analyzing protein trafficking in immune cells. Not only did he learn a lot of hands-on biology, but he also learned that he wanted to make research his career.

For graduate school, Dan worked with Jenny Ting at the University of North Carolina at Chapel Hill. She is a hard-core immunologist with a very active and productive laboratory. During his graduate studies, Dan became the resident expert on how to study cell death. In a remarkable synergy, just as he was finishing his degree, another project in the laboratory evolved to a point where his expertise in cell death became crucially important, and he stayed in the Ting lab for another year as a postdoctoral fellow.

For the next step in his career, he wanted to explore more basic research. He joined the laboratory of Jeff Sekelsky, also at UNC Chapel Hill.



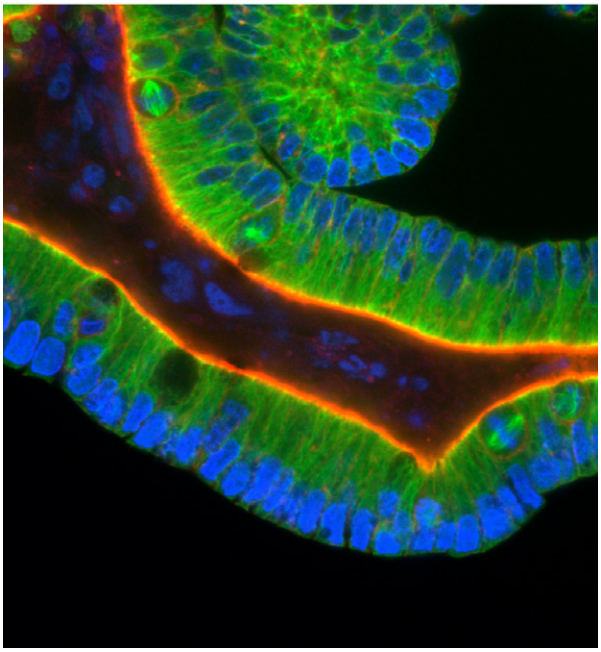
Dividing epithelial cells demonstrate a surprisingly dynamic relationship with the tissue layer. This time course shows a new cell, born without an obvious connection to the basement membrane (bottom of the tissue), reintegrating into the Drosophila *follicular epithelium. The other product of division is not seen in this plane of focus.*

He knew he would be able to work well with Jeff, whom he had met already during his interview weekend at UNC and with whom he had become good friends. In addition, since the Sekelsky lab studies DNA repair using fruit flies, this was a great opportunity to kill two birds with one stone. Dan was able to build on the expertise from his graduate work to study a topic of great importance for human health, and he could do it in a model organism addressing basic biological questions. Within a year, Dan and Jeff had identified the human ortholog of a fly DNA repair protein and demonstrated that it has the same DNA repair function in humans. Things were off to a great start.

But then Dan rocked the boat and decided, for personal reasons, to move to England. Although saying goodbye to the Sekelsky lab was painful, such a dramatic change also brought opportunities to explore new frontiers. In particular, he wanted to broaden his experience with *Drosophila* cell biology. He landed a postdoctoral position at the University of Cambridge, an academic institution with a long and illustrious history in fruit fly genetics and with many laboratories pursuing cutting-edge research in *Drosophila* cell and developmental biology. Dan joined the world-famous laboratory of Daniel St Johnston in 2008 and was ready to settle into his new life. But there were a few more twists to come.

After just a couple of weeks in the United Kingdom, Dan learned that his new lab might relocate to the Institut Curie in Paris. However, this was soon resolved. Professor St Johnston was made the director of the Gurdon Institute at Cambridge, meaning that the lab could remain in its present location.

The second twist took longer to resolve. Dan had been recruited to work on a project to follow up on recent findings in the laboratory on how tissues polarize—findings that had resulted in two high-profile publications. The problem is it turns out the original observations are the result of a technical artefact, a common experimental mistake, and thus the published findings are wrong.



Intestinal stem cells grown in three-dimensional culture conditions develop into organoids, tissue-like structures with features of intestinal crypts. This organoid has been stained for tubulin (green), DNA (blue), and actin (red). Several dividing cells, two with easily identified mitotic spindles, are evident.

