

BMB FACULTY MENTORS FOR INDEPENDENT RESEARCH PROJECTS
(BCMB 4960R, BCMB 4970R, BCMB 4980R)
Potential Projects for SPRING and/or SUMMER, 2023

Dr. Michael W.W. Adams (Life Sciences, Rm. B218. Tel: 706 542-2060. adamsm@uga.edu). 1. Physiology, metabolism and enzymology of microorganisms growing near 100°C from marine volcanic vents. 2. Microbial metabolic engineering for conversion of plant biomass to biofuels at extreme temperatures. 3. Characterization of human gut microbes that utilize the metal tungsten. All three projects involve biochemical, genetic and genomic based approaches

Dr. Tessa Andrews (Life Sciences, Rm C208A, Tel: 706-542-3340, tandrews@uga.edu) 1. Teacher expertise for active-learning instruction in large undergraduate courses; 2. Sources of support and barriers to investing in improving teaching among college science faculty; 3. How beliefs, attitudes, and identity shape college teachers. Research methods include interviews, surveys, video analysis and classroom observation.

Dr. Adam Barb (Life Sciences, abarb@uga.edu). 1) Linking structure and function in immune system glycoproteins 2) Characterizing the composition of immune receptors from primary human tissue

Dr. Maor Bar-Peled (Complex Carbohydrate Research Center, 315 Riverbend Road; Tel: 706 542-4496. peled@ccrc.uga.edu). 1. Characterization of recombinant enzymes that control synthesis of glycan in plant and human fungal pathogens and in pathogenic bacteria that impact animals. 2. Molecular mechanism for localization of membrane bound proteins to ER and Golgi. 3. Analyses of mutants affecting polysaccharide synthesis in fungi and in bacteria, 4. Study of biofilm formation and bacteria colonization.

Dr. Carl Bergmann (Complex Carbohydrate Research Center, 315 Riverbend Road Tel 706-542-4428 cberg@ccrc.uga.edu) Proteomic and glycomic changes in Medaka fish as a result of chronic low dose exposure to ionizing radiation.

Dr. David L. Blum (Life Sciences, Rm A414A. Tel: 706 542-1035. blum@uga.edu). 1. Improving expression of recombinant proteins in microbial and mammalian cell culture. 2. Discovery monoclonal antibodies against novel targets

Dr. Belen Cassera (Life Sciences, maria.cassera@uga.edu). 1. Characterization of isoprenoid biosynthesis (metabolites and proteins) in eukaryotic pathogens. 2. Antimalarial drug discovery from natural products and synthetic sources.

Dr. Erin Dolan (Life Sciences, B210B. Tel: 706-713-2324. eldolan@uga.edu) 1. Key features and outcomes of scalable ways of involving undergraduates in research. 2. Structures and functions of undergraduate research mentoring and how they relate to student outcomes. 3. Applying theories and methods from industrial, organizational, and social psychology to improve undergraduate teaching and learning. Research methods include surveys, classroom observations, interviews, focus groups, and qualitative content analysis as well as statistical analyses such as linear regression and multi-level modeling.

Dr. Diana M. Downs (361A Biological Sciences, 706-542-9573. dmdowns@uga.edu). 1. Biochemical and genetic analysis of metabolic integration in bacteria. 2. Enzyme purification and analysis.

Dr. Art Edison (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 1040, aedison@uga.edu). 1. NMR metabolomics applications, metabolomics technology development, NMR probe development. 2. Nematode chemical ecology, *Caenorhabditis elegans* metabolomics and chemical signaling, *C. elegans* systems biology.

Dr. Kosuke Funato (Center for Molecular Medicine, 325 Riverbend Rd., Rm 2210 Tel: 706-542-0814. kosuke.funato@uga.edu). 1. Modeling malignant brain tumors using human pluripotent stem cells. 2. Developing tailor-made therapies for malignant brain tumors. 3. Dissecting the role of human specific genes in malignant brain tumors.

