UNIVERSITY OF ROCHESTER DEPARTMENT OF

BIOLOGY

Summer Newsletter 2018

Specimen Collection Back in the Public Eye with New Website

Full story page 20

SCHOOL OF ARTS & SCIENCES
UNIVERSITY of ROCHESTER

A Message from the Chair

Michael Welte

Dear friends of the Department of Biology,

The last 12 months have been extremely eventful for the department and the University as a whole. Last fall we heard the heart-breaking stories surrounding the sexual harassment allegations and investigation at the University. Through winter and spring, we witnessed efforts to address past failures and to plan for the future. Many people are working to make the University a truly welcoming place where everybody is supported to succeed, and nobody has to fear being the target of inappropriate behavior. The Department of Biology is very invested in doing its part and in this issue of the newsletter, you'll learn about one of our efforts—our newly created Diversity Committee has gone to work quickly and, in addition to assessing the state of the department's culture, has already made very tangible contributions that make the department "ever better" for everyone.

In regard to our teaching mission, the past year was full of successes and new endeavors. Two of our faculty were honored for their extraordinary contributions as teachers. Last fall, Sina Ghaemmaghami, an associate professor in biology, received the Goergen Award for Excellence in Undergraduate Teaching. He was recognized as a creative, dedicated, and inspiring instructor whose innovative teaching approaches are a model even for much more senior faculty. And this summer, Thomas Eickbush, a professor of biology, was appointed the Mercer Brugler Distinguished Teaching Professor, an honor that recognizes excellence in teaching and encourages the development of cross-disciplinary instructional programs. Eickbush is a driving force behind the ongoing transformation of how we teach biology to first-year students. Over the last year, this transformation included implementing laboratory components into our first-semester introductory courses. Such hands-on experiences not only make learning

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more fun but also improve understanding and retention of the material. Introducing these new laboratory exercises was a major undertaking, since these courses serve well over 500 students. Great credit for the remarkable success of this new initiative goes to our recently hired instructor Alexis Stein who developed, tested, and implemented completely new lab modules. For more advanced students, David Goldfarb, a biology professor—in collaboration with Warner School faculty—pioneered an entirely new type of course, the Community Engagement Practicum, in which undergraduate students go out to local high schools to teach STEM laboratory exercises. This course not only teaches our undergraduates important skills in science communication and outreach but also benefits the larger Rochester community. This course is becoming a model for similar outreach activities in other departments at the University of Rochester.

Our Undergraduate Program in Biology and Medicine (UPBM) oversees and guides those students pursuing degrees in biology, biochemistry, cell and developmental biology, computational biology, ecology and evolutionary biology, microbiology, molecular genetics, and neuroscience. During the last year, the UPBM office underwent major restructuring and expansion. Professors Benyajati and Sia serve as cochairs, bringing unique and complementary expertise in administration and outreach to these roles. Instructor Danielle Presgraves joined the office as Associate Director of Student Affairs. In this role, she acts as liaison for undergraduates seeking research and clinical opportunities, develops new programs for undergraduate enrichment, and participates in curriculum development. And Marianne Arcoraci was promoted to Program Manager and Curriculum Advisor to UPBM in recognition of her essential contributions to the UPBM office and the students it serves.

As chair, one of my particular points of pride is the outstanding faculty in the department—faculty who make immense contributions to teaching, research, and service. This year several of our faculty were officially recognized for their great impact on the University, in addition to the teaching honors already mentioned above. Assistant professors Jennifer Brisson and Sina Ghaemmaghami were promoted to associate professor with tenure, and Amanda Larracuente, an assistant professor, was appointed the Stephen Biggar ’92 and Elisabeth Asaro ’92 Fellow in Data Science, a fellowship that allows the University to encourage outstanding faculty early in their academic careers. And last year, Arts, Sciences & Engineering introduced a new instructional faculty track to provide a stable and appropriately recognized career path for individuals principally involved in undergraduate teaching. Our lecturers Michael Clark and Ryan Bickel have been appointed as associate and assistant professors of instruction, respectively, in this track, and we look forward to the appointment of others to this track in the near future.

This summer, we also welcomed three new faculty to the department. Nancy Chen, an assistant professor, just opened her brand-new laboratory on the fourth floor of Hutchison Hall. She studies birds, in particular the endangered Florida scrub-jay, using approaches that range from genomics and computational biology to natural history and field biology. This multidisciplinary approach allows her to address fundamental questions in ecology, evolution, and genomics. Anne Meyer, an associate professor, recently arrived from the Netherlands and officially starts at the University this September. Her broad research program employs bacteria to study both basic and applied problems. On the one hand, she analyzes the effects of environmental stress on the bacterial chromosome, using genomic and proteomic approaches to study chromosome organization, transcription, and translation. On the other hand, she engineers bacteria to produce spatially patterned materials by 3D printing of bacteria. Jonathon Holz, an associate professor of instruction, is a highly accomplished teacher whose main responsibility will be teaching courses in human physiology and human anatomy, together with the associated labs. During the 2017–18 academic year, he had already served in an adjunct position in the department and now joins us full time.

The unsung heroes in our department are our exceptionally competent and devoted staff, who go out of their way to make the department run smoothly. Usually working behind the scenes and out of the spotlight, they make essential contributions to the success and well-being of all department members. This year, I want to explicitly thank three of them: our Graduate Coordinator Cynthia Landry is deeply invested in shepherding our graduate students from initial application through their thesis defense. One of them recently wrote in his thesis, “Her zest to help

graduate students have a smooth, hassle-free life is unparalleled." Our Facilities Manager Mary Bissell responds to emergencies day and night, always available, always thinking about what's best for the department, always able to come up with practical solutions while keeping the bigger implications in mind—and, as a faculty member recently commented, "She has a heart of gold." And our Department Administrator Brenna Rybak is a powerhouse, extremely organized, insightful, and thorough. She is a wizard when it comes to solving complicated interpersonal problems in the work place, and she is very skilled at both nitty gritty details and high-level analysis. One faculty member summarized it nicely, "Brenna is a joy to work with, and I cannot imagine the department running without her!" The department is extremely fortunate to have such a wonderful staff.

This newsletter also features an update about a long-term project in the department to make historical materials housed in the University of Rochester available to the broader community. In the late 1800s, Henry A. Ward developed a natural history museum here that at the time was the third largest in North America. Our goal is to make some of the original specimens and documents of this museum broadly accessible in a "virtual museum." The new Ward Project website showcases our progress to date. If you are excited about this project and/or would like to get involved—in any way—please let us know.

