BIO 395 RESEARCH MENTOR LIST

To set up a BIO 395 research experience you should contact a faculty member whose research area interests you and discuss possible projects. When you decide on a particular mentor, and you and the mentor have agreed that you may work in the lab, you must fill out a BIO 395 Research Contract and submit it the Biology Department, 101 TH Morgan, within one month of the beginning of the semester in which you are registered for BIO 395. New contracts must be submitted each semester you register for BIO 395, even if you are just continuing the same project. Biology needs to know which lab you are in so we can request a grade at semester's end.

This list of potential mentors is organized by College and by Department and represents a cross-section of labs doing biological research across campus. This list is *NOT* inclusive; there are *many* other acceptable mentors. You may work with someone not on this list as long as the research is biological and the contract you submit is approved by the Director of Undergraduate Studies. Note that each college's and department's web address is included so you can scan other, non-listed faculty member's research areas as well.

Be sure to fill out the contract completely. The most important parts are your mentor's name and email address (so we know who to get a grade from) and the description of the research you propose to carry out. Follow the directions stating your hypothesis (the moon is made of green cheese), how you intend to test it (send a rocket containing mice to the moon and send a rocket with a mouse counter but no mice one month after the first one), and how you will interpret possible results (if there are lots of mice present after a month then the moon *could be* made of cheese and the hypothesis is supported).

The work you propose must be biological and it must be experimental. This means that you have to do actual experiments to determine whether your hypothesis is valid or not. Literature reviews and other passive reading or studying of other peoples' work does NOT qualify as research and those contracts will not be approved. If BIO 395 is not the appropriate way to get credit for your proposed work then you can consider EXP 396 (Experiential Education). Many activities that are not research can still be carried out for academic credit as EXP 396. Contact Experiential Education by going to room 116 Stuckert Bldg, 0494, or calling 257-3632.

If you want to work with a mentor in the Biology department you should consider applying for a Ribble Undergraduate Research Scholarship. Ribble Scholarships are worth $1,500 per year. Ribble scholars must be Kentucky residents and must do their research in a Biology department faculty member's laboratory. Further criteria are: junior or senior status when the research begins, excellent achievement and promise in biology, potential for a productive research experience as exemplified by the written research plan, and need for the scholarship to enhance your education.

College of Arts and Sciences

Biology Department: http://www.as.uky.edu/Biology/

Carol Baskin
Department: **Biology**
Location: 120 MDR3
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-3996
Email: ccbask0@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=baskinc
Research area and interests:
Life cycle ecology of herbaceous plants, with particular reference to the ecology, biogeography, and evolution of seed dormancy and germination.

Philip Bonner
Department: **Biology**
Location: 213 MDR3
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-3117
Email: pbonner@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=bonner
Research area and interests:
Axon growth and branching during development and regeneration.

Vincent Cassone
Department: **Biology**
Location: 302 TH Morgan
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 7-6766
Email: vcass2@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=cassone
Research area and interests:
Chronobiology & Neuroscience.

Robin L. Cooper
Department: **Biology**
Location: 225 TH Morgan
Mail Address: 675 Rose St., 0225
Campus phone: 257-5950
Email: RLCOOP1@email.uky.edu
Lab webpage: http://web.as.uky.edu/Biology/faculty/cooper/default.htm
Research area and interests:
Research goals of my laboratory are to understand the physiological mechanisms involved in synaptic plasticity among neurons in vivo and in situ. We are also interested in general comparative physiological processes.

Philip H. Crowley
Department: **Biology**
Location: 113 MDR3
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-1996
Email: pcrowley@uky.edu
Lab webpage: http://web.as.uky.edu/biology/faculty/crowley/phil.html
Research area and interests:
My students and I address a broad range of ecological topics from physiological to ecosystem levels, with animals, plants, and disease organisms, using both empirical methods (lab, field and semi-field experimentation; comparative and descriptive studies) and theoretical methods (analytical, numerical, and simulation modeling). We also use interdisciplinary approaches, such as comparative analysis of decision making, emphasizing the role of game theory. We welcome undergraduate researchers, particularly those whose interests fit with ongoing graduate-student research in the lab.

Elizabeth Debski
Department: **Biology**
Location: 201 MDR#3
Mail address: 101 Morgan Bldg., 0225
Campus phone: 323-9537
Email: debski@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=debski
Research area and interests:
My laboratory investigates the mechanisms underlying activity-dependent organization of the visual system.

Scott Gleeson
Department: **Biology**
Location: 109 MDR3
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 323-3284
Email: skglees@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=gleeson
Research area and interests: Understanding of plant adaptations and their community consequences, particularly the acquisition of and competition for multiple limiting resources.

Doug Harrison
Department: **Biology**
Location: 300B T.H. Morgan
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-6275
Email: dough@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=harrison
Research area and interests:
My primary research interest is in the transduction of developmental signals for cell proliferation and differentiation, specifically focusing on the Janus kinase (JAK) signaling pathway in the fruit fly, *Drosophila melanogaster*.

Grace Jones
Department: **Biology**
Location: 304A T.H. Morgan
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-3795
Lab webpage: http://biology.uky.edu/faculty/bio/index.php?name=jones
Email: gjones@uky.edu
Research area and interests: Nuclear Receptor Signaling

Rebecca Kellum
Department: Biology
Location: 314A T.H. Morgan
Mail address: 101 T H Morgan Building
Campus phone: 257-9741
Email: rkellum@uky.edu
Lab webpage: http://biology.uky.edu/faculty/bio/index.php?name=kellum
Research area and interests:
Research in the Kellum lab is focused on the roles of heterochromatin proteins in the mechanics of chromosome segregation and gene regulation in the genetically tractable model system of Drosophila melanogaster. Particular emphasis is on the activities of two heterochromatin proteins, the highly conserved HP1 protein and its telomeric partner (HOAP), in regulating the critical decision in the sex determination pathway of Drosophila.

Jim Krupa
Department: **Biology**
Location: 108 MDR3
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-8417
Lab webpage: http://biology.uky.edu/faculty/bio/index.php?name=krupa
Email: bio149@uky.edu
Research area and interests:
One aspect of my research involves groups of undergraduates involved in field-oriented research. Projects typically involve aspects of mammal ecology at the University of Kentucky's 11,000 acre Robinson Forest. Studies have

included flying squirrel ecology, the impact of fire on small mammals such as the white-footed mouse, and the abundance, distribution, and ecology of the Allegheny woodrat.

Catherine Linnen
Department: **Biology**
Location: 200A T.H. Morgan
Mailing Address: 101 Morgan Bldg., 0225
Campus phone: 323-3160
Email: Catherine.linnen@uky.edu
Lab webpage: http://www.uky.edu/~cli242/Linnen_Lab/Home.html
Research area and interests:
I use plant-feeding insects as models to understand how adaptation to different habitats (in this case, different host plants) drives the formation of new species. To address these questions, my lab combines a variety of approaches, including: fieldwork, behavioral studies, genetic crosses, population genetics, phylogenetics, and genomics.

