Dr. Carole Cramer – Professor of Molecular Biology
Contact Info: ccramer@astate.edu; 680-4307

1. Research Project:
   Research in my group is focused on using plants to produce complex proteins for medical application in therapeutics and vaccines. Students are exposed to techniques in gene design, molecular and cellular biology, plant-based bioproduction, bioinformatics, and analysis of plant-made proteins as they interact with human and animal cells.
2. ABI Mission compatibility:
   Our research is positioned at the interface of plant biology (using a tobacco plant as the production factory) and biomedical outcomes. Thus our research is highly relevant to the goals of the ABI.
3. Contributions to the scholarly or creative community:
   Students that will be involved in ABI-supported research experiences will gain both technical skills and the ability to understand and communicate complex scientific concepts. Their efforts will support advances in understanding how plants process complex human proteins and the impacts of those proteins on the plant. In addition, the students will gain in their competitiveness for advanced education. Students that have worked in my research group are often recognized by awards to UG student at conference poster competitions or A-State's Create@astAte and have been successful in getting into medical school or PhD programs.

Dr. Elizabeth Hood – Distinguished Professor of Agriculture
Contact Info: ehood@astate.edu; 680-8427

1. Research Project:
   The Hood lab works on technology that facilitates making products from renewable, plant-based raw materials. We use plant biotechnology to make plant seeds a "bio-factory" for producing proteins (enzymes) that are useful for changing complex plant "bodies" into small molecules that then can be used for manufacturing biofuels and other types of products, such as plastics. Our main goal is to work on technology that replaces petroleum based products as well as polluting chemicals from industry. We clone genes and gene regulatory sequences, move those genes into plants, analyze those plants and test the enzymes for activity in applications that could be relevant to industry.
2. ABI Mission compatibility:
   The ABI mission comprises research into topics that interface agriculture with health of Arkansans. It can also include tobacco-related diseases. Our research benefits the health of Arkansans in that we promote a healthy physical environment, thus lowering probability of disease from encounters with toxic chemicals.
3. Contributions to the scholarly or creative community:
   We are interested in making our discoveries available to industry and the public. Sometimes we patent our discoveries and sometimes we publish them. We always present them at conferences either through oral presentations or poster presentations. We have weekly lab meetings where we discuss our findings and help each other figure out what to do next. Lab meetings are also forums for learning about new topics that are relevant to our laboratory work.

Dr. Jianfeng (Jay) Xu – Associate Professor of Biochemical Engineering
Contact Info: jxu@astate.edu; 680-4812

1. Research Project:
   Research in the Xu lab aims to effectively produce recombinant proteins of potential pharmaceutical or industrial applications (e.g., vaccines, interleukins, and enzymes) with plant cell/tissue culture (including microalgae). Specifically, we engineer novel glyco-peptides, called HypGPs, that can function as a "molecular carrier" to excrete tagged-proteins to cell culture media, which dramatically increases the secreted protein yields. Experiments are focused on understanding gene expression, protein synthesis and post-translational modification, protein separation/purification, and protein bioactivity. In addition, bioprocess engineering strategies are also utilized to maximize the protein production and scale up the process.
2. ABI Mission compatibility:
   My research exploits plant cell/tissue culture as a safe and low-cost bioproduction "factory" to produce high-value proteins. It supports the ABI Mandated Research Areas 2: Bioengineering research that expands genetic knowledge & creates new applications in agriculture/medicine. Successful completion of ongoing or upcoming projects will facilitate global availability of high-quality protein therapeutics. ABI at A-State selects "Plant-based production of medicinal molecules" as one of major research growth areas and the research projects in my lab dovetails nicely with this effort.
3. Contributions to the scholarly or creative community:
   Our *HypGPs engineering* technology has transformative potential to make the plant cell-based bioproduction platform economically feasible and competitive with current microbial and mammalian cell "factories". By working on this project, participating students will be exposed to a wide range of techniques, such as molecular cloning, cell culture, recombinant protein expression/detection, and biomedical assay, which will prepare them for the next phase in their careers.

Mohammad Abrar Alam – Assistant Professor of Chemistry
Contact Info: malam@astate.edu; 972-3319

1. Research Project:
   In my research group we develop new synthetic methodologies for the synthesis of new small molecules as potential anticancer agents. We use inexpensive and readily available reagents and carry out the reactions under environmentally benign conditions. Simple reaction conditions help undergraduate students to accomplish the projects.
2. ABI Mission compatibility:
   The long term goal of my research is to find potent anticancer molecules to improve the health of millions of people. So, my research is in align with the ABI Mission Statement.
3. Contributions to the scholarly or creative community:

In my lab, students learn organic synthesis; set-up, monitor, and work-up reactions. Students also get expertise in nuclear magnetic resonance (NMR) spectroscopy to elucidate the structure of new molecules. To test the compounds against different cancer cell lines, students will also learn tissue culture.