In hindsight, Dan is quite philosophical about this episode in his life. He talks about it as a learning experience and how this inadvertently gave him the opportunity to explore a new project outside the interests of the St Johnston lab. But at the time, it must have been quite anxiety provoking. Going in, it was not obvious that there was even a problem. The original results were supported by independent findings in a different laboratory. Getting used to dissecting and analyzing fly ovaries, Dan occasionally made a simple, probably quite common, switch in the order of steps in the procedure, a change that might be expected to have no consequences. But Dan quickly realized that this switch did change the outcome and, more importantly, realized that it led to results suspiciously similar to what had been published as a real biological phenomenon. This was an exasperating time for Dan. He had become highly suspicious of the original findings but did not yet have enough evidence to convince himself, let alone others, that they were indeed based on an artefact. And if his suspicions were indeed correct, the fallout was potentially enormous; the basis for his research project would fall apart, and the whole episode would be quite embarrassing for his boss

and the lab. So Dan had to be completely sure, and that would take time.

In the end, it worked out well. He and a graduate student collaborated on the project and slowly convinced each other that there was indeed no other explanation—the original findings were the result of a technical artefact. Then, over a few days of back-and-forth discussion, Dan laid out such an airtight case that Daniel St Johnston agreed with him. The original papers were retracted, and—in another twist—what could have been a very embarrassing episode for his advisor turned into a badge of honor. The website Retraction Watch hailed the retraction as "a poster case of doing the right thing by science," i.e., rigorously purging the literature of an error and making the error widely known instead of sweeping it under the rug.

To Dan, this episode is a big lesson in how to be a scientist. Technical problems leading to artefactual results can happen to anybody. The real challenge arises when the result happens to confirm a point of view that one is already favoring, tempting one to be less diligent in following up. Dan learned that it is critical to have other people look at what you are doing, both because they may spot different patterns in the data and because they bring different ideas and biases to the table. Science is a team effort, and the reality check that coworkers and colleagues can provide is invaluable.

In a final twist, Dan credits this episode with launching him on a path to independence. During the time he discovered and resolved the artefact, he became deeply interested in the regulation of cell division: in particular, to what extent the orientation of the mitotic spindle controls the outcome. This problem has been studied extensively for asymmetric divisions, where the two daughter cells differ in size and properties. However, in epithelia, cells tend to divide symmetrically, and how such symmetric divisions are accomplished and what happens if they fail is still largely unclear. Because this question is outside the focus of the St Johnston laboratory, Dan was able to develop an independent line of inquiry. But it also means that Dan carved out a unique niche to build his own career on. And here at the University of Rochester, he has a lot of colleagues with overlapping and complementary interests, providing a great scientific fit.

Rochester is also appealing to Dan because of the tremendous opportunities to pursue his musical passion. His childhood home had been filled with music, and his love for music has carried through his entire life. After trying out the piano and trumpet, he started playing the guitar as a teenager and fell in love with it. He practiced many hours a day, even taking the guitar on car rides. Originally playing punk rock, he quickly expanded his repertoire and become interested in many kinds of music. He plays jazz guitar and in Cambridge also studied classical guitar. He has already arranged lessons with a jazz guitar professor for the fall semester. He also moved into an apartment two blocks away from the Eastman School to have ready access to concerts. Next year, his wife, Tara, will join him; she is currently finishing up her PhD at the University of Cambridge.

It is very gratifying to see how enthusiastic Dan is about coming to Rochester and joining our department. He is full of energy (perhaps channeling his high school teacher?) and, within days of his arrival, has started to immerse himself in departmental activities. If anybody is more excited than he, it is the members of our department. Over the summer, I have heard from faculty, staff members, and students eagerly anticipating his arrival, including people from other parts of campus. We welcome Dan to the University of Rochester and look forward to having him as part of our community.

Profiling New Faculty: Yogeshwar Kelkar

by Amanda Larracuente, PhD

Yogeshwar Kelkar joined the Department of Biology as a full-time lecturer and research associate in August 2016. He is a computational biologist interested in the impact of life history and population changes on the structure and function of genomes. He received his PhD in 2010 from Penn State University in Integrative Biosciences and did his postdoctoral training at Yale University and the University of Rochester.

Growing up in a major biodiversity hotspot—Western Ghats in India—helped cultivate Yogeshwar's interest in biology and biological diversity. Yogeshwar's particular interests are in how this diversity arises on a genomic level, and to pursue his interest he joined the genome evolution lab of Kateryna Makova as a graduate student at Penn State. During his graduate studies, he used comparative and population genomic methods to study some of the most rapidly evolving parts of genomes—short tandem repeats called microsatellites.

