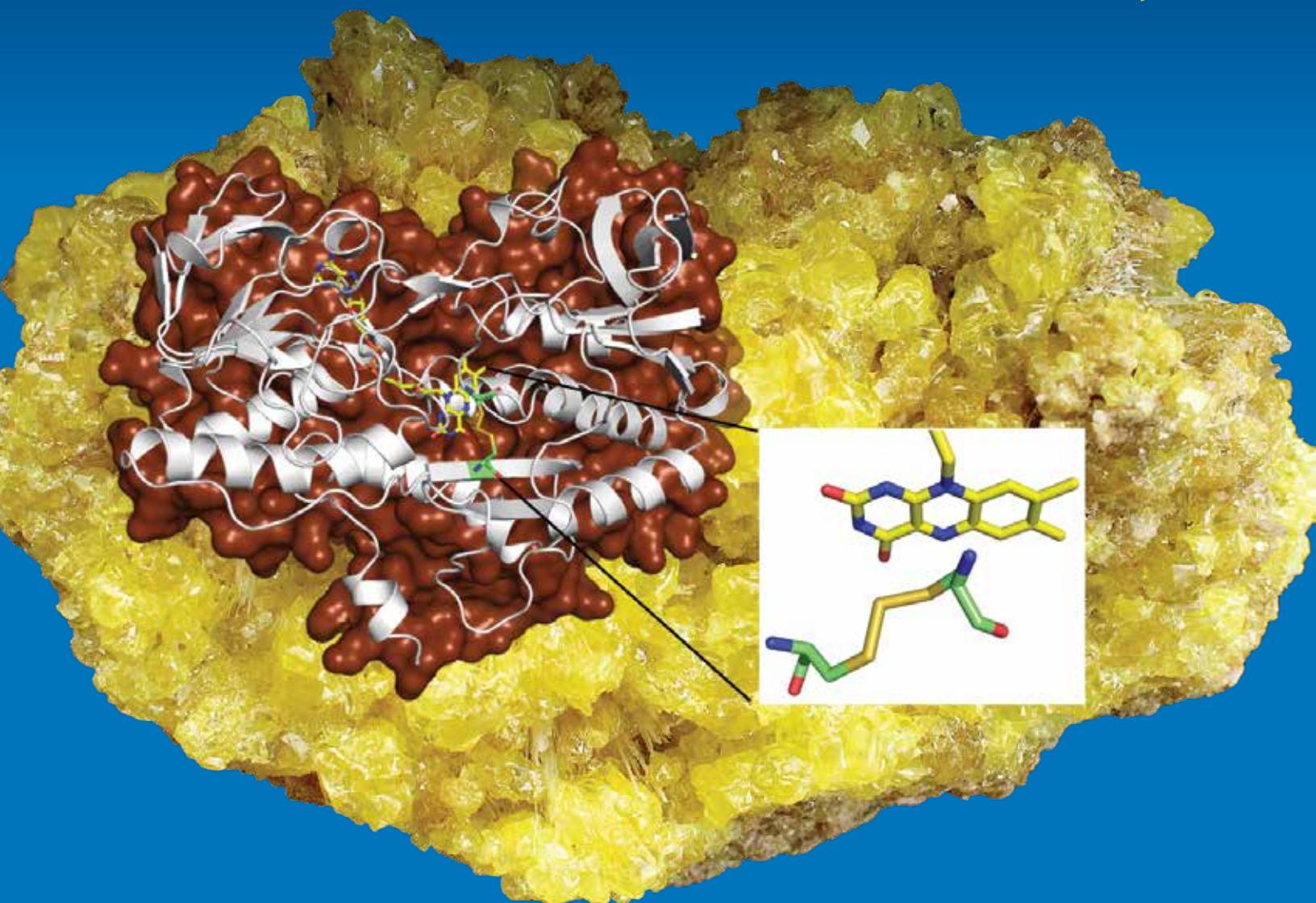


BIOLOGICAL CHEMISTRY
News & Review
2019



BIOLOGICAL CHEMISTRY

Letter from the Chair Phyllis Hanson M.D., Ph.D.

Dear Friends of Biological Chemistry

As my first year here comes to a close, I am delighted to reflect on the vibrant scientific community I have joined and to share my excitement for the future of the Department. I hope that each of you will find a way to connect or reconnect with us over the coming year and invite you to join us for a Tuesday noon seminar, stop by the Department, peruse the website, or write anytime!

Our community of 26 primary instructional track faculty along with secondary, affiliate, and research track faculty are engaged in combinations of cutting-edge research, exemplary teaching, and impactful service. Our postdoctoral, Ph.D., M.S., and undergraduate trainees continue to achieve great things while defining and reaching their personal goals. Our research and administrative staff are among the best and enable all that we do. Here I want to highlight just a few developments and achievements from the past year, while inviting you to browse many more across the pages of this newsletter.

Congratulations to our faculty who earned promotions in 2019, including Uhn-Soo Cho who was promoted from Assistant Professor to Associate Professor with tenure, and Angela Fleischhacker who was promoted from Research Investigator to Assistant Research Scientist. Also special congratulations to Ruma Banerjee who received the 2019 ASBMB-Merck Award for outstanding contributions to research in biochemistry and molecular biology and to Yang Zhang who will receive the 2020 ASBMB DeLano Award for Computational Biosciences. I also want to highlight this year's new Endowment for Basic Sciences Research Staff Award which was given to Catherine Baker, Research Lab Specialist in the Morrissey lab, and the American Heart Association Postdoctoral Fellowship awarded to Romila Mascarenhas of the Banerjee lab for her project "Cytosolic Vitamin B12 Trafficking and Disease."