David Gilmore – Associate Professor of Aquatic Ecology
Contact Info: dgilmore@astate.edu; 972-3263

1. Research Project:
   The Gilmore Lab dabbles in research, generally in collaboration with other researchers, in the general area of microbial ecology, the interaction of microbes and their environment. Lately we have been testing novel compounds as potential antimicrobials to combat the rising tide of antibiotic resistance. One promising approach to the development of new antibiotics is to find compounds that interrupt the ability of bacteria to communicate with each other; bacteria often do not "pull out their most dangerous weapons" until they have achieved high numbers in an infection. By blocking their ability to communicate, we could perhaps make the bacteria less dangerous and buy more time for host defenses to fight the infection. However, different types of bacteria have their own unique ways of signaling to each other, making it difficult to test potential new drugs against a panel of important pathogenic bacteria. Fortunately, many researchers, each studying a different pathogen, have genetically engineered their bacterium of interest to respond to communication amongst them by producing green fluorescent protein, potentially eliminating our problem of screening potential drugs against several bacteria with different communication systems. The goal of this research is to obtain engineered bacteria from several labs and attempt to develop a screening assay to test many different potential drugs against a panel of different pathogens.
2. ABI Mission compatibility:
   This research supports the mission of ABI in a couple of ways. First of all, if the project is successful, it will be possible to screen both old and new substances in a way that tests for a novel action, potentially leading to improved health for our citizens. While some of the substances that could be tested this way are synthetic compounds, plants are a tremendous source of compounds, and some may turn out to have helpful and unexpected activity that this new screening test could reveal.
3. Contributions to the scholarly or creative community:
   Work on this project would provide excellent opportunities for both a student (and a mentor; there's always new things to learn!). Tangible progress could be reported at Create@Astate as well as the annual meeting of the South Central Branch of the American Society for Microbiology and perhaps other venues. Some level of success could provide data that would help secure future funding. For example, it may be necessary to re-engineer some of the bacteria to allow screening of a wider array of plant compounds. If we can show that the general approach is successful, it would produce an excellent starting place for continued research.

Dr. Fabricio Medina-Bolivar – Associate Professor of Metabolic Engineering
Contact Info: fmedinabolivar@astate.edu; 680-4319

1. Research Project:

Title: Bioproduction of medicinal compounds from plants

The Medina-Bolivar laboratory team is involved in the discovery and bioproduction of bioactive plant compounds with medicinal applications (such as obesity and cancer). Our studies utilize "immortalized" root cultures (known as "hairy roots") as factories for a large diversity of plant natural products. Students involved in this project will learn molecular biology (gene cloning and PCR), plant tissue culture (micropropagation and hairy root cultures) and analytical/ purification techniques (high performance liquid chromatography and high performance countercurrent chromatography) for the production, isolation and characterization of bioactive plant compounds. Bioactivity assessment of the distinct natural products produced in the roots cultures is currently done in our laboratory and through collaborative projects with scientists at Arkansas State University, University of Arkansas for Medical Sciences (UAMS), University of Mississippi Medical Center, University of Tennessee Health Science Center and St. Jude Children's Research Hospital. The students are expected to participate in all aspects of the research and produce results for presentation at scientific conferences.

2. ABI Mission compatibility:

   The research projects in the Medina-Bolivar laboratory supports the mission of the Arkansas Biosciences Institute by developing strategies for sustainable production plant natural products with medicinal applications to improve the health of Arkansas.

3. Contributions to the scholarly or creative community:

   Students will have the opportunity to contribute to peer-reviewed publications and presentations at scientific meetings. As shown in the list below, undergraduate students from the Medina-Bolivar laboratory has provided poster and oral presentation at local, state and national meetings. Several of these students have received awards for their presentations. Students (undergraduate and graduate students) have also been first or co-authors in peer-reviewed publications (see below).

Selected Presentations (5 of 215 total presentations)– [*Undergraduate students underlined and italics*]

Marsh Z, Nopo-Olazabal L, Yang T, Joshee N, **Medina-Bolivar F**. 2012. Elicitation and secretion of specialized metabolites in *Scutellaria lateriflora* hairy root cultures treated with cyclodextrin and methyl jasmonate. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster). (**First Place Poster Award by undergraduate student Z Marsh**)

Ogutu L, Nopo-Olazabal L, **Medina-Bolivar F**. 2013. Biosynthesis enhancement of stilbenoids from hairy root cultures of peanut. In Vitro Biology Meeting. Providence, RI. June 15-19. (poster).

