

PBS Faculty Mentors

The following faculty members have active labs in the Pharmaceutical and Biomedical Sciences Department:

Dr. Michael Bartlett, Associate Dean for Science Education and Georgia Athletic Association Professor in Pharmacy Email: mgbart@uga.edu

The Bartlett lab's research centers around applications of analytical chemistry to study biological problems. Currently, he and his team are studying the absorption, distribution, metabolism and excretion (ADME) of drug substances and environmental toxicants with the goal of developing novel methods to address significant questions in the biomedical sciences. In collaboration with other faculty they aim to provide realistic risk assessments for common environmental contaminants and also study many compounds shown to affect memory and cognition.

Dr. Houjian Cai, Assistant Professor Email: caihj@uga.edu

The goal of the Cai lab is to interrogate the molecular mechanisms in facilitation of tumor progression and provide the scientific rationale for using small molecule inhibitors for cancer treatment. Numerous oncogenic proteins require fatty acyl modifications to carry out their functions in cancer cells. Protein acylation, including myristoylation and palmitoylation, is particularly essential for leading these proteins to the correct location at the cytoplasmic membrane, thereby facilitating molecular functions.

Dr. David Crich, DÈSSC, Professor, Georgia Research Alliance and David Chu Eminent Scholar in Drug Design Email: David.Crich@uga.edu

The Crich lab is an organic and medicinal chemistry group with diverse interests in drug design and development, synthetic methodology, and carbohydrate chemistry and biology. Current projects include:

1. The design, synthesis, evaluation, and development of novel anti-infective agents for the treatment of multidrug-resistant infectious diseases. Currently, this project emphasizes the development of novel aminoglycoside antibiotics with reduced toxicity for the treatment of ESKAPE pathogens.
2. The design, synthesis and evaluation of glycomimetics with potential for use as novel therapeutic agents. The current goal is the exploration of small molecule analogs of the β -(1 \rightarrow 3)-glucans for use as immunostimulants.
3. The development of improved chemistry for the stereoselective synthesis of glycosidic bonds of all types. Emphasis is currently placed on the bacterial sialic acids, legionaminic and pseudaminic acid, with the goal of preparing otherwise difficultly accessible bacterial oligosaccharides for applications in glycobiology.
4. The exploration of under-represented functional groups in medicinal chemistry with the aim of expanding chemical space and diversity.

Dr. Deborah Elder, Clinical Associate Professor Email: dlstrong@uga.edu

Dr. Elder is PBS's only clinical faculty member. Her current research projects focus on the preparation of extemporaneously prepared sterile and non-sterile pharmaceutical products, beyond-use-dating (expiration) of compounded non-sterile pharmaceuticals, drug formulation for individualized patient care, and the use of technology in teaching and assessing pharmacy skills.

Dr. Phillip Greenspan Email: greenspn@uga.edu

Dr. Greenspan's research interests center on the health benefits of nutraceuticals and functional foods; these terms can be broadly defined as natural food products that are ingested or incorporated into the diet to help slow the progression of certain disease states. In the past several years, Dr. Greenspan has investigated the effect of muscadine grape extracts (Georgia is a major producer of this Southern specialty grape) and select sorghum bran extracts on important biological processes such as inflammation, protein glycation and LDL oxidation. These pathways are thought to be the underlying cause of two of the most prevalent diseases in America, coronary heart disease and diabetes. It is interesting to note that while natural products have been shown to inhibit protein glycation and LDL oxidation both in vitro and in vivo, there is currently no FDA approved drug designed to arrest these critical disease pathways. Dr. Greenspan's work in natural product research has led to the commercialization of numerous products both in the United States and on international markets.

Dr. Neil Grimsey, Assistant Professor Email: neilgrimsey@uga.edu

The Grimsey group is driven by two key questions:

- 1) How do cells regulate the temporal kinetics of signaling cascades?
- 2) How can we harness or inhibit these processes to alter the progression of disease?

Using multiple cutting edge approaches they are investigating the impact of kinase signaling networks in vascular inflammation, angiogenesis, and the progression of chronic lung disease, retinal disease, wound healing and tumor growth.

Dr. Deigo Huet Email: diego.huet@uga.edu

Dr. Huet's current research focuses on the unusual aspects of apicomplexan biology. This group of protozoan pathogens cause morbidity, mortality and substantial economic loss. Notably, they contribute to more than half a million annual deaths due to malaria. The apicomplexan *Toxoplasma gondii* infects an estimated 25% of the world's population, making it one of the most ubiquitous human parasites, and it is a leading cause of death from foodborne illness in the United States.