Dr. David J. Garfinkel (Life Sciences, Rm. A130. Tel: 706 542-9403. djgarf@uga.edu). 1. Understanding the mechanism of Ty1 retrotransposon copy number control in *Saccharomyces cerevisiae* and closely related species. 2. Understanding the variation and evolution of Ty1 copy number control. 3. Generating and characterizing Ty1 elimination strains using Cas9 editing.

Dr. Michael G. Hahn (Complex Carbohydrate Research Center, 315 Riverbend Road; Tel: 706 542-4457. hahn@ccrc.uga.edu). 1. Characterization of monoclonal antibodies against plant cell wall polysaccharides. 2. Characterization of proteins encoded by a gene family involved in the biosynthesis of pectic polysaccharides in plant walls. 3. Studies of plant signal transduction pathways.

Dr. Robert S. Haltiwanger (Complex Carbohydrate Research Center, 315 Riverbend Road, Tel: 706 542-4151, rhalti@uga.edu). 1. Regulation of the Notch signaling pathway by glycosylation. 2. Effects of glycosylation on protein folding. 3. Involvement of glycosylation in development and disease.

Dr. Gerald W. Hart (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 3034, Tel: 706-583-5550. gerald.hart@uga.edu). 1. Nutrient Regulation of Signaling & Transcription. 2. O-GlcNAc & diabetes. 3. O-GlcNAc & Alzheimer's disease. 4. O-GlcNAc regulation of RNA Polymerase II. 5. O-GlcNAc regulation of translation.

Dr. Natarajan Kannan (Life Sciences, A318. Tel: 706 542-7326. nkannan@uga.edu). 1. Cell signaling and kinase-substrate interactions in normal and disease states. 2. Cancer genomics and bioinformatics. 3. Glycoinformatics and proteomics.

Dr. Eileen J. Kennedy (Pharmacy South, Rm 342. Tel: 706 542-6497. ekennedy@rx.uga.edu). Chemical biology projects focusing on kinase signal transduction and regulation in breast, prostate, and lung cancer.

Dr. William N. Lanzilotta (Life Sciences, A130. Tel: 706 542-1573. wlanzilo@bmb.uga.edu). 1. Structure/function investigation into the mechanism of heme uptake and transport by enteric pathogens. 2. The role of iron-sulfur clusters in radical chemistry: biochemical and structural analysis of the 1,3-propanediol pathway from *Clostridium acetobutylicum*.

Dr. Paula Lemons (Life Sciences, Rm. C116. Tel: 706 542-9616. plemons@uga.edu). (1) Undergraduate problem solving about biochemistry, particularly in the area of molecular structure and function and metabolic pathway dynamics and regulation; (2) College science faculty teaching attitudes and practices and how to support faculty through professional development. Data collection methods include tests, interviews, classroom observations, focus groups. Data analysis methods include qualitative content analysis and statistics.

Dr. Amy E. Medlock (Coverdell Building. Tel: 706 542-7843. medlock@uga.edu) . 1. Heme synthesis and intracellular trafficking. 2. Organismal heme homeostasis.

Dr. Debra Mohnen (Complex Carbohydrate Research Center, 315 Riverbend Road. Tel: 706 542-4458. dmohnen@ccrc.uga.edu). 1. Characterization of glycosyltransferases involved in pectin biosynthesis, a plant cell wall polysaccharide required for plant growth with beneficial effects on human health and importance in the food, biofuel, agricultural and materials industries. 2. Structure/function relationships and mechanisms of biosynthesis of cell wall matrix polysaccharides and novel cell wall proteoglycans/polymers with emphasis on the *GAUT1*-related gene family. 3. Modification of plants to improve plant growth and cell wall polymer synthesis, to enhance biomass for biofuel, biopolymer and materials production, and to provide a knowledgebase for sustainable development.

Dr. Kelley Moremen (Complex Carbohydrate Research Center, 315 Riverbend Rd., Rm 3055; Tel: 706 542-1705. moremen@uga.edu). 1. Expression and characterization of mammalian enzymes and lectins involved in glycoprotein biosynthesis and degradation. 2. Structure-function studies on glycoprotein processing enzymes. 3. Transcript analysis and gene regulation of glycan-related genes.