As you can see from this overview and the rest of the newsletter, there is always lots of news from the department, and you don't have to wait for the next newsletter to stay in touch with us—we are always delighted to hear from you! In addition, you can follow the latest news, as well as coverage of ongoing research projects and other departmental activities at our website. Please feel free to pass our newsletter on to friends, classmates, and fellow alumni.

This Meliora Weekend, the department will host an open house. Please join us to learn more about the history, the present, and the future of the department and chat with faculty, students, and alumni over refreshments.

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.

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

Kate Clyde
Associate Director of Advancement
(585) 273-2050, kate.clyde@rochester.edu

Graduating Student Profiles

Lily Deng ’18
Computational Biology

The most important thing I’ve learned from my time here is how great collaboration can be. Because the Department of Biology offers a range of courses that allow you to explore different concentrations, everyone brings their own strengths to any project or collaborative work. This has also helped me realize there is so much potential for interdisciplinary work, and that the skills we gain both in and outside of the classroom can be transferrable to so many different settings. The department has given me the opportunity to build my leadership skills and confidence in working independently through teaching assistant roles and independent research projects.

During my time here, I have been challenged to think critically and analytically. I have recognized the importance and the value in constantly learning and exploring new approaches to problems. As I start my career with future plans to pursue graduate school, these skills make me confident in adapting to and succeeding in any situation.

My advice to incoming students would be to not be afraid of going outside your comfort zone—take the class you’re curious about, reach out to get involved in that research project. Don’t be afraid to ask for help—either from peers or professors—they are supportive in helping you achieve your goals, and they were instrumental in my development during my four years here. And lastly, I would strongly encourage students to give back to the community and find ways to engage with our neighbors. That way, students can not only recognize the impact of their work, but they will also be able to see the potential they have to make a difference.

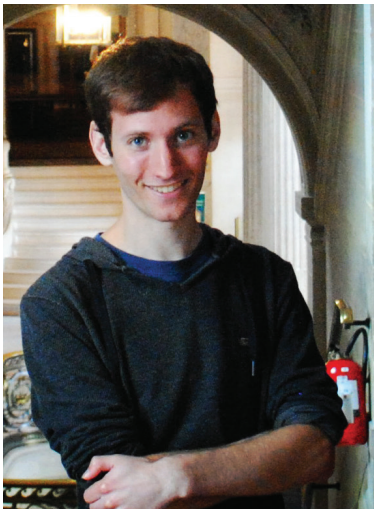
Monica Nair ’18
Computational Biology

As a computational biology major, I have learned how to solve challenges in biology with computer science. I have learned how to think in terms of algorithms and data structures and apply this thought process to interpreting sequencing data.

After graduation, I will be working as a research technician in a computational biology, oncology-focused lab. From working on group projects to reading current publications to researching neurodevelopmental disorders at the Medical Center, the Department of Biology has taught me to think critically and have confidence in designing my own experiments.

My advice to incoming students is to fully immerse yourself in biology.
Ask questions during class, seek extra help during office hours, get involved with research, attend seminars at the Medical Center—take full advantage of all the ways there are to learn on this campus, inside and outside of the classroom.

In my spare time, I played on the Women's Club Soccer Team, served as a residential advisor, and worked as an academic mentor for students with intellectual disabilities through the TOUR program. I was involved with the social justice organization GlobeMed and the STEM initiative club. In the Rochester community, I have volunteered at the Wilmot Cancer Center and St. John's nursing home.



Eli Rogers '18

Molecular Genetics

The most important thing I learned during my time at the University of Rochester was how to consider possibilities as stemming from a variety of interconnected influences. Studying biology has taught me that we perceive only the surface of reality, and that finding the underlying truth is an effort of keeping the mind open and exploring many avenues of possibility.

The program has expanded my capacity to ask probing questions and consider multiple methods of finding answers. Since there are rarely straightforward paths and "right" answers, I found that the investigative and critical-thinking skills that the biology department taught me were pivotal in helping me to consider problems from many angles.

My advice to incoming students is to branch out of just biology—the skills were very helpful to me, but I think insight from other majors, minors, and activities helped me to put my knowledge in greater context.

I also took a second major in French and minors in chemistry, clinical psychology, and comparative literature. Outside of class I volunteered as a crew chief for MERT and a service leader for UR Hillel and climbed at RIT's Red Barn with the UR Rock Climbing Club. I also worked as TA for Bio 110, 112, and 198P with Dr. Clark and as a French Writing Fellow. I studied abroad for 15 months in France, England, and Israel. I conducted research in biology, medicine, and public health across my undergrad experience at UR, University of Colorado, Imperial College London, the Sorbonne (University of Paris), and the Technion (Israel Institute of Technology). Additionally, I took classes in classical piano and modern Hebrew and am an avid fine artist. I was very happy to find considerable free time outside of the biology major and have always felt it important to maintain skills and well-roundedness in various aspects of life.

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.

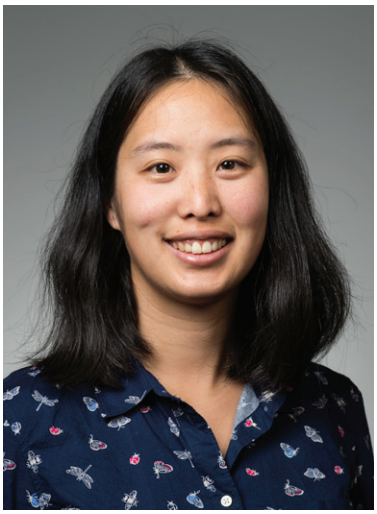
Or contribute funds to enhance the **innovative workshop program** that enables peer-to-peer learning and one-to-one interactions for students, teaching assistants, and professors—even in large lecture classes.

Or help to fund the department's **community outreach program** or **essential instrumentation** that makes computational biology and bioinformatics possible and keeps Rochester competitive.

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.