Highlights of science in the Department this year are many and are regularly updated on our website (<https://medicine.umich.edu/dept/biological-chemistry>). Some notable advances include discovery of how fungi produce prenylated indole alkaloids with an almost unprecedented enzyme-catalyzed Diels-Alder reaction (Smith and Sherman labs, *Nature Chemistry* 2019), new insight into mechanisms used to detoxify hydrogen sulfide in the colon (Banerjee and Cho labs, *Cell Chemical Biology* 2019), development of a new CRISPR-Cas3 system that enables targeting and deletion of long stretches of DNA, effectively serving as a "DNA shredder" vs. the now widely used Cas9 based "DNA scissors" (Yan Zhang lab, *Molecular Cell* 2019), and elucidation of gene-independent mechanisms for regulating transcriptional propensity across the genome (Freddolino lab, *Cell Systems* 2019 and *Elife* 2018).

We had a very successful year with graduate students, granting seven Ph.D. degrees and eight M.S. degrees. Our students continue to be among the most talented and hard-working anywhere, and we look forward to supporting and following their success in the years ahead. We welcome 4 new second-year Ph.D. students, 10 new Master students, and 13 first-year Program in Biological Sciences (PIBS) Ph.D. students who are rotating through our laboratories and immersed in our dynamic first-year curriculum.

Our seminar series continues to provide a weekly highlight for both the Department and the larger University community. The exciting lineup of speakers, made possible in part by your generosity in supporting named lectureships, continues to fill the lecture hall with engaged students, faculty, research staff, and others. Please note our lineup of phenomenal lectureship speakers on pages 3-4 as well as the special series of seminars on protein quality control on page 12 organized by Assistant Professor Ryan Baldrige, and consider contributing to sustain these unique events.



Department Holiday Party, December 2018

As in previous years, this past fall we had another wonderful retreat that included excellent talks, posters, and fellowship. Everyone who attended had a great time at the Kellogg Biological Station surrounded by beautiful Gull Lake. After the business day concluded the Department's students, postdoctoral fellows, and faculty together enjoyed games of volleyball, frisbee, swimming, boating, and memorable late-night BBQs. I enjoyed and am honored to be a part of such an event, providing a unique opportunity to get to know each other in an informal setting.

As you read this, we will be in the heart of our recruitment efforts. One of our important goals is to expand the Department, with plans to hire new junior and senior faculty addressing the most exciting questions in biological chemistry over the next few years. I look forward to working with newly appointed associate chair Pat O'Brien, our recently elected faculty advisory committee (Jim Morrissey, Janet Smith, Peter Freddolino, Yali Dou, and Angela Fleischhacker), department staff, and medical school leadership to optimize our space, equipment, and infrastructure to support our success and meet the changing needs of modern biochemistry. Please send your best and brightest trainees our way!

I would like to sincerely thank everyone for all you have done to help acclimate me into the Department and the University. It has been a lot of fun getting to know people and to understand the ins and outs of the Department. Individually we are strong, but together we are stronger. I am always interested in hearing from all our Department's members and friends, past and present. Please feel free to email me at pihanson@umich.edu with any information, questions, or to keep us abreast of where you are and what you are doing. You are all important parts of our community, and a strong foundation on which to build the future of Biological Chemistry!

Finally, I hope you will look forward with us to celebrations in 2022 when we will mark the Department's centennial.

Phyllis J. Hanson



Endowment for Basic Sciences Awards Luncheon, May 2019



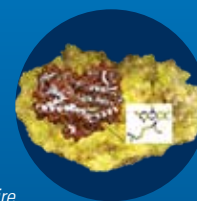
Department Retreat at Kellogg Biological Station, August 2019

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On the Cover

Submitted by Ruma Banerjee, Vincent Massey Collegiate Professor, and Uhn-Soo Cho, Associate Professor, Department of Biological Chemistry



The human colon hosts about 100 trillion microbes that acquire nutrients from undigested materials from our diet. In turn, cells lining the colon use the microbial metabolite butyrate as their primary energy source. The colon also houses bacteria that produce hydrogen sulfide, a respiratory poison, which is removed by the action of SQR (short for sulfide quinone oxidoreductase), an enzyme found in the mitochondrion. Both energy production from butyrate and hydrogen sulfide clearance require coenzyme Q10, a naturally occurring compound, posing the dilemma of how priority for competing processes is established. Results from the laboratories of Ruma Banerjee and Uhn-Soo Cho showed that SQR can form coenzyme A persulfide, which inhibits energy production from butyrate, and allows prioritization of hydrogen sulfide clearance to protect cells against poisoning. The team also reported crystal structures of human SQR, which revealed that hydrogen sulfide clearance relies on an unexpected chemical strategy involving a cysteine trisulfide.

Reference Article: Landry AP, Moon S, Kim H, Yadav PK, Guha A, Cho US, Banerjee R. A Catalytic Trisulfide in Human Sulfide Quinone Oxidoreductase Catalyzes Coenzyme A Persulfide Synthesis and Inhibits Butyrate Oxidation. *Cell Chem Biol.* 2019, *in press.*

THE ENDOWED LECTURESHIPS: 2019-2020

Rowena Matthews Lectureship in Biological Chemistry



Wilfred van der Donk, Ph.D.

Richard E. Heckert Professor of Chemistry,
University of Illinois at Urbana-Champaign
Investigator, Howard Hughes Medical Institute

September 24, 2019



William E.M. Lands Lectureship on the Biochemical Basis for the Physiology of Essential Nutrients



Peter Tontonoz, M.D., Ph.D.

