BCMB INDEPENDENT RESEARCH PROJECTS
(BCMB 4960L/H, BCMB 4970L/H, BCMB 4980L/H)

Course Description for Spring and Summer, 2018

All students who major in Biochemistry & Molecular Biology are required to take ***two semesters*** of independent research (BCMB 4960L/H and BCMB 4970L/H, each 4 hr credit). For additional semesters of research, BCMB 4970L/H can be repeated and/or students can take up to two semesters of **BCMB 4980L/H**. Honors students may elect to complete **BCMB 4990H** as an Honors Thesis (also 4 hr). BCMB 4960L/H requires no previous lab experience.

Objective: The objective of these courses is to train students in the basic techniques used in biochemistry and molecular biology, and the application of the scientific method. Students typically become part of a dynamic research environment and gain experience in both the experimental approach and the culture of a research laboratory. Students in these courses have been co-authors of research papers published in the primary scientific literature.

How to find a Laboratory: These courses are unusual in that the onus is on the student to find a Faculty member that will accept the student into their laboratory. Attached is a list of Faculty mentors and their research interests. All are familiar with the requirements of these courses and most have mentored students in the past. Prospective students should arrange for an appointment with prospective Faculty mentors to discuss research areas. Students choose laboratories based on personal research interests, their knowledge of the professor, recommendations from other students, etc. Although it is possible for students to take BCMB 4960 and BCMB 4970 courses in separate laboratories, they are usually carried out in the same laboratory. Indeed, most professors prefer students to complete more than one semester.

Laboratories outside of BCMB: Students can take the BCMB 4960 and 4970 courses with faculty members not on the attached list (outside of the Biochemistry Dept) as long as the research is biochemically-related and it is pre-approved the prior semester by the BCMB undergraduate committee. To obtain approval, please submit to Dr. Adams (adamsm@uga.edu) a one-page abstract of the proposed research together the name and email address of the proposed mentor.

When to find a Laboratory: BCMB 4960 and BCMB 4970 courses must be arranged during the semester ***prior*** to when the student will begin the course. It is never too early to talk to prospective Faculty mentors about their research and about the possibility of taking this course with them.

Registration: Permission of the Department is required to resister for these courses. A **REGISTRATION FORM** must also be completed by the student and signed by the Faculty mentor. The form can be obtained from the Departmental web site (http://www.bmb.uga.edu/student-forms-and-documents), from the Biochemistry Office (Life Sci., B122) or from the Biochemistry Advisor. Once the form is signed by the Faculty mentor, you must take the signed form to Ms. Angie Stockton in the Biochemistry Office (Life Sci., B122) and you will be cleared to register.

Time Requirement: BCMB 4960L and BCMB 4970L are taken for 4 hr credit each. Students should expect to be in the laboratory for a minimum of 12 hr/ week (for 15 weeks) in the Spring/Fall or 24 hr/week (for 7.5 weeks) in the Summer. The exact schedule is to be determined by the Faculty mentor and the student.

Examinations and Grades: The final grade is determined by the Faculty mentor. This is based on:
a) Performance in the laboratory (75%). This does not mean the number or accuracy of the results! It reflects the aptitude, effort, reliability, dependability, perseverance and meticulousness of the student in the laboratory setting.
b) Written Presentation of Research (25%). Each student must write a **Research Report**, which describes what has been accomplished in the laboratory. The report should resemble a brief scientific paper and be of at least 8 pages in length (double spaced, 1" margins). The report should be sub-divided into a) Summary, b) Introduction, c) Experimental Methods, d) Results, e) Discussion and f) References. For instructions, see: http://www.bmb.uga.edu/students/undergrad-research-report

The Research Report should be sent by email as a single word.doc or pdf file attachment to Dr. Adams (adamsm@uga.edu) **by 5 pm on the last day of classes**.

Note that Research Reports not received by 5 pm on Wednesday April 25th (Spring) or Friday, July 27th (Summer) will result in a C grade (no exceptions)

(07/18/17)

FACULTY MENTORS FOR INDEPENDENT RESEARCH PROJECTS
(BCMB 4960L/H, BCMB 4970L/H)
Potential Projects for Spring and Summer, 2018

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 including biochemical, genetic- and genomics-based approaches. 2. Metabolic engineering for plant biomass conversion and biofuel production at extreme temperatures.