Microsatellite loci change in copy number over short evolutionary time scales, thus generating a huge amount of genetic diversity within and between species. Yogeshwar was interested in microsatellite mutational dynamics: how fast do microsatellites change and what evolutionary and genomic forces drive these changes? To address these questions, Yogeshwar developed statistical models of microsatellite mutation dynamics that have helped highlight the role played by microsatellite structures in their mutation dynamics. He was particularly interested in how jumping genes called transposable elements contribute to changes in microsatellite landscapes across primate genomes. Throughout the course of his graduate work, Yogeshwar made several important discoveries about the tempo of microsatellite changes on a short time scale and the turnover of microsatellites on a long timescale.

Yogeshwar continued his work on genomic diversity during his postdoctoral studies at Yale University with Howard Ochman. Here he studied how random genetic drift affects genome size in fungi and the effect of reduced genome size on the diversification of genes in bacteria. His work showed that in bacterial pathogens that lose large numbers of their original genes, surviving genes show signatures of functional diversification, potentially to offset the effects of gene loss.

> "My work on genome evolution follows a unique trajectory, starting from the complex primate genomes, to the more compact fungal and insect genomes, to those of the smallest bacteria."

In 2013, Yogeshwar moved to Rochester as a postdoctoral fellow. He continued his work on genomic sources of diversity in various model systems. In collaboration with Jack Werren and Ellen Martinson in the Department of Biology, Yogeshwar studies the consequences of asexuality on insect genomes. He uses comparative genomic methods to study pairs of parasitoid wasp species where one species is asexual and its close relative is sexual. By comparing genes in these species' genomes, he aims to understand how sexual antagonism evolves. These wasps inject a concoction of venom proteins in their insect hosts, and the origin and function of these venoms are of great interest to biologists due to the high

Yogeshwar examines how asexuality impacts the genomes of parasitoid wasps that stopped reproducing sexually in the past few million years. Pictured here is Nasonia vitripennis, a parasitoid of multiple fly species.

rate at which they evolve—the suite of venom proteins differs between wasp species. Yogeshwar collaborates with members of the Werren lab to study the origins of these venom proteins.

Yogeshwar's collaborations extend beyond the Department of Biology—he is part of a diverse group of biologists that have joined forces to sequence and annotate the genomes of several parasitoid wasp species. He also works with mathematicians and statisticians in the Department of Biostatistics and Computational Biology at URMC to develop methods to infer microbial interactions from longitudinal human gut and vaginal data.

The department is excited by the computational expertise that Yogeshwar brings to the biology faculty. Yogeshwar teaches BIO 253 (Computational Biology), a course that introduces students to important algorithms in genomics. Beginning in Spring 2017, Yogeshwar will teach a new course, BIO 254 (Data Mining for Biological and Biomedical Sciences). This course will instruct students in computational algorithms dealing with large datasets in systems biology. Both courses are a part of the core curriculum for the new major in Computational Biology (BCB).

Yogeshwar lives in Brighton with his wife, Juilee Thakar (an assistant professor in microbiology and immunology at URMC), and their two children, Aakash and Mihika. When not doing research or teaching, Yogeshwar enjoys running, kayaking, and spending time with his family. His interest in ancient human history and archeology has taken him to historically interesting places, and he promises to not let this hobby be relegated to history.

Tony Olek Retires

by Tom Eickbush, PhD

In 1994, the Department of Biology hired Anthony (Tony) Olek as a senior lecturer. Tony came to Rochester from the University of Maryland, where he had been an assistant professor of zoology and director of their undergraduate biology program.

As a lecturer, Tony taught a number of biology courses, but a major component of that teaching was freshman biology, BIO 110 (Principles of Biology I). Each fall semester for 20 years, Tony taught 350–400 students, typically increasing his workload by dividing the students into two smaller sections. Over the years, Tony taught over 7,500 students in this single course. By most criteria BIO 110 should be regarded as the hardest course to teach in this department. I personally never realized how hard it was until I started teaching it myself. Freshmen arrive at the University of Rochester with a wide range of experiences, abilities, and attitudes. Most of those students did well in their high school biology class, often by simply "memorizing" terms and pathways, and assume that they

will continue to do well in college. Of course, college biology is more difficult than high school because "understanding" the principles behind biological processes is intellectually challenging.

If taught appropriately, students will often complain that their first real course in biology "asks for too much work," "has too hard or confusing exams," or is simply "unfair." Too often in this situation the instructor is beaten down by student attitude and will eventually slide into an approach more like that in high schools, where students are told exactly what they need to know and then are tested on exactly what they have been told.

To Tony's credit he never lost faith in his approach, steadfastly emphasizing the importance of understanding why biological processes work as they do. Indeed, Tony typically started off with the thermodynamic principles that drive all biological processes from enzyme activity, the movement of molecules through membranes, to generating and storing energy.

