University of Missouri
Summer 2016 Undergraduate Research Programs for Visiting Students

Animal Sciences • Biochemistry • Cell & Molecular Biology

Other Programs:
Medical Sciences
Neuroscience
Physics: Materials and Modeling
Biocomplexity and High-Performance Computing

General Information: The Office of Undergraduate Research at the University of Missouri (MU) coordinates a number of summer research programs for undergraduates enrolled at other institutions. All programs run for 9 weeks (Wednesday, June 1 - Friday, July 29), with travel days being Tuesday, May 31 and Saturday, July 30. Students selected for these programs live in on-campus, air-conditioned housing (double rooms), and receive a meal plan, covered by the program. Summer interns also receive one hour of academic/research credit, travel to and from Columbia, and a stipend of $3800.

Funds are available for approximately 50 non-MU students in different programs (described on the following pages). An additional 50+ undergraduates from MU or in other programs will participate in all research and educational programming activities, creating a vibrant community of undergraduate researchers. Students will work on their own research project under the guidance of an MU faculty mentor and present their results at a poster Forum at the end of the summer program (July 28). Students become part of a research team that typically includes other undergraduate students, graduate students, lab technicians, and post-doctoral researchers. With 1,000 faculty members, over fifteen academic departments, and eight interdisciplinary programs and centers (all focused on the life sciences), MU is a great place for undergraduates preparing for a challenging career in physics and other sciences research and education. Our Columbia campus includes schools and colleges of Arts & Science; Agriculture, Food & Natural Resources; Engineering; Health Professions; Medicine; and Veterinary Medicine -- all within walking distance. MU is home to the nation’s largest (10MW) nuclear reactor found on a college campus. The MU Research Reactor (MURR) provides advanced research opportunities for students and faculty in the neutron-related sciences and engineering and is an excellent facility for radiochemistry research.

Summer program alumni have entered graduate programs at University of California-Irvine, University of California-San Diego, University of Chicago, University of Colorado, Indiana University, Iowa State University, University of Michigan, University of Missouri, Purdue University, University of Virginia, Washington University in St. Louis, and the University of Wisconsin.

The Campus and Community: MU, the flagship campus of the University of Missouri system, is home to more than 34,700 students (7,700 in graduate and professional programs) and 2900 faculty. Columbia, midway between St. Louis and Kansas City, is a vibrant community with a population of more than 113,000. Columbia offers most of the benefits of large cities (restaurants, art, theater, music, and a variety of churches) and yet maintains the atmosphere and convenience of a small, diverse college town. There are numerous trails for walking, running, and
biking, and a variety of city and state parks nearby.

**Eligibility:** Applicants are expected to have completed at least one year of full-time college enrollment prior to June 2016 and be pursuing a major in animal sciences, biology, biochemistry, chemistry, plant sciences, computer sciences, or related fields. Students graduating prior to December 2016 are not eligible. **Students must be citizens or permanent residents of the U.S.** Please see the information on the individual programs for additional eligibility information.

**Application Information:** The deadline for applying to these programs is **Monday, February 15, 2016.** Students must complete the attached application form and provide an unofficial transcript (including fall 2015 grades); at least one letter of recommendation (two preferred); a personal statement including career plans, prior research experience (if any), and statement of research interests; and a resume. Completed application packets should be sent to Office of Undergraduate Research, 150 Christopher S. Bond Life Sciences Center, University of Missouri, Columbia, MO 65211. FAX: 573-884-9395. Questions can be directed to Michael Cohen (CohenME@missouri.edu, 573-882-4818).

**Educational Programming:** In addition to their research work, students participate in a full series of evening seminars and small group sessions designed to provide them with information about research, career preparation and options, and scientific ethics. Speakers from previous years have included MU faculty, a scientist from the Stowers Medical Institute, members of the National Academy of Science, clinical oncology researchers, science teachers, directors of graduate programs, and other scientists. Weekly small group seminars provide opportunities for students to focus on a topic and engage in discussion with peers and faculty members. These specialty discussions are open to all students, regardless of program affiliation. Small group seminar topics have included evolution, animal locomotion, science communication, applying to graduate school, professional skill development, and learning to read scientific literature. Social activities also provide opportunities for participants to get to know each other and other members of the MU science community. A mandatory orientation session that includes team-building activities is scheduled for Wednesday, June 1.

