

Biological Chemistry

NEWS & REVIEW

2017



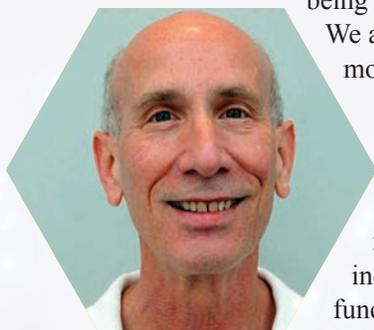
MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

BIOLOGICAL CHEMISTRY

Letter From the Chair Dr. Dan Goldman

Dear Friends of Biological Chemistry

Welcome to our annual newsletter. I am happy to report that the department continues to grow and thrive. We just kicked off the academic year with our annual Biological Chemistry Department Retreat at the Kellogg Biological Station that is situated on the shores of Gull Lake. Thanks to faculty members Peter Freddolino and Kaushik Rangunathan, and graduate student Meredith Skiba for organizing such a wonderful event. We had a great turnout and the weather was perfect. As usual, our graduate students and postdocs dominated the scientific presentations at the Retreat. However, we also learned more about the research programs of 3 new faculty that just joined the department. These most recent faculty recruits are assistant professors Ryan Baldrige from Harvard and Michael Cianfrocco from UCSD, and professor Jim Morrissey from University of Illinois, U-C. They, along with last year's recruits, Kaushik Rangunathan and Yan Zhang, have greatly added to the breadth of science being done in the department and contribute to an exciting research atmosphere. We are thrilled they have joined our ranks! Please read the newsletter to learn more about these new faculty.



Our Ph.D. and M.S. programs continue to do well. There are 24 Ph.D. students, 9 M.S. students, and 19 Post-Doctoral Fellows in the Department. With input from students and faculty we have updated and revised our course offerings and departmental committees. New courses include Biochem 660 - Molecules of Life that focuses on protein structure, function and dynamics; Biochem 690 – Biochemical Regulatory Mechanisms that focuses on signal transduction processes; and Biochem 713 – Emerging Areas of Biochemistry that was organized by Bruce Palfey this year and is a seminar-based course on the Origins of Life. This will be a biochemical perspective on the origins of life with outside speakers invited to give seminars and meet in small groups with students. Sounds interesting! We have also expanded our course offerings for MS students, including Biochem 601 – Tools of a Scientist; and Biochem 603 – Literature Review and Analysis.



As detailed in this newsletter, I am happy to report that our new Graduate Student and Postdoc Career Development Committee organized our first Career Development Symposium in September. We have a new committee for Diversity, Equity and Inclusion which aims to develop and implement plans for recruiting and retaining a diverse set of graduate students and faculty along with creating a more supportive and inclusive environment. Our Equipment Committee has used department funds to purchase new shared equipment and repair that which was inoperable. And, thanks to Pat O'Brien we have obtained funds to help us purchase a new Typhoon Biomolecular Imager. Finally, I am happy to report we have upgraded a couple of our small conference rooms with new white boards and audiovisual equipment.



Our department's research activities continue to thrive and we thought you might like to hear about some of these activities periodically. We plan to feature specific faculty in the newsletter and this year we are highlighting the research of Professor Ruma Banerjee and Assistant Professor Uhn-Soo Cho. I hope you enjoy reading about their research and we look forward to making this a newsletter tradition.

Regarding our seminar series, I am also happy to announce that we will inaugurate the George W. Jourdian Lectureship this academic year thanks to a generous gift from Dr. Lilian Hsu who was trained by Dr. Jourdian. The inaugural Jourdian lecture will be given by Dr. Patrick Cramer from The Max Planck Institute on March 27, 2018. Plans are in the works for creating the Rowena Matthews Lectureship and to fulfill other Lectureships that remain only partially funded – we welcome your contributions. The complete list of our named lectureships is detailed in the newsletter.

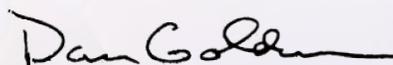
In last year's newsletter I mentioned the University is searching for a new permanent chair for Biological Chemistry and as you can guess from my writing this introduction, the search is continuing this year. We are keeping our fingers crossed and hope this position will be filled soon.

I also want to give a shout-out to our administrative staff. They provide crucial support to the department and have helped generate this newsletter. They are the best and we greatly appreciate their help.

If you haven't done so yet, please visit our web page at <https://medicine.umich.edu/dept/biological-chemistry> where you can find more news and details about the department.

I would like to conclude with a reminder that we are interested in hearing from you. Our department members and the friends of the department would love to keep abreast of what you are up to. Please send correspondence to my email address: neuroman@umich.edu.

With warm regards,



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On the Cover



Michigan image designed by Graduate Student Meredith Skiba for the Department of Biological Chemistry Retreat T-shirts.