Nicholas McLetchie
Department: **Biology**
Location: 102 MDR#3
Mail address: 101 Morgan Building
Campus phone: 257 6786
Email: mclet@uky.edu
Lab webpage: http//wort.uky.edu/~mclet
Research area: My research program focuses on elucidating the factors resulting in an entire plant species or population being dominated by one sex. Such factors include variation in offspring sex ratios and sex differences in growth, asexual reproduction, survival and sex expression.
Possible research projects for undergraduates: The majority of student projects deal with detecting sex differences at the whole plant level (life histories), at the physiological level (photosynthesis related traits) and, at the morphological and molecular level (genetic variation). I try to match the project with the student interests, ongoing research and availability of resources within the lab. Students are welcome to visit the lab.

Peter M. Mirabito
Department: **Biology**
Location: 319 T.H. Morgan
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-7642
Email: pmmira00@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=mirabito
Research area and interests:
Function of the Anaphase-Promoting Complex or Cyclosome (APC/C) in Aspergillus nidulans, Functional Genomics of Mitosis.

Ann Morris
Department: **Biology**
Location: 215 T.H. Morgan Bldg.
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-8823
Email: ann.morris@uky.edu
Lab webpage:
http://www.as.uky.edu/academics/departments_programs/Biology/Biology/faculty_research/faculty/morris/
Research area and interests:
Our laboratory studies cellular differentiation and gene expression in the vertebrate retina, the photosensitive lining at the back of the eye. The light-capturing neurons of the retina are the photoreceptors. Rod photoreceptors mediate dim light vision, whereas cone photoreceptors mediate daytime and color vision. Photoreceptor degeneration associated with ocular diseases such as retinitis pigmentosa (RP), macular degeneration, and retinal

detachment is a significant cause of visual impairment and blindness, for which there is currently no cure. One promising avenue of research is to study the retinas of vertebrate animals that innately possess the capacity to regenerate retinal neurons following injury. For this reason, the zebrafish retina represents a valuable model system in which to study the mechanisms of neural progenitor proliferation, differentiation, and photoreceptor regeneration. One of the projects in my laboratory involves identifying the genetic pathways that mediate photoreceptor development and regeneration in zebrafish. A second project involves the generation of zebrafish models of human retinitis pigmentosa in which we have temporal control over photoreceptor degeneration and regeneration. Overall, our research spans several areas of interest, including developmental biology, genetics, molecular and cellular biology, and neuroscience.

Bruce O'Hara
Department: **Biology**
Location: 334 T.H. Morgan
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-2805
Email: bohara@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=ohara
Research area and interests:
My laboratory uses molecular and genetic approaches to better understand sleep and circadian rhythms. We have also developed an automated method of monitoring sleep and wake in mice allowing for non-invasive and large-scale studies in many inbred and out bred mouse populations, and also in preclinical studies of how drugs or brain injury interact with and influence sleep.

Jeffrey L. Osborn
Department: **Biology**
Location: 115 T.H. Morgan (office) 205 MDR3 (lab)
Mail address: 101 T.H. Morgan Bldg., 0225
Campus phone: 257-3988
Email: jeffrey.osborn@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=osborn
Research area and interest:
The laboratory of Dr. Jeffrey Osborn provides a specialized environment where all students experience "science in action". The physiological research laboratory focuses upon the neural control of renal sodium and water balance and the role of renal sympathetic nerves in the control of blood pressure**.**

Brent Palmer
Department: **Biology**
Location: 204 T.H. Morgan
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-5824
Email: bpamler@uky.edu
Research area and interests:
My research program focuses on conservation of wildlife species, using comparative reproductive biology and endocrinology. I specialize in lower vertebrates, particularly turtles and tortoises.

Edmund B Rucker
Department: **Biology**
Location: 313 T.H. Morgan
Mail Address: 101 Morgan Bldg., 0225
Campus Phone: 257-2175
Email: ebru222@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=rucker
Research area and interests:
Molecular Genetics and Transgenics

Brian Rymond
Department: **Biology**
Location: 335A T.H. Morgan
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-5530
Email: rymond@uky.edu
Lab webpage: http://biology.uky.edu/faculty/bio/index.php?name=rymond
Research area and interests: Using genetic and proteomic approaches to investigate the mechanism of spliceosome assembly and the fidelity of pre-mRNA splicing

Robert Craig Sargent
Department: **Biology**
Location: 115 MDR3
Mail Address: 101 Morgan Bldg., 0225
Campus phone: 257-8742
Email: csargent@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=sargent
Research area and interests:
My research combines original theory with laboratory and field experiments to study the ecology and evolution of reproductive and life-history strategies in teleost fishes. Most of my current research focuses on conflicts of interest (e.g. "the battle of the sexes," intrasexual competition for mates, parent/offspring conflict), and their implications for the fish mating systems. My research program integrates several levels of biological organization and includes elements of population biology, sensory physiology, and genetics.

Ashley Seifert
Department: **Biology**
Location: 211 T.H. Morgan
Mail Address: 101 Morgan Bldg., 0225
Email: awseifert@uky.edu
Webpage: www.ashleyseifert.com
Research area and interests:
Our lab investigates the cellular and molecular mechanisms regulating tissue and organ regeneration in animals. Research projects also focus on understanding the embryological development of skin and musculoskeletal structures. The lab uses amphibians and mammals as experimental systems to test hypotheses about how some animals can regenerate damaged tissue. Projects typically involve working with live animals, animal tissue and cells. We have a limited number of undergraduate research positions available each year. Freshman and sophomores are especially encouraged to apply. See the Seifert lab website for more information (www.ashleyseifert.com).

Jeramiah Smith
Department: **Biology**
Location: 311 T.H. Morgan
Mailing address: 101 Morgan Bldg., 0225
Email: jjsmit3@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=smith
Research area and interests:
The unique selective pressures and functional constraints that vertebrate lineages have experienced over deep evolutionary time have resulted in a diversity of different mechanisms that mediate recombination (meiotic and mitotic), gene duplication, and the evolution of novel functional elements and developmental mechanisms. I am generally interested in understanding how vertebrate genomes evolve at the molecular level and how these changes contribute to the evolution of development. Ongoing studies take advantage of the deep evolutionary history of key vertebrate groups (including lamprey and salamander) in order to better understand how novel genomic functions arise and contribute to an organism's biology.

Randal Voss
Department: **Biology**
Location: B453 BBSRB
Mail address: 101 Morgan Bldg, 0225
Campus phone: 257-9888
Email: srvoss@uky.edu
Webpage: http://biology.uky.edu/faculty/bio/index.php?name=voss
Research area and interests:
I am interested in understanding how and why some organisms can regenerate their limbs and spinal cord, while others, including humans, cannot. I am studying salamanders because they show the greatest regenerative potential of all vertebrates. I also study the genetic basis of species differences, especially differences that are thought to have arisen through the evolutionary process of natural selection.

