Dear Friends,

What an exciting whirlwind of a year this has been for our Department and the University of Michigan—new colleagues, new science, a new president, and a trip for the 13-0 Wolverines to the Fiesta Bowl and College Football Playoffs. I hope you will enjoy reading about the year in Biological Chemistry across the pages that follow and invite you to connect or reconnect with us in the new year. Events and highlights are regularly featured on our website https://medicine.umich.edu/dept/biological-chemistry, and as of a few months ago you can follow me @PIHanson in the Twitterverse.

Top of the news for 2022 is our welcoming of new faculty colleagues. Joining us are Jay Brito Querido, Rachel Niederer, and Tobias Giessen as Assistant Professors and Jim Daley as Research Assistant Professor. Jay comes to us from the MRC Laboratory of Molecular Biology (Cambridge, UK), Rachel from Yale University, Tobias from U-M Biomedical Engineering and previously Harvard University, and Jim from University of Texas Health Science Center at San Antonio. Watch for great things from this group! We are also excited to once again be in the midst of faculty recruiting and look forward to welcoming additional colleagues next year.

Congratulations to Associate Chair Pat O’Brien for his promotion to Professor, to Allison Lamanna for her promotion to Lecturer IV, and to our retirees Roland Kwok and, effective at the end of this year, Phil Andrews. Read more about these milestones, as well as many other awards and recognitions to our faculty and trainees in the following pages. In late-breaking news, Associate Professor Peter Freddolino and the U-M protein folding team he supervised came out at the top of the biennial international Critical Assessment of Structure Prediction CASP15 competition and were recognized last weekend in Antalya, Turkey. Read more about this next year.

Our Ph.D. and Master’s degree programs are thriving, with ~50 Ph.D. and 12 Master’s students currently in our laboratories. We continue to focus on student-centered educational programming that emphasizes mentoring and scientific engagement, led by our Associate Chair for Education and Research Anne Vojtek and our M.S. program co-directors Mike Uhler and Debra Thompson. Our Diversity, Equity and Inclusion Committee chaired by faculty members Chase Weidmann and Allison Lamanna led a number of initiatives this year including popular group “write-in” sessions that brought students (and others) together to move individual ongoing writing projects forward. Top of the list for many were their preliminary exam project proposals—which all completed with flying colors. We were proud to award 5 Ph.D. and 16 M.S. degrees last year and are excited about the careers these young alumni are launching.

It has been wonderful to see students and others engage in person again in activities that bring our community together. A highlight was the department retreat at Kellogg Biological Station, which was a perfect September weekend of science, companionship, and great food (particularly the late night installments of pizza and grilled salmon and peaches prepared by our own Bruce Palfey). A special feature was the presentation of our trainee awards that recognize individual excellence and achievement while also connecting today’s members with the past. We also enjoyed a new tradition of monthly outdoor happy hours at the Ann Arbor legend Casa Dominick’s.

Travel and the relaunching of in-person scientific conferences this year reminded all of us of the joy and excitement that come from sharing discoveries with colleagues around the world. Many of our trainees attended and presented posters or talks at their first conference, thanks in part to the generosity of our donors. Our seminar series continued to bring us together every Tuesday to hear about advances in biochemistry. This fall’s special series led by Assistant Professor Mike Cianfrocco focused on the latest in cryo-electron microscopy and how this technique has and will continue to revolutionize structural biology.
detailed on p. 15. Michigan’s cryo-EM community is at the forefront of this revolution and leading structural biology into the future.

We ended the year with a departmental celebration last week at the U-M Golf Course Clubhouse, recognizing this year’s new members, milestones—and the first 100 years of the department as wittily presented by Associate Professor Bruce Palfey (see photos on p. 17). It was terrific to learn about a century of evolution and growth of Biological Chemistry in geography, leadership, and science. I look forward to sharing plans for additional celebration of our first 100 years and our legacy of scientific excellence with you in the coming months.

2022 saw turnover in our top leadership at U-M, with former president and Biological Chemistry faculty member Mary Sue Coleman returning for a nine-month encore and Santa J. Ono from the University of British Columbia beginning his term as our 15th president on October 14. During his first week on campus, Assistant Professor Yan Zhang shared details of her CRISPR editing work with Dr. Ono, who is enthusiastic about research at Michigan (and about much else: check out @SantaJOno on Twitter).

Please feel free to email me at pihanson@umich.edu with updates, questions, photos, or other information. I am always happy to hear from alumni, members, and friends of the Department!

Best wishes in 2023,

[Signature]

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Design for the 2022 Biological Chemistry Retreat t-shirt, created by graduate student Zoe Yeoh
Trainee Achievements and Recognition

Sydney Alibeckoff, a graduate student mentored by Ruma Banerjee and Yatrik Shah, was appointed to the Chemistry Biology Interface Training Program for 2022–2023.

David Beier, a graduate student mentored by Sarah Keane, received an NSF Graduate Research Fellowship for his proposal “Revealing the Structure and Dynamics of RNA-Based Thermosensor Regulation of Bacterial Virulence Factor Expression.”

Jutta Diesl, Ph.D., a postdoctoral researcher in Ruma Banerjee’s lab, received a Michigan Life Sciences Fellowship for her research proposal “Metabolic Interactions During H2S and Oxygen-Based Signaling.”

Jeremy Dortch, a graduate student mentored by Ryan Baldridge, was appointed to the Pharmacological Sciences Training Program for 2022–2023.

Natalia Harris, a graduate student mentored by David Sherman and Janet Smith, was awarded a Ruth L. Kirschstein National Research Service Award (NIH F31) for her project “Recovery Is Achievable: Biocatalytic Approaches to Diversifying Mitragynine Analogs for Opioid Substitution Therapies.” Natalia was also a member of a U-M team that placed 2nd Overall and 1st in People’s Choice in the 2022 Science Policy Writing Competition sponsored by Forefront and the National Science Policy Network.