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Biological Chemistry at University of Michigan



The Endowed Lectureships: 2017-2018



Irwin J. Goldstein Lectureship in Glycobiology



Jeffrey Esko, Ph.D.
Professor of Cellular and Molecular
Medicine
University of California, San Diego

April 25, 2017

*Proteoglycans - Arbiters of
Lipoprotein*

Hudson Freeze, Ph.D.
Professor of Glycobiology
Sanford Burnham Prebys Medical
Discovery Institute

September 18, 2017

*Human Glycosylation Disorders: An
Evolving Biochemical Landscape*



If you would like to donate specifically to any of these lectureships, please visit <https://leadersandbest.umich.edu/find/#1/mimed/mimed/biochem>

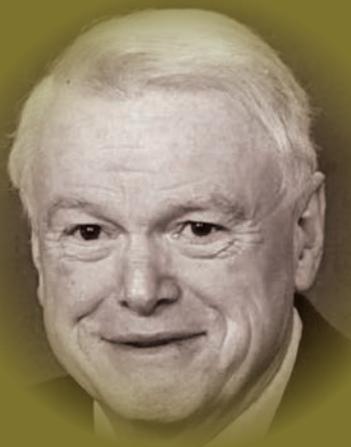
Martha Ludwig Lectureship in Structural Biology



Thomas Steitz, Ph.D.
Sterling Professor of Molecular
Biophysics and Biochemistry
Professor of Chemistry
Yale University

April 10, 2018





George William Jourdian Lectureship in Biological Chemistry

Patrick Cramer, Ph.D.
Professor & Director, Department
of Biochemistry
Universitat Munchen LMU

March 27, 2018



If you would like to donate specifically to any of these lectureships, please visit <https://leadersandbest.umich.edu/find/#1/mimed/mimed/biochem>

G. Robert Greenberg Lectureship in Biological Chemistry



Jay Keasling, Ph.D.
Professor, Department of Chemical
Engineering
University of California, Berkeley

March 21, 2017

Synthetic Biology for Synthetic Chemistry



Erica Ollmann Saphire, Ph.D.
Professor, Department of Immunology
and Microbial Science
The Scripps Research Institute

March 20, 2018



The Endowed Lectureships: 2017-2018 *continued*

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



Robert Farese, M.D.

Professor of Genetics and Complex
Diseases
Professor of Cell Biology
Harvard Medical School



October 3, 2017

***Mechanisms and Physiology of Fat
Synthesis and Storage in Lipid Droplets***

If you would like to donate specifically to any of these lectureships, please visit <https://leadersandbest.umich.edu/find/#1/mimed/mimed/biochem>

The Distinguished Graduate Lectureship



John Denu, Ph.D.

Professor, Department of Biomolecular
Medicine
University of Wisconsin-Madison

May 16, 2017

***Epigenetics and Metabolism: Functions
of NAD⁺ - dependent Deacylases***

New Faculty Highlights

Ryan Baldrige, Ph.D. received his Ph.D. from the Department of Biological Sciences at Vanderbilt University. With Todd Graham, his Ph.D. work was focused on defining how a subfamily of P-type ATPases evolved from transporting cations to transporting relatively large, amphipathic phospholipids. This subfamily (P4-ATPases) recognize phospholipids and transport them across a lipid bilayer to establish membrane asymmetry.



Collectively, his results suggest that the ubiquitin ligase (called Hrd1) forms a ubiquitin-gated protein-conducting channel.

In his own lab, Ryan will study basic mechanisms of membrane-bound protein-quality control systems. He

plans to determine how membrane-bound systems select substrates to identify cellular pathways regulated by these systems (including ERAD). These systems are important in pathologies related to cell stress, protein misfolding, and protein misregulation. Some of the human conditions linked to these problems include Parkinson's disease, Alzheimer's disease, and various cancers. His long-term goals are to define mammalian pathways regulated by membrane-bound quality control systems to understand how changing conditions target substrate proteins to these systems. Eventually, he would like to develop a screening platform to identify activators and inhibitors of these various quality control systems. Understanding these systems using novel assays should allow screening for, and refinement of, therapeutics with value in a wide range of pathologies.

Dr. Baldrige is a 2017 Biological Science Scholar of the University of Michigan.

Ryan completed his postdoctoral training with Tom Rapoport in the Department of Cell Biology at Harvard Medical School. With Tom, he worked on a protein quality control system called endoplasmic reticulum associated degradation (ERAD). Ryan addressed a long-standing question in ERAD: how are misfolded proteins transported from the ER lumen to the cytosol for degradation by the proteasome? The protein responsible for the movement back to the cytosol is termed the "retrotranslocon." Ryan used a biochemical reconstitution approach to demonstrate that an integral membrane ubiquitin ligase facilitates misfolded protein movement, meaning this ligase forms the enigmatic "retrotranslocon." His work also showed that autoubiquitination of the ligase is the critical gating mechanism to allow the ERAD substrates to cross the membrane.