Profiling New Faculty

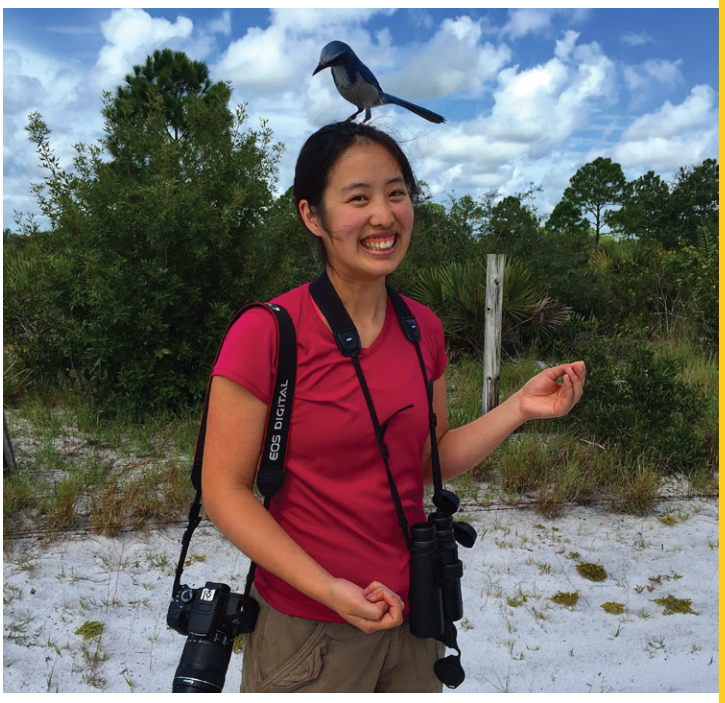


Nancy Chen
by Justin Fay

Most species will eventually become extinct. Yet, the evolutionary processes leading up to these events are rarely captured. Nancy Chen, a new assistant professor in the Department of Biology, has developed a research program to study a species on the brink of extinction: the Florida scrub-jay *(Aphelocoma coerulescens)*. Nancy's research will track evolution over short timescales by leveraging recent advances in genomics and unique collections of samples spanning decades of research.

Shrinking populations are a forewarning of extinction, and numerous species with small population sizes have been listed as threatened and likely to become extinct. While conservation efforts often focus on habitat loss, loss of genetic diversity can also be critical to a species and its ability to adapt to ever-changing environments. Theoretical models make a number of predictions about the consequences of declining population sizes, including increased inbreeding, lower fitness, and reduced efficacy of selection. Yet, there have been few empirical evaluations of the evolutionary processes that play out in species at the brink of extinction.

Nancy's research program, an extension of work she initiated during her doctoral thesis, will provide new empirical insights into evolution over short timescales, such as those relevant to the Florida scrub-jays, now listed as a threatened species. By using pedigree information to predict allele frequency change through time and space, she will be able to link genetic variation to individual fitness. Because there are relatively few systems with detailed phenotypic, pedigree, demographic, and genetic data available for entire populations over time, Nancy is at the forefront of population genetics studies on ecological timescales.



Field studies of the Florida scrub-jay were initiated by Dr. Glen Woolfenden at Archbold Biological Station near Lake Placid, Florida, in the late 1960s. Over the years, scientists at Archbold collected decades of blood samples from more than 4,000 birds along with records of each bird's birth and relatives. For her dissertation research, Nancy generated the first assembly of the scrub-jay genome and used it to quantify population structure and relatedness. She found small peripheral populations can play an important role in maintaining genetic diversity and brought to light a number of new and interesting research avenues to pursue. During her thesis research, Nancy was mentored by the

ornithologist Dr. John Fitzpatrick and by Dr. Andrew Clark, an expert in population genomics. Her training and accomplishments earned her funding from the National Science Foundation to continue her studies as a postdoctoral fellow in Dr. Graham Coop's lab at University of California at Davis.

Nancy's interest in science was piqued at an early age. Growing up in Yorba Linda, California, she was drawn into avian genetics while competing in the Science Olympiad. While an undergraduate at Harvard University, she majored in biochemistry and published her first paper on macroscopic thermoelectric inhomogeneities in *Applied Physics Letters.* However, it was during spring break of her sophomore year while waiting in line at the bookstore that she happened upon an ornithology textbook and signed up for the class on a whim. The class led her to an avian research project in the lab of Dr. Scott Edwards. Nancy found herself particularly drawn to broad questions about diversity and decided to pursue her PhD in avian genomics at Cornell. By forging a novel comentored project with Dr. Fitzpatrick and Dr. Clark, Nancy brought genomics to bear on long-standing questions about evolution over short timescales and the declining populations of the Florida scrub-jay.

Nancy arrived in Rochester this summer and is looking forward to setting up and recruiting new members to her lab. Once she is settled into the biology department, she will establish a new course with a focus on population genetics and mathematical modeling grounded in biological applications. As a mentor and instructor, she wants to help students become comfortable with mathematics, statistics, and computer programming, all of which play important roles her research.

Outside of the lab, Nancy enjoys hiking, backpacking, running, and cooking. She's looking forward to living in Rochester and starting her career in the Department of Biology at the University of Rochester.

Anne S. Meyer

by Daniel Bergstralh

The Department of Biology is delighted to welcome Anne S. Meyer, an associate professor who is joining the faculty this September. The Meyer lab is interested in understanding the complex cellular responses to stress that allow organisms to maintain biological integrity. The lab is also working to harness biology to create new materials.

Anne's path to the University of Rochester has had stops on multiple coasts and even on different continents. Her interest in biology was first piqued in high school. Although she found that the amount of information presented in her AP biology class was wearying, Anne took an independent look through the textbook and realized that many questions in biology remained unanswered. She was inspired to continue studying biology as an undergraduate at Yale. From there, Anne moved to the Department of Biological Sciences at Stanford, where she earned her PhD in Judith Frydman's lab. Anne's doctoral work made use of an exciting

array of structural and biochemical techniques, including cryo-electron microscopy single-molecule reconstruction, X-ray diffraction, and enzymatic assays. These experiments required Anne to use enzyme purified from bovine testes, which she recovered fresh from "Rancho Veal" in the California wine country. This work resulted in a publication in the prestigious journal *Cell.*

For her postdoctoral research, Anne moved to the biology department at MIT, where she studied bacterial stress responses in the lab of Tania Baker. During this time, Anne fell in love with bacteria as she realized that they represent a system that we can not only understand but can also harness. As she puts it, "the world of bacteria is so large and so diverse that it has developed many different solutions to different problems, and we can now recombine these solutions to our benefit." In part because of these interests, Anne was recruited to an assistant professor position at the Delft University of Technology *(Technische Universiteit Delft),* which was establishing a new interdisciplinary department of bionanoscience. This initiative brought together scientists from diverse backgrounds, including physics, chemistry, and biology, to apply their perspectives to biological problems. Anne sees similar opportunities to work in an interdisciplinary context here at Rochester and is particularly enthusiastic to be joining our department, which has a strong emphasis on the fundamental and applied biology questions that excite her.