For most students, Tony's teaching approach was nothing like the approach used in high schools, and many students did not like the extra effort required to truly understand. Thus Tony's end-of-the-course student ratings suffered. When I started teaching BIO 110, Tony offered to provide both help with the content as well as psychological support. He warned me to be prepared that no matter what I did, at least half the students would crucify me in their student evaluations. He was right. It would be hard for anyone to take such student abuse for 20 years, but Tony did. What keeps any good teacher motivated is that a rigorous approach is appreciated by those students who want to understand. Many students have told me that only after they clearly saw the need for integrating and understanding in their upper-level biology courses, did they fully understand what Tony was attempting to teach them in their first course in biology.

In addition to BIO 110, Tony taught many other courses in the biology curriculum, most often BIO 247 (Environmental Animal Physiology), BIO 151 (Introduction to Biochemistry Lab), and BIO 105 (Introduction to Biology Laboratory). He also played the important role of temporarily filling in for faculty on sabbatical leaves or after sudden departures.

Finally, for 10 years Tony was director of the Undergraduate Program in Biology and Medicine. In this capacity he oversaw and helped integrate our BA degree as well as our many BS

degrees in the biological sciences. Throughout his career he was also advisor to a large number of our BA students and all our biology minors and made all decisions on the transfer of credit to and from other schools.

The department owes Tony a great deal of gratitude for sticking to his principles to teach students to understand the basics of biology and thus give the students the ability to think creatively and work through problems. We also thank him for continually filling in the gaps in all matters related to undergraduates. We wish Tony good luck in his retirement. Always interested in identifying foods that are healthy based on actual data, as opposed to what is only perceived to be healthy food, Tony and his wife have plans to buy a small farm in Naples, New York. There he hopes to raise pigs on a diet high in nuts to provide a more favorable omega-6 to omega-3 essential fatty acids ratio in their meat.

Faculty Headlines

Q&A: Biologist earns raves for work with yeast (3/22/16)

David Goldfarb, professor of biology, researches yeast as a model organism for understanding the aging process in humans. Goldfarb joined the Rochester faculty in 1988, five years after earning his PhD in biochemistry at the University of California–Davis and completing postdoctoral work at Stanford University.

Read More...

Goldfarb & Tombline give interview about combating aging by studying yeast (4/5/16)

WXXI's Monthly Science Roundtable looks at yeast as a key to living longer.

Read More...

Amanda Larracuente finalist in "Explore Your Most Interesting Genome" contest (4/11/16)

Fireflies! So much about these fascinating critters remains shrouded in mystery—from the details of how they light up their lanterns to the way some species are disappearing.

Read More...

Vera Gorbunova gives TED talk in Cannes (5/27/16)

Vera Gorbunova gives a TED talk in Cannes about the importance of aging research and why some animals of the same species live much longer than others. See her talk here.

Read More...

Dragony Fu recipient of Faculty Early Career Development (CAREER) Award (6/8/16)

Four Rochester researchers are among the latest recipients of the National Science Foundation's most prestigious award for junior faculty members: the Faculty Early Career Development (CAREER) Award.

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Thermo Fisher Scientific recognizes Sina Ghaemmaghami at ASMS 2016 (6/10/16)

Thermo Fisher Scientific will recognize the winners of the 2016 Thermo Scientific Tandem Mass Tag (TMT) Research Award at a ceremony held in conjunction with the 64th American Society of Mass Spectrometry (ASMS) Conference on Mass Spectrometry and Allied Topics in San Antonio.

Read More...

Graduate Student News

AS&E Outstanding Dissertation Awards Announced (5/9/16)

Former graduate student, Anthony Geneva, is a recipient of the Outstanding Dissertation Award for 2015–2016.

Read More...

Past winners from the Department of Biology include

- 2015—Cara Brand
- 2014—Xiao Tian
- 2010—Christopher Hine
- 2009—Zhiyong Mao
- 2004—Qun Yu
- 2002—Miriam Barlow
- 2001—Andrea Betancourt
- 2000—Daven Presgraves

Tian Zhang received the Messersmith Fellowship in 2016

The Messersmith Fellowship is a one-year fellowship for students in biology, chemistry, optics, physics, or the preclinical departments of SMD. Appropriate candidates have passed the qualifying exam and are in the process of writing their dissertations or are at least engaged in full-time research. The fellowship provides stipend support.

Graduate Thesis Defenses

Emily Landeen

Supervised by Daven Presgraves **(3/28/16)**

"Investigating the molecular genetic basis of the large X effect in *Drosophila* speciation"

In October, Landeen begins her postdoctoral position in the laboratory of Doris Bachtrog at the University of California at Berkeley, Department of Integrative Biology.