**Faculty Mentors:** Students are encouraged to read about the research interests of potential faculty mentors on the appropriate MU web sites. Students may find information on each of the faculty mentors listed below by accessing their departments’ web sites. Students should list up to 8 faculty that they are interested in working with on their application, regardless of which programs they are applying to. Please note that there is overlap in programs for many of our faculty mentors. Students should check to ensure that faculty mentors they list are participating in the program(s) for which they are applying.

**Website:** undergradresearch.missouri.edu
Summer Research in Biochemistry

Biochemistry at Missouri is noted for interdisciplinary research and effective instruction. The two are interwoven to provide excellence in both. Even our name spans biology and chemistry. In the same spirit, the Department spans many other interfaces. For instance, we are part of both the School of Medicine and the College of Agriculture, Food and Natural Resources, and share faculty with more than five other departments as well as with the interdisciplinary Bond Life Sciences Center.

Our faculty members are internationally known researchers and prize-winning teachers, including two members of the National Academy of Sciences and multiple members of disciplinary academies and honorary organizations. More than thirty faculty conduct research in Gene Expression; Molecular Medicine; Plant Sciences; Receptors and Signaling; Macromolecular Synthesis, Assembly and Localization; Structural and Chemical Biology; Proteomics, Genomics and Combinatorial Chemistry; Enzymology, Nutrition and Metabolism.

The Biochemistry Summer Research Program seeks undergraduates from other institutions who are interested in exploring graduate education opportunities in Biochemistry at MU while conducting full-time research with an MU Biochemistry faculty member.

Eligibility Requirements:

~ Applicants must meet basic eligibility requirements.
~ Students must be planning on pursuing a PhD in Biochemistry.
~ Students are expected to have completed two years of college (including two semesters of organic chemistry) and have earned a minimum of a 3.0 gpa.
~ Students must be planning on pursuing a PhD in Biochemistry.
~ Applicants must meet basic eligibility requirements.

Please visit the department website for a list of faculty members and their research areas before completing your application form: (biochem.missouri.edu)

Miller Summer Research Internships in Animal Sciences

The objective of the Miller Summer Research Internship program is to introduce students to animal sciences research, emphasizing food and fiber producing animals. Animal Sciences faculty research a variety of areas, including: ruminant and nonruminant nutrition; reproductive physiology; genetics and molecular biology; environmental physiology; and production and management. Each student will be working directly within a laboratory under the supervision of an internationally recognized researcher. The participant will gain an understanding of recent advances in basic science and applied animal sciences research. Students will receive a stipend of $3800.

Eligibility Requirements:

~ Applicants must meet the basic eligibility requirements.
~ Students are expected to have a minimum of a 3.0 gpa and have completed 2 years of college.
~ Selection is partially based on the applicant’s potential and motivation for future graduate study (PhD level) in animal sciences.

Division of Animal Sciences Potential Faculty Mentors: (animalsciences.missouri.edu)

- Gavin Conant, Bioinformatics
- Christine Eilks, Computational genomics
- Jeffre D. Firman, Poultry physiology and nutrition
- Kevin L. Fritsche, Lipid nutrition, immunology
- Rodney D. Geisert, Reproductive physiology-swine
- Jonathan Green, Molecular biology
- Duane Keisler, Reproductive physiology
- Monty S. Kerley, Ruminant nutrition
- William R. Lamberson, Animal breeding and genetics
- Carol Lorenzen, Meat science
- Dennis Lubahn, Nutritional aspects of estrogen and hedgehog signaling in reproduction and cancer
- Mathew Lucy, Molecular endocrinology
- Tom McFadden, Lactational physiology
- Allison Meyer, Ruminant nutrition
- David Patterson, Extension beef cattle reproduction
- Randall Prather, Reproductive physiology/molecular biology
- Rocio Rivera, Animal molecular and cell biology
- R. Michael Roberts, Molecular biochemistry
- Tim Safranski, Extension-swine breeding and genetics
- Robert Schnabel, Genetics
- Marcia Carlson Shannon, Extension-swine nutrition
- Michael Smith, Reproductive physiology
- Tom Spencer, Reproductive Biology and Genomics
- Peter Sutovsky, Molecular/cell/development biology
- Jeremy Taylor, Genomics
- Kathy Sharpe Timms, Infertility and endometriosis
- Kevin Wells, Genetics
- Byron Wiegand, Meat science

