



*Summer 2013 Undergraduate Research Programs
at the University of Missouri
for Non-MU Students*

Animal Sciences - open application
Biology/Biochemistry - limited application
Plant Genomics - open application
Cell & Molecular Biology - open application

Other Programs (see last page)

Medical Sciences

Computational Neurosciences

Biomaterials & Condensed Matter (Physics) – (pending funding)

Undergraduate Bioinformatics Institute – May 20 – 31

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, May 29 - Friday, July 26**), with travel days being Tuesday, May 28 and Saturday, July 27. Students selected for these programs live in on-campus, air-conditioned housing (double rooms), and receive a full meal plan, covered by the program. Summer interns also are provided with funds to cover one hour of academic/research credit, travel to and from Columbia, and a stipend of \$3600.

Funds are available for approximately 30 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 (July 25th). Students become part of a lab 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 biomedical and life 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 California-Irvine, California-San Diego, Chicago, Colorado, Indiana, Iowa State, Michigan, Missouri, Purdue, Virginia, Washington University (St. Louis), and 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 growing community with a population of more than 110,000. 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 two years of full-time college enrollment prior to June 2013 and be pursuing a major in animal sciences, biology, biochemistry, chemistry, plant sciences, or related fields. Students graduating prior to December 2013 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 **Friday, February 15, 2013**. Students must complete the attached application form and provide an unofficial transcript (including fall 2012 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. Students attending one of the MU Summer Partner Schools (Barry, Fort Valley State, Grinnell, Long Island University, Medgar Evers, Missouri State, Monterey Bay, Prairie View A&M, and Truman State) should discuss their interest with their faculty contact at their home institution and submit their application through their faculty contact well in advance of February 15th. Completed application packets should be sent to Pam Cooper, 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 Pam Cooper (MonroeP@missouri.edu, 573-882-5979) or Director Dr. Linda Blockus (BlockusL@missouri.edu).

Educational Programming: In addition to their research work, students participate in a full series of evening workshops and brown bag lunches designed to provide them with information about research, career preparation and options, and scientific ethics. Speakers have included MU faculty, a scientist from the Stowers Medical Institute, a scientist from Pioneer Seed, a veterinary oncologist, members of the National Academy of Science, clinical oncology researchers, science teachers, directors of graduate programs, and other scientists. Weekly specialty discussions provide opportunities for students to read articles relevant to the topics and engage in discussion with peers and faculty members. These specialty discussions are open to all students, regardless of program affiliation. A presentation on writing abstracts and designing posters is held in preparation for the poster Forum. 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, May 29th.

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



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.

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 Elsik**, *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*
- **David Ledoux**, *Mineral metabolism*
- **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*
- **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*
- **Trista Strauch Safranski**, *Captive wild animal management*
- **Robert Schnabel**, *Genetics*
- **Justin Sexten**, *Ruminant nutrition*
- **Marcia Carlson Shannon**, *Extension-swine nutrition*
- **Michael Smith**, *Reproductive physiology*
- **Don Spiers**, *Environmental physiology*
- **Peter Sutovsky**, *Molecular/cell/development biology*
- **Jeremy Taylor**, *Genomics*
- **Kathy Sharpe Timms**, *Infertility and endometriosis*
- **Matthew Waldron**, *Dairy nutrition*
- **Kevin Wells**, *Genetics*
- **Byron Wiegand**, *Meat science*

Please visit the department website (animalsciences.missouri.edu) for detailed research descriptions before completing your application form.

PGI@MU

Plant Genomics Internships at MU

The University of Missouri (MU) is a nationally recognized center for plant genetics research and has been awarded over ten grants from the National Science Foundation to fund research in plant structural and functional genomics. MU consistently ranks among the top five universities in the country for NSF funding in the area of plant genomics. MU's graduate programs in plant sciences are highly competitive and attract some of the best doctoral students and post-doctorate researchers in the country. Faculty in biological sciences, biochemistry, plant sciences, and the USDA/ARS are eager to provide training opportunities for undergraduates who wish to participate in collaborative research. Research areas include: genome organization, gene expression, signal transduction, hormone action, organelle biochemistry, disease resistance, and crop plant productivity. Genomics approaches to understanding these problems include: genetic and physical mapping, multiple methods for functional analysis, and bioinformatics.

MU Interdisciplinary Plant Group Website:

IPG.missouri.edu

Eligibility Requirements:

- ✓ Applicants must meet the basic eligibility requirements.
- ✓ Students must be majoring in biology, biochemistry, plant science, or a related field and intending to pursue graduate work in one of the life sciences.
- ✓ Students must be entering their sophomore, junior, or senior year in college. Freshman with previous research experience may apply.