Kira Holton, a graduate student mentored by Chase Weidmann, was appointed to the Chemistry Biology Interface Training Program for 2022–2023.

Carla Loomis, a graduate student mentored by Emily Scott, was awarded a Ruth L. Kirschstein National Research Service Award (NIH F31) for her project “Defining Structural and Functional Differences Between Cytochrome P450 11B1 and 11B2 Interactions with Redox Partner Adrenodoxin for Developing Cushing’s Disease and Primary Aldosteronism Treatments.”

Roshan Kumar, Ph.D., a postdoctoral researcher in Ruma Banerjee’s lab, was the first author of an Editors’ Pick in the Journal of Biological Chemistry: “A Redox Cycle With Complex II Prioritizes Sulfide Quinone Cycle Oxidoreductase-Dependent H2S Oxidation.”

Romila Mascarenhas, Ph.D., a postdoctoral researcher in Ruma Banerjee’s lab, received a Pathway to Independence Award (K99/R00) from NIGMS for her project “Vitamin B12 Trafficking and Selectivity in Gut Bacteria.”

Willow Morgan, a graduate student mentored by Peter Freddolino, was selected as a trainee in the Biomedical Informatics and Data Science Training Program.

Mason Myers, a graduate student mentored by Yan Zhang, was appointed to the Genetics Training Program for 2022–2023.

Chris Ohmer, a graduate student in the Program in Chemical Biology mentored by Stephen Ragsdale, received a U.S. Department of Energy Office of Science Graduate Student Research award for his research project “Structural Characterization of the Ni(I)-Active Methyl-Coenzyme M Reductase: Nature’s Catalyst for Methane Synthesis, Activation, and Oxidation.”

Joseph Roman, Ph.D., a postdoctoral researcher in Ruma Banerjee’s lab, was awarded a Ruth L. Kirschstein National Research Service Award (NIH F32) for his project “Allosteric Regulation of Human Cystathionine β-Synthase.”

Jenn Russ, a graduate student mentored by Ryan Baldridge, was appointed to the Genetics Training Program for 2022–2023.

Josepha Sedzro, Ph.D., a postdoctoral researcher in Jim Morrissey’s lab, received the 2022 Biological Sciences Thesis Prize from the National Academy of Pharmacy of France.

Renke Tan, a graduate student mentored by Yan Zhang, received a Barbour Scholarship from the University of Michigan for 2022–2023.

Anibal Tornes Blanco, a graduate student mentored by Scott Pletcher, was appointed to the Career Training in the Biology of Aging Training Program for 2023.
Zoe Yeoh, a graduate student mentored by Melanie Ohi and Janet Smith, received an honorable mention for her oil painting *McCreary 208* in the 2022 U-M Science as Art competition. Zoe explains, “The scientific concept I was inspired by was hypothesis-driven research. *McCreary 208* references a physical laboratory space: my undergraduate lab at Gettysburg College, PA. Here, I learned the importance of testing hypotheses and careful record-keeping and observation of the results. In addition, what was most intriguing to me was that obtaining unexpected results could dramatically subvert expectations but lead to exciting discoveries. When I visualized this piece, I wanted to evoke the same subversion of expectations that manifested with hypothesis-driven research by reimagining my sterile laboratory as a space reclaimed by nature.”

**Undergraduate Mentoring Honors**

Each academic year the Undergraduate Research Opportunity Program (UROP) at U-M recognizes mentors who have exceeded expectations in providing research opportunities and guidance to their UROP students. A trio of scientists from the Banerjee lab were commended for their exceptional mentorship of two undergraduate students, Rita Lin and Proud Sethaudom, for 2021–22. Congratulations to Zhu Li, Ph.D., for her nomination and to Roshan Kumar, Ph.D., and Ruma Banerjee, Ph.D., for their selection for Outstanding Mentor Awards. The Awards were announced at UROP’s 2022 Spring Research Program on April 20, where both students presented posters about their research projects: “Developing Primary Antibodies to Detect Human CblC” by Rita Lin, Ruma Banerjee, and Zhu Li, and “Mechanistic Insights Into the Proangiogenic Effects of Hydrogen Sulfide” by Apichaya Sethaudom, Ruma Banerjee, and Roshan Kumar.

**UROP Mentor Award Nominee**

**Zhu Li, PhD**

Michigan Medicine, Department of Biological Chemistry

“We often have discussions that catch her along time as she is very passionate about what she does and she always seeks knowledge to pursue whenever I have a question about a concept or a technique she is teaching me she always open to answering and most importantly in point of view she is always ready to listen to my problems or questions and respond in an opportune manner.”

Nominated by: Rita Lin

**UROP Mentor Award Winner**

**Roshan Kumar, PhD**

Michigan Medicine, Department of Biological Chemistry

“From my first meeting with Dr. Banerjee, could not be any easier for me to learn and acquire research skills. She is always willing to share her knowledge and experience with her student. I am so grateful and thankful for this experience.”

Nominated by: Proud Seth

**UROP Mentor Award Winner**

**Ruma Banerjee, PhD**

Michigan Medicine, Department of Biological Chemistry

“Ruma is a great mentor and has a very motivational teaching style. She always gives me assignments that can increase my knowledge about the topic. She provides me with the necessary knowledge to complete the assignment and support me with all my research projects, which helped me to quickly understand the task. Her ability to work with her lab for UROP.”