Dr. Shelley Hooks, Associate Vice President for Research and Associate Professor

Email: shooks@uga.edu

The Hooks laboratory studies the molecular mechanisms by which cellular signaling regulates cell function, and how these signaling mechanisms go awry in cancer and central nervous system disorders. Specifically, they study G-protein signaling cascades and their dynamic regulation by activating receptors and deactivating RGS proteins (Regulator of G-protein Signaling proteins). They have a long-standing interest in a family of receptors activated by Lysophosphatidic Acid (LPA) and Sphingosine 1-phosphate (S1P), which are important bioactive lipid growth factors that play important roles in normal physiology and in the

development of cancer and inflammatory/immune diseases. They are also exploring the ability of RGS proteins to attenuate these effects and impact disease progression. Their current focus is on defining the function and regulation of RGS proteins in cancer and neuroinflammatory disease using a combination of cellular, molecular, and genetic approaches.

Dr. Eileen Kennedy, Dr. Samuel C. Benedict Professor Email: ekennedy@uga.edu

The protein kinase superfamily comprises one of the largest gene families encoded in the human genome. A comprehensive understanding of kinase activity under normal and disease states is critical in order to identify targets for disease intervention. However, studying kinase signaling is inherently challenging since there are more than 500 kinases in the human genome, and as a result, there is significant crosstalk among multiple kinases for phosphorylation targets. Additionally, multiple isoforms exist for many kinases, thereby making it nearly impossible to address the question using genetic knockdowns/knockouts since other genes will compensate with altered expression levels. To address this question, the Kennedy lab is developing novel chemical biology strategies to synthetically disrupt protein:protein interactions (PPIs) using chemically stabilized peptides. This methodology allows for the development of investigative tools that can be applied to elegantly and selectively manipulate protein-protein interactions that are involved in signaling pathways within a cellular environment. The long-term goal of the lab is to develop synthetic biologics that can be used to probe cell signaling events that are mediated by kinases.

Dr. Dexi Liu, Panoz Professor of Pharmacy Email: dliu@uga.edu

The Liu laboratory is interested in the use of gene/protein as a drug for prevention and treatment of obesity, diabetes, cancer and other diseases. Our emphasis is on identification of genes that code for a therapeutic protein and on illustration of its mechanisms of action. We employ gene cloning, biochemical, cell biological, immunological, and gene delivery/transfer techniques to conduct basic research in cell culture and in animal models.

Dr. Mandi Murph, Associate Professor Email: mmurph@rx.uga.edu

Dr. Murph's laboratory focuses on therapeutic questions of two diseases, melanoma and serous epithelial ovarian carcinoma. For both malignancies, treating patients is coupled with major clinical frustrations, like chemoresistance; this is where science can aid in developing therapeutics and molecular strategies to overcome such obstacles. Enormous progress has been made in the fight against breast and prostate cancer, and childhood leukemia that it is time all cancer subtypes mimic that success. Recently, drugs such as vemurafenib, dabrafenib, trametinib, ipilimumab, pembrolizumab and nivolumab, which treat melanoma, bolster the hope that additional options will soon become available.

Dr. Gurvinder Singh Rekhi, Director, B.S. Program Email: gsrekhi@uga.edu

Nanotechnology – absorption of low solubility / permeability drugs; Immediate and controlled-release dosage forms; Topical and Transdermal Dosage Forms; In vitro in vivo correlation (IVIVC); Chemistry Manufacturing Controls (CMC), Technology transfer; Regulatory Submissions; Patent – Development (US, EP), Interference, Litigation, Expert.

Dr. Christopher Rice, Assistant Research Scientist, Center for Drug Discovery

Email: christopher.rice@uga.edu

Dr. Rice received his doctorate from the University of the West of Scotland in 2014. Following his education, he became a Postdoctoral Fellow for Dr. Dennis E. Kyle at the University of South Florida and led Dr. Kyle's amoeba drug discovery project. In this role, he developed high throughput screening methodology for the discovery of novel therapeutics for the brain eating amoeba, *Naegleria fowleri*. Throughout his Postdoc he developed similar phenotypic high throughput screening methodology for two other diverse pathogenic free-living amoeba, *Acanthamoeba* species and *Balamuthia mandrillaris*. He transitioned to UGA with Dr. Kyle in 2017 where he has been lead optimizing many of the hits the amoeba team discovered throughout their discovery phase via secondary assays for the prioritization of these molecules. This has been fundamental in the discovery and development of posaconazole as a combination partner drug for the treatment of Primary Amoebic Meningoencephalitis caused by *N. fowleri*.