Faculty Mentors for Plant Genomics Internship at MU (PGI@MU)

Department of Biochemistry (www.biochem.missouri.edu)

- **Bill Folk** – Improvement of plant nutritional quality and adaptation to abiotic stress
- **Jan Miernyk** – Systems biology analysis of soybean development, protein interactions, ionomics
- **Bruce McClure** – Mechanisms of pollen recognition and rejection
- **Jay Thelen** – Proteomics and phosphoproteomics of seed development in canola, Arabidopsis, and soybean

Division of Biological Sciences (www.biology.missouri.edu)

- **Jim Birchler** - Studies of chromosome structure and function using fluorescent in situ hybridization to maize chromosomes
- **Candace Galen** – Canary in the coal mine: Impacts of climate change on high alpine plant and pollinator communities
- **Mannie Liscum** – Molecular and cellular regulation of plant growth and development
- **Paula McSteen** – Plant developmental biology; hormone signal transduction
- **Kathy Newton** - Plant mitochondrial genetics; interorganellar interactions and DNA transfers
- **Chris Pires** - Functional genomics of polyploids
- **Patrick Shiu** - Meiotic silencing by unpaired DNA: A new RNAi phenomenon

Department of Computer Science (www.cs.missouri.edu)

- **Toni Kazic** – The maize lesion network: A model system for understanding complex phenotypes by genetics and modeling

Division of Plant Sciences (plantsci.missouri.edu)

- **Walter Gassmann** – Molecular mechanisms of immune responses
- **Hari Krishnan** - Genetic modification of soybean seed composition; symbiotic plant-bacterial interactions in soybean
- **Melissa Goellner Mitchum** - Molecular mechanisms that regulate plant-nematode interactions
- **Henry Nguyen** - Functional genomics of plant responses to abiotic stress and soybean seed development
- **Jack Schultz & Heidi Appel** - Molecular and chemical ecology of plant-insect interactions
- **Gary Stacey** - Functional genomics of plant development; molecular studies of plant-microbe interactions
- **Zhanyuan Zhang** – Optimization of in vitro culture conditions for improved regeneration and transformation



2013 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 2013. 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 2013, 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 Training Grant at MU. A list of eligible faculty mentors appears below. Additional questions may be directed to Pam Cooper (MonroeP@missouri.edu, 573-882-5979) 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)

- **Bill Folk** - Improvement of plant nutritional quality and adaptation to abiotic stress
- **Mark Hannink** - BTB-Kelch substrate adaptor proteins and regulated protein ubiquitination
- **Dennis Lubahn** - Finding novel molecular functions for human and mouse estrogen receptors, the female sex steroid receptors
- **Scott Peck** - Proteomics of protein phosphorylation and protein kinases; signaling and secretion during host-pathogen interactions
- **Brenda Peculis** - Applying genetic, biochemical and developmental assays to understand a novel protein involved in RNA stability and putative roles in cancer
- **Charlotte Phillips** - Collagen in inherited and acquired diseases of bone and kidney; Matrix metalloproteinases; Medical genetics
- **Gary Stacey** - Functional genomics of plant development; molecular studies of plant-microbe interactions
- **Grace Sun** - Biochemistry of the nervous system, How microglial cells kill neurons
- **Jay Thelen** - Proteomics and phosphoproteomics of seed development in canola, Arabidopsis, and soybean

Division of Biological Sciences (www.biology.missouri.edu)

- **Jim Birchler** - Studies of chromosome structure and function using fluorescent in situ hybridization to maize chromosomes
- **Mannie Liscum** - Molecular and cellular regulation of plant growth and development
- **Kathy Newton** - Plant mitochondrial genetics; interorganellar interactions and DNA transfers
- **Chris Pires** - Functional genomics of polyploids
- **John Walker** - Molecular analysis of signaling pathways in plants

Department of Molecular Microbiology & Immunology (mmi.missouri.edu)

- **Dongsheng Duan** - Gene therapy in animal models of human diseases
- **Chris Lorson** - Molecular basis of spinal muscular atrophy; RNA processing; gene therapy
- **David Pintel** - Parvovirus infection and host-cell response
- **Stefan Sarafianos** - Drug discovery targeting replication and entry of HIV, SARS, Foot-and-mouth disease virus, Hepatitis B virus, and XMRV
- **Habib Zaghvani** - Basic mechanisms of auto immune diseases

Department of Computer Sciences (www.cs.missouri.edu)

- **Jianlin (Jack) Cheng** - Bioinformatics and computational systems biology
- **Dong Xu** - Bioinformatics and computational biology

Other Programs

Two week Biomedical Informatics Institute for Undergraduates!