Nominated by: Rita Lin

Proud Seth

Image credits: https://twitter.com/UROPumich
Welcome to Jailson Brito Querido, Ph.D., who was appointed as an Assistant Professor of Biological Chemistry in September 2022. Jay is also a Faculty Scholar in the Center for RNA Biomedicine and a Research Assistant Professor in the U-M Life Sciences Institute.

A native of Cape Verde, Jay received undergraduate and M.S. degrees at the University of Lisbon. For his Ph.D., Jay worked with Dr. Yaser Hashem in Strasbourg, France, using cryo-EM to study parasitesspecific ribosomal proteins. Jay then moved to Dr. Venki Ramakrishnan’s lab at the MRC Laboratory of Molecular Biology for postdoctoral work, where he tackled longstanding questions surrounding translation initiation on eukaryotic mRNAs. Most prominently, Jay determined the structure of a 48S translation initiation complex and suggested a novel mechanism for ribosome recruitment and mRNA scanning (Science. 2020; 369: 1220–27).

Jay is currently exploring translation initiation on structured mRNAs and the role of the human tumor suppressor protein PDCD4 in regulating translation. He has exciting plans to continue in this field, with a goal of understanding the many ways in which RNA helicases regulate gene expression in health and disease. Jay is temporarily located in the Life Sciences Institute, while his new laboratory and office space on the fourth floor of MSRB II are being renovated.

To expand the range of research opportunities available to students, select U-M faculty members who engage in biochemical research have been welcomed as mentors in the Biological Chemistry graduate program. Five new members joined our affiliate faculty in 2022. Kathleen Collins, M.D., Ph.D., of the Microbiology and Immunology and Internal Medicine Departments, studies viral mechanisms of immune evasion. Markos Koutmos, Ph.D., of the Chemistry and Biophysics Departments, seeks to understand how the structure and dynamics of proteins and RNAs drive their biological function. Scott Pletcher, Ph.D., of the Molecular and Integrative Physiology Department, combines genetic, biochemical, and behavioral techniques to understand the nature of aging-related disease. Ling Qi, Ph.D., of the Molecular and Integrative Physiology and Internal Medicine Departments, investigates protein degradation and quality control in the endoplasmic reticulum. Brandon Ruotolo, Ph.D., of the Chemistry Department, focuses on developing new tools and methods for determining the three-dimensional structures and stabilities of proteins and multi-protein assemblies important in biology and medicine.

James Daley, Ph.D., joined the Department of Biological Chemistry as a Research Assistant Professor in December 2021. Jim earned his Ph.D. in Cellular and Molecular Biology at U-M in 2007, working with Dr. Tom Wilson. After postdoctoral research at the University of Montreal, he worked with Dr. Patrick Sung as an Associate Research Scientist at Yale University and as a Research Assistant Professor at the University of Texas Health Science Center at San Antonio. Jim’s research interests center on DNA double strand break repair, and he is affiliated with the laboratories of Dr. Pat O’Brien and Dr. Tom Wilson.

Tobias Giessen, Ph.D., has become an Assistant Professor of Biological Chemistry, effective July 2022. After obtaining his undergraduate degree and Ph.D. (mentored by Dr. Mohamed Marahiel) at Philipps-Universität Marburg in Germany, Tobias completed postdoctoral studies at Harvard Medical School under the guidance of Dr. Pamela Silver. Tobias was recruited to U-M as an Assistant Professor in 2019 by the Biomedical Engineering Department. Since beginning his work in BME, he has published multiple papers and secured NIH funding. Tobias was previously an affiliate member of our Department and is currently mentoring two Biological Chemistry Ph.D. students. His laboratory is on the second floor of MSRB II.

The Giessen lab is broadly interested in the chemistry, biology, and molecular engineering of microbes. Their current focus is on understanding and engineering large protein assemblies that act as microbial protein-based organelles in various aspects of microbial stress resistance and host-microbe interactions within human microbiomes. The lab utilizes interdisciplinary
techniques and approaches spanning the fields of biochemistry, structural biology, microbiology, bionanotechnology, and synthetic biology. Studying microbial protein organelles will lead to new and fundamental insights into the functioning of complex protein machines and illuminate the role spatial control and compartmentalization play in microbial stress resistance, nutrient utilization, and pathogenicity. This research will also lay the foundation for future protein organelle engineering for applications as functional nanomaterials, nanoreactors, and programmable nanodevices, with the ultimate goal of engineering microbes as living diagnostics, therapeutics and nanofactories.

We are happy to announce that **Rachel Niederer, Ph.D.**, joined the Biological Chemistry faculty as an Assistant Professor and the Center for RNA Biomedicine as a Faculty Scholar in November 2022. We also extend a warm welcome to Research Lab Specialist **Andrew Shurer**, Rachel’s husband and colleague.

Rachel was an undergraduate at the University of Maryland, College Park, and went on to obtain her Ph.D. from Johns Hopkins University under the mentorship of Dr. David Zappulla, where she defined shared structural and functional features in telomerase RNA and explored the transcriptional response to telomere loss and senescence. Rachel carried out postdoctoral studies first with Dr. Melissa Moore at the University of Massachusetts Medical School and then (when Dr. Moore moved to Moderna) with Dr. Wendy Gilbert at Yale, studying mechanisms of translational control. Rachel developed a novel method to rapidly and quantitatively measure ribosome recruitment to thousands of 5′-UTR sequences to define features controlling translation initiation. This approach, termed Direct Analysis of Ribosome Targeting (DART), has uncovered hundreds of new, functional RNA elements in yeast that differ in their ability to recruit ribosomes and to act as sequence-specific translational repressors (*Cell Syst.* 2022; 13: 256–64).

Rachel’s laboratory will explore mechanisms of translational control using a new set of cutting-edge approaches for studying translation initiation. Her permanent laboratory and office space will be on the fourth floor of MSRB II, and until February she can be found on the third floor of MSRB III.