As the head of her own lab, Anne has pursued both basic and applied research into bacteria. She is very excited about the lab's latest discovery in fundamental bacterial biology, which has just appeared in the journal *Cell* (doi: 10.1016/j.cell.2018.06.049). This report is the first evidence that bacteria may undergo phase transitions under starvation. When bacteria have been starved for several days, their DNA adopts a crystalline packing. Surprisingly, this conformation does not have any obvious effect on the enzymatic activity of transcriptional enzymes, meaning that these proteins can still enter the crystal. According to Anne, this finding is "super funky" because it suggests that the DNA forms a liquid crystal with properties of liquid-liquid phase separation (like oil and water). However, other enzymes *are* excluded from the liquid crystal, meaning that access to DNA is somehow being regulated. This observation raises exciting new questions. As Anne puts it, "we need to do a lot of work to understand the mechanism of exclusion and to find out just what is being excluded and what isn't." The Meyer lab will approach these questions using techniques and ideas from proteomics, physics, and microscopy.

However, Anne describes the starvation project as "only one little chunk of what we do." The lab is also asking "Can we harness bacteria to create new materials?" Whereas the synthesis of new materials is commonly approached from a chemical perspective, it may be that synthetic biology can make this process easier, cheaper, and more environmentally friendly. The lab is therefore developing mechanical tools and using genetic engineering to give new functions to pre-existing organisms. They can harness bacteria to make conductive materials; to make tough, robust structural materials that resemble seashells; and to make actual living materials, where the bacteria *is* the material. To that end, the Meyer lab developed a 3-D printer—the first of its kind—that prints bacteria that have been engineered to make biofilms. Anne suggests that this technique could lead to patternable materials for functions that could include water purification. Another exciting possibility is that synthetic biology could literally pave the way for the exploration of other planets. "If we want to build a colony on Mars, we can't use a Falcon Heavy to ship a ton of cinderblocks. Can we instead bring a tube of bacteria that use the regolith as a substrate to make new materials onsite?" The Meyer lab has established an ongoing collaboration with NASA Ames Research Center to study just that possibility.

Anne is very keen to welcome rotating graduate students to her lab. Students in the Meyer lab will have the opportunity to apply sophisticated technology, including high-throughput sequencing, single bacterial-cell microscopy, and force-probe microscopy, to the study of biology. The Meyer lab is also recruiting a postdoctoral researcher to expand on "protein fingerprinting," which is a new technique for single-molecule protein sequencing. There are also "tons of projects" for undergraduates from diverse backgrounds, including biochemistry, synthetic biology, and engineering, and Anne would love to speak with interested students! As an additional incentive, Anne is happy to offer new lab members the opportunity to be kissed by her family's new puppy, Bertie.

Thomas Eickbush Awarded Mercer Brugler Distinguished Teaching Professorship

Thomas Eickbush, a professor of biology, is a recipient of the Mercer Brugler Distinguished Teaching Professorship, which recognizes excellence in teaching and encourages the development of crossdisciplinary instructional programs. The professorship was established in 1979 to honor Mercer Brugler, former chair emeritus of the Board of Trustees, with support from Sybron Corp., Brugler, and others.

When Eickbush started teaching Introduction to Biology, he recognized the course was challenging for first-year students who did not have sufficiently rigorous preparation in high school. Eickbush worked with Rochester's David T. Kearns Center for Leadership and Diversity to launch a mentor-based section of the course. The program not only helps students catch up on background information in biology but also teaches critical study skills to assist them in classes across disciplines. Known for his innovative approaches to teaching, Eickbush additionally transformed the foundational biology course for all students by introducing online and other nonclassroom components and helped initiate a hands-on laboratory component.

Eickbush graduated with his PhD in biology from Johns Hopkins University in 1979 and arrived at Rochester as an assistant professor in 1983. A fellow of the American Association for the Advancement of Science, Eickbush served as the chair of Rochester's Department of Biology on three separate occasions. In 2002, he received the Goergen Award for Excellence in Undergraduate Education and in 2017 Rochester's Edward Peck Curtis Award for Excellence in Undergraduate Teaching. He received grants from the National Institutes of Health, the American Cancer Society, and the National Science Foundation to further his research on population genetics and mobile DNA segments that make up a large percentage of genomes. After a successful research career, Eickbush decided—beginning in academic year 2014–15—to close his lab and devote his energy full time to undergraduate teaching.

Sina Ghaemmaghami Honored with the Goergen Award for Teaching Excellence

Established in 1997, the award recognizes distinctive teaching accomplishments of faculty in Arts, Science, & Engineering. Honorees were nominated by the chairs of their respective departments and chosen by Jeffrey Runner, dean of the College; Gloria Culver, dean of the School of Arts & Sciences; and Wendi Heinzelman, dean of the Hajim School for Engineering & Applied Sciences.

"The recipients embody all that we value in teaching at the University," says Runner. "Students change over the years. We can't keep doing the same thing. Good teachers react to that and get the best outcome, something these three recipients all have in common."

The Goergen Awards are named for University Trustee and Board Chair Emeritus Robert Goergen '60 and his wife, Pamela, who created an endowed fund in 1997 to establish and provide ongoing support for the awards. In 2010, the Goergen Awards program was redesigned to make larger awards focused exclusively on excellence in undergraduate teaching by individual faculty members.

Hometown: Born in Lexington, Kentucky; raised in Tehran, Iran

Joined University: 2012

Since 2012: Assistant professor of biology

Degrees: Bachelor's in biochemistry, McMaster University (Ontario, Canada), 1997; PhD in biochemistry, Duke University, 2001

Personal: Lives in Rochester with wife, Brenda. Enjoys biking, gardening, and weekend road trips.

"Sina invests tremendous amounts of energy and time to help students succeed. He was the first in our department to video record his lectures. He often listens to his lectures from the previous year before he gives the newest incarnation. He edits his lectures for clarity, and when due to a technical mishap the recording fails, he goes through the trouble of re-recording the lecture on his own time so that the students have access to complete information."
— Michael Welte, professor and chair, Department of Biology

Faculty Headlines

Anne Meyer Targets Protein that Protects Bacteria's DNA 'Recipes' (August 17, 2018)

Bacteria cause many serious illnesses, from food poisoning to pneumonia. The challenge for scientists is that disease-causing bacteria are extraordinarily resilient. For example, when bacteria like *Escherichia coli (E. coli)* undergo starvation, they massively reorganize their bacterial DNA, allowing them to survive stressful conditions.

Read more...

Michael Welte says lipid droplets play crucial roles beyond fat storage (August 14, 2018)

Lipid droplets: they were long thought of merely as the formless blobs of fat out of which spare tires and muffin tops were made. But these days, they're "a really hot area of research," says Michael Welte, professor and chair of biology at the University of Rochester.

Read more...

Vera Gorbunova explains what naked mole rats tell us about cancer and longevity (July 30, 2018)

Vera Gorbunova, the Doris Johns Cherry Professor in the Department of Biology and codirector of the Rochester Aging Research Center, talks about her research on cancer prevention and longevity in longer-living rodents.