Tollet CA, Nopo-Olazabal L, **Medina-Bolivar F**. 2014. Production of stilbenoids in hairy roots cultures of peanut and their purification by high performance counter current chromatography. 247th American Chemical Society National Meeting. Dallas, TX, March 16-20. (**invited talk; First Place Award by undergraduate student CA Tollett**)

Knapp T, Luis Nopo-Olazabal L, **Medina-Bolivar F**. 2015. Production of stilbenoids in hairy root cultures of muscadine grape: Effect of methyl jasmonate and cyclodextrin. 249th American Chemical Society National Meeting & Exposition, Denver, CO. March 22-25. (invited talk by undergraduate student T. Knapp)

Creameans J, Fang L, *McGregory D*, Nopo-Olazabal L, **Medina-Bolivar F**. 2015. Annatto hairy roots: A sustainable source of bioactive compounds with applications in human health. 6th Annual Conference of the American Council for Medicinally

Active Plants (ACMAP). Spokane, WA. June 9-12 (poster). **First Place Award by undergraduate student J Creameans.**

Selected Publications (5 of 36 publications)
(Undergraduate students supervised by Dr. Medina-Bolivar in *italics and underlined*)

Abbott J, **Medina-Bolivar F**, Martin E, Engelberth AS, *Villagarcia H*, Clausen EC, Carrier DC. 2010. Purification of resveratrol, arachidin-1 and arachidin-3 from hairy root culture of peanut (*Arachis hypogaea*) and determination of their antioxidant activity and cytotoxicity. Biotechnology Progress. 26(5):1344-1351

Medina-Bolivar F, *Condori J, Nopo-Olazabal C*, Carrier J, Abbott J, Nair V, *Atwill R*, Baker J, Nopo-Olazabal L, Dolan M. 2010. Controlled production of stilbenoids in hairy root cultures of peanut (*Arachis hypogaea*). Polyphenols Communications. 1: 42-43.

Nopo L, Woffenden B, Reed D, *Buswell S*, Zhang C, **Medina-Bolivar F**. 2012. Super-promoter: TEV, a powerful gene expression system for tobacco hairy roots. Methods Mol. Biol. 824:501-526.

Marsh Z, *Yang T*, Nopo-Olazabal L, *Wu S*, Ingle T, Joshee N, **Medina-Bolivar F**. 2014. Effect of light, methyl jasmonate and cyclodextrin on production of polyphenolic compounds in hairy root cultures of *Scutellaria lateriflora.* Phytochemistry 107:50-60.

Yang T, Fang L, *Nopo-Olazabal C*, *Condori J*, *Balmaceda C*, Nopo-Olazabal L, **Medina-Bolivar F**. 2015. Enhanced production of resveratrol, piceatannol, arachidin-1 and arachidin-3 in hairy root cultures of peanut co-treated with methyl jasmonate and cyclodextrin. Journal of Agricultural and Food Chemistry. 63(15):3942-50.

Malathi Srivatsan – Professor of Neurobiology

Contact Info: msrivatsan@astate.edu; 972-3167

1. Research Project:
   Title: Promoting Regeneration and Communication in the Nervous System
   In higher organisms including humans the primary functional cells of the nervous system, the neurons, do not divide to replace dead neurons. Therefore any injury or disease that kills neurons in the spinal cord or brain leads to permanent loss of function in those organisms or individuals. Neuroscientists are frantically researching to find ways to help repair such injuries (regeneration) and make neurons communicate well again. In Srivatsan's laboratory the research is focused on guiding more undifferentiated cells (cells that have not decided to become neurons yet) to become neurons and help the new neurons communicate well with existing adult neurons. Currently we are using engineered 3-D matrix to grow and stimulate un-differentiated cells to become new neurons and we will then research how to make these new cells communicate better with existing adult neurons. We use cool techniques such as cell culture, immunocytochemistry, fluorescence microscopy, gene expression analyses, and analyses of patterns of electrical activity from the neurons in this research. Our research team includes undergraduate students, graduate students and postdoctoral researcher, all working together and learning from each other.
2. ABI Mission compatibility:
   Each year 12,000 new patients are added as suffering from paralysis due to spinal cord injury and 60,000 new patients are diagnosed with Parkinson's disease in US. In Arkansas alone currently 53,000 patients suffer from Alzheimer's disease. Being able to increase the availability of new neurons and improve their connections is an important research that provides hope for

treating and curing these conditions. Thus our research aligns well with the ABI mission "to improve the health of Arkansans through new and expanded agricultural and medical research initiatives. "

3. Contributions to the scholarly or creative community:
   Our findings will be published and will lead to (1) marketing the new matrices as well as our techniques to generate more healthy neurons for possible transplantation to patients in the future. (2) The topic as well as techniques used in this research that bridges materials engineering with biomedical application is timely and cutting edge. The results will be used to developing new grant proposals for funding from outside agencies. (3) More importantly, students participating in this research will learn the subject and techniques well, will be able to participate in international neuroscience conferences, be authors of published manuscripts and thus improve their knowledge and career success significantly.