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**Moving Into MSRB II**

The Biological Chemistry Department is pleased to be expanding into MSRB II to accommodate new assistant professors Jay Brito Querido and Rachel Niederer and their research teams. Jay and Rachel will occupy two of three new faculty offices in a suite on the fourth floor and will share adjacent laboratory space. Construction work on the office suite is finished, and the laboratory renovations are slated for completion in February 2023. MSRB II is a short walk (through MSRB I) from existing department space on the third, fourth, and fifth floors of MSRB III.

**The newly constructed MSRB II faculty offices overlook the Huron River and the Kellogg Eye Center.**

**Chairs stand ready to be filled with researchers in the MSRB II office suite shared by Jay and Rachel.**
A representation of work from a paper by research investigator Zhonggang Hou, Ph.D., and assistant professor Yan Zhang, Ph.D., was featured on the cover of the February 2022 issue of Current Protocols. It shows the CRISPR-Cas3 machinery as a locomotive moving along railroad tracks (the genome), shredding DNA into pieces.

Roland Kwok, Ph.D., Associate Professor of Obstetrics and Gynecology and of Biological Chemistry, retired on April 30, 2022. Roland received his B.Sc. degree from Chu Hai College (Hong Kong) in 1982, his M.Sc. degree from the University of Saskatchewan (Canada) in 1985, and his Ph.D. degree from the University of Pittsburgh in 1991. He received postdoctoral training at Oregon Health Sciences University. Roland joined the University of Michigan faculty in 1998, and was promoted to associate professor in 2006. His research focused on how post-translational modifications of factors involved in cell death pathways determine cell death in cancer cells.

Allison Lamanna, Ph.D., was promoted from Lecturer III to Lecturer IV effective September 1, 2022. Allison was a lecturer in the Chemistry Department at Boston University for seven years before joining Biological Chemistry in 2018.

Professor Neil Marsh, Ph.D., received a Distinguished Faculty Governance Award from the U-M Senate Advisory Committee on University Affairs. The award recognizes distinguished service to faculty governance over several years, with an emphasis on universitywide service.

In May the Board of Regents approved the recommendation for promotion of Patrick O’Brien, Ph.D., to Professor of Biological Chemistry. Pat has been a member of the department since 2004, and his promotion took effect in September. The O’Brien lab applies biochemical, biophysical, and structural approaches to understand mechanisms of human DNA repair. Congratulations to Pat for advancing to this academic rank on the basis of his scholarship, productive research, teaching and mentoring contributions, and exceptional service.

Four scientists from the Life Sciences Institute who are also members or affiliates of the Biological Chemistry Department received a $1.5 million award from the Beckman Foundation to advance a cutting-edge structural biology technique, cryo-electron tomography, at U-M. The award-winning team included principal investigator and affiliate faculty member Melanie Ohi, Ph.D., assistant professors Michael Cianfrocco, Ph.D., and Shyamal Mosalaganti, Ph.D., and professor Janet Smith, Ph.D.

Janet Smith, Ph.D., has been named the Rita Willis Professor of the Life Sciences, representing the first appointment to an endowed professorship at the U-M Life Sciences Institute. “The Rita Willis Professorship honors a woman who was a great supporter of the life sciences at the University of Michigan,” said U-M President Mary Sue Coleman, Ph.D., at a September 15 ceremony installing Smith to the new position. “It is appropriate and deserving that its first recipient is a woman who has done so much to advance her field at U of M and worldwide.” The Regents of the University of Michigan approved the five-year appointment effective September 1, 2022.

Research associate professor Jeanne Stuckey, Ph.D., received a Research Faculty Achievement Award from the U-M Office of the Vice President for Research in recognition of her research program devoted to structure-based drug design and her leadership of the Center for Structural Biology.

Anne Vojtek, Ph.D., has been appointed as the Associate Chair for Education and Research in Biological Chemistry, and she continues to serve as an Associate Director of the Program in Biomedical Sciences (PIBS).
Part of the mission of the Biological Chemistry Department is to reach beyond laboratory walls to communicate research advances and scientific insights widely. Two faculty members accepted this challenge in innovative ways in 2022.

Associate professor Peter Freddolino, Ph.D., worked with staff at the U-M Museum of Natural History, partly through their Science Communication Fellows program, to develop a research station entitled “Gut Reaction.” The exhibit highlights how Peter and his collaborators study the way bacteria interact with their human host, with the goal of fostering probiotics—the good microorganisms that live in the gut.

In the exhibit’s audio introduction Peter says, “I remember going to museums, kind of like the Museum of Natural History, and seeing the exhibits they would have there and being really fascinated with that...I got especially interested in microbiology as I got a little older. For me it’s mostly about how bacteria make decisions. Bacteria have always been around as long as we’ve been evolving, and way longer than that. They are always a double-edged sword, where on one side some bacterial species are really important to our health. Our body needs them to produce vitamins. Our body needs them to produce some signals, for example, to keep your gut healthy. But on the other side, where we hear about them more is often when things go badly, because some species of bacteria can cause disease. They’re just fascinating little critters. If we understand how they make decisions, we can try to manipulate the interactions between bacteria and us to optimize the health-promoting side of things and minimize the potentially dangerous side.”

The exhibit will be on display on the second floor of the museum, in the “Under the Microscope” gallery, until September 2023. Other scientists who contributed to the project are graduate students Eric Bell and Catherine Barnier, postdoctoral researcher Rishu Dheer, research lab specialist Manny Plasencia, and faculty members Phil Andrews and Vince Young.