Read more...

Bob Minckley says desert bees have a secret (May 24, 2018)

Around the world, there's a higher proportion of specialist bees in arid environments than in humid ones. But scientists don't know why. "One interpretation is that to survive in really hot, unpredictable parts of the desert you need to be able to be synchronized with that plant very well," says Bob Minckley, a professor of biology.

Read more...

Presgraves and Brand discover gene controlling genetic recombination rates (April 23, 2018)

Genetics is a crapshoot. During sexual reproduction, genes from both the mother and the father mix and mingle to produce a genetic combination unique to each offspring. In most cases, the chromosomes line up properly and cross over. In some unlucky cases, however, "selfish DNA" enters the mix, causing abnormal crossovers with deletions or insertions in chromosomes, which can manifest as birth defects.

Read more...

Zhao, Gorbunova, and Seluanov find another piece to the puzzle in naked mole rats' long, cancer-free life (February 7, 2018)

With their large buck teeth and wrinkled, hairless bodies, naked mole rats won't be winning any awards for cutest rodent. But their long life span—they can live up to 30 years, the longest of any rodent—and remarkable resistance to age-related diseases, offer scientists key clues to the mysteries of aging and cancer.

Read more...

John Jaenike's field guide to fruit flies documents these surprisingly close human relatives (October 5, 2017)

"Fruit flies can reveal a lot about genetics, disease progression, addiction, crop parasites, you name it," says John Jaenike, a professor of biology at the University of Rochester. Jaenike, along with Thomas Werner, an assistant professor of biological sciences at Michigan Technological University, recently coauthored an open-access field guide, *Drosophilids of the Midwest and Northeast.* The book documents the physical and behavioral characteristics of fruit fly species in the titular regions and is the first comprehensive guide to fruit flies published in nearly a century.

Read more...

Faculty Headlines, Continued

Amanda Larracuente mapping 'world's second-most interesting genome' (September 21, 2017)

Larracuente, who is also the Stephen Biggar '92 and Elisabeth Asaro '92 Fellow in Data Science, is a specialist in evolutionary genetics and genomics and has been involved in a project studying *Photinus pyralis*—or the Big Dipper firefly. "In order to take pictures of the chromosomes," she says, "we need wild fireflies."

Read more...

Dragony Fu identifies protein in post-chemo cell death puzzle (September 13, 2017)

Because anticancer drugs are designed to kill growing cells, they also affect normal, fast-growing cells—blood cells forming in the bone marrow, for example, and digestive, reproductive, and hair follicle cells. Chemotherapy may also affect cells in vital organs such as the heart, kidney, bladder, lungs, and nervous system.

Read more...

Graduate Student News

Jenna Lentini receives a Donald M. and Janet C. Barnard Fellowship

Graduate student Jenna Lentini is a recipient of the 2018–2019 Donald M. and Janet C. Barnard Fellowship. This fellowship recognizes PhD students with strong research portfolios, outreach experience, leadership qualities, and mentoring experience. Congratulations, Jenna!

Jillian Ramos describes protein translation in three minutes or less

Jillian Ramos showed exactly how to capture an audience's attention, and hold it, at the University of Rochester's third annual Three Minute Thesis Competition finals.

Read more...

GRADUATE EDUCATION

Consider a gift that keeps on giving . . .

Are you more interested in our PhD program? Create or contribute to a **graduate scholarship.** Competitive graduate fellowships and stipends help us to attract the most qualified students.

*Check out some of the **existing Graduate Fellowships and Awards.***

Keeping Up with Alumni

Peggie Chien ’17

Cell and Developmental Biology

After I graduated from the University last year, I headed straight to UCLA for graduate school to pursue my PhD in the Molecular Biology Interdepartmental Program, concentrating in cell and developmental biology. I recently joined Dr. April Pyle’s lab, where my project focuses on defining skeletal muscle cell states derived from human pluripotent stem cells with the goal of delivering *ex vivo* corrected stem cells in cell replacement therapies for Duchenne muscular dystrophy. UCLA is an incredible place to investigate skeletal muscle development, in that I collaborate daily with other labs within the Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research and engage in educational and outreach activities in the Center for Duchenne Muscular Dystrophy at UCLA.

Furthermore, I have been teaching elementary and middle school kids about muscle biology through a campus organization called the Bruin Allies for Duchenne. I was recently awarded with an NIH T32 training grant entitled “Muscle Cell Biology, Pathogenesis, and Therapeutics,” which provides me with funding to pursue my research and opportunities to deepen my involvement in the skeletal muscle field.

A significant part of my life at Rochester was my participation in the Symphony and Chamber Orchestras. I am grateful to be able to continue to play the violin in graduate school by playing with the UCLA Symphony Orchestra.

Although I am enjoying southern California’s beautiful sun more than the harsh winters up in Rochester, I do miss the peaceful snowy days from time to time, and I am deeply appreciative of all the academic and research opportunities the U of R gave me, which helped to get me to where I am now!

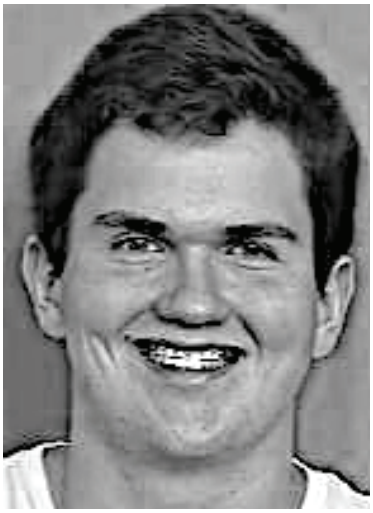
Michael Gilbert ’17

Biochemistry

Following graduation, I received a Fulbright grant to work in Dr. Zhongjun Zhou’s cancer and aging lab at the University of Hong Kong. I chose Hong Kong because it is one of the largest research and biotech hubs in the world, where labs work closely with patients and companies alike to streamline the introduction of new therapies. I quickly noticed fundamental differences in how students in Hong Kong approach academic problems when compared to students in the United States. Additionally, the structures of the projects themselves varied widely from what I was accustomed to. While the content of the research is similar, the United States more frequently has long-term projects, with a variety of collaborators. On the other hand, Hong Kong has shorter, individualistic projects. These differences are rooted not only in cultural idiosyncrasies, but also differences in funding structure. It is also interesting how political dynamics subtly play into research. When hearing about collaborations or establishing research centers in new locations, I had never considered the political nuances of research endeavors.

