Summer 2010 Undergraduate Research Programs at the University of Missouri

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

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 2 - Friday, July 30**), with travel days being Tuesday, June 1 and Saturday, July 31. 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 $3400.

Funds are available for approximately 24 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 29th). Students become part of a lab team that typically includes other undergraduate students, graduate students, lab technicians, and post-doctoral researchers. With 350 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 over 31,300 students (7,500 in graduate and professional programs) and 2,500 faculty. Columbia, midway between St. Louis and Kansas City, is a growing community with a population of more than 102,000. 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 2010 and be pursuing a major in animal sciences, biology, biochemistry, chemistry, plant sciences, or related fields. Students graduating prior to December 2010 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 12, 2010.** Students must complete the attached application form and provide an unofficial transcript (including fall 2009 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, Florida A&M, Grinnell, Jackson State, Medgar Evers/Kingsborough CC, Missouri State, Prairie View A&M, St. Elizabeth, Truman State, University of Arkansas-Pine Bluff, and Xavier University of Louisiana) 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 12th. Completed application packets should be sent to Pam Monroe, 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 Monroe (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, June 2nd.

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

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Miller Summer Research Internships in Animal Sciences

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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.*
- **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.*
- **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.*
- **Robert Weaber**, *Animal breeding.*
- **Kevin Wells**, *Genetics.*
- **Byron Wiegand**, *Meat science.*
- **James E. Williams**, *Ruminant nutrition.*

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:
www.plantgroup.org

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
(biochem.missouri.edu)

- **David Emerich** - Proteomic analysis of symbiosis
- **Bill Folk** – Improvement of plant nutritional quality and adaptation to abiotic stress
- **Bruce McClure** - Cell-cell interactions in pollen recognition and rejection
- **Jan Miernyk** – Systems biology analysis of soybean development, protein interactions, ionomics
- **Joe Polacco** - Genomic analysis of soybean activation of urease: Roles of duplicated genes
- **Jay Thelen** – Proteomics and phosphoproteomics of seed development in canola, Arabidopsis, and soybean
- **Shuqun Zhang** - Genetic analysis of MAP kinase signaling in plants

Division of Biological Sciences
(biology.missouri.edu)

- **Jim Birchler** - Studies of chromosome structure and function using fluorescent in situ hybridization to maize chromosomes
- **Candace Galen** – Sensory ecology and evolution in plants --- from fragrance to photons
- **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
- **Patrick Shiu** - Meiotic silencing by unpaired DNA: A new RNAi phenomenon
- **John Walker** - Molecular analysis of signaling pathways in plants

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)

- **Heidi Appel** - How plants respond and defend themselves against insects
- **Sherry Flint-Garcia** – Using genetics, genomics, and breeding to understand agronomic traits in corn
- **Walter Gassmann** – Molecular mechanisms of immune responses
- **Hari Krishnan** - Genetic modification of soybean seed composition; symbiotic plant-bacterial interactions in soybean
- **Mike McMullen** – Genetic and genomic analysis of complex agronomic traits of maize
- **Melissa Goellner Mitchum** - Molecular mechanisms that regulate plant-nematode interactions
- **Henry Nguyen** - Functional genomics of plant responses to abiotic stress
- **Mel Oliver** – Functional genomics of dehydration tolerance in maize and resurrection plants
- **Jim Schoelz** - Molecular characterization of plant defenses against virus infection
- **Gary Stacey** - Functional genomics of plant development; molecular studies of plant-microbe interactions

2010 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 2010. 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 2010, 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 Monroe (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 (biochem.missouri.edu)

- **Donald H. Burke** - RNA-based HIV-1 drugs and drug resistance; Molecular engineering of RNA enzymes
- **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
- **Bruce McClure** - Cell-cell interactions in pollen recognition and rejection
- **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
- **Michael Roberts** – Gene expression changes in human embryonic stem cells treated with growth factors
- **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
- **Steve Van Doren** – Targeting metalloproteases that are crucial in cardiovascular disease and cancer
- **Gary Weisman** - Investigating the role of P2Y2 nucleotide receptors in inflammatory disorders, including Alzheimer's disease, atherosclerosis and Sjögren's syndrome
- **Shuqun Zhang** - Genetic analysis of MAP kinase signaling in plants

Division of Biological Sciences (biology.missouri.edu)

- **Steve Alexander** – Making anticancer drugs work better: The role sphingolipids play in regulating cellular sensitivity to chemotherapeutic drugs
- **Jim Birchler** - Studies of chromosome structure and function using fluorescent in situ hybridization to maize chromosomes
- **D. Cornelison** – Functional properties of muscle stem cells
- **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

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

- **Deborah Anderson** – Molecular determinants of Yersini pestis virulence
- **Karen Bennett** – Molecular genetic studies of germline development using the model organism c. elegans
- **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** – Structure-based approaches to developing anti-HIV drugs
- **Habib Zaghouani** – Basic mechanisms of auto immune diseases

Department of Pathology & Anatomical Sciences (anatomy.missouri.edu)

- **Sharon Stack** - Proteinase regulation in ovarian carcinoma and squamous cell carcinoma of the oral cavity

Two Summer Programs Pending Funding!

Computational Neurosciences

Psychological Processes & Effects of Mass Media

The University of Missouri is awaiting word from the National Science Foundation on two new REU programs for Summer 2010.

The planned **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.

In the planned **Psychological Processes & Effects of Mass Media** program summer interns will study how the human mind processes media content delivered over both traditional and newer interactive platforms. In a society where the average person spends approximately 6 hours/day engaging with a communication medium, it is important to understand the influence media have on individuals utilizing multiple measures including psychophysiology, self-report, and memory testing. This program seeks to bring together an interdisciplinary team of undergraduates with backgrounds in communication, journalism, psychology, biology, and computer sciences.