Dr. Arthur Roberts, Associate Professor Email: audie@uga.edu

The Roberts lab seeks to advance technology and approaches that accelerate the development of drugs to treat major diseases such as cancer, heart disease and AIDs. To accomplish this goal, the laboratory uses biophysical techniques such as solution NMR, computer modeling and fluorescence spectroscopy to study drugs. They are particularly interested in studying drugs with membrane-bound proteins. These proteins often serve as drug targets for human disease and have numerous important biological functions such as cell signaling, transport and immune recognition. Specifically, they study drug interactions with the multiple drug resistance (MDR) transporter. Additionally to these research goals, they are developing creative and novel teaching methods to train students of different skill levels in the laboratory. To ensure the success of these students, they put considerable effort into their professional development, including having them meet with world-renowned scientists at national and international conferences. Achieving these research and teaching goals will not only advance medicine and improve drug therapies, but will also prepare students well for industry or academic careers in the 21st century.

Dr. Brian Seagraves, Academic Professional Associate (Skills Lab Coordinator)

Email: cgraves@uga.edu

Dr. Seagraves coordinates all four Essentials of Pharmacy practice courses for the PharmD program. Under his guidance students will perform clinical assessment of patients using bloodwork and laboratory markers as well as physically assessing a patient; assess the laboratory skills of students by determining clinically acceptable best practices; learn to prepare a S.O.A.P note; and assist in gathering data from patient encounters to be used in research.

Dr. Eva-Marie Strauch, Assistant Professor Email: estrauch@uga.edu

Dr. Strauch's lab is using computational structural design and protein engineering tools to understand, inhibit and re-purpose biological processes on the protein level. Their main focus is on how to diagnose, prevent and treat viral infections with the aim to generate new anti-virals and candidates for vaccination. While they are studying viral surface proteins principally to understand how they can target them or provide new immunogens, they also seek to shed light on how protein chemistry is involved in making viruses so successful. Viruses and their surface proteins hold the molecular keys for identifying specific host cells, entering them and re-programming them—much of what will be needed to fight cancer.

Dr. Catherine White, Associate Professor Email: cwhite44@uga.edu

Dr. White's research focuses on the influence of age and gender on the disposition of drugs and toxicants, and their subsequent therapeutic or toxic outcomes, and the physiological-based pharmacokinetic modeling for utilization in predicting toxicity and exposures. She also studies drug:drug interactions occurring at the maternal-placental-fetal interfaces, and pre-clinical evaluation of pharmacokinetics and toxicity of new drug entities. She is also searching for educational strategies that enhance active learning for pharmacy students.

Dr. Jason Zastre, Associate Professor Email: jzastre@uga.edu

Impact of vitamin B1 supplementation on cancer progression: Vitamin B1 (thiamine) is an essential enzyme cofactor intersecting multiple metabolic pathways within the glycolytic metabolism network. Maintaining thiamine homeostasis requires the activity of two SLC transporters THTR1 and THTR2 to facilitate the intracellular uptake prior to activation into the coenzyme thiamine pyrophosphate (TPP) by thiamine pyrophosphokinase-1 (TPK1). Vitamin B1 is an essential enzyme cofactor for 3 key metabolic enzymes, pyruvate dehydrogenase (PDH) and alpha-ketoglutarate dehydrogenase (a-KGDH) in the tricarboxylic acid cycle (TCA), and transketolase (TKT) within the pentose phosphate pathway (PPP). The overall research objectives are i) characterize the differences in thiamine homeostasis between cancer and normal tissue. ii) determine the impact of vitamin B1 supplementation on cancer cell survival and metabolism. III) Develop strategies to reduce thiamin mediated effects on malignant progression. The results of this research will link dietary influences on cancer progression with alterations in the homeostatic regulation of vitamin B1. In addition the research will contribute new insight into the pro-survival and pro-apoptotic effects of a physiologically and pharmacologically important enzyme cofactor. Overall, the outcomes of this research will require a critical rethinking of the usage and composition of dietary supplements and implementation of nutritional monitoring protocols for cancer patients.

Dr. Y. George Zheng, Professor and Graduate Coordinator Email: yzheng@uga.edu

Dr. Zheng's research lab works on the forefront area of chemistry, biology and medicine. They are particularly interested in addressing critical problems and challenges in the rapidly evolving field of epigenetics that describes gene expression profile changes that are irrelevant to genomic sequence. Mounting data show that epigenetic processes play pivotal roles in transforming normal cells into malignant tumors and in various other human pathologic conditions. Abnormality in epigenetic landscape presents characteristic biomarkers for disease diagnosis. Therefore, identifying key chromatin regulatory factors such as histone modifying enzymes and chromatin remodeling complexes, understanding their activity, specificity and functional roles, and inventing potent and selective drug compounds embody demanding needs in today's biology and pharmaceutical research. The lab is innovating and applying advanced chemical and biological strategies, tools and agents to elucidate functions of epigenetic enzymes in disease mechanism and meanwhile provide new diagnostic and therapeutic regimens. Current active research areas include: (1) development of potent and selective epigenetic therapies, and (2) design of chemical biology strategies and probes to interrogate protein acetylation- and methylation-regulated disease processes.