This phenomenon is certainly not restricted to Hong Kong. Working in as international an environment as the Gorbunova lab in Rochester gave me a taste of how cultural differences give rise to various research perspectives, but moving to Hong Kong provided a firsthand account. The University of Rochester definitely provided an international and collaborative atmosphere, such that transitioning to working in Hong Kong was not an overwhelming culture shock.

Through Fulbright, I have had the opportunity to explain the importance of biomedical research and academic opportunities not only to communities in Hong Kong but also to underprivileged groups throughout Asia. I have spoken at schools in Vietnam, Cambodia, and the Philippines about research careers. The recent emergence of new research centers has made research-oriented careers a more accessible reality for more and more previously underprivileged demographics. Especially in China and Southeast Asia, new places are quickly becoming research powerhouses. Given the globalization of research, international collaboration is imperative for the future of biomedical research. In addition to avoiding redundant findings and maximizing funding, globalized research provides increased employment opportunities in a competitive field and the potential for better outcomes for patients. After having completed the Fulbright grant in July, I am attending the University of Pennsylvania this fall for a PhD in biochemistry and molecular biophysics.



News from the Front Line of the Human Genomes Project

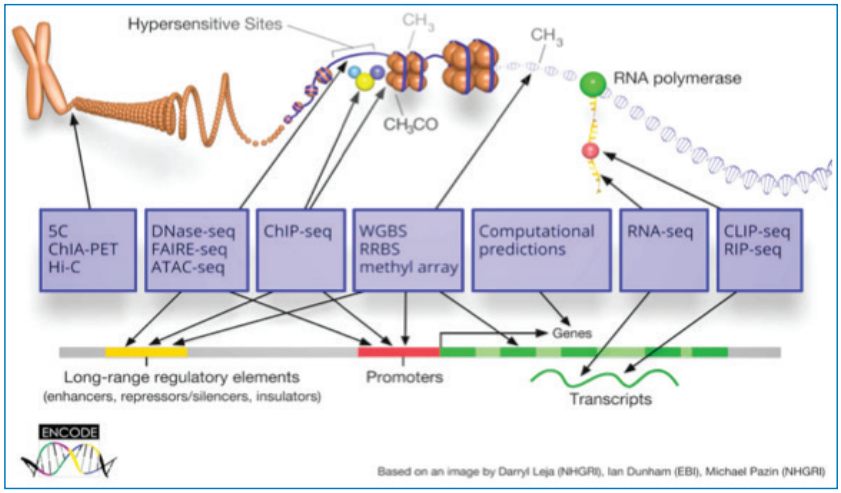
Samuel Moore ’16

Imagine you are studying a foreign language and your first assignment is to read a book without spacing, punctuation, or proper grammar. You might be able to make out a word here or there, but the overall message would be lost. We need syntax to help us understand the function of a sentence and how that sentence works with other sentences to tell a story. The same logic applies to our genome sequence.

In 2003, an unprecedented advance in biomedical research came with the announcement that the human genome had been sequenced. The scientific community now had information on more than three billion base pairs at their disposal. These data were expected to be a critical resource in enhancing our understanding of cancer, diabetes, and many other diseases. Unfortunately, this multibillion-letter resource lacked the regulatory “grammar” needed to maximize this understanding.

We know now that the DNA sequence is more complex than a simple string of letters. These letters can be grouped together as a gene or as something that impacts the function of that gene, like an enhancer or promoter. These types of interacting regions are not always close to one another, and their interactions are often facilitated by other things that impact gene function, like RNA and proteins. All these elements of gene function are necessary for the normal functioning of our genome. When something goes wrong with one of these elements, the “message” can be lost and the function of our genome can be impaired. The impairment can lead to disease onset.

I work with the Encyclopedia of DNA Elements or “ENCODE” project at the National Human Genome Research Institute. ENCODE is a large, collaborative project that seeks to catalog all functional elements in the human genome. That is, the regulatory grammar that impacts the function of our genome. ENCODE data are freely available as a resource to the biomedical research community, in the hope that it enhances our understanding of human health and disease.



Samuel has spent the past two years at the National Human Genome Research Institute at the NIH working with the ENCODE project. He started medical school at the SUNY University at Buffalo in August.

News from the Diversity Committee

At the end of 2017, Department Chair Michael Welte appointed a new committee tasked with a three-pronged mission: to assess the status and opportunities in the department for women and LGBTQ individuals, to gather information (What do other departments do, both across the University and at other universities? What are current University guidelines?), and to brainstorm ideas for increased inclusivity in our department.

This newly formed Diversity Committee met for the first time on January 12. Composed of four faculty members (Dan Bergstralh, Jennifer Brisson, Justin Fay, Danielle Presgraves), one administrative staff person (Brenna Rybak), and one graduate student (Roxan Stephenson), the committee quickly realized the need for additional members, and in early April it was pleased to recruit one postdoctoral associate (Anusha Naganathan) and one undergraduate student (Sofia Maestro Sanz).

The committee has met roughly once a month since its inception, and members have been enthusiastic, discussing current needs not only for women and the LGBTQ population but also for foreign nationals, first-generation students, and those with disabilities.

On April 27, the Diversity Committee held a Safe Space training session intended to provide information about ways to provide safe spaces and support for lesbian, gay, bisexual, transgender (LGBT), and allied people regarding issues they may confront in the workplace and elsewhere. Each attendee was given a Safe Space decal, which may be displayed in their office and identifies it as a Safe Space. Approximately 25 department members attended this training, including faculty, staff, graduate students, postdocs, and laboratory staff. Attendees were unanimous in their enthusiasm, and everyone came away with fresh perspectives and information.

In addition, one of the committee's initial discussions centered on the need for a lactation room in our building for nursing mothers. Department members went to work swiftly to identify a space, secure funding and materials, and begin renovations. On July 23, the lactation room in Hutchison Hall was finished and opened for use.

The committee also saw the need for a digital brochure that would condense the various resources on campus into one place. The new document rolled out in late July and will be given to each new member of the department during orientation.

The fledgling committee has had a great start so far and is excited to keep moving forward toward greater inclusivity and diversity in the Department of Biology.

Department of Biology Fall Retreat— **Bristol Harbour Lodge & Golf Club**

October 9, 2017

On October 9, 2017, the Department of Biology held our annual retreat at the Bristol Harbor Resort in the scenic Finger Lakes region of central New York. Spectacular foliage, sweeping views, and plenty of groundbreaking science greeted our faculty, students, and staff. The retreat featured the return of two department alumni: Dr. J. P. Masly and Dr. Cesar E. Perez-Gonzalez.

