Fall 2023 Retreat
Graduate Training Program in Quantitative and Chemical Biology

August 26, 2023
FAR Contemporary Arts Museum
202 S Rogers St, Bloomington, IN 47404

Saturday, August 26, 2023

8:15 – 9:00 am	**Breakfast and Opening Remarks**	Dr. Giedroc
9:00 - 9:20 am	Phase separation by SARS-CoV-2 N-protein is disrupted outside of a narrow range of nucleic acid stoichiometry	Patrick Laughlin (Zlotnik)
9:20 – 9:40 am	Structural and energetics investigations of Acinetobacter baumannii ZigA, a candidate COG0523 metallochaperone	Max Osterberg (Giedroc)
9:40 – 10:00 am	Linking peptidoglycan elongation to metabolism in Streptococcus pneumoniae	Averi McFarland (Winkler)
10:00 – 10:20 am	Exploring Industry: A Summer at Helix Biostructure	§Morgan Nyman (Dann)
10:20 – 11:10 am	Protein stabilization plays a key role in signaling by bacterial chemoreceptor complexes	Dr. Lynnmarie Thompson
11:10 – 12:00 pm	Poster Session 1	All
12:00 – 12:45 pm	**Lunch**	
12:45 – 1:15 pm	Games/Free time	All
1:15 – 1:40 pm	Business	For training cohort
1:40– 1:50 pm	Mutational Analysis and Domain-Swapping Yields New Insights for Two Cross-functional Initiating Glycosyltransferases in Agrobacterium tumefaciens Unipolar Polysaccharide Biosynthesis	Alan Gramillo (Fuqua)
1:50 – 2:00 pm	Identifying Lysosomal Defects in Senescent Preadipocytes	Hunter Richman (Yu)
2:00 – 2:20 pm	Development of Improved Detection Methods for Proteomic Analysis of Tyrosine Sulfation	Cayla Rose (Dann)

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2:20 – 2:40 pm	The role of phase separation in EWS regulated cancers	Renee Kinne (Hollenhorst)
2:40 – 3:00 pm	Investigating the role of ADARs in Germline RNA Regulation	Emily Erdmann (Hundley)
3:00 – 3:50 pm	Mining microbial natural products for precision medicine	Dr. Brian Bachmann
3:50 – 4:40 pm	Poster Session 2	All
4:40 – 5:40 pm	Alumni Career Panel	Brooke Sashary Rachel
5:40 – 6:00 pm	Closing Remarks	Dr. Giedroc

*Catering provided by **One World Catering.***

Keynote Speakers

Lynmarie Thompson
University of Massachusetts Amherst

Bacterial chemotaxis proteins are both potential targets for novel antibiotics and a key model system for understanding transmembrane signaling mechanisms. Molecules in the environment are detected by a remarkable sensor array of membrane-bound chemoreceptors with two cytoplasmic partner proteins. Signaling through this complex begins as a ligand-induced 2 Å displacement of a receptor alpha helix that extends from the periplasm through the membrane. How is the signal propagated an additional ~200 Å from the membrane to the cytoplasmic tip of the receptor, and how does it control the activity of the kinase bound to the tip of the receptor? To address this question, we assemble homogeneous, native-like functional complexes of an E. coli Asp receptor cytoplasmic fragment (CF) with the kinase CheA and coupling protein CheW. A synergistic combination of solid-state NMR and hydrogen exchange mass spectrometry (HDX-MS) has identified highly dynamic regions of CF and CheA in these complexes. Furthermore, the CF is partially disordered within functional complexes and has a small, well-ordered protein interaction region. Reduced dynamics and slower exchange in CF in the kinase-activating state suggest signaling inputs modulate the disorder of the cytoplasmic domain to control the kinase activity. HDX-MS of CheA alone and in these functional complexes indicate that stabilization of the kinase core domains is key to kinase activation. NMR experiments are in progress to study protein-protein and domain-domain interactions in these complexes. This study reveals the mechanistic role of protein disorder and stabilization in signaling and control of catalysis.
This research supported by National Institutes of Health Grant R01-GM120195, T32 GM008515, and T32 GM139789.

Brian Bachmann
Vanderbilt University

Natural products are drivers of remarkable phenotypic changes in the ecosystems in which they are produced, often precisely mediating multipartite transactions between organisms. As precision phenotypic drivers, natural products can be borrowed to manipulate human chemical biology, often in a therapeutically productive way. In this talk I will discuss: (1) how we can discover the next generation of precision therapies using single cell chemical biology techniques, (2) our progress towards the discovery of mediators of natural product induced antitumor immunity, and (3) the discovery of the target and mechanism of a family of natural products with promising anti-leukemic activity.