David Weisrock
Department: **Biology**
Location: Rm 117 MDR#3
Mail address: 101 Morgan Bldg., 0225
Campus phone: 257-2249
Email: dweis2@uky.edu
Lab web page: http://sweb.uky.edu/~dweis2/The_Weisrock_Lab/Front_Page.html
Research area and interests:
Research in the Weisrock Lab combines genetics, genomics, and evolutionary biology. Much of our research centers on using genetics to resolve the geographic boundaries of species in nature, reconstruct the relationships among these lineages, and address the mechanisms that have led to their formation.

David F. Westneat
Department: **Biology**
Location: Rm 104 MDR#3
Mail address: 101 Morgan Bldg., 0225
Campus phone: 323-9499
Email: biodfw@uky.edu
Lab Webpage: http://web.as.uky.edu/biology/faculty/Westneat/Personal/westneat.html
Research area and interests:
We study the ecology of social behavior, including dominance and aggression, social foraging, parental care, mate choice, and signaling, mostly in birds. We typically have projects for undergraduates in all semesters, including summer. These can range from working outside with free-living birds, subjects in aviaries, or lab analyses of samples. For more information, please visit the Westneat lab homepage.

Psychology http://www.uky.edu/AS/Psychology/

Michael T. Bardo
Department: **Psychology**
Location : 447 BBSRB
Mail address: 741 S. Limestone
Campus phone: 257-6456
e-mail: mbardo@uky.edu
Research area and interests: Psychopharmacology, behavioral neuroscience
Possible research projects for undergraduates : (1). Assessment of the environmental and genetic factors that increase risk for drug abuse using rodent models. Both behavioral and neurochemical levels of analysis are being pursued. (2). Development of novel medications for the treatment of stimulant abuse, including methamphetamine and nicotine. This work is being pursued with colleagues in the College of Pharmacy.

Susan Barron
Department: **Psychology**
Location: Kastle 208
Mail Address: Department of Psychology, Kastle Hall, 0044
Campus phone: 257-5401 (office), 257-2864 (lab)
e-mail: sbarron@uky.edu
Research area and interests: Prenatal drug effects, alcohol-related neurotoxicity.
Possible research projects for undergraduates: Research projects that undergraduates are involved with examine the effects of prenatal drug exposure on behavioral outcome using a rodent model. In addition, students work on projects in which we use pharmacological manipulations to try and reduce alcohol-related damage to the CNS.

Peter R. Giancola
Department: **Psychology**
Location: 207K Kastle Hall
Mail Address: Department of Psychology, Kastle Hall, 0044
Campus phone: 257-4502
e-mail: peter@uky.edu
Research area and interests: Alcohol-Related Aggression; Neuropsychological Aspects of Violence.
Possible research projects for undergraduates: Many projects are available.

Thomas Zentall
Department: **Psychology**
Location : Kastle Hall 202B
Mail address: Department of Psychology
Campus phone: 257-4076
e-mail: zentall@uky.edu
Research area and interests: comparative cognition, social learning in aniamls, animal memory, concept learning in animals, timing in animals, spatial learning in animals
Possible research projects for undergraduates: Undergraduates take part is several research projects as part of a larger team. The projects vary a lot from semester to semester. Together with a graduate student each undergraduate selects one or two experiments as the focus of their attention during the semester.

College of Agriculture http://www.ca.uky.edu/

Thomas M. Chambers
Department: **Veterinary Science**
Location: 443 Gluck Equine Research Center
Mail address: 108 Gluck Equine Research Center, speedsort 0099
Campus phone: 257-4757 ex 81126
e-mail: tmcham1@uky.edu
Research area and interests: equine influenza, influenza viruses, West Nile virus
Possible research projects for undergraduates: viral gene nucleotide sequencing, horse vaccination efficacy studies, antibody response studies

Charles Fox
Department: **Entomology**
Location : Ag Science Center North room S-307B
Mail address: Entomology, 0091
Campus phone: 257-7474
e-mail: cfox@uky.edu
Research area and interests: Evolutionary ecology and behavior

Bernhard Hennig
Professor of Nutrition and Toxicology, and Director of the University of Kentucky Superfund Research Center (UK-SRC)
Department: **College of Agriculture, Food and Environment**
Location: 501 Wethington Building
Mail Address: 599 Wethington Building
Campus phone: 218-1343
e-mail: bhennig**@uky.edu**
Research area and interests: Dietary lipids, inflammatory mediators and vascular endothelial cell dysfunction. The primary focus of our research is to determine the molecular mechanisms that underlie the inappropriate overproduction of growth factors by cancer cells. Most of our studies are centered on the gene encoding platelet-derived growth factor (PDGF), which has been strongly implicated as a mediator of malignant growth in cancers of the breast, brain and bone. Having recently identified DNA response elements that are critical for both activation and repression of PDGF gene transcription, our current goals are to 1) identify the polypeptide transcription factors that bind to these elements and mediate their regulatory functions, 2) determine the extent to which these functions are related to growth factor overexpression in human cancers and 3) develop new strategies to treat cancer based on our new knowledge of PDGF gene transcription, either by restoring regulatory control of PDGF and other growth factor genes, or possibly by targeting for destruction cancer cells whose regulatory functions are compromised.
Possible research projects for undergraduates: 1. Examine gene expression profiles in panels of human cancer cell lines, with a focus on gene products involved in PDGF transcriptional control; 2. Analyze the binding of nuclear polypeptide factors to either positively-or negatively-acting DNA elements in the PDGF gene.

Subba R Palli
Department: **Entomology**
Location: S225 Ag. Science N 0991
Campus Phone: 257-4962
e-mail: rpalli@uky.edu
Webpage: http://www.uky.edu/~rpalli/
Research area and interests: Hormonal regulation of insect development and reproduction
Possible research projects: We use a variety of post-genomics technologies including RNA interference, next-generation sequencing, quantitative real-time PCR etc. to determine the function of gene products that play key roles in hormonal regulation of development, reproduction and insecticide resistance. Opportunities for training in physiology, biochemistry, toxicology, molecular biology and genome biology are available.

College of Dentistry http://www.mc.uky.edu/Dentistry/

College of Dentistry Mentors
(Additional information can be obtained from the following web site:
http://www.mc.uky.edu/cohr

Cynthia S. Beeman, D.D.S., Ph.D.
Associate Professor of Orthodontics
Department: **Oral Health Practice, Orthodontics**
Location: D-418 College of Dentistry
Mail Address: 800 Rose Street
Campus Phone: 859-323-4196

e-mail: cbeeman@uky.edu
Research Area and Interests: Techniques in orthodontic clinical research will be introduced to the student. These orthodontic research techniques are routinely employed to measure craniofacial growth and development and the efficacy of treatment in clinical trials. The student will learn cephalometric analyses, space analyses, craniofacial growth predictions and tooth size analyses and their use in orthodontic clinical research.