Jim Morrissey, Ph.D.

received his Ph.D. from the University of California at San Diego and did postdoctoral research at the University of Oxford and the



Scripps Research Foundation. Since the mid-1980s, Dr. Morrissey's research focuses on biochemical mechanisms by which the blood clotting system is triggered, with a particular emphasis on studying protein-membrane

interactions in clotting. In 2006, his laboratory also discovered that inorganic polyphosphate, which is released from activated human platelets, is a potent modulator of blood clotting and inflammation. Work from his lab has led to a number of spin-offs with potential clinical applications, including new diagnostic assays. His lab is also working on novel hemostatic agents for treating bleeding, and anti-inflammatory/anti-thrombotic agents with potential for reduced bleeding side effects relative to conventional anticoagulant drugs.

Michael Cianfrocco, Ph.D.

joins the Department of Biological Chemistry as an Assistant Professor, and is jointly appointed in LSI as an assistant research professor.



His research program will focus on understanding the molecular details that determine how, where, and when motor proteins transport intracellular cargo. Problems in this process can result in neurodevelopmental and neurodegenerative diseases.

"Neurons are huge cells that go all the way from your back down to your toe," Cianfrocco says. "And these motor proteins have to 'walk' back and forth along the length of the neuron carrying organelles and other important cargos. So the big questions in the field revolve around how mutations in these proteins lead to diseases like Huntington's and Parkinson's — and how might we translate more detailed molecular understandings into measures that could prevent or correct these defects?"

Cianfrocco comes to the University of Michigan from a Damon Runyon postdoctoral research fellowship at the University of California, San Diego, where he specialized in cryo-electron microscopy and single-molecule methods.

Cryo-electron microscopy, or cryo-EM, involves freezing proteins in a thin layer of solution and then bouncing electrons off of them to reveal their shape. Because the frozen proteins are oriented every which way, computer software can later combine the thousands of individual snapshots into a 3D picture at near-atomic resolution.

Dr. Cianfrocco is a 2017 Biological Science Scholar of the University of Michigan.

New Faculty Highlights (cont'd)

Kaushik Ragnathan, Ph.D. has joined the faculty as an Assistant Professor of Biological Chemistry.



Dr. Ragnathan received his Ph.D. at the University of Illinois in 2012 under the direction of Professor Taekjip Ha (HHMI/Physics). During this time, he developed and applied single molecule fluorescence based methods to visualize transient and dynamic protein-protein and protein-DNA interactions in the context of DNA repair and ribosome assembly. His doctoral dissertation focused on E.coli RecA, a homolog of the DNA repair protein Rad51 in eukaryotes, which plays a pivotal role in DNA repair via the homologous recombination pathway. His work demonstrated how protein sliding on DNA molecules can provide a novel mechanism for RecA mediated homology search and strand exchange.

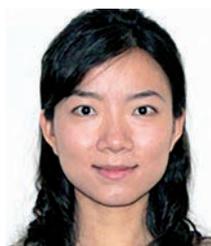
After completing his graduate degree, Dr. Ragnathan joined Danesh Moazed's (HHMI/Cell Biology) lab at Harvard Medical School. During this time, he was awarded a postdoctoral fellowship award by the Leukemia and Lymphoma Society.

In the fission yeast, *Schizosaccharomyces pombe*, heterochromatin domains are marked by the methylation of histone H3 at lysine 9 (H3K9me) – an evolutionarily conserved feature of constitutive heterochromatin in higher eukaryotes. Dr. Ragnathan engineered a small molecule based approach that allows for spatial and temporal control of heterochromatin establishment at a defined locus. These studies conclusively established an idea that lies at the heart of epigenetics, that is, histones and their modifications can act as carriers of epigenetic memory.

At the University of Michigan, Dr. Ragnathan's lab is focused on understanding how weak and transient interactions between proteins and modified histones produce epigenetic gene expression states that are stable on time scales ranging from hours to days. His lab uses an innovative combination of genetics, biochemistry, single cell and single molecule approaches to capture dynamic cellular events across different lengths scales and timescales.

Dr. Ragnathan is a 2016 Biological Science Scholar of the University of Michigan.

Yan Zhang, Ph.D. was appointed as an Assistant Professor in the Department of Biological Chemistry here at the University of Michigan in March of 2017.



Dr. Zhang earned her Ph.D. in Biomolecular Chemistry in 2011, at the University of Wisconsin-Madison School of Medicine and Public Health. Under the guidance of Professor Michael Sheets, her graduate studies elucidated mRNA translational control mechanisms critical for vertebrate embryo development. Dr. Zhang was a postdoctoral fellow with Professor Erik Sontheimer at Northwestern University

until 2014, and then at the RNA Therapeutics Institute of the University of Massachusetts Medical School until early 2017. Her postdoctoral work provided fundamental insights into the biology, mechanism and application of CRISPR-Cas9, the RNA-guided, bacterial adaptive immune system.

At the University of Michigan, Dr. Zhang will continue to investigate the CRISPR pathways using complementary biochemical, genetic, genomic, microbiological and mammalian cell culture approaches. The research interests of Dr. Zhang's laboratory

include the non-conventional biological roles of Cas9 in bacterial physiology and endogenous gene control, the mechanisms of how CRISPRs capture the invader's DNA as immunological memories, the regulation of CRISPR-Cas gene expressions, as well as the development of novel CRISPR-based technological tools.