Dr. Artur Muszynski (Complex Carbohydrate Research Center, 315 Riverbend Rd, Rm 2029; Tel: 706 542-4479. muszynski@ccrc.uga.edu). Structure of lipopolysaccharides, glycolipids and cell surface polysaccharides of human pathogenic and plant symbiotic bacteria and their biological role in host interaction. a) introduction to cultivation of bacteria and basic microbial techniques in glycobiology; b) techniques for characterization of microbial polysaccharides and glycolipids including extraction of biologically significant microbial cell polysaccharides and lipids, methods of purification, size exclusion, liquid and gas chromatography, glycosyl and fatty acid composition, gel electrophoresis, mass spectroscopy and spectrometry, colorimetry.

Dr. Ron Orlando (Complex Carbohydrate Research Center, 315 Riverbend Road. Tel: 706 542-4429. orlando@ccrc.uga.edu). 1. Proteomics. 2. Mass Spectrometry. 3. Identifying post-translational modifications on proteins

Dr. Robert Phillips (Chemistry, Room 313. Tel: 706 542-1996. rshellips@chem.uga.edu). 1. Isolation of wild-type and mutant enzymes and comparison of kinetic properties, and site-directed mutagenesis to prepare new mutant enzymes.

Dr. James Prestegard (Complex Carbohydrate Research Center, 315 Riverbend Rd., Rm 1077 Tel: 706 542-6281. jpresteg@ccrc.uga.edu). 1. Expression and structural characterization of proteins using nuclear magnetic resonance (NMR). 2. Structural characterization of carbohydrates using NMR. 3. Enzyme kinetics using NMR. 4. Preparation of isotopically labeled substrates and ligands for biochemical studies.

Dr. John Rose (Life Sciences, Rm. B204B. Tel: 706 542-1750. rose@bcl4.bmb.uga.edu). Structural biology, structure function studies of the augmenter of liver regeneration and its cellular partners; structure function studies of the oxytocin receptor; structure function studies of HIV/host protein complexes; soft x-ray phasing of macromolecular structures

Dr. Robert Sabatini (Life Sciences, Rm A128B. Tel: 706 542-9806. rsabatini@bmb.uga.edu). 1. Characterization of enzymes involved in the glucosylation of telomeric DNA in kinetoplastids. 2. Investigate the biological role of DNA glucosylation in telomeric gene expression/recombination in African trypanosomes.

Dr. Walter K. Schmidt (Life Sciences, Rm. A416. Tel : 706 583-8241. wschmidt@bmb.uga.edu). Characterization of Rce1p, a regulatory protease in cellular transformation/cancer and of Ste23p, the yeast ortholog of a protease involved in Alzheimer's.

Dr. Michael Terns (Life Sciences, Rm. A326. Tel: 706 542-1896. mterns@uga.edu). CRISPR-based prokaryotic immune systems, host-viral interactions and development of biotechnological tools.

Dr. Michael Tiemeyer (Complex Carbohydrate Research Center, 315 Riverbend Road, 706 542-2740, mtiemeyer@ccrc.uga.edu)
1. Structure and function of carbohydrates that direct cell-cell interactions during nervous system development in *Drosophila*. 2. Genetic control of tissue-specific glycan expression, 3. Comparative glycomics and proteomics of model organisms.

Dr. Breeanna Urbanowicz (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 2029. Tel: 706 542 4479. breeanna@uga.edu). 1) Structure and function of carbohydrate active enzymes. 2) Production of renewable, biobased plastics from plant biomass. 3) Developing tools for pectin analysis.

Dr. Bi-Cheng (B.C.) Wang (Life Sciences, Rm. B204A. Tel: 706-542-1747. wang@bcl1.bmb.uga.edu). 1. New approach for the characterization of metal oxidation state in macromolecules by a novel extended wavelength 4D crystallography. 2. Se-DNA as a tool for phasing DNA/RNA and their protein complexes. 3. Sulfur-SAD approach in direct determination of protein structures. 4. Structure-function revisits of selected metalloproteins.