Jeffrey L. Ebersole
Department: **Oral Health Practice**
Location: HSRB 422, Bosomworth Building
Mail address: HSRB 422, Bosomworth Building
Campus Phone: 859-323-5357
e-mail: jleber2@uky.edu
Research area and interests:
(1) To characterize the use of a murine model for studies delineating the bacterial and host components that contribute to both soft and hard tissue destruction caused by these pathogens. We have used this model to provide comparative characteristics of soft tissue destruction and host responses by various oral pathogens. Additionally, the model has been utilized to evaluate alterations in virulence capacity induced by *in vitro* and *in vivo* environmental conditions. This model system is also be used to discriminate the characteristics of the host response that may provide innate and acquired immune protection from the virulence of these microorganisms.
(2) To utilize the nonhuman primate model of periodontitis to evaluate host-bacterial interactions in the chronic inflammatory disease. We have used this model system of infection to examine the local and systemic host responses, which may control destructive periodontal infections. The nonhuman primate model has been used to manipulate the components and kinetics of the host inflammatory/immune response. Additionally, this model is now being used to explore the oral-systemic infection linkage.
(3) To delineate the macromolecules of these bacteria that elicit the production/secretion of various host inflammatory mediators (*ie*. arachidonate metabolites) and cytokines (ie. IL-1ß, IL-6, IL-8, GM-CSF) from non-immune cells (*ie*. gingival fibroblasts, epithelial cells). This has included the isolation and characterization of various proteins (*eg.* leukotoxin, momps, heme binding proteins, cystalysin), LPS molecules (*eg. P. gingivalis, A. actinomycetemcomitans, C. rectus, T. pectinovorum*), and structures (*eg*. outer membrane vesicles, fimbria, capsular polysaccharide) from periodontal pathogens. These have been used to evaluate the capacity of individual bacteria to stimulate pro- and anti-inflammatory host responses.
Possible research projects for undergraduates: Examination of host responses to oral treponemes associated with HIV periodontitis. Determination of host responses linking oral disease to systemic health problems.

C. Brad Huang
Department: **Dentistry Research and Graduate Studies**
Location: HSRB 161
Mail address: HSRB 161
Campus phone: 257-4427
e-mail: chuan2@uky.edu
web page: http://www.mc.uky.edu/COHR/huang.htm
Research area and interests: Oral microbiology and immunology; Oral infection, inflammation, and HIV reactivation
Possible research projects for undergraduates: Oral infections associated with the gingival margin and subgingival sulcus leads to host inflammatory responses. Gingivitis is primarily a response to the bacteria in plaque. This "disease" affects nearly everyone in the population worldwide, at some time during their life. Periodontitis is a multifactorial disease that encompasses the hard and soft tissue, microbial colonization (with/without invasion), inflammatory responses, and adaptive immune responses. Gingivitis, periodontitis and caries affect as large a proportion of the global population as any modern disease known to mankind. The goal of my research is to use the newest biotechnology and techniques to study the oral infection and inflammation, and to understand the molecular pathways and mechanisms which cause these diseases. I have a lot of experience in working with Bio395 students. Current research projects include anti-caries, anti-periodontal and gingival diseases, protease inhibitors, Interaction between the oral bacteria and HIV-1 infected latent cells, and natural products.

Craig S. Miller
Department: **Oral Health Practice**
Location: MN118
Mail address: College of Dentistry
Campus phone: 323-5598
e-mail: craig.miller@uky.edu
website: http://www.mc.uky.edu/microbiology/miller.asp
Research area and interests: Herpes virus latency and reactivation (see above web site for additional information) Salivary biomarkers in oral health and systemic disease
Possible research projects for undergraduates: Identification of genes important in reactivation. Identification of proteins critical for reactivation. Lab bench experience in virology, cell culture, latent infections, ELISA

Richard J. Mitchell, Ph.D.
Department: **Oral Health Practice**
Location : D630 Medical Center; College of Dentistry
Mail address: 800 Rose Street; Campus 0297
Campus Phone: 323-5495
e-mail: rjm1@uky.edu
Research area and interests: : Degradation of bonding between dental filling materials and enamel or dentin; effects of restorative materials that a designed to inhibit caries on the mineralization of dentin and enamel, marginal breakdown of dental amalgam
Possible research projects for undergraduates: 1) the effects of storage in "aging" solutions on the bond strength of polymers to dentin; 2) demineralization of enamel and dentin adjacent to dental restorative materials when challenged by solutions designed to produce artificial caries, and 3) resistance of different types of dental amalgam to strained controlled cyclic loading. I'll send interested students detailed information about these and several other biomaterials-related projects upon request.

College of Engineering http://www.engr.uky.edu/

J. Zach Hilt
Department: **Chemical and Materials Engineering**
Location: FPAT 163A
Mail address: 177 F. Paul Anderson Towe
Campus phone: 257-9844
e-mail: hilt@engr.uky.edu
Research area and interests: Intelligent polymers, biomimetic materials, bio-inspired materials, and diagnostic & therapeutic microdevices. In our laboratory, science and engineering fundamentals are applied to the rational design, synthesis and characterization, and application of novel macromolecular materials. We are particularly interested in designing and fabricating intelligent polymer networks to exhibit unique properties providing for application as recognition and/or actuation elements in innovative devices for microsensing, microarray, and other micro- and nanoscale applications, primarily of medical and biological significance. For example, we design and develop biomimetic recognitive polymer networks. These polymers mimic biological recognition pathways and at the same time exhibit other abiotic properties that are more favorable, such as greater stability in harsh environments. These biomimetic polymer networks are advantageous because they can be tailored to bind any molecule with controlled selectivity and affinity, provided that certain interactions exist.

Christine Trinkle
Department: **Mechanical Engineering**
Location: 277 Ralph G. Anderson Building
Campus phone: 218-0640
email: trinkle@engr.uky.edu
webpage: http://www.engr.uky.edu/me/faculty_staff/trinkle.html
Research area and interests: Microfluidic Systems, Micro-scale Design and Fabrication, MEMS, Biologically-Inspired Design, Precision Machine Design

Possible research projects for undergraduates: The biological research in our lab focuses on producing novel methods of tissue engineering and studying cells ex vivo. This includes studying the interaction of cells with surface biochemical patterns and microscale topography. The overall goal is to generate well-controlled biomimetic microenvironments that increase cell viability and specificity ex vivo.