Dr. Zhang has been awarded the NIH K99/R00 Career Transition Award, and the 2016 Biological Sciences Scholar of University of Michigan, and is a 2016 Biological Sciences Scholar of the University of Michigan.

Faculty Awards



Anne Vojtek was elected to serve on the University of Michigan Medical School Curriculum Policy Committee (September 2017 - August 31, 2020).



Nils Walter was named the Francis S. Collins Collegiate Professor of Chemistry, Biophysics, and Biological Chemistry, College of Literature, Science and the Arts. He was also awarded the RNA Society Mid-Career Award 2017.



Renny Franceschi had his research featured on the cover of DOD Prostate Cancer Research Program August, 2016 annual report. He also is mentor to AADR Hatton Awardee, Fatma Mohammed (First Place, Senior Category).



Ray Trievel co-organized the ASBMB Symposium on Transcriptional Regulation that was held in October 2016 in Snowbird, Utah.



Janet Smith received the Distinguished Faculty Lectureship Award, University of Michigan Medical School.



Robert Fuller received the 2017 SACNAS Distinguished Scientist Award. SACNAS is the Society for Advancement of Hispanics/Chicanos and Native Americans in Science.



Pat O'Brien received the EBS teaching award.

Annual Faculty Spring Reception



Peter Freddolino, Ph.D., Alex Ninfa, Ph.D., Dan Goldman, Ph.D., and Patrick O'Brien, Ph.D.

Yan Zhang, Ph.D., Zhonggang Hou, Ph.D., Debra Thompson, Ph.D., Uhn-Soo Cho, Ph.D., and his spouse, Hyun Joo Yoo



Audrey Seasholtz, Ph.D., and Suzanne Admiraal, Ph.D.



Charles Williams, Ph.D., Angela Williams, and Jean Ballou



Faculty Highlights

Signaling Through Hydrogen Sulfide: Research in Ruma Banerjee's Laboratory

The interplay between what we eat, the bugs that we host, and our cells in the gastrointestinal tract influence health and disease. In the Banerjee laboratory, this molecular ball game is being studied through the lens of a small gaseous molecule named hydrogen sulfide (H_2S). Historically known as a toxic gas found in volcanic emissions and also associated with the smell of rotten eggs, H_2S is also naturally produced by our cells. H_2S is derived from the sulfur-containing amino acids, methionine and cysteine, which are obtained from the diet, and processed by enzymes that rely on B vitamins like B12, B6 and folic acid. In addition to making H_2S , cells in our colon are routinely exposed to very high levels of H_2S produced by sulfate-reducing and other bacteria. Little is known about how our cells control H_2S production or regulate its clearance and even less about how H_2S signals, and thereby influences processes ranging from cell proliferation to inflammation and cardioprotection.



This picture taken at the 2016 International H_2S Conference shows H_2S spewing out of the Solfatara crater in Naples, Italy.

Studies in the Banerjee laboratory have been illuminating the strategies used by human cells to regulate H_2S . Two of the three enzymes (cystathionine γ -synthase (CBS) and γ -cystathionase) involved in H_2S synthesis are remarkably promiscuous, i.e. are lax with respect to the substrate selection, resulting in them catalyzing several reactions in parallel. The net effect is that



The crystal structure of human mercaptosulfurtransferase, which synthesizes H_2S and stabilizes a Cys-SSH intermediate in its active site (red arrow) is shown. Reported by the Banerjee laboratory in collaboration with Dr. Markos Koutmos' group (also at U-M).



if unregulated, these enzymes could be simultaneously making cysteine or utilizing cysteine to make H_2S . A built-in heme switch in CBS makes it sensitive to inhibition by the other regulatory gases nitric oxide and carbon monoxide, generated in response to cellular stresses, and in doing so, switches the selectivity of γ -cystathionase towards H_2S synthesis.

These results show how signaling molecules can switch enzyme preference making them responsive to cellular needs and reveal how patients with the rare genetic disease homocystinuria due to CBS deficiency can be susceptible to dysregulated H_2S production. A major effort is to develop inhibitors of γ -cystathionase both as a potential therapeutic agent and as a molecular tool. The functional studies are complemented by elucidation of crystal structures of enzymes involved in H_2S synthesis, clearance and signaling, in complex with substrates and inhibitors.

For H_2S to influence diverse physiological processes, its presence must be communicated. This is done via a modification known as persulfidation, which decorates cysteine residues on proteins with an extra -SH group changing them from Cys-SH to Cys-SSH. The Banerjee laboratory, in collaboration with clinician scientists and microbiologists is examining how the microbiome influences H_2S homeostasis in colon. And in collaboration with bioinformaticians and cancer biologists, the laboratory is also elucidating the network of proteins marked by persulfidation in nonmalignant and malignant colon epithelial cells and how they influence metabolic reprogramming that accompanies cellular transformation.