Professor of Pathology and Laboratory Medicine,
University of California, Los Angeles

October 15, 2019



George William Jourdian Lectureship in Biological Chemistry



Vamsi Mootha, M.D.

Professor of Systems Biology and Medicine,
Harvard Medical School
Investigator, Howard Hughes Medical Institute

November 12, 2019



G. Robert Greenberg Lectureship in Biological Chemistry



Brian Hoffman, Ph.D.
Professor of Chemistry,
Northwestern University

March 10, 2020



Martha Ludwig Lectureship in Structural Biology



Elena Conti, Ph.D.
Director of Structural Cell Biology,
Max Planck Institute of Biochemistry

March 24, 2020



Irwin J. Goldstein Lectureship in Glycobiology



Lara Mahal, Ph.D.
Professor of Chemistry and Canada
Excellence Research Chair in Glycomics,
University of Alberta

April 7, 2020



The Distinguished Graduate Lectureship



Vahé Bandarian, Ph.D.
Professor of Chemistry,
The University of Utah

April 28, 2020

Faculty Awards and Achievements



Uhn-Soo Cho, Ph.D.
Promoted to Associate Professor of Biological Chemistry



Angela Fleischhacker, Ph.D.
Promoted to Assistant Research Scientist of Biological Chemistry



James Morrissey, Ph.D.
UMMS Learning Environment Task Force Teaching Commendation



Patrick O'Brien, Ph.D.
Appointed as the Associate Chair of Biological Chemistry



Audrey Seasholtz, Ph.D.
Appointed as an Associate Director of the Neuroscience Graduate Program



Janet Smith, Ph.D.
Elected as a Fellow of the American Crystallographic Association



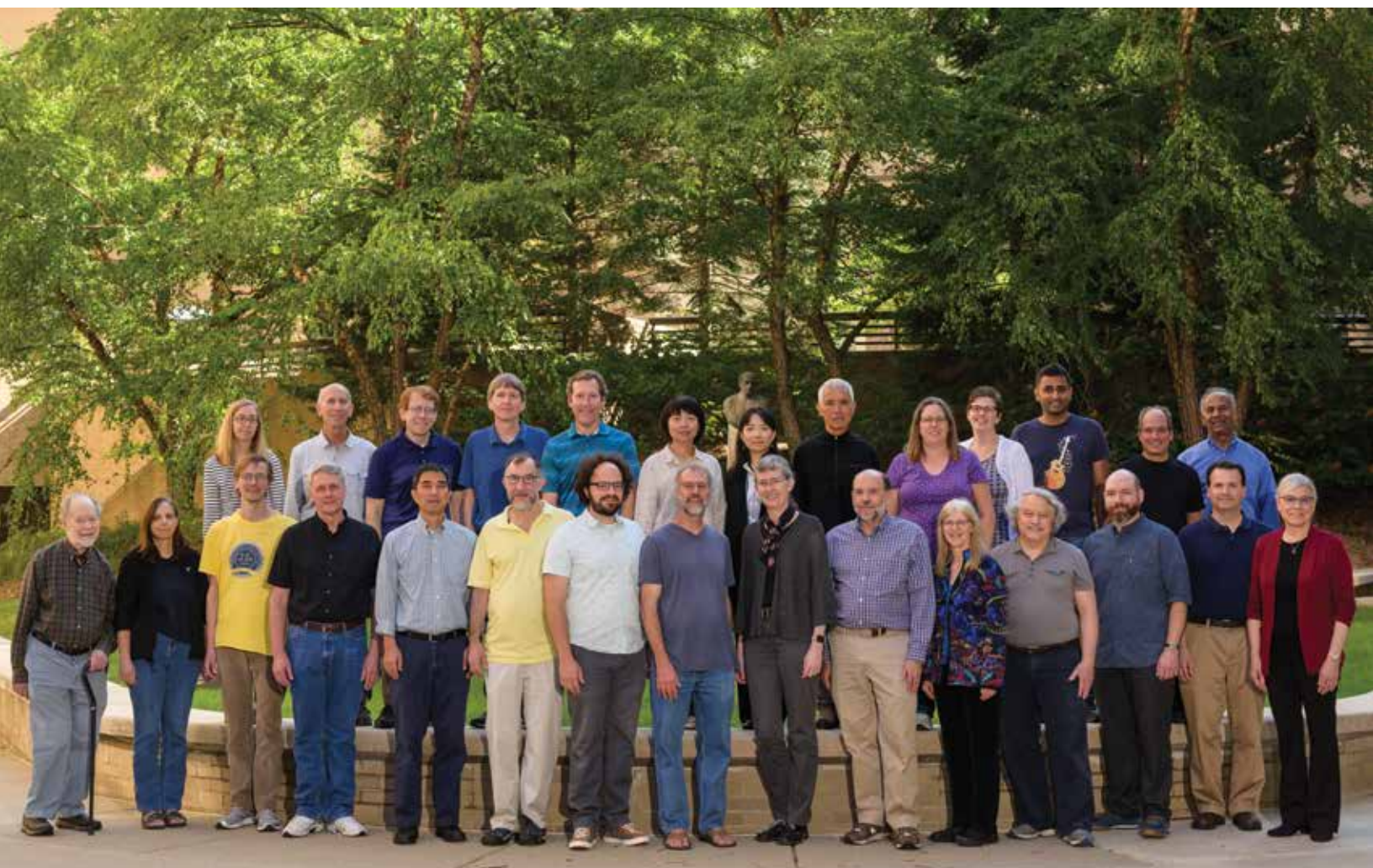
Jeanne Stuckey, Ph.D.
2019 Endowment for Basic Sciences Teaching Award