College of Health Sciences http://www.mc.uky.edu/HealthSciences/

Brian Noehren
Department: **Physical Therapy and Rehabilitation Science**
Location: 204D Charles T. Wethington Building, 0200
Phone: 859-218-0581
e-mail- b.noehren@uky.edu
Research area and interests: I am a researcher in the division of Physical Therapy who specializes in the understanding of lower extremity injury biomechanics and muscle function. I am interested in injuries such as knee pain, total joint replacements, ACL reconstructions, and Osteoarthritis. In my lab we look at the alterations in movement mechanics and muscle function that maybe related to the development of these injuries. We also develop and test new and novel treatment interventions. The lab uses 3D models created from motion capture cameras (like the video games). From these models we can measure the joint angles and forces during many activities such as running and walking. We have several ongoing studies and many more in development and are always looking for individuals who may be interested in helping out in the lab.

College of Pharmacy http://www.mc.uky.edu/pharmacy/

E. Penni Black
Department: **Pharmaceutical Sciences**
Location: 343 BioPharm Building
Mail address: 789 S. Limestone, 40536
Campus phone: 323-5898
e-mail: penni.black@uky.edu
website: http://pharmacy.mc.uky.edu/faculty/EstherBlack.php
Research area and interests: Targeting therapies in lung cancer using genomic signatures of response; mining genomic signatures of response to understand the underlying biology.
Possible research projects for undergraduates: We use genomic signatures of response to therapy to understand the underlying biology of the response in lung cancer. We use cell culture model systems for investigating the roles of genes comprising the signature in lung cancer. Cell culture systems are amenable to ectopic expression and characterization of genes of interest as well as RNA interference technology to transiently inhibit gene expression for characterization purposes.

Robert A. Lodder, Ph. D.
Department: **Pharmaceutical Sciences, College of Pharmacy**
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e-mail: Lodder@uky.edu
Research area and interests: (see **http://www.pharm.uky.edu/** for details).
Astrobiology, In vivo chemical analysis and high resolution imaging of atherosclerotic plaques
Near Infrared and Infrared imaging analysis of lipid metabolism and energy
Expenditure, spectrophotometric and electrophoretic analysis of carotid plaque lipoproteins
Lipoprotein determination in single cells by near infrared spectromicrography
Computerized assignment of near IR absorbances to molecular motions of proteins and peptides.
Possible research projects for undergraduates:
Astrobiology
Astrotoxicology and Pharmacology
Energy transfer model of living organisms
General purposes biosensor/chemical sensor
Lab on a chip
PH sensitive reporter gene NPF
Prediction of blue mold outbreaks using satellite images
MAReNIR for glucose determination in diabetes
Magnetoelastic antibody sensor
Fluorescence based phosphate sensor
Electrorheological fluid microfluidics
Tin oxide array sensors for gas analysis
IR NSOM imaging of superconducting films

College of Medicine

Anatomy and Neurobiology http://www.mc.uky.edu/neurobiology/

Dr. Marilyn J. Duncan
Department: **Anatomy and Neurobiology**
Location : HSRB 424 and 426
Mail address: Dept. of Anatomy and Neurobiology, MN 215 Chandler Medical Center
Campus phone: 3-4718
e-mail: mjdunc0@uky.edu
Research area and interests: circadian rhythms and aging and serotonin
Possible research projects for undergraduates: Specifc projects vary over time, but may involve the following topics and methods:
1) Effects of age on serotonergic regulation of gene expression in brain regions regulating circadian rhythms (project involves administration of drugs to hamsters, monitoring of circadian rhythms of wheel running, tissue sectioning, in situ hybridization and image analysis)
2) Interactions between the circadian pacemaker and neurons regulating reproduction (project involves monitoring circadian rhythms of wheel running and reproductive state, preparing tissue sections, conducting immunohistochemistry and/or in situ hybridization and image analysis)
3) Neurochemical identification of the neurons in the hamster brain that possess specific serotonin receptors or estrogen receptors (project involves immunohistochemistry using dual antibodies)

Greg A. Gerhardt, Ph.D.
Department: **Anatomy and Neurobiology, Neurology and Psychiatry, Neurosurgery**
Location : MN 206
Mail address: 800 Rose Street
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Research area and interests: Parkinson's disease, Normal Aging, Attention Deficit Hyperactive Disorder (ADHD), Brain machine interfaces, Microelectrode development for brain recording.
Dr. Gerhardt's laboratory focuses on studies of the dopamine neurotransmitter system in animal models of Parkinson's disease. For these studies, his lab uses both the 6-hydroxydopamine-lesioned rat model and the MPTP-lesioned primate model of Parkinson's disease. Using his microsensor techniques, Dr. Gerhardt's lab has investigated the release and uptake of dopamine in the striatum of the normal and parkinsonian brain. A major finding for these studies is that there is a severe disruption of dopamine regulation in the parkinsonian brain. This disruption of the control of dopamine may relate to some of the movement problems seen in this CNS disease. His laboratory is currently investigating the use of growth factors, such as GDNF, to restore function to damaged dopamine neurons.

Another area of research in his laboratory involves studies of movement abnormalities in aging. Such studies are performed in the cerebellum and striatum of young and aged Fischer 344 rats, and in young and aged nonhuman primates. His recent studies have shown that, dopamine and norepinephrine synapses change in their ability to regulate neurotransmitter release through changes in the monoamine transporters. This lack of regulation or change in the regulation of neurotransmitter signaling may account for some of the motor abnormalities that are seen in aged animals and humans.

A major focus of Dr. Gerhardt's laboratory is the dynamics of neurotransmitter function in the central nervous system. In order to perform such studies, his lab develops microsensors (5-30 microns) and instrumentation for the rapid, sensitive, and spatially resolved measurement of neurotransmitters and neuromodulators, such as dopamine, norepinephrine, serotonin, nitric oxide, and glutamate. A major goal of these studies is to understand neurotransmitter signaling in biological systems. This forms the basis for the Center for Sensor Technology.
Possible research projects for undergraduates: Microelectrode recordings in D4 knockout mice, freely moving measures of dopamine, glutamate and choline in animal models of Parkinson's disease, Development of new recording technologies for measures of neruotransmitters in the brains of mice and rats, Effects of GDNF on doapmine systems in younga nd aged rats.