Assistant professor Michael Cianfrocco, Ph.D., has been sharing his scientific expertise and perspectives in the podcasting domain. Along with Mimi Ho (Columbia) and Liz Kellogg (Cornell), Mike is co-hosting The Plunge, a video podcast featuring innovators in the field of cryo-electron microscopy (cryo-EM). Each episode explores the unique career path, experiences, and scientific vision of a different member of the cryo-EM community, with guests from diverse backgrounds ranging from early career scientists to established leaders in the field. The first of six episodes was released on October 10, with new episodes available every 2–3 weeks until January 2023. The series is sponsored by Thermo Fisher Scientific.

Mike was on the other side of the microphone when he was interviewed by Eva Amsen in a recent episode of Cryo-Talk, a podcast from Thermo Fisher Scientific and Bitesize Bio. Each episode in this series explores the fascinating world of cryo-EM “through the eyes of the experts and delves beyond the electron beam into what drives them in their careers, their inspirations, and passions.” In the wide-ranging conversation, Mike discussed topics that included the tools he is developing to help fellow cryo-EM users, a surprise that he experienced in his own research, and career advice for scientists who are just starting out.
M.S. Degrees Awarded

Kayla Chattinger, M.S.  
April 28, 2022  
Mentor: Ryan Baldridge, Ph.D.

Sarah Lee, M.S.  
April 28, 2022  
M.S. Thesis: “Co-crystallization of Mouse Viperin and Human TRAF6”  
Mentor: Neil Marsh, Ph.D.

Jue Chen, M.S.  
April 28, 2022  
M.S. Thesis: “Elucidating Mechanisms of Anti-CRISPR Inhibition of Neisseria CRISPR-Cas9”  
Mentor: Yan Zhang, Ph.D.

Tatiana Maine-Brown, M.S.  
April 28, 2022  
M.S. Paper: “Epigenetic Modifications in Cancer: A Review of Drug Resistant Adaptations Within Rare Cancer Populations”  
Mentor: Kaushik Ragunathan, Ph.D.

Jeannette Cruz, M.S.  
April 28, 2022  
M.S. Thesis: “The Role of Mutant Histone 3 in Diffuse Intrinsic Pontine Glioma”  
Mentor: Stefanie Galban, Ph.D.

Claire Maiocco, M.S.  
April 28, 2022  
M.S. Thesis: “Addition of a Tetra-Cysteine Motif into Soluble Heme Oxygenase-2”  
Mentor: Stephen Ragsdale, Ph.D.

Kayla Daniels, M.S.  
April 28, 2022  
M.S. Thesis: “Heme Binding to Human Heme Oxygenase-1: Strategies for Heme Acquisition and the Effects of Heme on Protein Stability”  
Mentor: Stephen Ragsdale, Ph.D.

Alexander Scott, M.S.  
April 28, 2022  
M.S. Thesis: “Purification and Characterization of Murine Monoclonal Antibodies Against Polyphosphate”  
Mentor: James Morrissey, Ph.D.

Rosemary Gedert, M.S.  
April 28, 2022  
M.S. Paper: “Roles of Long Noncoding RNA MALAT1 in Cancer Metastasis”  
Mentor: Chase Weidmann, Ph.D.

Danielle Silverman, M.S.  
April 28, 2022  
Mentor: Audrey Seasholtz, Ph.D.

Nolan Gersabeck, M.S.  
April 28, 2022  
M.S. Thesis: “Glucocorticoid Receptor Regulation of Gene Expression in Stem Cell-Derived Excitatory and Inhibitory iNeurons”  
Mentor: Michael Uhler, Ph.D.

Michelle Wang, M.S.  
April 28, 2022  
M.S. Thesis: “Investigating the Function of MicroRNA Variants Linked to Inherited Retinal Disease”  
Mentor: David Turner, Ph.D.

Alexandra Hicks, M.S.  
April 28, 2022  
Mentor: Raymond Trievel, Ph.D.

Manasa Yadavalli, M.S.  
April 28, 2022  
M.S. Thesis: “Investigating the Binding Efficiency of a Novel Nucleotide Analog and Remdesivir to the NiRAN Domain of the SARS-CoV-2 RdRp Using In Silico Alchemical FEP Methods”  
Mentor: Peter Freddolino, Ph.D.

Jarred Howard, M.S.  
December 20, 2021  
M.S. Thesis: “Cas3 from Neisseria lactamica Type I-C CRISPR-Cas Possesses Novel Robustness in Interference”  
Mentor: Yan Zhang, Ph.D.

Zhiying Yang, M.S.  
April 28, 2022  
Mentor: Phyllis Hanson, M.D., Ph.D.
Ph.D. Degrees Awarded

**BIOLOGICAL CHEMISTRY**

**Dissertation Seminar**

*Fabienne Birkle*

"Regulation of Serine Proteases in Blood Clotting and Beyond"

Wednesday, March 2, 2022; 2:00 P.M.
North Lecture Hall, Medical Science II

[https://umich.zoom.us/j/92215248064](https://umich.zoom.us/j/92215248064)

Password: 030222

Dissertation Committee:
Professor Emeritus Alexander J. Ninfa
Professor Emeritus Robert A. Bender
Associate Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek
Associate Professor Patrick J. O’Brien
Professor Stephen W. Ragsdale, Chair
Associate Professor Patrick J. O’Brien
Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek

**BIOLOGICAL CHEMISTRY**

**Dissertation Seminar**

*Divyani Paul*

"Investigating Protein-Membrane Interactions Mediated by Factor X that Regulate the Blood Clotting Cascade"

Friday, January 21, 2022; 3:00 P.M.