If you are interested in either of these programs, please check our website (listed below) for updated information after February 5, 2010. Applications will be due around March 1, 2010. You may also contact Pam Monroe (MonroeP@missouri.edu) to be put on a mailing list to receive information once we have learned about our level of grant funding for these two programs.

undergradresearch.missouri.edu/programs-jobs/programs

Examples of speakers and topics from our 2008 and 2009 summer programs:

Dr. Joel Maruniak (Biological Sciences) *Finding your right livelihood*
Dr. Linda Blockus (Undergraduate Research) *Writing Effective Personal Statements*
Chris Pierret (Biological Sciences) *Finding my niche: Stem Cells, Yogurt, and Sectional Sofas*
Dr. Pam Hinton (Nutritional Sciences) *Determinants of Bone Health*
Dr. Dennis Lubahn (Biochemistry and Animal Sciences) *How wanting to live forever leads to one-eyed sheep and prostrate cancer*
Bill Allen (Journalism) *A Career of Science Writing*
Dr. Michael Garcia (Biological Sciences) *Insulin and your nerves: Myelin to multiple sclerosis*
Dr. Angela Speck (Astronomy) & Dr. Alan Whittington (Geological Sciences) *Balancing Academic Science Careers and Family Life*
Brandon Blakey (Applied Biosystems Genomic Analysis Division & 1992 Summer Intern) *This is My Life: Industry Sales, Service & Consulting*
Dr. Ray Semlitsch (Biological Sciences) *The graduate application process*
Dr. Bill Folk (Biochemistry) *Clinical trials of plant based traditional medicines*
Dr. Sherry Flint-Garcia (USDA) *Using sequence diversity to understand agronomic traits*
Dr. Marc Johnson (Molecular Microbiology & Immunology) *How do viruses put themselves together?*
Dr. Heidi Appel (Plant Sciences) *Can plants tell insects apart?*
Dr. Fred vom Saal (Biological Sciences) *Plastics-based endocrine disrupters and your health*
Dr. Eddie Hedrick (Emerging Infections Coordinator, Missouri Department of Health & Human Services) *H1N1 -- A Novel Influenza; and how I got to be an Epidemiologist*
Dr. Mannie Liscum (Biological Sciences) *Plants do cool things too: Molecular genetics and cell biology of photropism*
Joseph Parks (Chief Clinical Officer & Director of Comprehensive Psychiatric Services, Missouri Department of Mental Health) *The Role of Behavioral Health Professionals in Clinical Medicine*
Dr. David Geary (Psychological Sciences) *The Origin of Mind*

University of Missouri

2010 Summer Internship Application

Name_____

College/University_____

Major_____

Current Grade Level
☐ Sophomore ☐ Junior ☐ Senior

Date of Graduation
☐ Spring 2011 ☐ Spring 2012 ☐ Other_____

Date of Birth_____

Gender: ☐ Male ☐ Female

Citizenship: ☐ United States ☐ Other _____

Permanent Resident of the U.S.? ☐ Yes ☐ No

Resident of Missouri?
☐ Yes (eligible for in-state tuition) ☐ No

Racial/Ethnic Background(optional)_____

E-Mail Address_____
[print clearly so we can contact you!]

Address while at school/ZipCode/Phone & Area Codes

_____

_____

Phone_____ Cell Phone _____

This address good until _____

Permanent Address/Zip Code/Phone

_____

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_____

Address/Zip Code/Phone I will be at after school ends and before travel to Columbia (if different from permanent address)

_____

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City with closest major airport _____

Please consider my application for the following program(s) that I am eligible for. (All programs require that students be either U.S. Citizens or Permanent Residents, and are currently enrolled in undergraduate study.)

☐ **NSF-REU in Life Sciences** (limited to students from Arkansas-Pine Bluff, Barry, FAMU, Grinnell, Jackson State, Medgar Evers/KCC, Missouri State, Prairie View A&M, St. Elizabeth, Truman State, Xavier-Louisiana. Students MUST apply through the faculty liaison at their home institution.)

☐ **Plant Genomics Internship at MU** (open to all students with an interest in plant genomics research; freshmen with previous experience may apply)

☐ **Miller Research Internship Program in Animal Sciences** (open to students who have completed two years of college and are preparing for graduate study in animal sciences)

☐ **Summer Research Internship in Cell & Molecular Biology** (preference given to students interested in finding more about MU's PhD programs in Life Sciences)

Please carefully review the faculty listings at departmental web sites (see information booklet).
List below 8 MU faculty members (in order of preference) whose research is of interest to you. Please check the application information to ensure that the faculty you list are participating in the program(s) you are applying for!

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

Courses: Fall Semester 2009 Winter/Spring (current) Semester

Dept.	Title	Credits	Grade	Dept.	Title	Credits

Overall GPA: _____ on a _____ scale.

Previous Research Experience _____

_____

_____

_____

_____

Educational and Career Plans after Graduation _____

_____

_____

_____

Plans for advanced degree(s): ☐ MA/MS ☐ PhD ☐ MD ☐ MD/PhD ☐ Unknown ☐ Other _____

Brief Summary of your Research Interests for this summer and beyond _____

_____

_____

_____

_____

Other comments: _____

_____

How did you learn about our summer program? _____

Please include an unofficial transcript, personal statement, resume, and at least one letter of recommendation from a science faculty member (someone who has taught you or with whom you have worked). Two letters of recommendation are preferred. A resume is very helpful, but optional. Please PRINT CLEARLY.

Please return your application to Pam Monroe, Office of Undergraduate Research, 150 Bond Life Sciences Center, University of Missouri, Columbia, MO 65211. (Fax: 573-884-9395.) The deadline is Friday, February 12, 2010 for all programs.