Diane M. Snow
Professor of Neuroscience and Endowed Chair
Spinal Cord and Brain Injury Research Center
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Research area and interests: Neuronal Growth Cone Guidance and Extracellular Matrix Molecules.
The functional organization of the adult nervous system depends upon the connections formed during development, when axons extend from neuronal cell bodies and navigate along specific pathways toward their targets. The direction of axonal extension is accomplished by the growth cone - the motile structure at the distal tip of the elongating axon. Growth cones detect and respond to positive and negative signals, or guidance cues, in the nervous system milieu, e.g., cell surface and extracellular matrix (ECM) molecules. Dr. Snow's research focuses on a class of ECM molecule, the proteoglycans, specifically the chondroitin sulfate proteoglycans (CSPGs), and their effect on migrating growth cones. CSPGs are located in regions where axons do not grow *in vivo*, e.g. the roof plate, and act as inhibitors of neurite outgrowth *in vitro*. Importantly, CSPGs are upregulated following central nervous system(CNS) injury where they contribute to failed regeneration. An understanding of the role of PGs will offer new insights into nervous system development, causes for a lack of recovery of function following injury, and potential targets for strategies and therapies for the treatment of CNS system injury.
In an effort to understand the regulatory mechanism(s) governing growth cone migration by CSPGs, both during development and following CNS injury, the experimental goals are to: 1) determine whether PGs inhibit neurite outgrowth by blocking the influence of growth- promoting ECM molecules, such as laminin; 2) determine the role of second messengers and signaling cascades in the CSPG-induced inhibitory response; 3) determine the role of the

neuronal cytoskeleton in growth cone turning in response to contact with inhibitory molecules, and 4) examine the differential effects of PGs on sensory neurons. Techniques employed include cell culture, immunocytochemistry, image analysis, biochemical methods, and molecular biology. The experimental focus is on animal models, such as chicken and/or rodent dorsal root ganglion neurons, retinal ganglion cell neurons, and hippocampal neurons.

Many laboratories routinely use a variety of assays *in vitro* to grossly determine choices neuronal growth cones make as they elongate. We have developed a novel methodology that allows for assessing *subtle* growth cone behaviors that correlate with neuronal inhibition, permitting a more "holistic" view of growth cone responses to substratum-bound molecules. We have termed this technique the "Inhibitory Quotient System", or "IQ System". In brief, using time-lapse video-microscopy, we record neuronal growth cones as they elongate on a growth-promoting substrata, typically laminin, then interact with the inhibitory proteoglycan in question, either adsorbed in purified form to a tissue culture surface, or expressed by endogenous cells (e.g. reactive astrocytes). A frame-by-frame analysis of neuronal responses (morphologies as well as behaviors) that results in a composite score determines the inhibitory potency for a given CSPG. Score comparisons can be made between various CSPG samples that reflect their differing structures. Currently, we are determining structural differences between CSPGs using FACE analysis. Using this approach, we are amassing extensive detail about each facet of growth cone behavior and the micro-structures of CSPGs that induce growth cone inhibition.
Possible research projects for undergraduates: Spinal cord injury; regeneration; axon guidance; development

Behavioral Sciences http://www.mc.uky.edu/behavioralscience/

Thomas H. Kelly, Ph.D.
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Research area and interests: Clinical Psychopharmacology, Individual Differences in Drug Abuse Vulnerability
Possible research projects for undergraduates: Students are welcome to collaborate on all aspects of ongoing research, based on schedule availability and interests

Microbiology and Immunology http://www.mc.uky.edu/microbiology/

Subbarao Bondada
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Research area and interests: Function of B lymphocytes and macrophages in immune responses, Autoimmunity, Immunology of neonates with respect to vaccines; Growth regulation of B cell lymphomas and chronic lymphocytic leukemia, myelodysplastic syndrome
Possible research projects for undergraduates: Cell culture ;Measurement of cytokines in cultures of B cells and macrophages stimulated with vaccine polysaccharides; Real time PCR analysis of gene expression; Western blot analysis of kinases and cell surface molecules involved in lymphocyte activation; Lymphoma/leukemia growth modulation with kinase inhibitors or by gene expression.

Sarah E.F. D'Orazio, Ph.D.
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web page: http://www.mc.uky.edu/microbiology/dorazio.asp
Research area and interests: Immune responses against intracellular bacterial pathogens
Possible research projects for undergraduates: The goal of our research is to understand the type of immune responses that can protect individuals from developing life-threatening infections with Listeria monocytogenes. Some of the projects in the lab are focused on understanding the bacterial factors that trigger innate immune responses. Other projects focus on the differential susceptibility of T cells isolated from either inbred mouse strains or human peripheral blood to rapidly secrete the pro-inflammatory cytokine interferon-gamma after Listeria monocytogenes exposure. Undergraduates working in the lab could gain experience with molecular cloning techniques, protein expression, transfection of mammalian cells, and cellular assays to test immune functions.

Anthony Sinai
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Research area and interests: Molecular Parasitology/ Infectious Diseases/ Cell Signaling
Possible research projects for undergraduates: The primary focus of my laboratory is the protozoan parasite Toxoplasma gondii, an agent of clinical significance in immunocomprimised individuals such as those with HIV-AIDS and organ transplant recipients. There are two main areas of research in the laboratory. The first examines the contribution of autophagy (self-eating) in normal parasite biology and as a target for drug development. The second focuses on the molecular dissection of the processes underlying the development and stability of tissue cysts associated with the chronic stage of infection. Several additional projects including the establishing the feasibility of novel approaches to the development of low cost diagnostics We use techniques of molecular and cell biology with a strong emphasis in biochemistry in our research.
Undergraduates accepted into the laboratory will have a true independent project in order to obtain hands on experience into both the intellectual and technical aspects of research in the biological sciences.

Brett Spear
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Research area and interests: Transcriptional Regulation, Liver Function in the Control of Lipids and Cardiovascular Disease, Transgenic and Gene Knock-out mice.
Possible research projects for undergraduates: Depends on the interests of the student and the time they wish to commit. Cloning projects, work with tissue culture cells are projects that can be completed in a semester. Longer term projects could include some mouse work.

Molecular and Cellular Biochemistry http://www.mc.uky.edu/biochemistry/

Trevor Creamer
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web page: http://http://www.mc.uky.edu/biochemistry/dept_personnel/faculty/creamer.asp
Research area and interests: The Role of Intrinsic Disorder in the Regulation of Calcineurin
Possible research projects for undergraduates: The goal of our research is to understand how the phosphatase calcineurin is regulated. Calcineurin is of wide interest because it is involved in neuronal signaling, cardiac

development and activation of T cells in the immune system. Calcineurin is activated when the calcium-sensing protein calmodulin binds to a regulatory domain. This domain of calcineurin is disordered (i.e. devoid of stable structure). We are also interested in other proteins involved in calcineurin regulation, including CHP, which is structurally similar to calmodulin but has the opposite effect (i.e. inhibits calcineurin), and Rcan1, which also inhibits and is itself a completely disordered protein. Some of the methods we use include molecular biology for the expression of proteins and mutants thereof, standard protein purification techniques, fluorescence spectroscopy, circular dichroism, NMR spectrometry and analytical ultracentrifugation. Undergraduates in the laboratory would primarily be involved in characterizing interactions between calcineurin and its regulating proteins using fluorescence and circular dichroism. Molecular biology and protein purification are also possibilities.