Zhaohui Xu, Ph.D.
Appointed as the Interim Director of the Program in Chemical Biology



Yang Zhang, Ph.D.
2020 ASBMB DeLano Award for Computational Biosciences



Faculty Highlights



Research in Kaushik Rangunathan's Laboratory

Much like clocks that carry 'witness marks'—intentional or accidental grooves that serve as remnants of the watchmaker's thought process, cells have special molecular

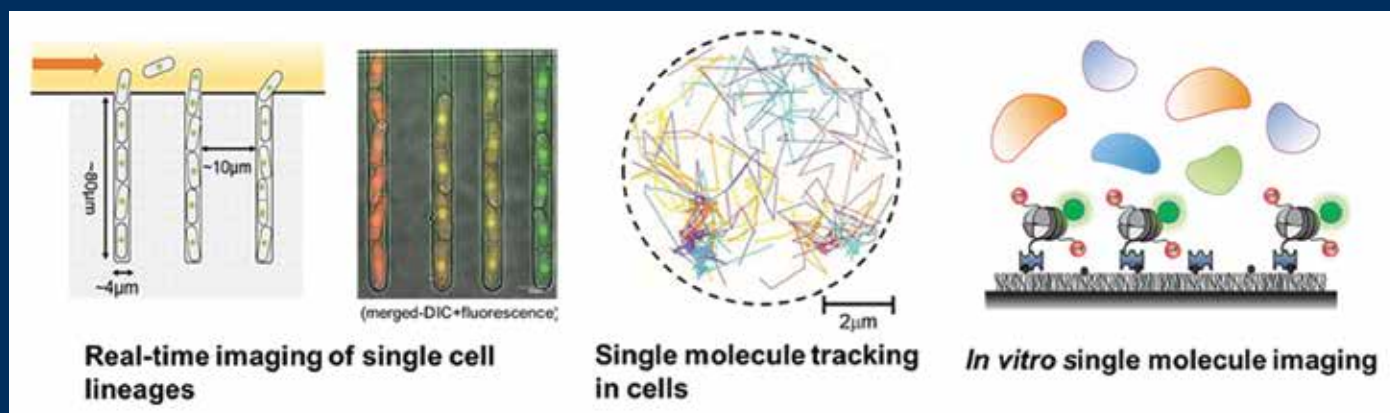
imprints that preserve memories of past experiences. This process impinges on the covalent modification of DNA and DNA packaging proteins called histones. Establishing epigenetic states enables cells with identical genomes to create unique histories and identities that are often preserved throughout their lifetimes. My lab is interested in understanding how cells establish and 'remember' epigenetic memories that are subsequently passed on to daughter cells. Furthermore, errors in passing on this information lead to diseases such as cancer, where cells lose all perspective of which genes ought to stay silent and which ones must be active. Our goal is to use a unique combination of genetics, biochemistry, and high-resolution imaging approaches to animate the secret lives of molecules that encode and transmit epigenetic states.

Cells experience a wide range of unforeseen challenges in their natural environment. Under these circumstances, change is often not a choice. Cells inevitably find new ways to adapt and survive upon exposure to acute stress. Plants make decisions about their flowering times based on their time of exposure to cold conditions. Cancer cells, when exposed to chemotherapeutic agents, can become resistant, posing a significant challenge to treatment and worsening patient outcomes. Epigenetic changes produce rapid, reversible, and adaptive cellular responses that have profound consequences for cell growth and survival. One area of research in my lab delves into how cells make epigenetic choices that could be the thin red line between certain death and cell survival. We use real-time microfluidic-based devices to visualize the decisions that cells make in real-time.

The epigenetic choices that cells make are the outcome of molecules within the cell interacting with each other at specific sites in the genome. We do not understand how epigenetic molecules traverse the complex and chaotic environment of the nucleus to find each other. We labeled proteins involved in epigenetic silencing with a fluorescent reporter. Each time a molecule zips across the nucleus, we record its trajectory and its speed. In collaboration with Julie Biteen's lab in Chemistry we discovered that how fast molecules move is really a question of what they encounter. In essence, the affinity of interactions can either slow down or speed up proteins diffusing within the nucleus. Based on this quantitative imaging approach, we directly measured the biochemical properties of epigenetic regulators in living cells. These studies bridge a chasm that currently exists between reconstitution approaches and the behavior of proteins within the native cellular context.

Ultimately, the most stringent test of our models lies in our capacity to reconstitute their activities in a test tube. We purify proteins involved in epigenetic silencing and identify how they form complexes to carry out their unique cellular functions. In one example, we discovered that a protein long thought to be an enzyme has a non-enzymatic function that resets epigenetic memory. We overturned a long-standing paradigm wherein the enzymatic reversal of histone modifications was widely believed to be the sole mechanism that regulates epigenetic inheritance.

Students in my lab learn interdisciplinary thinking and use a variety of approaches to attack curiosity-driven scientific questions. A project could easily shift between using genetics to create new yeast strains to purifying complexes that fulfill distinct molecular functions. Alternatively, a project that starts out using high-resolution imaging approaches could ultimately employ genetics to engineer precise cellular perturbations. My own scientific journey was simply the outcome of my incessant curiosity to understand the world around me. Like most teenagers caught up reading mystery novels, I always wanted to be a detective. Little did I know that being a scientist is just like being a detective investigating the mysteries of all things small, invisible, and beautiful.