The first speaker was Dr. Masly, who received his PhD with Dr. Allen Orr. After his postdoctoral fellowship, Dr. Masly became a faculty member in the Department of Biology at the University of Oklahoma, where he is currently an associate professor with tenure. Dr. Masly delivered a seminar entitled "The causes and consequences of rapid morphological evolution." His presentation described the evolutionary and genetic mechanisms that generate biodiversity. Dr. Masly highlighted research within his lab using fruit flies and damselflies to address how and why organisms differ in size, shape, and developmental patterns.

The second alumni speaker was Dr. Cesar E. Perez-Gonzalez, who received his PhD with Dr. Tom Eickbush. Dr. Perez-Gonzalez is the science program administrator and training coordinator at the National Eye Institute of the National Institutes of Health (NIH) in Bethesda, Maryland. In this role, Dr. Gonzalez serves to improve the training and career development of scientific trainees ranging from high school students to postdoctoral fellows. He delivered the talk "There and Back Again: A Career Journey at the NIH." In his presentation, Dr. Perez-Gonzalez spoke about his unique career path, which included academic research, public policy consulting, journal editing, and his current post as scientific program administrator. He also highlighted his goal of increasing the representation of persons with disabilities, minorities, and women in science.

Following the talks, attendees were treated to lunch on the patio overlooking beautiful Canandaigua Lake. During the scientific poster session presented by graduate students and postdoctoral associates, department members feasted on ice cream sundaes. Afterward, second-year graduate students presented a comedic video that was a scientific parody of the Food Network TV show *Chopped.* The festivities continued as many students and faculty stayed overnight at the resort. This group held a barbecue and participated in a number of social activities and friendly competitions including making s'mores by a bonfire. Overall, the retreat provided an opportunity for faculty, students, and staff to enjoy a relaxing day of science, games, and outdoor activities.

Howard Bryant Scholarship Fundraiser

Thursday, May 31, 2018

The Department of Biology held its first Cornhole Tournament on May 31, 2018. This tournament takes the place of our annual golf tournament and supports the Howard Bryant Memorial Scholarship fund.

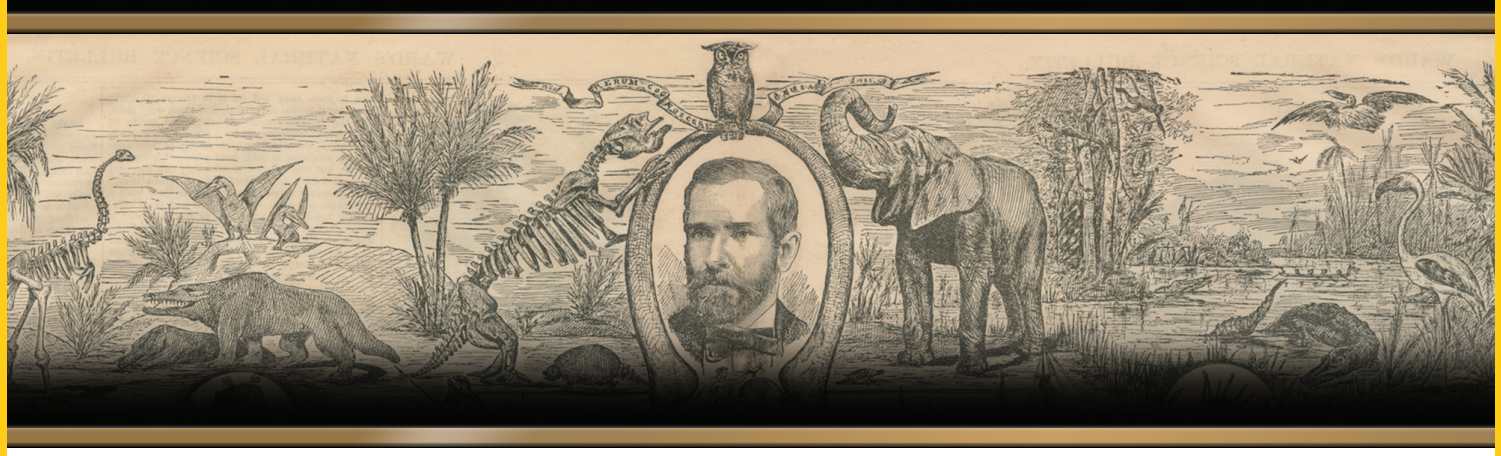
Held in the Roundhouse at Genesee Valley Park, the tournament fielded 36 teams and raised more than $3,000 for the scholarship fund. As a game that everyone can participate in, cornhole teams comprised department members and their families, members of the Mount Vernon Baptist Church, and many vendors and friends of the department and the University.

The tournament was a big success and was watched with great enthusiasm, particularly in the final round. Long-standing Howard Bryant Committee member Dan Leyrer and his teammate, Dave Maynes, placed first and also took home this year's Spirit Award.

In honor of Howard Bryant's favorite pastime—golf—players could also compete in the Marshmallow Longest-Drive contest. Assistant professor of instruction Jon Holz took home the coveted s'mores kit prize.

The afternoon proved a fantastic way to celebrate Howard Bryant's legacy and raise funds for the scholarship. We look forward to next year's fundraising event with great anticipation!

If you'd like to attend this annual event or you'd like more information about it, please contact **Brenna Rybak** for details.



Specimen Collection

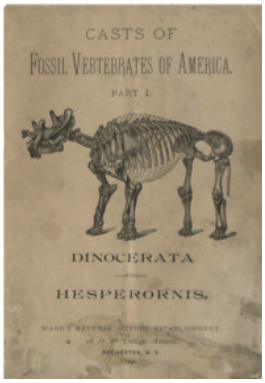
Back in the Public Eye with New Website

by Bob Minckley and Brenna Rybak

Launching the website

In December 2017, the Ward Project website entered its final phase toward launch. Years of work and research began to take shape as the website moved closer to its final form. On December 4, 2017, Dr. Bob Minckley from the University of Rochester and Melanie McCalmont from the University of Wisconsin–Madison presented a seminar entitled, "The Impact of Ward & Howell Museum Collections on the History of Biology" at noon in the new Humanities Center at Rush Rhees Library. There they presented the fledgling website to the public and explained a bit more about the history of the specimen collections. Attendance was impressive and included colleagues from across the University, several members of Ward's Science, and various members of the Departments of Biology; Earth and Environmental Sciences; History; and Rare Books, Special Collections, and Preservation. Commemorative pins depicting some of the specimens were popular with attendees, who left with handfuls of them as well as a much broader perspective about the history of biological specimens. In fact, a few faculty members were so enthusiastic they suggested we obtain a blue whale skeleton to hang in the lobby of Hutchison Hall!