Zoom: [https://umich.zoom.us/j/99898345310](https://umich.zoom.us/j/99898345310)

Password: biochem

Dissertation Committee:
Professor Emeritus Alexander J. Ninfa
Professor Emeritus Robert A. Bender
Associate Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek
Associate Professor Patrick J. O’Brien
Professor Stephen W. Ragsdale, Chair

**BIOLOGICAL CHEMISTRY**

**Dissertation Seminar**

*Liu Liu*

"The Regulatory Function of Heme Oxygenase in Modulating Mammalian Heme Bioavailability and Homeostasis"

Wednesday, April 13, 2022; 2:00 P.M.
North Lecture Hall, Medical Science II

[https://umich.zoom.us/j/9904450610](https://umich.zoom.us/j/9904450610)

Password: biochem

Dissertation Committee:
Professor Emeritus Alexander J. Ninfa
Professor Emeritus Robert A. Bender
Associate Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek
Associate Professor Patrick J. O’Brien
Professor Stephen W. Ragsdale, Chair

**BIOLOGICAL CHEMISTRY**

**Dissertation Seminar**

*Christine A. Ziegler*

"Engineering Virus-Like Particles for the Delivery of Genome Editing Enzymes"

Tuesday, February 15, 2022; 2:00 P.M.

Zoom: [https://umich.zoom.us/j/98795938808](https://umich.zoom.us/j/98795938808)

Password: 824971

Dissertation Committee:
Professor Emeritus Alexander J. Ninfa
Professor Emeritus Robert A. Bender
Associate Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek
Associate Professor Patrick J. O’Brien
Professor Stephen W. Ragsdale, Chair

**BIOLOGICAL CHEMISTRY**

**Dissertation Seminar**

*Christine A. Ziegler*

"Mechanisms of nutrient sensing and gene regulation by the E. coli Leucine-responsive Regulatory Protein, a global feast-famine transcriptional regulator"

Wednesday, June 29, 2022; 9:00 A.M.
North Lecture Hall, Medical Science II

[https://umich.zoom.us/j/96898345310](https://umich.zoom.us/j/96898345310)

Password: biochem

Dissertation Committee:
Professor Emeritus Alexander J. Ninfa
Professor Emeritus Robert A. Bender
Associate Professor Emeritus Robert C. Battey
Associate Professor Anne B. Vojtek
Associate Professor Patrick J. O’Brien
Professor Stephen W. Ragsdale, Chair

Images are from flyers made by Beth Goodwin, with a background designed by former graduate student Meredith Skiba for a department retreat t-shirt.
2022–2023 M.S. Students

**Evan Arnold** is a graduate of Michigan State University, East Lansing. Mentor: Ryan Baldridge, Ph.D.

**Sydney Brender** is a graduate of Grand Valley State University in Allendale, MI. Mentor: Bruce Palfey, Ph.D.

**Payton Dunning** is a graduate of Eastern Michigan University, Ypsilanti. Mentor: Raymond Trievel, Ph.D.

**Sabrina Fluharty** is a graduate of Central Michigan University in Mount Pleasant. Mentor: David Turner, Ph.D.

**Anthony Frasier** is a graduate of the University of Michigan, Ann Arbor. Mentors: David Sherman, Ph.D., and Janet Smith, Ph.D.

**Jiawen Jiang** is a graduate of the University of Connecticut, Storrs. Mentor: Nicole Koropatkin, Ph.D.

**Houde Li** is a graduate of China Agricultural University in Beijing, China. Mentor: Patrick O’Brien, Ph.D.

**Kunlin (Karen) Li** is a graduate of the University of Massachusetts, Amherst. Mentor: James Morrissey, Ph.D.

**Ryan McMullen** is a graduate of Madonna University in Livonia, MI. Mentor: Yan Zhang, Ph.D.

**Shannon Stein** is a graduate of Central Michigan University in Mount Pleasant. Mentor: Chase Weidmann, Ph.D.

**Yahui (Emily) Yang** is a graduate of Michigan State University, East Lansing. Mentor: Michael Uhler, Ph.D.

**Sarah Yoon** is a graduate of Regis University in Denver, CO. Mentor: Audrey Seasholtz, Ph.D.

M.S. student/faculty hike at Waterloo State Recreation Area, August 2022. From left: Professor Debra Thompson, Houde Li, Sydney Brender, Shannon Stein, Jiawen Jiang, Evan Arnold, Sarah Yoon, Professor Mike Uhler

M.S. students Shannon Stein, Sydney Brender, Evan Arnold, Anthony Frasier, and Ryan McMullen display their department t-shirts at the 2022 Biological Chemistry Retreat at Kellogg Biological Station.
Incoming Ph.D. Students Join Research Groups

**Sydney Alibeckoff** is a graduate of The Ohio State University, Columbus. Mentors: Ruma Banerjee, Ph.D., and Yatrik Shah, Ph.D.

**Willow Morgan** is a graduate of Rutgers, The State University of New Jersey, Camden. Mentor: Peter Freddolino, Ph.D.

**Carmen Castillo** is a graduate of the University of California, Riverside. Mentor: Markos Koutmos, Ph.D.

**Mason Myers** is a graduate of Ohio University in Athens, OH. Mentor: Yan Zhang, Ph.D.

**Alexi Chabez** is a graduate of Marquette University in Milwaukee, WI, and the University of Michigan, Ann Arbor. Mentor: Emily Scott, Ph.D.

**Jackline Onyango** is a graduate of Kenyatta University in Nairobi, Kenya, and Western Michigan University in Kalamazoo. Mentor: Kathleen Collins, M.D., Ph.D.