Maureen Dolan, Associate Professor of Molecular Biology
Contact Info: mdolan@astate.edu; 680-4359

1. Research Project:
   Undergraduate research scholars in the Dolan lab will be a part of a dynamic research team that includes undergraduate, graduate and senior researchers focused on using plants as "factories" and recombinant DNA techniques to produce animal therapeutic proteins. Specifically we use this plant production system to develop fish protein therapeutics that could be used as alternatives to antibiotics in controlling disease outbreaks in farmed raised (aquacultured) fish. Other projects in the lab in collaboration with engineering faculty are involved with the development of DNA-based diagnostics that can be used for identifying fish species that is important for managing our food supplies as well as in supporting conservation management efforts. Student researchers will have opportunity for hands-on experience using some of the skills and techniques seen/learned in your lab courses including buffer preparation, pipetting, PCR, DNA extraction, protein chromatography, electrophoresis and animal cell culture. Student scholars are paired with senior researchers in the lab to train in the techniques they will use to carry out their research project. Please check out this weblink for more information about research in our lab:
   http://www.plantpoweredproduction.com/faculty/maureen-dolan/
2. ABI Mission compatibility:
   These projects align with the ABI mandate research areas focused on agricultural research with animal health implications, bioengineering to expand new applications in agriculture and fostering true interdisciplinary science with potential for future knowledge-based economic development.
3. Contributions to the scholarly or creative community:
   These projects contribute to the scholarly community in providing innovative technologies for real world problems. The research aimed at hand-held DNA diagnostics if successful will provided tools for ensuring sustainability of limited aquatic resources and food security. Research aimed at the aquaculture industry

that will reduce the negative footprint this industry has on the environment by providing innovative solutions to reduce/mitigate the use of antibiotics in farmed fish.

Dr. Michael Bowman, Assistant Professor of Media
Contact Info: mbowman@astate.edu; 972-3429

1. Research Project:
   Most of my research involves producing media presentations (television/radio programs, documentaries, multimedia presentations) on a variety of topics. These types of media programs will focus on how agriculture and media research is improving the health of Arkansans.
2. ABI Mission compatibility:
   A key component in improving the health of Arkansans is the dissemination of knowledge about health issues. As a former television producer at KAIT, I produced a program titled *Issues in Health* in cooperation with St. Bernards Regional Medical Center that featured a panel of doctors who provided viewers with important information about a variety of health issues. Creating media presentations is an excellent method of spreading information about health issues important to Arkansans.
3. Contributions to the scholarly or creative community:
   Creative media content is an important tool toward improving the health of Arkansans, especially among underserved populations. Research involved in this project could reveal how media can be used to reach out to these communities in new and innovative ways. I envision directing an interdisciplinary team of scholars from Media, Health Professions, ABI, Sociology, World Languages, and more in producing media content helpful in improving the health of Arkansans.

Dr. Edward Salo, Associate Professor of History
Contact Info: esalo@astate.edu; 972-3130

1. Research Project:
   I propose in this project to develop a case study in how heritage studies can assist a community, like Cave City, to promote eating a healthy diet that is composed of locally grown fruit or vegetable, something that is lacking in Arkansas, while promoting their agricultural heritage. Using the funding, I propose students conducting research on the history of growing watermelons in Cave city and the gathering of recipes for the fruit. We will examine the recipes and adapt them to make them healthier if necessary.
2. ABI Mission compatibility:
   Using this information, we will develop a brochure, poster, and webpage on the heritage of the watermelons in Cave City as well as a way to distribute the healthy recipes. The information then can be distributed to local schools, civic groups, etc., to promote eating watermelons, not just in the summer and at picnics. This will hopefully get people interested in eating the fruit or vegetable more of the year, and also get people in touch with the heritage of farming.

3. Contributions to the scholarly or creative community:

This project will serve as a pilot project and if it is successful it can be used as a model for other local communities to highlight their signature crops as a means to promoting healthier eating.