Faculty Highlights

Finding Cures from Molecules



Dr. Cho earned his undergraduate and master degrees from Korea University (South Korea). He then earned a Ph.D. degree from the University of Washington (Advisor: Dr. Wenqing Xu) and continued his scientific training as a postdoctoral fellow at Harvard Medical School (Advisor: Dr. Stephen C. Harrison).

Dr. Cho joined the Biological Chemistry Department at the University of Michigan in 2012, and has since become a great asset to the department. A staff scientist (Dr. Sojin An), two postdoctoral fellows (Dr. Hanseong Kim and Dr. Sangho Park), and a graduate student (Ms. Jennifer Chik) are currently active members in Cho lab. He plays golf and tennis routinely and enjoys photography in his spare time.

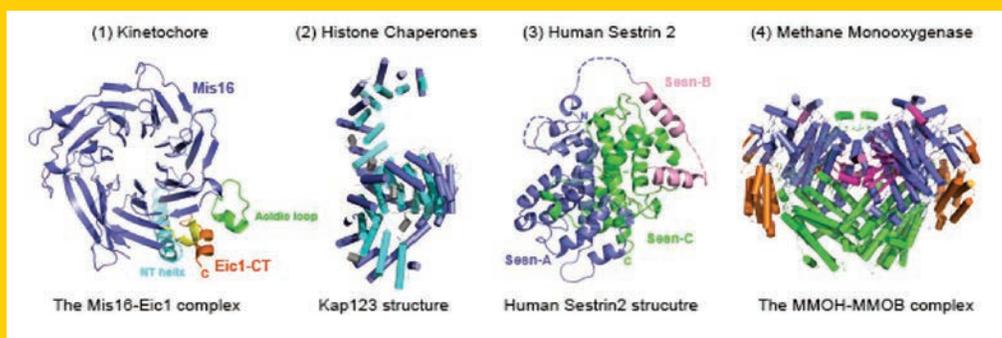
Research focus: The malfunction of macromolecules at a molecular level is the main driving force for many disease related biological events, including cancers, diabetes, and aging. Therefore, efforts to develop pharmaceuticals are focused on the structural and mechanistic understanding of key macromolecules and their associated molecules. The main research goal of our laboratory is to elucidate the fundamental molecular mechanisms of key biological events using structural approaches (X-ray crystallography and single particle cryo-electron microscopy (Cryo-EM)) to develop the knowledge-based medicines to ultimately cure human diseases. In particular, Cryo-EM is quickly becoming an invaluable technique in the field of structural biology that allows for the determination of large macromolecular structures and their dynamics at the near-atomic level. Our laboratory currently focuses on the structural and biochemical aspects of four projects: (1) kinetochore assembly during cell division, (2) histone chaperones as key epigenetic regulators, (3) human Sestrin2 as a cellular stress sensor, and (4) methane monooxygenase to utilize natural gas as an alternative energy source.

(1) **Kinetochore:** The kinetochore is a large assembly of protein complexes that is important for reliable chromosome segregation during cell division. Aberrant chromosome segregation has been observed in many cancers and birth defects. We are particularly interested in the early stage of kinetochore assembly, which acts as a potential drug target for cancer treatment by selectively suppressing rapidly growing cells. (An et al, 2015, JMB).

(2) **Histone chaperone:** Histone-mediated epigenetic regulation plays an active role in key cellular events, such as cell differentiation, development, and proliferation. Therefore, it is not surprising that many anti-cancer drugs that are currently under development or FDA approved modulate key epigenetic regulators. We particularly focus on the structure-based mechanism of histone chaperones, one of essential histone regulators.

(3) **Human Sestrin2 (hSesn2):** hSesn2 is a stress-inducible gene that has beneficial effects on cancers, type II diabetes, and aging. Recently, we determined the first crystal structure of hSesn2 and uncovered the molecular mechanism by which hSesn2 responds to and protects from cellular stresses (Kim et al, 2015, Nat. Comm). We will further study the signaling mechanism of hSesn2 and its related pathway to maximize its beneficial effect.

(4) **Methane Monooxygenase (MMO):** Methane gas (Shale gas) is a promising alternative energy source but requires difficult chemical conversions to methanol for its safety and transportation. Methanotrophic bacteria can convert methane to methanol in the ambient environment using the catalytic activity of MMO. Understanding its chemistry has the potential to develop a catalyst that mimics the reaction, which holds great potential in industrial and environmental applications. Our current focus is to elucidate how the MMO activity is modulated by its regulatory subunits based on its complex structures (Lee et al, 2013, Nature).



2017 Annual Graduate Student Awards

The Halvor N. and Mary M. Christensen Award For Ph.D. Graduate Study in the Department of Biological Chemistry



is presented to a 2nd year student on the basis of the student's academic record.

2017 Awardee: **Adam Thelen**
Mentor: Patrick O'Brien, Ph.D.

The Adam A. and Mary J. Christman Award For Ph.D. Graduate Study in the Department of Biological Chemistry



is presented to a 3rd year student who is judged to be the most outstanding in that class.