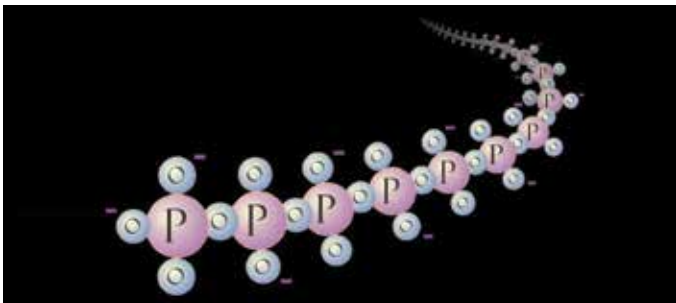
Faculty Highlights



Biochemistry of Blood Clotting: Research in Jim Morrissey's Laboratory

The blood clotting system keeps us all alive by limiting bleeding following injury, but it also has a dark side: thrombosis, or unwanted clots forming in arteries or veins, is a leading cause of disability and death worldwide. Not surprisingly, regulation of the blood clotting system is very complex and much still remains to be understood in molecular terms. The Morrissey lab comprises a talented and hard-working team of graduate students, technicians, postdoctoral fellow, and research assistant professor whose research centers on understanding the control mechanisms that regulate blood clotting in health and disease. Current projects include:

- **Polyphosphate:** Polyphosphates are linear polymers of inorganic phosphates that have been comparatively little studied in higher eukaryotes. In 2006, the Morrissey lab was the first to report that polyphosphate—which is released from activated platelets—is a potent modulator of blood clotting.

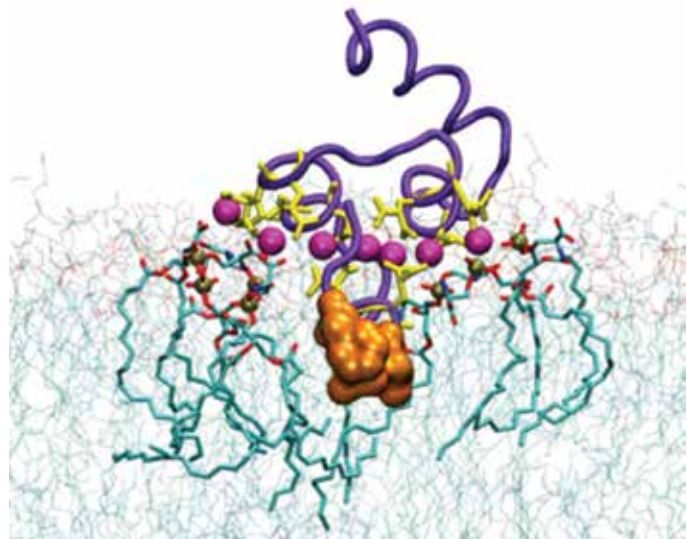


Polyphosphate

A series of mechanistic studies published since then has delineated the specific steps in the blood clotting cascade that are accelerated by polyphosphate. These studies have provided new explanations for ways in which platelets modulate blood clotting reactions that couldn't be explained before. This research has now shown that platelet polyphosphate modulates other important processes such as inhibiting the complement cascade and promoting cell differentiation that can underlie normal processes like wound healing and abnormal processes like fibrotic disease. Recently, the Morrissey lab has collaborated with the lab of Dr. Jay Kizhakkedathu at U. British Columbia to develop polyphosphate inhibitors as potential antithrombotic drugs with a completely novel mechanism of action relative to conventional anticoagulants. The Morrissey lab is also

actively collaborating with several U. Michigan investigators to explore new roles for polyphosphate and new avenues for intervention.

- **Trauma-Induced Coagulopathy:** In 2018, our University assumed the prime contractor role for TACTIC, a large, multi-center grant funded by the National Heart, Lung, and Blood Institute of NIH. Led by Dr. Morrissey at U. Michigan and Dr. Steve Wisniewski at U. Pittsburgh, TACTIC brings together a unique blend of trauma surgeons, clinical trial specialists, and basic researchers across the United States to focus on understanding why traumatic injury can cause life-threatening dysregulation of the blood clotting system. TACTIC is identifying possible targets of intervention in trauma-induced coagulopathy, including polyphosphates, histones, and other damage-associated molecules, and is helping define the changes in the pathophysiology of trauma patients during resuscitation.
- **Protein-Membrane Interactions:** This exciting project grew from a collaboration between the Morrissey lab and the labs of Dr. Emad Tajkhorshid at U. Illinois (molecular dynamics simulations) and Dr. Chad Rienstra at U. Wisconsin (solid-state NMR) to understand, with atomic resolution, how blood clotting proteins bind reversibly to membrane surfaces and how this membrane binding interaction regulates the clotting system. It is currently funded by a Transformative Research Award from the NIH Director's Office with the goal of creating a toolkit of new, high-resolution methods that will allow one to solve atomic-scale structures of membrane lipids as they bind to biologically important ligands, including proteins. These studies will allow a new type of structural insight into how membrane lipids regulate the function of membrane proteins.



Snapshot from a molecular dynamics simulation of the membrane-binding domain from one of the human blood clotting proteins (factor VII) reversibly bound to a membrane surface (Collaboration with Emad Tajkhorshid, U. Illinois).

2019 Annual Graduate Student Awards



THE HALVOR AND MARY CHRISTENSEN AWARD for Demonstrated Excellence in Academic Scholarship and Research Contributions
Awardee: **Brian Peterson**
Mentor: Ryan Baldrige, Ph.D.



THE ADAM AND MARY CHRISTMAN AWARD for Demonstrated Excellence in Academic Scholarship and Research Contributions
Awardee: **Liu Liu**
Mentor: Stephen Ragsdale, Ph.D.