Robert Dickson
Department: **Molecular and Cellular Biochemistry**
Location : 210 Combs
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Research area and interests: Part of my research effort focuses on understanding which signal transduction pathways control aging and life-span. Another part of my research focuses on signal transduction pathways that govern cell growth in both normal and abnormal states including cancer. Finally, we study how cells protect themselves against stresses including high temperature and high salt . In all of these research areas we aim to understand how the signaling pathways work and what cellular processes they regulate. We use a variety of molecular, biochemical, genetic and immunological techniques in the laboratory.
Possible research projects for undergraduates : Would be happy to discuss possible projects with students

Tianyan Gao
Department: **Molecular and Cellular Biochemistry, Markey Cancer Center**
Location: BBSRB B367
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Research area and interests: Our lab focuses on elucidating the functional importance of a novel family of protein phosphatase, PHLPP, in regulating tumorigenesis. We use colon cancer as a model system to study how PHLPP functions in suppressing cancer development and progression. Normal physiological functions of our body are controlled by cellular signaling proteins. Anything that disturbs the activity balance of these proteins contributes to human diseases such as cancer. Tumor suppressor proteins play critical roles in balancing cell growth and survival signals in which they function to prevent the formation and progression of tumors. PHLPP is one of these tumor suppressor proteins that help our body to fight off cancer. Recently, we have found that loss of PHLPP expression is commonly associated with colon cancer and re-introduction of PHLPP into colon cancer cells inhibits tumorigenesis. The long-term goal of my lab is to understand the physiological function of PHLPP and the molecular mechanisms underlying PHLPP-mediated regulation in cancer. In addition, we have developed PHLPP knockout mouse models in our lab to further investigate the physiological role of PHLPP. The results from our studies will aid in developing novel therapeutic strategies in cancer treatment by using PHLPP as a target.
Possible research projects for undergraduates: The research conducted in my lab is currently funded by NCI. The lab is located on the 3rd floor of BBSRB and it is a part of the cancer research group supported by the Markey Cancer Center. We combine molecular biological, biochemical, and genetic approaches in our research. The PI has previous experience training graduate and undergraduate students. Once an undergraduate student joins the lab, he/she will be involved in one of the ongoing research projects in the lab and supervised by PI herself. We will provide the necessary training for the student to gain research experience in cancer biology and scientific findings and results generated by the student can be used in future publications.

Elizabeth Head
Sanders Brown Center on Aging
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Research Interests: The goals of our research are to identify interventions that may prevent the onset and/or progression of Alzheimer's disease and thus promote healthy brain aging. To do this, our lab tests hypotheses using an animal model of human brain aging. Our focus is on testing combinations of treatments, each targeting different pathological pathways associated with aging or Alzheimer's disease. Aging canines naturally develop learning and memory impairments, as well as similar types of brain pathology as humans. Our studies are multidisciplinary and range from magnetic resonance imaging (MRI) to testing cognitive function (learning and memory) and neurobiological studies (anatomical, genomics and proteomics). In parallel with work in animal model systems, our laboratory is also following learning and memory changes with aging in adults with Down syndrome http://www.uky.edu/DSAging/). People with Down syndrome are at a high risk for developing Alzheimer's disease because they have an extra copy of chromosome 21 and the overexpress beta-amyloid protein. Our study participants undergo neuropsychological tests, a neurological and physical examination and magnetic resonance imaging. In addition, blood samples are drawn and a variety of protein levels are being measured. In the future, we hope that treatments developed in the canine model can be translated to people with Down syndrome to slow or prevent the development of Alzheimer's disease.

Louis Hersh
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Research area and interests: Alzheimer's disease, gene regulation
Possible research projects for undergraduates: Expression and purification of recombinant proteins. Analysis of their properties.

Jianhang Jia
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Research area and interests: Hedgehog (Hh) signaling and its roles in cancer.
Possible research projects for undergraduates: Dr. Jia studies molecular mechanisms of Hh signaling (R01 GM079684; ACS 114887; AHA NSDG0830009N), which is associated with patterning, cell proliferation, and morphogenesis. His group has shown that the seven-pass transmembrane protein Smoothened (Smo) transduces Hh signals by directly recruiting a Costal2-fused (Cos2-Fu) complex and that Smo activation requires phosphorylation by PKA and casein kinase I, leading to increased Smo cell-surface levels and signaling activity. In addition, his laboratory uncovered a feedback mechanism by which Fu promotes Smo hyperphosphorylation and cell-surface accumulation by antagonizing Cos2. Most recently, his laboratory identified and characterized PP4 and PP2A as phosphatases that influence Hh signaling by regulating Smo and Ci, respectively. Since abnormal Smo activation results in such cancers as basal cell carcinoma and medulloblastoma, these studies will provide insights into fundamental developmental problems and new avenues for cancer diagnosis and therapy. The goal of Dr. Jia's research is to understand the molecular mechanisms of the Hedgehog signaling pathway, using Drosophila (fruit-fly) as a model system. Current projects in the Jia Lab are to determine how Hh activity gradient can be translated into different thresholds of downstream gene expression, to identify and characterize smo-interacting genes that play critical roles in Hh signal transduction, and to evaluate the roles of Hh signaling components in cancer formation.

Chunming Liu
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Location : BBSRB B375
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Research area and interests: The Wnt/ß-catenin signaling pathway plays important roles in early development, stem cell renewal, and tumorigenesis. In addition, Wnt signaling is crucial in the organization and maintenance of the human intestinal epithelium. In this pathway, many different components work together to transduce an external signal into changes in gene expression within the target cell. Upon binding its receptor, the Wnt ligand ultimately results in the stabilization of cytoplasmic ß-catenin, which is then free to enter the nucleus and activate transcription through its interaction with the TCF/LEF family of transcription factors.

Hunter Moseley
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Web: http://bioinformatics.cesb.uky.edu/
Research area and interests: Our lab develops computational methods for analyzing and interpreting biological and biophysical data that: i) leverage relevant information from public scientific databases and ii) integrate system-wide analyses across omics-level datasets.
Most of the applications of these methods are in the areas of metabolomics, systems biochemistry, and structural biology.

Qingjun Wang
Department: **Molecular and Cellular Biochemistry**
Location: BBSRB B163
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Research area and interests: Autophagy is a lysosomal degradation pathway that plays important roles in a variety of essential cellular processes and many devastating human diseases. The Wang lab takes an integrated approach that combines mouse genetics, proteomics and cell biology to study (i) all key steps of the mammalian autophagy pathway including signaling and regulation, roles of autophagy in (ii) the healthy brain and neurodegeneration, (iii) platelets and hemostasis, and (iV) cancer.