2017 Awardee: **Claire Cato**
Mentor: John Tesmer, Ph.D.

The Anthony and Lillian Lu Award

is awarded to a current student on the basis of academic background, achievement in the graduate program, and potential as a scientist Presented to a student on the basis of academic



background, achievement in the graduate program, and potential as a scientist.

2017 Awardee: **Thomas Jurkiw**
Mentor: Patrick O'Brien, Ph.D.

The Lee Murphy Memorial Prize

is awarded annually to a student in the Biological Chemistry Ph.D. program who embodies the highest ideals of scientific integrity



and who has published a paper or a series of papers judged most significant by the Awards Committee.

2017 Awardee: **Meredith Skiba**
Mentor: Janet Smith, Ph.D.

The Minor J. and Mary Lou Coon Award



is awarded annually to the student who exhibits overall excellence in research, teaching, and service to the department.

2017 Awardee: **Jennifer Bohn**
Mentor: Janet Smith, Ph.D.

New Ph.D. Students



Fabienne Birkle received her Bachelor of Science in 2013 and her Master of Science from Heidelberg University, Heidelberg, Germany in 2015.

Mentor: Dr. James Morrissey



April Kaneshiro received her Bachelor of Science in Chemistry in 2016 from Grand Valley State University, Allendale, MI.

Mentor: Dr. Neil Marsh



Liu Liu received her Bachelor of Medicine in 2016 from Shanghai Jiaotong University, Shanghai, China, and her Master of Science in Biological Chemistry in 2017 from the University of Michigan, Ann Arbor, MI.

Mentor: Dr. Stephen Ragsdale



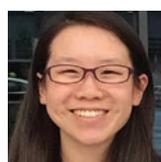
Divyani Paul received her Bachelor of Science in 2015 from Sri Venkateswara College in Delhi, India and her Master of Science in 2016 from All India Institute of Medical Science, Delhi, India.

Mentor: Dr. James Morrissey



Beth Rousseau received her Bachelor of Science in 2012 from Wayne State University, Detroit, MI.

Mentor: Dr. Yan Zhang



Yuqi Wang received her Bachelor of Science in 2015 from The Hong Kong University of Science and Technology, Hong Kong.

Mentor: Dr. James Morrissey



Christine Ziegler received her Bachelor of Science in 2016 from the University of Rochester, Rochester, NY.

Mentor: Dr. Yan Zhang

New M.S. Students



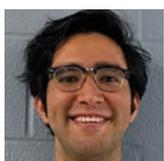
JonCarlos Anderson received his Bachelor of Science in 2017 from Concordia University, Ann Arbor, MI.
Mentor: Dr. Ruma Banerjee



Shahzaib Chughtai received his Bachelor of Science in 2017 from the University of Michigan, Ann Arbor, MI.
Advisors: Dr. Alex Ninfa and Dr. Ruthann Nichols



Ali Farhat received his Bachelor of Science in 2016 from the University of Michigan, Ann Arbor, MI.
Mentor: Dr. Peter Freddolino



Alexander Fischbach received his Bachelor of Science in 2015 from The Ohio State University, Columbus, OH.
Mentor: Dr. Michael Uhler



Aditi Gupta received her Bachelor of Science in 2017 from Oberlin College, Oberlin, OH.
Mentor: Dr. Ruma Banerjee



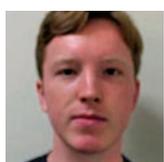
Brian Hardaway received his Bachelor of Science in 2017 from the University of Michigan, Ann Arbor, MI.
Mentor: Dr. Nils Walter



Jordan Hochstetler received his Bachelor of Science in 2017 from Butler University, Indianapolis, IN.
Advisors: Dr. Alex Ninfa and Dr. Ruthann Nichols



Charles Knox received his Bachelor of Science in 2016 from the University of Illinois at Urbana-Champaign, Champaign, IL.
Mentor: Dr. Daniel Goldman



Robin Pearce received his Bachelor of Science in 2017 from the University of Michigan, Ann Arbor, MI.
Mentor: Dr. Yang Zhang

Ph.D. Degrees Granted



Bradley P. Klemm, Ph.D.
December 5, 2016
"Substrate Recognition by Protein-only Ribonuclease Ps"
Mentor: Carol A. Fierke, Ph.D.



Andrew P. Sikkema, Ph.D.
December 12, 2016
"Structural and Biochemical Studies of the Initiation Steps in Three Natural Product Biosynthetic Pathways"
Mentor: Janet Smith, Ph.D.



Qingyun Dan, Ph.D.
January 9, 2017
"Structural and Biochemical Characterization of the Early Steps in Fungal Indole Alkaloid Biosynthesis"
Mentor: Janet Smith, Ph.D.



Nicole A. Motl, Ph.D.
May 15, 2017
"Structural Enzymology of Sulfide Oxidation by Persulfide Dioxygenase and Rhodanese"
Mentor: Ruma Banerjee, Ph.D.

M.S. Degrees Granted



Liu Liu, M.S.
August 18, 2017
"The Role of TGF β Signaling in Zebrafish Retinal Regeneration"
Mentor: Daniel Goldman, Ph.D.