Poster presentations (alphabetical)

Marian Addo (Gerdt)
Small Molecule Cell Wall Modification Inhibitor Potentiates Phage infectivity
maaaddo@iu.edu

Noor Ali (Thielges)
Development of Site-specific Vibrational Probes for Study of Protein Dynamics
noorali@iu.edu

Lauren Augusta (Fuqua)
Ectopic Expression of a Heterologous Phosphodiesterase Provides Tunable Control of Adhesin Production and Biofilm Formation in Agrobacterium tumefaciens
laugusta@iu.edu

Andrew Bach (Snaddon)
Synthesis of Small Molecule Drug Moieties with Fluorine-Containing Stereogenic Centers
acbach@iu.edu

Ahmed Bello (Morais)
The Mechanochemistry of Force Generation and Coordination of Bacteriophage Phi28 DNA Packaging Motors
ahbello@iu.edu

Emily Erdmann (Hundley)
Screening for RNA Binding Proteins that affect fertility in C. elegans reveals a functional relationship between ADR-2 and SQD-1
emierdma@iu.edu

Abigail Garrett (Winkler)
Elevated cyclic-di-AMP levels alter peptidoglycan cell wall synthesis in Streptococcus pneumoniae
ahgarret@iu.edu

Allan Gramillo (Fuqua)
Mutational Analysis and Domain-Swapping Yields New Insights for Two Cross-functional Initiating Glycosyltransferases in Agrobacterium tumefaciens Unipolar Polysaccharide Biosynthesis
agramil@iu.edu

Jiachen He (Cook)
AI-Driven Biosynthesis/Synthesis Approach to Cost-Effective Production of Artemisinin
thronemaeda@gmail.com

***Ria Kidner** (Gerdt)
Uncovering the chemistry that drives symbiosis: A case study of the interactions between Capsaspora owczarzaki and Biomphalaria glabrata as a potential agent against Schistosomiasis
rqkidner@iu.edu

Renee Kinne (Hollenhorst)
The role of phase separation in EWS regulated cancers
rekinne@iu.edu

Amardeep Kumar (Lewis)
Lewis Group: New Approaches to Selective Catalysis
kumarama@iu.edu

Prashant Kumar (Pohl)
Synthesis of Nonulosonic Acids Using Aldolase Enzymes Naturally Occurring in Hyperthermophiles
pprashan@iu.edu

Laura Lastra (Jacobson)
Microfluidic Devices to Track Cell Death and Z-ring dynamics in Bacillus subtilis
lalastra@iu.edu

Patrick Laughlin (Zlotnik)
Phase separation by SARS-CoV-2 N-protein is disrupted outside of a narrow range of nucleic acid stoichiometry
Patricklaughlin99@gmail.com

Jo Lohman (VanNieuwenhze)
Progress Towards the Total Synthesis of Antibiotic Tripropeptin D and Analogs
jomlohm@iu.edu

Victoria Lopez (Tracey)
Testing the Role of Discoidin Domain Receptors in Nociception
velopez@iu.edu

Averi McFarland (Winkler)
Linking peptidoglycan elongation to metabolism in Streptococcus pneumoniae
avemcfar@iu.edu

Emma McRae (Giedroc)
Characterization of the Biophysical Properties of a COG0523 Metallochaperone and a Mur Ligase from Acinetobacter baumannii
emmcrae@iu.edu

§ **Morgan Nyman** (Dann)
Understanding cellular modification of de novo purine synthesis inhibitors: Impact of folylpolyglutamate synthetase (FPGS) on the action of cancer therapeutics
monyman@iu.edu

Cahmlo Olive (Lewis)
Lewis Group: New Approaches to Selective Catalysis
caolive@iu.edu

Maximillian Osterberg (Giedroc)
Structural and energetics investigations of Acinetobacter baumannii ZigA, a candidate COG0523 metallochaperone
mkosterb@iu.edu

***Brigham Pope** (Jacobson)
Size-Selective Particle Diversion with Laser-Driven Dielectrophoretic Nanorails
blpope@iu.edu

Anjaly Prasannajith (Walczak)
Role of Ran-GTP gradient in Kinesin-14 mediated spindle assembly
aprasan@iu.edu

Hunter Richman (Yu)
Identifying Lysosomal Defects in Senescent Preadipocytes
noorali@iu.edu

Cayla Rose (Dann)
Development of Improved Detection Methods for Proteomic Analysis of Tyrosine Sulfation
cayrose@iu.edu

Swapnil Singh (Thielges)
Conformational Selection of Calmodulin in Recognition of Isoforms of Nitric Oxide Synthase Characterized by Site-Specific Infrared Spectroscopy
swapnil1.singh@iu.edu

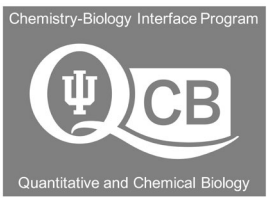
Basia Walenkiewicz (VanNieuwenhze)
Developing New Tools for Illuminating Bacterial Cell Wall
bwalenk@iu.edu

Jonah Wirt (Hohmann)
Peripherally Restricted Monoacylglycerol Lipase Inhibitor LEI-515 Both Reverses and Prevents Chemotherapy-Induced Peripheral Neuropathy Without Producing Physiological Dependence or Tolerance
jlwirt@iu.edu

Boyoon Yang (Hundley)
Uncovering Substrate Recognition of RNA Editing Enzymes in vivo
by6@iu.edu

Zhiyu (Troy) Zang (Gerdt)
The "small" game changer of bacteria-phage interactions
zzang@iu.edu

*Immediate past QCB Ambassadors (2022-2023), primary retreat organizers, and moderators
§Current academic year QCB Ambassadors (2023-2024)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