THE ANTHONY AND LILLIAN LU AWARD for Academic Achievement and Potential as a Scientist, Undergraduate Level
Awardee: **Liam McDevitt**
Mentor: Ruma Banerjee, Ph.D.



THE ANTHONY AND LILLIAN LU AWARD for Academic Achievement and Potential as a Scientist, Graduate Level
Awardee: **Fabienne Birkle**
Mentor: James Morrissey, Ph.D.



THE MINOR AND MARY LOU COON AWARD for Overall Excellence in Research, Teaching, and Service to the Department
Awardee: **Michael Wolfe**
Mentor: Peter Freddolino, Ph.D.



THE DZIEWIATKOWSKI AWARD for the Most Outstanding Ph.D. Dissertation Submitted in the Past Year
Awardee: **Meredith Skiba, Ph.D.**
Mentor: Janet Smith, Ph.D.

Ph.D. Degrees Granted



Justin R. McNally, Ph.D.
January 16, 2019
"Kinetic Analysis of Human DNA Ligase III"
Mentor: Patrick O'Brien, Ph.D.



Thomas J. Jurkiw, Ph.D.
January 17, 2019
"Mechanism and Specificity of Human DNA Ligase I"
Mentor: Patrick O'Brien, Ph.D.



Elizabeth T. Abshire, Ph.D.
April 3, 2019
"Structural and Functional Characterization of the Human Enzyme Nocturnin"
Mentors: Raymond Trievel, Ph.D., and Aaron Goldstrohm, Ph.D.



Claire Cato, Ph.D.
April 22, 2019
"Structural and Biochemical Analysis of G Protein-Coupled Receptor Kinase Activation and Small Molecule Inhibitor Specificity"
Mentors: John Tesmer, Ph.D., and Janet Smith, Ph.D.



René M. Arvola, Ph.D.
April 24, 2019
"Messenger RNA Control by Pumilio"
Mentor: Aaron Goldstrohm, Ph.D.



Michael B. Wolfe, Ph.D.
July 15, 2019
"Regulation of Gene Expression Through Nucleic Acid Binding Proteins: New Paradigms, Perspectives, and Tools"
Mentor: Peter Freddolino, Ph.D.



Jennifer A. Bohn, Ph.D.
July 30, 2019
"APOBEC3H Antiviral Mechanisms Driven by Protein-Nucleic Acid Interactions: Structure and Function"
Mentor: Janet Smith, Ph.D.

M.S. Degrees Granted



Kristena Abdelmalak, M.S.

May 2, 2019

Master's Paper: "*A Review of Acute Myeloid Leukemia*"

Course Track Mentor: Alex Ninfa, Ph.D.



Mohamad Bazzi, M.S.

May 2, 2019

Master's Paper: "*Modern Therapies for Cystic Fibrosis*"

Course Track Mentor: Alex Ninfa, Ph.D.



Christine Chang, M.S.

May 2, 2019

Master's Paper: "*Radial Glia-Like Cells and Adult Neurogenesis: Regulation, Mechanisms, and Diseases*"

Course Track Mentor: Daniel Goldman, Ph.D.



Max Gramelspacher, M.S.

August 20, 2019

Thesis: "*Sharing of Adaptation Proteins Between Cohabiting CRISPR-Cas Systems*"

Research Track Mentor: Yan Zhang, Ph.D.

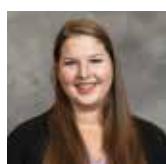


Parker Groom, M.S.

May 2, 2019

Master's Paper: "*Bone's Communicative Role in Endocrine Regulated Homeostasis: Mapping the Crosstalk Between Bone and Other Organ Systems*"

Course Track Mentor: Renny Franceschi, Ph.D.



Rebecca Jacobs, M.S.

May 2, 2019

Master's Paper: "*Transposable Elements, Age-Related Epigenetic Changes, and Neurodegenerative Disease: Could Reverse Transcriptase Inhibitors Slow Disease Progression?*"

Course Track Mentor: Audrey Seasholtz, Ph.D.



Kelsa (Krickett) Kzyak, M.S.

May 2, 2019

Master's Paper: "*Efficacy of Arginine Supplementation as a Therapy for Blood Clotting Related Disorders*"

Course Track Mentor: James Morrissey, Ph.D.



Michael Schmidt, M.S.

August 20, 2019

Thesis: "*Experimental Characterization of Computationally Predicted Esterases from Escherichia coli*"

Research Track Mentor: Peter Freddolino, Ph.D.

New Ph.D. Students



Amanda Ames received her Bachelor of Arts from Rollins College in Winter Park, FL, in May 2018.

Mentor: Kaushik Rangunathan, Ph.D.



Harsha Gouda received his Integrated Bachelor and Master of Science from the Indian Institute of Science Education and Research in Pune, India, in May 2019.

Mentor: Ruma Banerjee, Ph.D.



Michael Rankin received his Bachelor of Science from Michigan State University in East Lansing, MI, in May 2018.

Mentor: Janet Smith, Ph.D.



Jenna Veenstra received her Bachelor of Arts from Dordt College in Sioux Center, IA, in May 2018.

Mentor: Patrick O'Brien, Ph.D.

New M.S. Students



Francis DeVine received her Bachelor of Science from the University of Michigan, Ann Arbor, in December 2014.

Course Track Mentor: Peter Freddolino, Ph.D.



Sarah Ferris received her Bachelor of Science from the University of Michigan, Ann Arbor, in April 2018.

Research Track Mentor: Stefanie Galban, Ph.D.



Cameron Fornwald received his Bachelor of Science from Central Michigan University in Mt. Pleasant, MI, in May 2019.

Course Track Mentor: Patrick O'Brien, Ph.D.