Fernando Nunez, M.S.
August 18, 2017
"Investigating the Role of Mych in the Zebrafish Retina"
Mentor: Daniel Goldman, Ph.D.



Aushja Syed, M.S.
August 18, 2017
"Specificity of 8-Oxoguanine DNA Glycosylase (OGG1) for Different DNA Substrates"
Mentor: Patrick O'Brien, Ph.D.

Student Achievements & Recognition

Congratulations to **Meredith Skiba**, a Ph.D. candidate in Dr. Janet Smith's laboratory. Meredith was awarded a **2017-2018 Rackham Predoctoral Fellowship**. One of Rackham's most prestigious fellowships, it is awarded to candidates with an outstanding research record and who have achieved academic excellence throughout their graduate career.

Congratulations to **Christine Ziegler**, a recipient of a prestigious Graduate Research Fellowship from the National Science Foundation. Christine's proposal was titled the "Investigation of Bacterial Anticipatory Gene Regulation." Christine is now a second year student in the laboratory of Dr. Yan Zhang. Congratulations also go to **Christine Ziegler** for her appointment to the Genetics Training Program for 2017-2018.

Congratulations to **Adam Thelen**, a third year student in Dr. Patrick O'Brien's lab. Adam was appointed for a 2nd year to the Chemical Biology Interface (CBI) Training Grant for the 2017-2018 academic year.

Congratulations to **Jennifer Bohn** who has received an NIH F31 Fellowship. Her project title is "Characterization of Retroviral Restriction Factor APOBEC3H."

Career Development Symposium

The department's Career Development Committee was excited to present a half-day symposium this fall aimed at students and post-docs.

The Career Development Committee was formed in the summer of 2016 in order to provide more guidance for students and post-docs as they explore the variety of potential careers now available to scientists. In previous years the department has hosted a career panel at the annual department retreat, but this year elected to move the career development event to the fall, to facilitate a greater variety of speakers and events.



We started the afternoon with short talks from several professionals about their career paths. Dr. Brian Masek traveled to Ann Arbor from St. Louis to speak

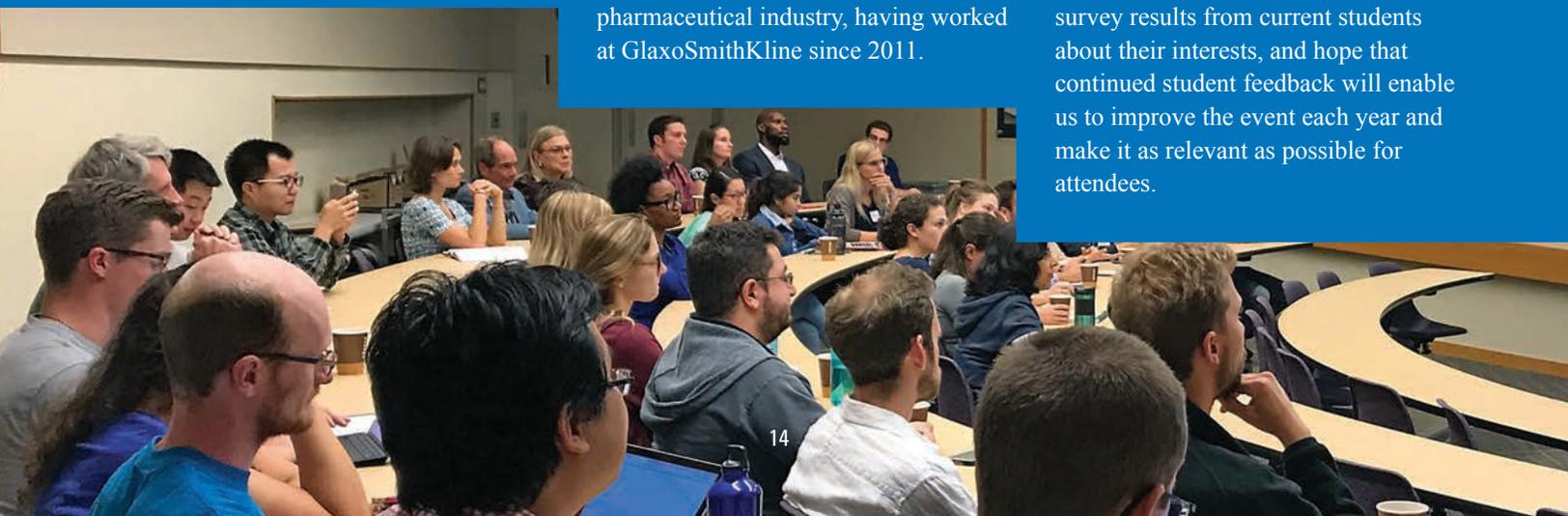
about his experience in the pharmaceutical industry, most recently as Product Manager at Certara. Dr. Erin Luetkemeier shared her experiences of being a AAAS Science and Technology Policy Fellow at the NIH and then continuing work at the NIH as a Health Science Policy Analyst.