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. Alan Darvill (Complex Carbohydrate Research Center, 315 Riverbend Road. Tel: 706 542-4411. adarvill@ccrc.uga.edu). 1. Structure and function of plant cell wall polysaccharides. 2. Oligosaccharin bioactivity studies 3. Development of methods for carbohydrate structural analysis.

Dr. Fikri Y. Avci (Complex Carbohydrate Research Center, Riverbend Road, Room 3064. Tel: 706 542-3831. avci@uga.edu). 1. Identification of molecular interactions involved in uptake and presentation of carbohydrate antigens by antigen presenting cells (APCs). 2. Isolation and characterization of T cells and their epitopes generated from model carbohydrate antigens. 3. Understanding the basis for cellular and humoral immune responses induced by carbohydrate presentation and recognition that enable eradication of disease-causing agents.

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 glycol-conjugates in human pathogen fungus and in plants. 2. Molecular mechanism for localization of membrane bound proteins to ER and Golgi. 3. Analyses of mutants affecting polysaccharide synthesis.

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. Russell W. Carlson (Complex Carbohydrate Research Center, 315 Riverbend Road. Tel: 706 542-4439. rcarlson@ccrc.uga.edu). Characterization of bacterial surface glycoconjugates in determining the virulence of bacterial pathogens (and symbionts) of plants and animals.

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. Stephen Dalton (Coverdell Building. Tel: 706 583-0480. sdalton@uga.edu). The biology of embryonic stem cells and their diferentiation into cell types that have applications for curing diseases such as diabetes.

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. Jorge Escalante (527 Biological Sciences, 706-542-2651. jcescala@uga.edu). 1. Genetic, biochemical and molecular analysis of coenzyme B12 biosynthesis. 2. Molecular basis for the toxicity of short chain fatty acids. 3. Regulation of protein function by reversible lysine acetylation

Dr. David J. Garfinkel (Life Sciences, Rm. A130. Tel: 706 542-9403. djgarf@bmb.uga.edu). 1. Functional organization of Ty1 antisense RNA effector regions that interfere with retrotransposition and determine copy number control. 2. Cellular genes involved in RNA metabolism and P-body function. 3. Creating a Ty1-less strain of S. cerevisiae using knockout technology. 4. Evolution of Ty1 antisense RNA interference.

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. Stephen Hajduk (Life Sciences, Rm B128. Tel: 706 542-1676. shajduk@bmb.uga.edu) . 1. Function and regulation of RNA editing in African trypanosomes. 2. Mechanism of human serum high density lipoprotein killing of African trypanosomes. 3. RNA and protein import into mitochondria.

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. Takahiro Ito (Coverdell Building. Tel 706 542-0197. ito@bmb.uga.edu). Mechanism and regulation of self-renewal cell division in tissue stem cells and cancer development.

Dr. Natarajan Kannan (Life Sciences. Tel: 706 542-7326. kannan@bmb.uga.edu). Comparative genomics; bioinformatics; computational structural biology; metagenomics

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. Problem-solving among undergraduate students enrolled in biology and biochemistry courses using social science methods (e.g., reviews of student work, interviews); 2. Supporting faculty who want to reform their teaching strategies using social science methods (e.g., interviews, video recordings of classroom activities, surveys, review of class materials).

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

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 commercially important functions in the food industry. 2. Studies on the role of the GAUT1-related gene family in plant cell wall synthesis and implications for enhancing biofuel production. 3. Studying the molecular basis for the anti-cancer effects of pectin.

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. 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. rsphillips@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. Michael Pierce (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm 3056. Tel: 706 542-1702. hawkeye@uga.edu). 1. Identification of glycan-specific cancer markers. 2. Investigation of members of a new family of animal lectins that have physiological functions in humans. 3. Effects of glycosylation on tumor cell adhesion, invasion, and tumorigenicity.