Dr. Ryan Weiss (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 3005. Tel: 706 542 6445. ryan.weiss@uga.edu). 1) Investigating the regulatory mechanisms of glycosylation using functional genomics. 2) Epigenetic and transcriptional regulation of glycosaminoglycan biosynthesis. 3) Drug discovery for rare human genetic disorders.

Dr. Lance Wells (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm 3018, Tel: 706 542 7806) 1. Role of glycoproteins/glycoenzymes in Congenital Muscular Dystrophy, 2. Role of Intracellular protein O-glycans in X-linked intellectual disability. 3. N-linked glycosylation synthesis and role in viral entry.

Dr. Chris West (Life Sciences, Rm. A310. Tel: 706 542-8486/4259. westcm@uga.edu). 1. Cellular mechanisms of O₂ sensing in protists including the social amoeba *Dictyostelium* and the agent for human toxoplasmosis *Toxoplasma gondii*. 2. Structural biology of E3(SCF)ubiquitin ligase complexes. 3. Glycogene editing in eukaryotic pathogens *Trypanosoma cruzi* and *Toxoplasma gondii*. 4. Structure/function studies on non-heme dioxygenases and glycosyltransferases.

Dr. Zachary Wood (Life Sciences, RM A428, Tel: 706 583-0304, zac@bmb.uga.edu). 1. Structural and biochemical studies of enzymes involved in nucleotide sugar metabolism. 2. Allosteric control of enzyme activity.

Dr. Robert J. Woods (Complex Carbohydrate Research Center, 220 Riverbend Road, 706 542-4454. rwoods@ccrc.uga.edu). Molecular simulations of proteins and carbohydrate-protein complexes of immunological relevance.

Dr. Ying Xu (Life Sciences, Rm A110, Tel: 706 542-9779, xyn@bmb.uga.edu). 1. Cancer systems biology, 2. Cancer evolution, and 3. Microbial systems biology.

Dr. Hang Yin (Complex Carbohydrate Research Center, 220 Riverbend Road, Rm. 2058, Tel: 706 583-0655. hyin@uga.edu). 1. Muscle stem cell biology, the self-renewal, differentiation and lineage determination of skeletal muscle stem cells and applications in curing muscle atrophy and sarcopenia. 2. Biology of brown adipose tissue, determination of adipose stem/progenitor cells, regulation of adipose functions and applications in preventing disease. 3. Metabolic controls of stem cell and cancer cell behaviors.

Dr. Nadja Zeltner (Center for Molecular Medicine, Riverbend Road, Room 2212, nadja.zeltner@uga.edu). 1. Generation of various cell types of the peripheral nervous system from human pluripotent stem cells. 2. Disease modeling of Familial Dysautonomia. 3. Generation of adrenal gland tissues from human pluripotent stem cells.

Dr. Shaying Zhao (Life Sciences, Rm. B316. Tel: 706 542-9147. szhao@bmb.uga.edu). 1. Microsatellite instability detection in cancer samples. 2. Gene expression alternation in cancer development and progression. 3. Gene expression alternation due to genomic rearrangements during evolution.

(10/07/22)

NON-BMB FACULTY MENTORS FOR INDEPENDENT RESEARCH PROJECTS (BCMB 4960R, BCMB 4970R, BCMB 4980R)

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The following faculty members are outside of the Department of Biochemistry & Molecular Biology but have served as mentors for BCMB 4960R courses in the past. Please see their respective laboratory or Departmental web sites for further information on their research. For these faculty members, pre-approval of proposed research projects is NOT required.

Faculty Member	Email	Department/College
Franklin West	westf@uga.edu	Animal & Dairy Science
Honxiang Liu	lhx@uga.edu	Animal & Dairy Science
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Sheba MohanKumar	shebamk@uga.edu	Veterinary Medicine

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