We also had the pleasure to hear from two alumni of the department. Dr. Gerwin Westfield ('13) told of his work in the pharmaceutical industry, currently as a Medical Affairs Manager at Aytu BioScience, Inc. Dr. Scott Berger ('05) also shared his experience in the pharmaceutical industry, having worked at GlaxoSmithKline since 2011.

Following these talks, students attended a workshop with local career coach Sally Schmall on developing their resumes.

We had a few more speakers join us for our afternoon Q&A sessions focused on the job search process in academia or industry. Dr. Madhu Bogdan from the Ann Arbor-based small pharmaceutical company Lycera joined us to add her perspective on finding an industry job. On the academia side, we welcomed Dr. Mary Kay Pflum from Wayne State University, Dr. Marti Morales from Adrian College, and Dr. Danny Ducat from Michigan State University.

The event ended with an open networking session to enable conversation with all the speakers. We selected the speakers in accordance with survey results from current students about their interests, and hope that continued student feedback will enable us to improve the event each year and make it as relevant as possible for attendees.



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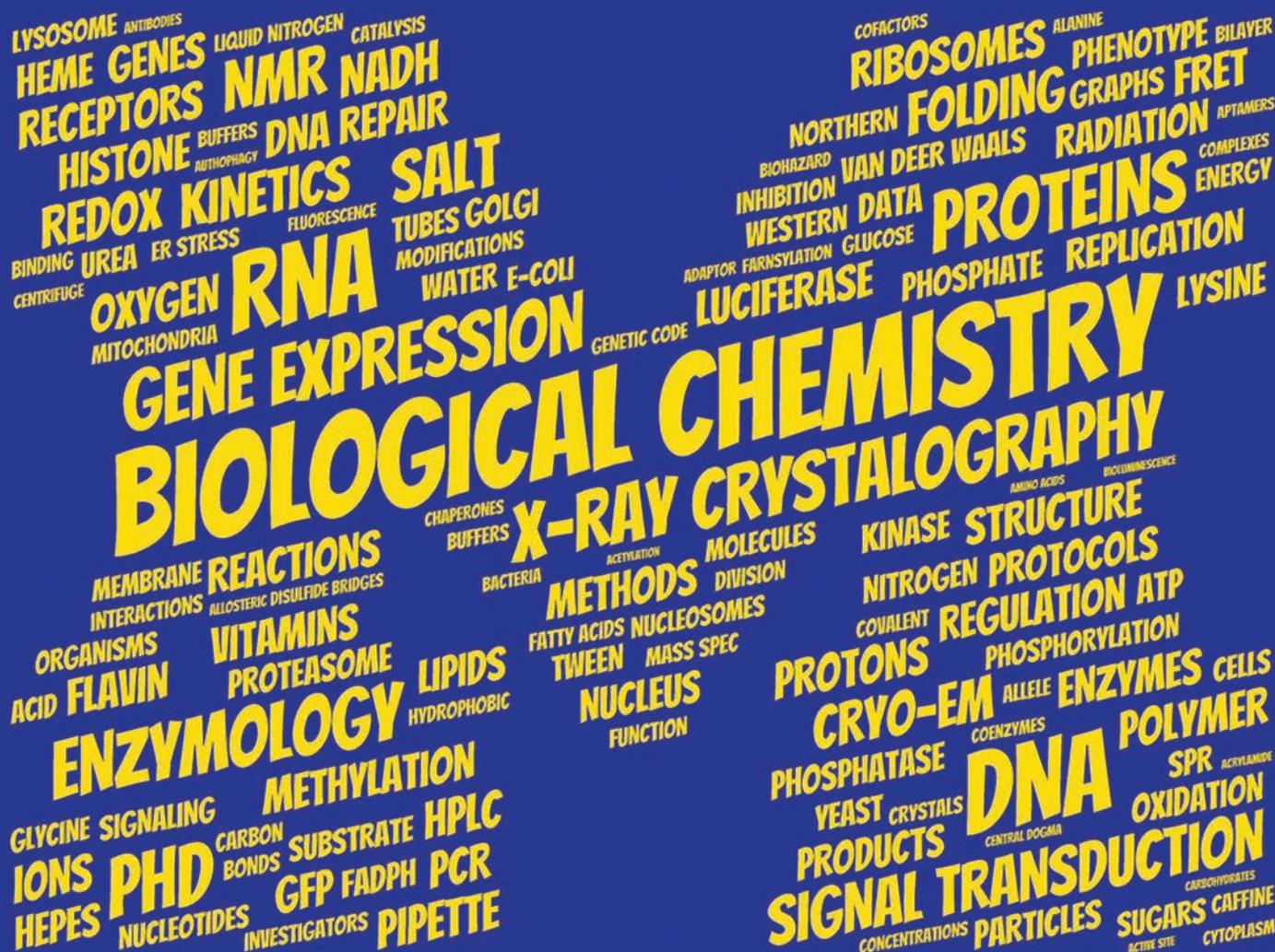
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