Megan Huynh received her Bachelor of Science from the University of Michigan, Dearborn, in April 2019.

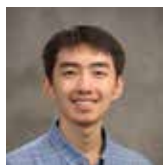
Course Track Mentor: James Morrissey, Ph.D.

New M.S. Students *continued*



Allison Maebius received her Bachelor of Science from the University of Michigan, Ann Arbor, in May 2019.

Research Track Mentor: Audrey Seasholtz, Ph.D.



Tianshu Pan received his Bachelor of Science from China Pharmaceutical University in Nanjing, China, in July 2019.

Research Track Mentor: Renny Francheschi, Ph.D.



Joseph Maniaci received his Bachelor of Science from the University of Michigan, Ann Arbor, in May 2019.

Course Track Mentor: Chang Kim, Ph.D.



Kendall Perkins received her Bachelor of Arts from Rollins College in Winter Park, FL, in May 2018.

Research Track Mentor: Michael Uhler, Ph.D.



Madeline Motsinger received her Bachelor of Science from the University of Wisconsin, Madison, in May 2019.

Research Track Mentor: Phyllis Hanson, M.D., Ph.D.



Mandra Quassis received her Bachelor of Science from the University of Michigan, Dearborn, in April 2019.

Course Track Mentor: Stephen Ragsdale, Ph.D.

Student Achievements and Recognition

Yuqi Wang, a graduate student in James Morrissey's lab, received an American Heart Association Predoctoral Fellowship in November 2018 for her project "The Mechanisms by Which Polyphosphate and Nucleic Acids Trigger Blood Clotting."

Liu Liu, a graduate student in Stephen Ragsdale's lab, received an American Heart Association Predoctoral Fellowship in November 2018 for her project "Investigation into the Regulatory Role of Heme on the Conformation and Function of Heme Oxygenase 2."

Brian Peterson, a graduate student in Ryan Baldrige's lab, received a National Science Foundation Graduate Research Fellowship for his proposal "Mechanistic and Functional Characterization of Hrd1, a Critical Component of ER Protein Quality Control."

Dr. Meredith Skiba, a recent graduate of Janet Smith's lab, received a ProQuest Distinguished Dissertation Award for 2018. This award, which includes an honorarium of \$1,000, is given in recognition of the most exceptional scholarly work produced by doctoral students at the University of Michigan who completed their dissertations in 2018. Meredith is currently a postdoctoral fellow at Harvard Medical School in the lab of Dr. Andrew Kruse.

Adam Thelen, a graduate student in Patrick O'Brien's lab, received a 2018-19 Endowment for the Development of Graduate Education (EDGE) Award from the Endowment for Basic Sciences (EBS) in the Medical School. Adam studies the mechanisms and substrate specificities of human and bacterial enzymes that repair alkylation damage in DNA.

Amanda Ames, a second-year graduate student in Kaushik Raganathan's lab, was appointed to the Genetics Training Program for 2019-2020.

Jenna Veenstra, a second-year graduate student in Patrick O'Brien's lab, was appointed to the Genetics Training Program for 2019-2020.

Beth Rousseau, a graduate student in David Turner's lab, was the recipient of a PIBS 2019 Graduate Student Award for her outstanding efforts in Research, Service, and Promoting Diversity, Equity, and Inclusion. Beth's award was presented during the PIBS 20th Anniversary Celebration in September 2019 (See p.11).

PIBS 20th Anniversary Celebration

The Program in Biomedical Sciences (PIBS), which coordinates admissions and first year graduate studies for Biological Chemistry and 13 other Ph.D. programs at the University of Michigan, celebrated its 20th anniversary in September 2019. A welcome reception at the University of Michigan Museum of Art kicked off the PIBS reunion on the evening of September 22. Remarks, career talks, poster presentations, and a networking session on September 23 gave current Ph.D. students, PIBS alumni, PIBS faculty, and other members of the PIBS community opportunities to learn about and celebrate the past, present, and future of the program.

As part of the PIBS festivities the department hosted a brunch for current members and two special guests, PIBS alumni Rebecca Haeusler and Jay Pieczynski. Dr. Haeusler earned her Ph.D. with David Engelke in 2007 and is currently an Assistant Professor of Pathology and Cell Biology at Columbia University. Dr. Pieczynski earned his Ph.D. with Ben Margolis in 2010 and is currently an Assistant Professor of Biology at Rollins College. David Engelke, Professor Emeritus of Biological Chemistry, served as the founding director of PIBS, and Anne Vojtek, Associate Professor of Biological Chemistry, is currently an associate director of PIBS.



A Unique Course on an Emerging Area of Biochemistry: Protein Quality Control

A Fall 2019 graduate course that explored protein surveillance and degradation in different cellular locations was organized by Ryan Baldrige, an assistant professor in the Biological Chemistry Department. The six invited speakers were all leaders in the field of protein quality control, and their seminars detailed discoveries unique to the microenvironments of the endoplasmic reticulum, nucleus, lipid droplets, mitochondria, ribosome, and plasma membrane. The entire department benefited from the course, since the seminars were integrated into the departmental seminar series. Students enrolled in BiolChem 713 were required to attend the seminars, participate in a small group discussion with each speaker, and submit a final term paper. Course director Ryan Baldrige studies mechanisms of membrane-bound protein quality control systems in his own laboratory. These systems are important in pathologies related to cell stress, protein misfolding, and protein misregulation, and human conditions linked to these problems include Parkinson's disease, Alzheimer's disease, and various cancers.