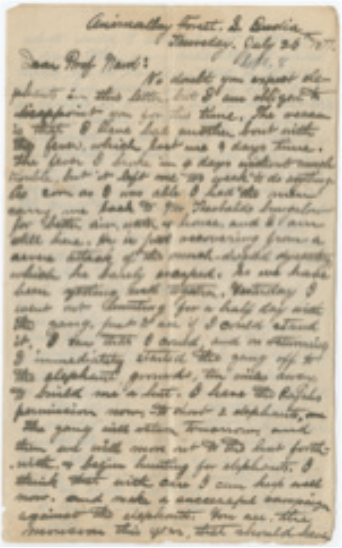
The week of March 26, 2018, marked a new milestone for the collection: the official launch of the Ward Project website. This website links our collection to material in the Department of Earth and Environmental Sciences and to related catalogs, bulletins, and letters housed in the Department of Rare Books, Special Collections, and Preservation. Now anyone can investigate 3-D images of specimens, find out information on their worth in the late-1800s, and (for some species) read early accounts about where these species lived and how they behaved.



During the period between the Civil War and 1900, the study of natural history grew rapidly worldwide, and the Ward Natural Science Establishment, located on the edge of the University of Rochester campus, was central to this growth. Most of the documentation for this period is housed at the University of Rochester.

The history behind the collection and what we are doing to preserve it

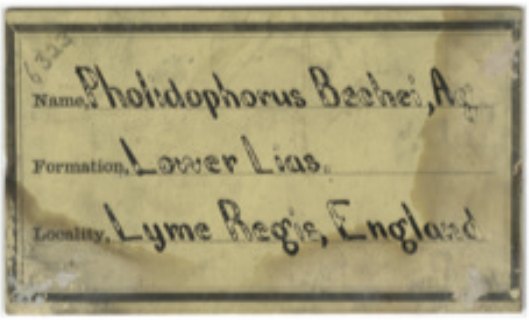
The University of Rochester's Natural History Museum was founded in the very early days of the University. It is currently regaining its fame—albeit gradually—due to the efforts of students, staff, and faculty who are pushing the project ahead and the public launch of the website that will serve as a repository for the project.



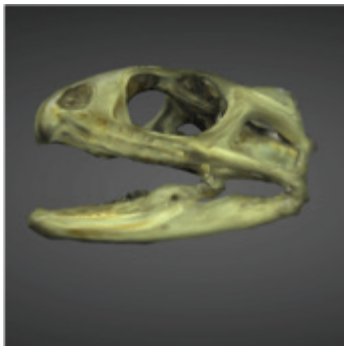
The Natural History Museum at the University of Rochester was the third largest in the United States in 1890 and had been assembled through the efforts of Henry A. Ward, a professor at Rochester and founder of Ward's Natural History Establishment. Ward's was the largest supplier in North America of biological and geological materials. It is hard to find a college, university, or museum active in the period from 1860 to 1900 that did not have Ward material. It was a period when the growth of the natural history museum was greatest, and Ward was referred to as the "Museum Builder."

The Ward Project website will eventually have images of specimens and models, which are on display today on the second floor of Hutchison Hall. It will also contain correspondence associated with the Natural History Museum and Ward's Natural History Establishment. The entire collection of letters from the Ward's Natural History Establishment and of many members of the Ward family are housed in the Department of Rare Books, Special Collections, and Preservation.

To assemble and make all of these different documents and objects available takes many people with very different skills. Undergraduate students from the Departments of Biology, Earth and Environmental Sciences, and History are scanning documents, categorizing them, and posting them on the website under the guidance of Melissa Mead (University archivist) and Dr. Bob Minckley (Department of Biology). Students from Rochester Institute of Technology (RIT) under the auspices of Craig Foster (Department of Medical Illustration, RIT) and Jim Barbero (Department of Art and Art History, University of Rochester) have been digitally "preparing" 3-D scans of specimens that will soon be added to the website.



There are already some three-dimensional specimen images on the Ward website that can be rotated, measured, and studied by various means. With the help of expertise from RIT, we plan to explore methods of digital presentation to best showcase objects ranging from a large skeleton to a stuffed, posed taxidermy specimen to a small biological model. Each specimen has presentation challenges that require different approaches.



In addition, as we had hoped, other museums are also contributing material to the website. In fact, the Smithsonian Institution maintains a large number of letters concerning the acquisition of specimens by trade or sale from Ward and his collaborators, and they have graciously contributed their records to our project. This will allow us to piece together a more detailed chronicle of our Natural History Museum.

For those interested in transcription, the website also allows volunteers to transcribe letters from Ward to luminaries worldwide. Be forewarned: the ability to read longhand script is a prerequisite.

The impact of the project so far

We are also attracting visitors. Most recently, Louis-Benedikt Sommer visited from Coburg, Germany. He is a fifth-generation builder of biological models from a company founded in 1876 called Somso Modelle. His insights on the models in our collection have greatly increased what we know about these interesting objects.

Greg Cowper from the Academy of Natural Sciences at Drexel University in Philadelphia stayed far longer than he had planned, perusing the halls of Hutchison and peering at the collection.

Mabel Rosenheck (Wagner Free Institute of Science, Philadelphia) visited the Department of Rare Books, Special Collections, and Preservation for three days in the spring to track down correspondence between Dr. Joseph Leidy (called the "smartest man alive" in his day) and Henry A. Ward. On one of those days, she took time out to visit Hutchison Hall. As a result of that visit and her remarkable energy, the specimen collection is now featured on **Atlas Obscura.**

How you can help

Powered substantially by undergraduate interest, the website is still embryonic but will eventually grow rapidly. The progress we have made so far is due almost entirely to the work and passion of many volunteers across several departments and disciplines. Each person brings a different skill set and a different point of view. At some point we are sure to reach a stage when we are simply not able to keep up.

Your interest is key. If you are excited about this project and/or would like to get involved—in any way—**please let us know.** Support and enthusiasm from alumni and friends of the University are so important and could help push our project through the next stages. Perhaps more importantly, your help will contribute to the preservation of a unique and vital collection of scientific history. In an increasingly modern age, the conservation and care of this history seems ever more necessary.

Help Support

our Specimen Collection and Archives

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

Kate Clyde
Associate Director of Advancement
(585) 273-2050, kate.clyde@rochester.edu

MELIORA WEEKEND

Save the Date

Department of Biology Open House

Friday, October 5, 2018
3:30–5:30 p.m.
Hutchison 316

All Are Welcome to Attend!

Chat with professors
Visit the Specimen Collection
Browse photos from days gone by

Hors d'oeuvres and refreshments provided

DEPARTMENT OF

BIOLOGY

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For more information about our department, please visit our website at
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