**Jeremy Dortch** is a graduate of Colorado State University in Fort Collins. Mentor: Ryan Baldridge, Ph.D.

**Minli Ruan** is a graduate of Fudan University in Shanghai, China. Mentor: Kristin Koutmou, Ph.D.

**Stephen Gonzelez** is a graduate of California State University, Fullerton. Mentor: Raymond Trievel, Ph.D.

**Jenn Russ** is a graduate of Colorado State University in Fort Collins. Mentor: Ryan Baldridge, Ph.D.

**Arkajit Guha** is a graduate of the Indian Institute of Science Education and Research in Pune, India. Mentor: Ruma Banerjee, Ph.D.

**Edian (Andres) Herrera Tequia** is a graduate of the Universidad Nacional de Colombia in Bogotá, Colombia. Mentor: Peter Freddolino, Ph.D.

**Kira Holton** is a graduate of Gustavus Adolphus College in Saint Peter, MN. Mentor: Chase Weidmann, Ph.D.

**Xin Li** is a graduate of China Pharmaceutical University in Nanjing, China. Mentor: Yan Zhang, Ph.D.

**Zexin (Jason) Li** is a graduate of the University of Pittsburgh in Pittsburgh, PA. Mentor: Ling Qi, Ph.D.

Ph.D. student outing to Blast Corn Maze in Dexter, October 2022. From left: Xin Li, Renke Tan, Juan Blume La Torre, Zhiying Yang, Rosa Romero, Caroline Jipa, Claudia Mak, Claire Griffith, Cara Loomis, Andres Herrera Tequia, Alexi Chabez, Kira Holton, Sydney Alibeckoff, Cassie Dutcher, Harsha Gouda, Seok Mu Kwon, Jane Kwon
The 2022 Research Retreat

Science and camaraderie were on the agenda when department members gathered at Kellogg Biological Station on September 16–17 for an in-person research retreat, after a three year hiatus due to pandemic restrictions in 2020 and 2021. Professional and personal connections were forged and strengthened during the seminar and poster sessions, as well as during free time on the premises and around meal tables and the campfire. A morning welcome by Phyllis Hanson and a series of student talks kicked off the program. The six winners of our trainee awards were honored at an afternoon ceremony, which was followed by research talks given by the awardees (see p. 14). New assistant professor Rachel Niederer introduced her research at an evening talk entitled “Uncovering Novel Translational Control Elements Within 5′-UTRs,” and the day concluded with a poster session and party. Old retreat traditions will continue and new ones are sure to be started in September 2023, when the annual retreat will relocate to Maumee Bay Lodge & Conference Center, on the Ohio shoreline of Lake Erie, to avoid scheduled construction at Kellogg.
HALVOR AND MARY CHRISTENSEN AWARD
(excellence in academic scholarship and research)
Awardee: Cara Loomis
Mentor: Emily Scott, Ph.D.
Retreat Talk Title: “Redox Partner Adrenodoxin Allosterically Alters the Function of the Human Steroidogenic Cytochrome P450 11B Enzymes”

ADAM AND MARY CHRISTMAN AWARD
(excellence in academic scholarship and research)
Awardee: Natalia Harris
Mentors: David Sherman, Ph.D., and Janet Smith, Ph.D.
Retreat Talk Title: “Recovery Is Achievable: Biocatalytic Approaches to Diversifying Mitragynine Analogcs for Opioid Substitution”

ANTHONY AND LILLIAN WU AWARD
(achievement in research and potential as a scientist)
Awardee: Roshan Kumar, Ph.D.
Mentor: Ruma Banerjee, Ph.D.
Retreat Talk Title: “A Redox Cycle With Complex II Prioritizes Sulfide Quinone Oxidoreductase-Dependent H2S Oxidation”

MINOR AND MARY LOU COON AWARD
(excellence in academic performance, service, and/or teaching)
Awardee: Zoe Yeoh
Mentors: Melanie Ohi, Ph.D., and Janet Smith, Ph.D.
Retreat Talk Title: “KHNYN Is a Zinc-Finger Antiviral Protein (ZAP) Cofactor that Degrades ZAP-Bound RNA”

LEE MURPHY MEMORIAL PRIZE
(excellence in research with publication of a significant paper or papers)
Co-Awardee: Harsha Gouda
Mentor: Ruma Banerjee, Ph.D.
Retreat Talk Title: “Redox Chemistry Controls Coenzyme B12 Synthesis in Mitochondria”

LEE MURPHY MEMORIAL PRIZE
(excellence in research with publication of a significant paper or papers)
Co-Awardee: Renke Tan
Mentor: Yan Zhang, Ph.D.
Retreat Talk Title: “Cas11 Enables Genome Engineering in Human Cells With Compact CRISPR-Cas3 Systems”
Cryo-EM: Where Are We Now and Where Are We Going?

The 2017 Nobel Prize in Chemistry was awarded to Jacques Dubochet, Joachim Frank, and Richard Henderson for “developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution.” Single particle cryo-electron microscopy (cryo-EM) continues to grow into a mainstream structural biology technique. Biological Chemistry faculty member Michael Cianfrocco led a Fall 2022 graduate course, BiolChem 713, that focused on the latest developments and innovations in using cryo-EM to study macromolecular 3D structure. Improvements in sample preparation, image analysis, and biochemical reconstitution have enabled structural biologists to understand complex molecular mechanisms. Talks by five invited scientists were included in the departmental seminar series, and registered students engaged in discussions with each speaker. Course director Michael Cianfrocco’s research program focuses on the structural biology and biophysics underlying microtubule-based intracellular transport through the use of cryo-EM, single molecule TIRF, and biochemistry, and his team also develops cloud computing tools for cryo-EM to facilitate its adoption and to remove barriers for new users.