09.17.19

*Nuclear Armageddon...
How the Cell Averts Global
Devastation from Nuclear
Protein Aggregation*

Richard Gardner, Ph.D.
University of Washington

10.01.19

*Cellular Lipid Homeostasis:
From Lipid Droplets to
Lipotoxicity*

James Olzmann, Ph.D.
University of California,
Berkeley

10.22.19

*Mallosteric Misfolding
and Rhomboidal
Retrotranslocation: Lessons
from Regulated ERAD*

Randy Hampton, Ph.D.
University of California,
San Diego

10.29.19

*Organelle Relationships
in Aging and Disease*

Adam Hughes, Ph.D.
University of Utah

11.05.19

*Mechanisms of
Ribosome-Associated
Quality Control*

Susan Shao, Ph.D.
Harvard Medical School

12.03.19

*A Modified Ubiquitin Code
for Responding to Cellular
Stress*

Jason MacGurn, Ph.D.
Vanderbilt University

Department Retreat

Kellogg Biological Station
August 23-24, 2019



OUTSTANDING TALK AWARDS

*Structural Basis of
Substrate Recognition
by the Enzyme That
Triggers Blood Clotting*

Fabienne Birkle
Morrissey Lab

*Detecting Incorrect
Function Annotations
in Public Protein
Databases*

Chengxin Zhang
Yang Zhang Lab



OUTSTANDING POSTER AWARDS

*Epigenetic
Adaptation Driven
by Heterochromatic
Misregulation*

Ajay Larkin
Ragunathan Lab

*Recognition of
1,N²-Ethenoguanine
by Alkyladenine DNA
Glycosylase*

Adam Thelen
O'Brien Lab

Supporting BioChem

The Department of Biological Chemistry relies upon the philanthropic 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 several ways:

General Departmental Support

- Biological Chemistry Select Fund (Research/Education)
- Graduate Program Endowment Fund

Lectureships

- George William Jourdian Lectureship
- G. Robert Greenberg Lectureship
- Irwin J. Goldstein Lectureship
- Martha L. Ludwig Lectureship
- William E.M. Lands Lectureship
- Rowena Matthews Lectureship

Scholarship

- Prasanta Datta Memorial Research Travel Endowment

For additional information on how you can make a positive difference in the Department of Biological Chemistry, please visit our giving page at: <https://leadersandbest.umich.edu/find/#1/mimed/mimed/biochem>

OR CONTACT:

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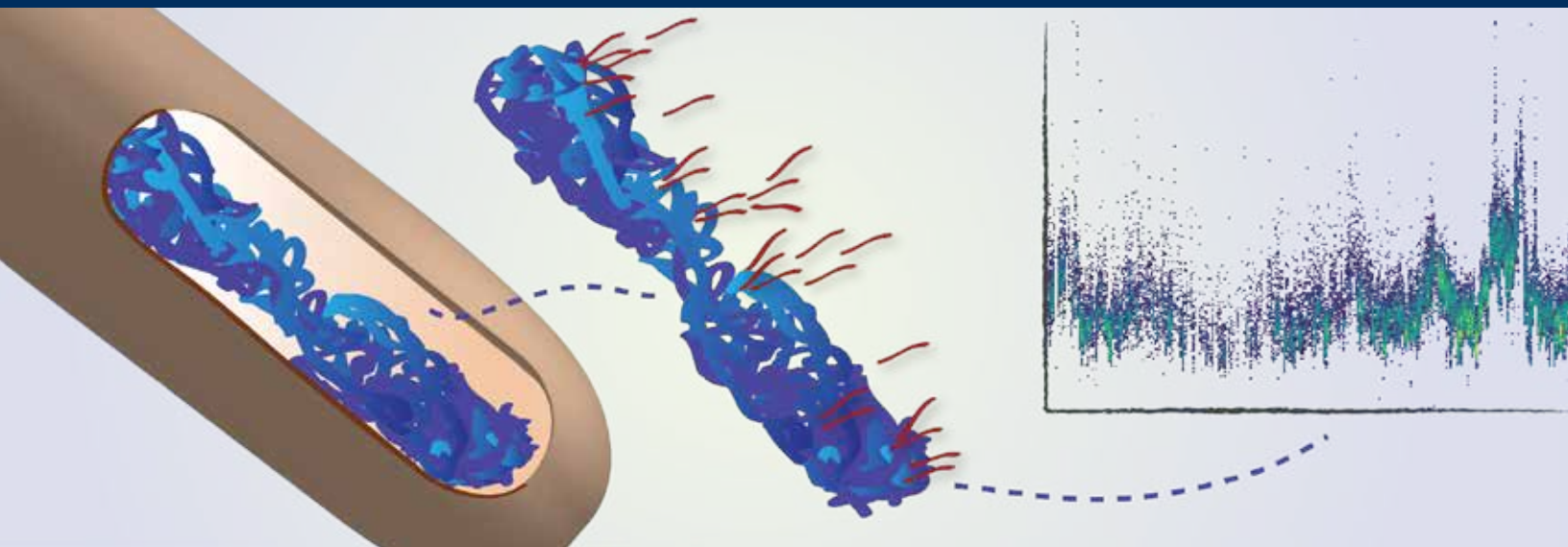
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High-Resolution Mapping of the *Escherichia coli* Chromosome Reveals Positions of High and Low Transcription



Submitted by Peter Freddolino, Assistant Professor of Biological Chemistry; Created by Scott Scholz, Freddolino Laboratory

Reference Article: Scholz SA, Diao R, Wolfe MB, Fivenson EM, Lin XN, Freddolino PL. High-Resolution Mapping of the *Escherichia coli* Chromosome Reveals Positions of High and Low Transcription. *Cell Syst.* 2019; 8: 212-225.e9.

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