Please visit the department website (animalsciences.missouri.edu) for detailed research descriptions before completing your application form.
2016 Summer Research Internship Program in Cell & Molecular Biology

The MU Life Sciences Fellows Program (http://lifescigradprograms.missouri.edu/) is actively seeking to diversify their graduate program application pool. As part of this effort, we are offering four summer research positions for undergraduates in 2016. Preference will be given to students interested in applying to PhD programs in the life sciences at the University of Missouri after completion of their undergraduate degree. Applicants are expected to have completed at least one year of full-time college enrollment prior to June 2016, be pursuing a major in biology, biochemistry, microbiology, or related fields, and be a citizen or permanent resident of the U.S.

Summer research interns selected for this program will conduct cell & molecular biology research with faculty mentors who are members of the NIGMS T32 Training Grant at MU. A list of eligible faculty mentors appears below. Additional questions may be directed to Michael Cohen (CohenME@missouri.edu, 573-882-4818) or Dr. Mark Hannink (HanninkM@missouri.edu).

FACULTY MENTOR LIST - please see departmental websites for information on research interests

Department of Biochemistry (www.biochem.missouri.edu)
- Peter Cornish - Single molecule analysis of ribosome function
- Mark Hannink - Mitochondrial movement and oxidative stress
- Abraham Koo - Regulation of jasmonate plant hormone levels
- Dennis Lubahn - Botanical prevention of prostate cancer
- Scott Peck - Phosphoproteomics of plant signaling
- Brenda Peculis - Regulation of RNA stability
- Nick Petris - Trafficking and utilization of copper
- Charlotte Phillips - Mutant collagen molecules and bone diseases
- Gary Stacey - Functional genomics of plant development
- Jay Thelen - Proteomic analysis of seed development
- Peter Tipton - Chemical mechanisms of enzyme-catalyzed reactions
- Steve Van Doren - Protein structure determination using NMR
- Judy Wall - Environmental microbiology
- Gary Weisman - Purinergic receptors and human disease
- Shuqun Zhang - Biochemical and genetic analysis of MAPK function in plants

Division of Biological Sciences (www.biology.missouri.edu)
- James Birchler - Structure and function of chromosomes
- David Braun - Genetic control of carbon partitioning in plants
- Anand Chandrasekhar - Developmental biology of zebrafish
- Dawn Cornelison - Stem cells of muscle
- Michael Garcia - Molecular biology of neurofilaments
- Mannie Liscum - Phototropism and plant development
- Paula McSteen - Genetic regulation of meristem function in plants
- Kathy Newton - Mitochondrial genetics of plants
- Chris Pires - Functional genomics of polyploidy
- David Schulz - Neurobiology of ion channels
- Laura Schulz - Physiological mechanisms of placental development
- John Walker - Protein kinases in plant development

Department of Molecular Microbiology & Immunology (mmi.missouri.edu)
- Deborah Anderson - Molecular pathogenesis of Yersinia pestis
- Brenda Beerntsen - Mosquito-parasite interactions and innate immunity of mosquitoes
- Donald Burke-Aguro - Aptamers as therapeutic agents against HIV
- Dongsheng Duan - Development of novel gene therapies
- Bumsuk Hahm - Interplay between viruses and host immunity
- Marc Johnson - Role of gag and env proteins in HIV assembly
- Shan-Lu Liu - Host restriction of viral infections and viral countermeasures
- Chris Lorson - Novel therapies for spinal muscular atrophy
- David Pintel - Host-virus interactions using parvoviruses
- Stefan Sarafianos - Development of drugs against viral polymerases
- Habib Zaghouani - Mechanisms of autoimmune diseases
- Guoquan Zhang - Vaccine-induced protective immunity against Coxiella burnetii

MU Informatics Institute (muii.missouri.edu)
- Jianlin (Jack) Cheng - Bioinformatics, computational biology
- Dong Xu - Bioinformatics, computational biology
Other Programs

**National Science Foundation – Research Experience for Undergraduates**
The University of Missouri is proud to be an NSF-REU site for the following Summer 2015 experiences:

*Neurosciences*

*Physics: Materials and Modeling*

*Biocomplexity and High-Performance Computing*

If you are interested in these programs, please check our website (listed below) for more information.