Cargo Transport by Dynein/Dynactin
Andrew Carter, Ph.D. • MRC Laboratory of Molecular Biology
September 13, 2022

Structural Basis for HCMV Receptor Recognition and Antibody Neutralization
Claudio Ciferri, Ph.D. • Genentech
September 27, 2022

Capturing Native and Intermediate States at Atomic Resolution by Cryo-EM
Z. Hong Zhou, Ph.D. • University of California, Los Angeles
October 18, 2022

Advanced Methods in Cryogenic Correlative Light and Electron Microscopy:
From Super-Resolution to Fluorescent Biosensors
Peter Dahlberg, Ph.D. • SLAC National Accelerator Laboratory
October 25, 2022

Single Particle Cryo-EM of INO80: The Basis of Its Mechanistic Versatility
Yifan Cheng, Ph.D. • University of California, San Francisco
November 1, 2022

* The Rowena Matthews Lectureship in Biological Chemistry *
In Memory

Bernard Agranoff, M.D.
1926–2022

Bernard Agranoff, M.D., who was a distinguished member of our department and of the Department of Psychiatry and the Mental Health Research Institute (now the Michigan Neuroscience Institute), passed away on October 21, 2022. Dr. Agranoff received his B.S. degree from the University of Michigan in 1946 and his M.D. degree from Wayne State University in 1950. He joined the University of Michigan faculty as a research scientist in 1960, was appointed associate professor in the Department of Biological Chemistry in 1961, and was promoted to professor in 1965 and senior research scientist in 1997. In 1983 he was named Professor of Biological Chemistry in the Department of Psychiatry. From 1991–2001 he held the title of Ralph Waldo Gerard Professor of Neurosciences. Dr. Agranoff was director of the Mental Health Research Institute from 1985–1995 and director of the Neuroscience Laboratory from 1983–2002 before retiring in 2003. He mourned the loss of his wife, Raquel Agranoff, in 2020, and is survived by his loving sons, William and Adam, their partners, and four grandchildren.

Early in his career, Dr. Agranoff demonstrated a requirement for protein synthesis in the goldfish brain for the formation of long-term memory, a major advance in neuroscience. His research extended to optic nerve regeneration and led to identification of molecular markers of neuroplasticity. He was one of the founding editors of the classic textbook Basic Neurochemistry, and his many former students and fellows are now investigators throughout the world.

Dr. Agranoff was the recipient of several of the University’s most prestigious honors, including the Distinguished Faculty Achievement Award (1984), the Distinguished Faculty Lectureship in Biomedical Research (1986), and the Henry Russel Lectureship (1988). He was a member of the National Academy of Medicine, served as Fogarty Scholar-in-Residence at the National Institutes of Health, and was a fellow of the American Academy of Arts and Sciences.

Daisy Sheldon McCann, Ph.D.
1927–2022

We regretfully share word of the death of Daisy Sheldon McCann, Ph.D., who was a faculty member in the Department of Biological Chemistry from 1970 to 1994. Surrounded by the love of her family, Daisy passed away peacefully on the evening of Friday, May 20, 2022, in the Toronto home that she shared with her son, Robert; daughter-in-law, Carolyn; and grandchildren, Ian, Dylan, and Aiden. Daisy was also survived by her sister-in-law Julie and numerous nieces, nephews, and cousins, and predeceased by her loving husband of 54 years, John Joseph McCann, and his five siblings. Born Gisela Schoendorff, Dr. McCann was a research biochemist and entrepreneur, who taught in the Department of Biological Chemistry at the University of Michigan, founded the temp-to-perm placement service Add-a-Tech, Inc., and served for many years as the Executive Director of the Clinical Ligand Assay Society. She was a source of wisdom and inspiration to many.

Robert Zand, Ph.D.
1930–2022

With sorrow we announce the passing of Robert Zand, Ph.D., who was a faculty member in our department for many years. Dr. Zand received his B.S. from the University of Missouri in 1951 and his Ph.D. in Biochemistry from Brandeis University in 1961. After postdoctoral training at Brandeis University and Harvard University, he joined the University of Michigan as an associate research biophysicist in 1963 and was promoted to research scientist in 1986. He was appointed assistant professor in the Department of Biological Chemistry in 1968, and was promoted to associate professor in 1973, and professor in 1986. He received the additional appointments of professor of macromolecular science and engineering in 1992 and adjunct professor of biophysics in 2008. Bob and his wife Charlene relocated to be near family in New York after his retirement at the end of 2012. He died in Rochester, NY, on September 14, 2022, at the age of 92.

Dr. Zand’s research focused on a brain protein that was soluble in organic solvents, evolving into the study of myelin basic protein and its role in experimental autoimmune encephalomyelitis and the etiology of multiple sclerosis. In addition to this work, Dr. Zand was involved in studies of unnatural cyclic and bicyclic amino acids, synthesis of semi-conducting synthetic polymers, and the stabilization of porcine heart valves in collaboration with Dr. Robert Levy. His research resulted in numerous scientific publications, chapters in books, and presentations at international meetings.
A department dinner celebration was held at the Postma Family Clubhouse at the U-M Golf Course on December 8 to highlight the year’s milestones and to recognize our centennial. Chair Phyllis Hanson welcomed new members, acknowledged faculty achievements, and publicly thanked the administrative staff for their many contributions. Associate Professor and 1993 alumnus Bruce Palfey entertained and informed attendees with his overview of 100 years of the department’s history.

Supporting Biological Chemistry

The Department of Biological Chemistry relies upon the generosity of donors to fund many aspects of its operations. Gift funds are essential to supporting activities beyond our basic operations. From endowed professorships and lectureships, to graduate student fellowships, seminar speakers, and gifts in direct support of research, donations help make the department an intellectually exciting and vibrant community. As a benefactor of the Department of Biological Chemistry, you can direct your gift in multiple ways:

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