Ritika Das

Supervised by Andrew Samuelson **(6/14/16)**

"The homeodomain-interacting protein kinase, HPK-1 influences aging through TORC1 mediated autophagy and HSF-1 signaling"

Das began a postdoctoral position in August in the laboratory of Jane Hubbard at the Skirball Institute of Biomolecular Medicine in New York City.

Xiao Tian

Supervised by Vera Gorbunova **(6/21/16)**

Identification of longevity and cancer resistance mechanisms in long-lived rodent species"

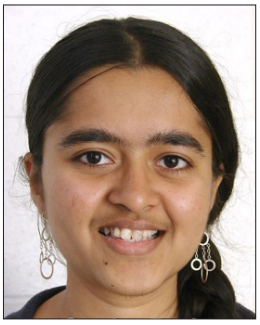
Tian will continue his research as a postdoctoral fellow in Vera Gorbunova's lab.

Alumni Updates

John Wilson '15 (Molecular Genetics)

Among the nineteen University students and graduates that were honored July 27, 2016 at City Hall for their community service in the Rochester Urban Fellows and Rochester Youth Year AmeriCorps VISTA programs.

Read more...



Sneha Rath '12 (Molecular Genetics)

I was Class of 2012 and graduated with a BS in genetics from Rochester. Now I am a fourth-year graduate student in the Department of Molecular Biology at Princeton. Recently, I was awarded the Charlotte Elizabeth Proctor Fellowship by the Graduate School at Princeton. This is a competitive, cross-disciplinary honorific that recognizes students "displaying the highest scholarly excellence in graduate work during the year."

I was nominated by my department, and winning the award provides me one year of full-tuition support and a stipend in excess of the base rate. I was also nominated to represent the department and compete nationally for the F99-K00 graduate-to-postdoctoral transition grant—a new initiative started by the National Cancer Institute just this year (we hope to get results in the fall).

Also, in non-science news, last year I married Shantanu Agarwal, who graduated from Rochester's physics department with a PhD in Quantum Optics in 2014. I really miss everyone in Rochester, and I'm so grateful for the research opportunities and training I got and the people I met during my time as an undergraduate there. Thank you!

Samantha Falk '08 (Molecular Genetics)

Read More...

Samantha was a recipient of the Nathaniel and Helen Wisch Endowed Undergraduate Scholarship in 2006–'07 and 2007–'08. The scholarship provides income that supports a promising junior or senior undergraduate student or students majoring in biology at the University of Rochester. It was created through a gift from Nathaniel Wisch '55, MD, and Helen Wisch.

Samantha successfully defended her thesis on "Centromere identity and the nature of CENP-A-containing nucleosomes" at the University of Pennsylvania this past December. Nathaniel Wisch was in attendance and was thrilled to congratulate one of his very first scholars. At the reception following her defense, Wisch met Samantha's family and some of her friends. It was a very exciting moment for both Samantha and Wisch. Congratulations, Samantha, on a job well done!

Paul Frost '95 (Biological Sciences)

I received the Rochester biology newsletter and quite enjoyed reading what is happening in the department. I graduated with a biological sciences degree in 1995 and then largely fell off the University map. I am still in biology as a professor at Trent University in Peterborough, Ontario (only about 100 miles from Rochester if you were a crow and wanted to fly due north over Lake Ontario). Here is my recently updated lab website that provides an overview of my current research: *people.trentu.ca/paulfrost*. Also, I have been named an associate editor of the journal *Limnology and Oceanography* (*http://aslo.org/lo/*), which is the flagship publication of the Association for the Sciences of Limnology and Oceanography (ASLO).

Deborah Lawrence wins United Way Shining Star Award

Deborah Lawrence was awarded the United Way Shining Star Award at the May 18th campaign close and thank you event in recognition of her standout leadership in managing the United Way Campaign for the Department of Biology! This award is given to individuals who truly set the example of what it means to be a successful campaign coordinator. They take on their role with enthusiasm, a drive to succeed, and have achieved impressive results in their department's campaign this year.

In speaking about her role in the campaign, Deb is genuine and enthusiastic. "I get such satisfaction out of knowing that the effort of giving a small portion of one's salary goes to help restore and change lives. That's huge!"

Thanks to the continued support from colleagues and the increase in new donors, the biology department's participation increased by 10% in 2016. This generosity will contribute to the success of the Rochester community as a whole and Deb looks forward to an even more successful 2017!

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our Specimen Collection and Archives

If you are interested in making a gift or discussing opportunities to help support the department, please contact:

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