MU's *Howard Hughes Medical Institute C3 Program* will offer a two-week undergraduate Biomedical Informatics Institute at the University of Missouri **May 20-31, 2013**. The institute is open to undergraduate students interested in biological and/or computer sciences. Examples of topics/activities include: introduction to bioinformatics; introduction to phenotypes and genotypes; NCBI resources and databases; biological sequence search and alignment tools; protein structure prediction; protein alignment/fold analysis; core research facilities tour; introduction to medical informatics; translational biomedical informatics; and group research projects. Participating students will receive room and board.

Additional information (including pre-requisites) and application materials will be made available at hhmi.missouri.edu

Computational Neurosciences

The **Computational Neurosciences** summer research program will recruit undergraduates from the disciplines of engineering and biological sciences and will provide interdisciplinary research experience in neuroscience with focus primarily on computational aspects, i.e., computational neuroscience. The faculty mentors are from the Colleges of Engineering, Arts & Science, Medicine, and Veterinary Medicine. Computational neuroscience provides tools to abstract and generalize principles of brain function using mathematics, with applicability to the entire neuroscience spectrum including molecular, cellular, systems, and behavior levels. Application deadline is February 15, 2013.

Additional information (including pre-requisites) and application materials are available at engineering.missouri.edu/neuroreu/projects/

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 March 15, 2013.

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

New Summer Program Pending Funding!

The University of Missouri is awaiting word from the National Science Foundation on a new REU program for Summer 2013.

Biomaterials & Condensed Matter (Physics)

The planned **Biomaterials and Condensed Matter** summer research program will include projects that are experimental, theoretical or modeling in the areas of biomaterials and condensed matter systems. Faculty mentors will be from the Department of Physics. Projects include computational condensed matter physics, Modeling RNA folding, Bioprinting, Charge transport in polymer-based transistors, Single molecule approaches to membrane proteins, Neutron scattering, and Modeling bio-molecular interactions. Successful applicants will have completed a calculus-based physics class.

If you are interested in this program, please check our website (listed below) for updated information after February 8, 2013. Applications will be due later in the spring. You may also contact Pam Cooper (CooperPJ@missouri.edu) to be put on a mailing list to receive information once we have learned about our level of grant funding for this program.

undergradresearch.missouri.edu/programs-jobs/programs

Examples of speakers and topics from our past summer programs:

- | | |
|---|---|
| Dr. Joel Maruniak (Biological Sciences) <i>Finding your right livelihood</i> | Dr. Sherry Flint-Garcia (USDA) <i>Using sequence diversity to understand agronomic traits</i> |
| Dr. Linda Blockus (Undergraduate Research) <i>Writing Effective Personal Statements</i> | Dr. Marc Johnson (Molecular Microbiology & Immunology) <i>How do viruses put themselves together?</i> |
| Dr. Pam Hinton (Nutritional Sciences) <i>Determinants of Bone Health</i> | Dr. Fred vom Saal (Biological Sciences) <i>Plastics-based endocrine disrupters and your health</i> |
| Dr. Dennis Lubahn (Biochemistry and Animal Sciences) <i>How wanting to live forever leads to one-eyed sheep and prostrate cancer</i> | Dr. Salman Hyder (Veterinary Biomedical Sciences) <i>Tumor Angiogenesis: A Target for Treatment and Prevention of Breast Cancer</i> |
| Bill Allen (Journalism) <i>A Career of Science Writing</i> | Dr. Mannie Liscum (Biological Sciences) <i>Plants do cool things too: Molecular genetics and cell biology of phototropism</i> |
| Dr. Michael Garcia (Biological Sciences) <i>Insulin and your nerves: Myelin to multiple sclerosis</i> | Dr. Casey Holliday (Pathology & Anatomical Sciences) <i>21st Century Paleontology: Functional morphology and evolution of the reptile head</i> |
| Dr. Angela Speck (Astronomy) & Dr. Alan Whittington (Geological Sciences) <i>Balancing Academic Science Careers and Family Life</i> | Dr. Jon Dyer (Dermatology & MU Intern) <i>You're a pediatric what?!? Pediatric dermatology clinical research</i> |
| Brandon Blakey (Applied Biosystems Genomic Analysis Division & 1992 Summer Intern) <i>This is My Life: Industry Sales, Service & Consulting</i> | Dr. Gary Stacey (Plant Sciences) <i>The Importance of Public Policy to your Scientific Career</i> |
| Dr. Ray Semlitsch (Biological Sciences) <i>The graduate application process</i> | Dr. Stephanie McKay (Animal Sciences) <i>Bovine Genome: Development of the first generation bovine haplotype map</i> |
| Dr. Jack Schultz (Bond Life Sciences Center) <i>Talking science to the public: Why don't they listen?</i> | |