Dr. James Prestegard (Complex Carbohydrate Research Center, 315 Riverbend Road. Tel: 706 542-6281. jpresteg@ccrc.uga.edu). NMR spectroscopy with applications to proteins and carbohydrates. Projects involve protein expression and protein purification, NMR of carbohydrates, and development of new media for NMR 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 kinetoplatids. 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. Richard Steet (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 3034 Tel: 706 583-5550. rsteet@ccrc.uga.edu). 1. Pathogenesis of lysosomal storage disorders using zebrafish. 2. Mechanisms of altered glycoprotein trafficking using chemical biology approaches. 3. Improvement of enzyme replacement therapy for lysosomal storage disorders

Dr. Michael Terns (Life Sciences, Rm. A326. Tel: 706 542-1703/1896. mterns@bmb.uga.edu and rterns@bmb.uga.edu). RNA-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. Jeffrey Urbauer (Life Sciences, Rm. A310, Tel: 706 542-7922. urbauer@chem.uga.edu). 1. Protein structure and stability using NMR spectroscopy. 2. Analysis of protein-protein interactions using biophysical and in vivo techniques. 3. Characterization of oxidation-induced structural and functional changes in proteins.

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. Lianchun Wang (Complex Carbohydrate Research Center, 315 Riverbend Road, Rm. 3005. Tel: 706 542-6445. Lwang@ccrc.uga.edu). The role and structure-function relationship of the polysaccharide heparan sulfate in vascular development and blood coagulation.

Dr. Lance Wells (Complex Carbohydrate Research Center, 315 Riverbend Road, Tel: 706 542-7806. lwells@ccrc.uga.edu). 1. Insulin signal transduction and type II diabetes, 2. Nutrient sensing and oncogenesis, 3. Proteomics and site-mapping by mass spectrometry of post-translational modifications in disease states.

Dr. Chris West (Life Sciences, Rm. A310. Tel: 706 542-8486/4259. westcm@uga.edu). 1. Cellular mechanisms of O_2 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. William B. Whitman (Biological Science Bldg., Rm. 541. Tel: 706 542-4219. whitman@uga.edu). 1. Isolation and characterization of soil bacteria. 2. Genetics and physiology of methanogenic archaea.

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. Computational structural biology. 2. Computational inference and reconstruction of biological pathways and networks. 3. Biological data mining.

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. William S. York (Complex Carbohydrate Research Center, 220 Riverbend Road, 706 542-4628. will@ccrc.uga.edu). 1. Bioinformatics of cell surface glycans in developing animal cells and roles of cell wall polysaccharides in plant development.

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

(07/18/17)

BCMB INDEPENDENT RESEARCH PROJECTS
(BCMB 4960L/H, BCMB 4970L/H)

REGISTRATION FORM FOR SPRING 2018

NAME: _____

ADDRESS: _____

_____

TEL. NUM. _____ UGA ID: _____

E-MAIL: _____

COURSE (circle one): BCMB 4960L BCMB 4970L BCMB 4980L
BCMB 4960H BCMB 4970H BCMB 4980H BCMB 4990H

CREDIT HOURS: 4

NAME OF PROFESSOR _____

SIGNATURE OF PROFESSOR _____

Date: _____

SIGNATURE OF STUDENT _____

Date: _____

PROVIDE COMPLETED COPIES OF THIS FORM (prior to Thursday, January 4th) TO:

- Professor/Faculty Mentor
- Ms. Angie Stockton in the Biochemistry Office (Life Sciences, Room B122). You will then be cleared to register.

NOTE: By 5 pm, Wednesday, April 25th:

Please send your complete Research Report by email to Dr. Adams (adamsm@uga.edu)

Send the Report as an attachment to the email as a single word.doc or pdf file

(07/18/17)

BCMB INDEPENDENT RESEARCH PROJECTS
(BCMB 4960L/H, BCMB 4970L/H)

REGISTRATION FORM FOR SUMMER 2018

NAME: _____

ADDRESS: _____

_____

TEL. NUM. _____ UGA ID: _____

E-MAIL: _____

COURSE (circle one): BCMB 4960L BCMB 4970L BCMB 4980L
BCMB 4960H BCMB 4970H BCMB 4980H BCMB 4990H

CREDIT HOURS: 4

NAME OF PROFESSOR _____

SIGNATURE OF PROFESSOR _____

Date: _____

SIGNATURE OF STUDENT _____

Date: _____

PROVIDE COMPLETED COPIES OF THIS FORM (prior to Tuesday, June 5th) TO:

- Professor/Faculty Mentor
- Ms. Angie Stockton in the Biochemistry Office (Life Sciences, Room B122). You will then be cleared to register.

NOTE: By 5 pm, Friday, July 27th:

Please send your complete Research Report by email to Dr. Adams (adamsm@uga.edu)

Send the Report as an attachment to the email as a single word.doc or pdf file.

(07/18/17)