[undergradresearch.missouri.edu/programs-jobs/programs](undergradresearch.missouri.edu/programs-jobs/programs)

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**Summer Research Internship in Medical Sciences**
The Office of Research at the University of Missouri School of Medicine coordinates a summer research program for undergraduates enrolled at other institutions. The objective of the program is to recruit underrepresented racial and ethnic groups to the medical school with the goal of improving diversity and inclusion in the clinical medicine workforce. Application deadline is February 12, 2016.

Additional information (including pre-requisites) and application materials will be made available at [medicine.missouri.edu/internship/](medicine.missouri.edu/internship/)

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**Examples of speakers and topics from our past summer programs:**

- **Bill Allen** (Journalism) *A Career of Science Writing*
- **Brandon Blakey** (Applied Biosystems Genomic Analysis Division & 1992 Summer Intern) *This is My Life: Industry Sales, Service & Consulting*
- **Dr. Linda Blockus** (Undergraduate Research) *Writing Effective Personal Statements*
- **Dr. Jon Dyer** (Dermatology & MU Intern) *You’re a pediatric what?!? Pediatric dermatology clinical research*
- **Dr. Sherry Flint-Garcia** (USDA) *Using sequence diversity to understand agronomic traits*
- **Dr. Michael Garcia** (Biological Sciences) *Insulin and your nerves: Myelin to multiple sclerosis*
- **Dr. Linda Godwin** (Physics & Astronomy) *Space: A Personal Perspective from Low Earth Orbit*
- **Dr. Sheila Grant** (Biomedical Engineering) *Nanostructure Materials for Tissue Engineering*
- **Dr. Pam Hinton** (Nutritional Sciences) *Determinants of Bone Health*
- **Dr. Casey Holliday** (Pathology & Anatomical Sciences) *21st Century Paleontology: Functional morphology and evolution of the reptile head*
- **Dr. Salman Hyder** (Veterinary Biomedical Sciences) *Tumor Angiogenesis: A Target for Treatment and Prevention of Breast Cancer*
- **Dr. Marc Johnson** (Molecular Microbiology & Immunology) *How do viruses put themselves together?*
- **Dr. Brick Johnston** (Health Psychology) *The Neuropsychology of Spirituality: Identifying the Neurologic Mechanisms of Mysticism after Traumatic Brain Injury*
- **Dr. Gavin King** (Physics & Astronomy) *Poking Molecules with Sharp Needles: Biophysical Insign via Force Microscopy*
- **Dr. Mannie Liscum** (Biological Sciences) *Plants do cool things too: Molecular genetics and cell biology of photopism*
- **Dr. Dennis Lubahn** (Biochemistry and Animal Sciences) *How wanting to live forever leads to one-eyed sheep and prostate cancer*
- **Dr. Joel Maruniak** (Biological Sciences) *Finding your right livelihood*
- **Dr. Stephanie McKay** (Animal Sciences) *Bovine Genome: Development of the first generation bovine haplotype map*
- **Dr. Fred vom Saal** (Biological Sciences) *Plastics-based endocrine disrupters and your health*
- **Dr. Jack Schultz** (Bond Life Sciences Center) *Talking science to the public: Why don’t they listen?*
- **Dr. Ray Semlitsch** (Biological Sciences) *The graduate application process*
- **Dr. Angela Speck** (Astronomy) & Dr. Alan Whittington (Geological Sciences) *Balancing Academic Science Careers and Family Life*
- **Dr. Gary Stacey** (Plant Sciences) *The Importance of Public Policy to your Scientific Career*