Nutritional Sciences http://www.mc.uky.edu/nutrisci/

Analia S. Loria
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Research area and interests: Effect of early life stress in cardiovascular and metabolic function.
Possible research projects for undergraduates: My principal interest is the study of origins of adult disease. My research has focused on the effects of early life stress (ELS) on adult vascular and renal phenotype. We use maternal separation, a model of ELS, which is a novel and promising model regarding the study of susceptibility to cardiovascular and renal diseases. My current research area expands our current knowledge on the mechanisms by which ELS induces a hyper-reactive response to stressors in adult life, specifically, modulating the renin-angiotensin system and sympathetic nervous system. In addition, my research as an independent scientist involves

the examination of mechanisms by which a high fat diet increases insulin resistance in rats exposed to ELS. This is an original approach to model the increasing epidemic of children with high dietary fat content in addition to exposure to an adverse environment.

Kevin J. Pearson
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Research area and interests: The main focus of my laboratory is to investigate the role of maternal diet and exercise during pregnancy on the health and disease progression in offspring. Specifically, using mice and rats as models, our goal is to find ways to improve the health of the next generation through interventions during pregnancy. We have several large projects in the laboratory where we can integrate and train students. Students will gain experience both at the bench (western blotting and real-time PCR) and in animal handling (glucose and insulin tolerance and body composition measurements) which should be an excellent first step toward a career in science.

Changcheng Zhou, Ph.D.
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Saha Cardiovascular Research Center
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Web: http://pharmns.med.uky.edu/users/czh229
Research area of interest: The main focus of my lab is to investigate molecular mechanisms of cardiovascular disease and metabolic disorders.
Possible research projects: Despite enormous research efforts and advances in treatments over the past few decades, atherosclerotic cardiovascular disease is the leading cause of death worldwide. Accelerated atherosclerosis is also the critical manifestation of macrovascular disease in type 2 diabetics and the major etiology of morbidity and mortality in these individuals. The goal of our research project is to use in vitro and in vivo approaches including molecular biology, cell culture and animal models to characterize the role of several key signaling pathways in atherosclerosis and metabolic diseases.

Pharmacology http://www.mc.uky.edu/pharmacology/

Rolf Craven
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web page: http://www.mc.uky.edu/pharmacology/faculty.asp
Research area and interests: Cancer signaling and experimental therapeutics
Possible research projects for undergraduates: The goal of our research is to understand the pathways that control tumor cell survival and spread. Our laboratory uses a combination of cell lines and mouse model systems to study the role of signaling pathways in tumor growth. Some of the methods we use to study tumor growth include molecular biology (such as RNAi), biochemical and immunohistochemical techniques, as well as more sophisticated methods such as lentiviral expression vectors and mouse xenograft systems for modeling tumor metastasis. Undergraduates working in the lab will gain experience with molecular biology (recombinant DNA

research), protein analysis (such as western blot analysis and cell staining), reviewing the scientific literature and building hypotheses.

Rina Plattner
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Research area and interests: Abl family of nonreceptor tyrosine kinases, cellular signaling, cancer research

Physiology http://www.mc.uky.edu/physiology/

Francisco H. Andrade, Ph.D.
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Research area and interests: Craniofacial and respiratory muscles
Possible research projects for undergraduates:
(1) cell culture of myogenic cell lines
(2) morphological and biochemical analyses of craniofacial muscles
(3) Genotyping and gene expression analyses

Steve Estus
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Research area and interests: Molecular biology of neuronal death in development and disease.

Lu-Yuan Lee
Department: **Physiology**
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web page: http://www.mc.uky.edu/physiology/people/lee.asp
Research area and interests: Role of TRPV channels in the regulation of airway function.
Possible research projects for undergraduates: The main objective of this research project is to investigate the mechanisms underlying the sensitizing effect of hyperthermia on vagal bronchopulmonary C-fiber sensory nerves. Our hypothesis is that the hyperthermia-induced hypersensitivity is primarily mediated through the temperature-sensitive transient receptor potential vanilloid type (TRPV) ion channels that are expressed on C-fiber neurons. Using a well-established animal model of asthma, the proposed studies will further test the hypothesis that chronic airway inflammation induced by allergen sensitization causes the lung temperature to increase and also up-regulates the sensitivity and/or expression of TRPV channels; together, they enhance the sensitizing effect of hyperthermia on pulmonary C fibers. In a parallel study, experiments are conducted in human subjects and asthmatic patients in collaboration with Dr. Mehdi Khosravi, Assistant Professor of Medicine. In summary, the students working with me on this project will learn how to identify the important questions and to perform experiments in the study of the mechanisms underlying the airway inflammation-induced hypersensitivity of these sensory nerves in the airways, and the role of TRPV channels in regulating the sensitivity and function of these neurons.

Sandra J. Legan
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web page: http://www.mc.uky.edu/physiology/people/legan.asp
Research area and interests: Neuroendocrine and circadian control of luteinizing hormone (LH) release and effects of prenatal exposure to opioids on the hypothalamic-pituitary-adrenal axis.
Possible research projects for undergrads: The overall goal of the major project in my laboratory is to elucidate the neuroendocrine and circadian mechanisms controlling the preovulatory LH surge, and answer the question: what is the mechanism that controls the circadian timing of the preovulatory LH surge? Current experiments are investigating the role of circadian phase advances and of circadian clock genes in control of the LH surge and the identification of the neurotransmitters that constitute the output signal from the suprachiasmatic nuclei (SCN) to the gonadotropin releasing hormone (GnRH) neurons. The second project in my laboratory is focused on the mechanisms whereby prenatal exposure to opiates permanently alters the response to stress. We are investigating the effects of prenatal oxycodone on the neuropeptides and neurotransmitters that control the HPA axis, and how these are differentially affected by sex hormones. Students will have the opportunity to learn advanced neuroendocrinology, neuroanatomy, and circadian biology. Techniques that they will learn or assist with include: jugular cannulation, stereotaxic surgery, anesthesiology, collecting and processing blood samples, radioimmunoassay for determination of plasma hormone concentrations, and immunohistochemistry for localization of clock genes and the neuropeptides mediating control of LH and ACTH secretion.

Tim McClintock
Department: **Physiology**
Location: MS535/MS585 Medical Center
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Research area and interests: Molecular biology, genomics and epigenetics of olfaction, especially the control of odorant receptor gene expression, the function of odorant receptors, and adult neurogenesis in the olfactory epithelium. Undergraduate research projects: undergraduates choose projects supporting the main objectives of ongoing research projects. These may range from bench work in molecular biology to computational analyses of large genomics data sets.

Melinda Wilson
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Research area and interests: Mechanisms of estrogen action.

Spinal Cord and Brain Injury Center http://www.mc.uky.edu/scobirc/

Edward D. Hall
Department: **Spinal Cord & Brain Injury Research Center**
William R. Markesbery, M.D. Chair in Neurotrauma Research
Professor of Anatomy & Neurobiology, Neurology, Neurosurgery and Physical Medicine & Rehabilitation
Location : BBSRB 477
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web page: www.mc.uky.edu/scobirc

Research area and interests: Pathophysiology and Neuroprotective Pharmacological Treatment of Acute Spinal Cord & Brain Injury

Surgery http://www.mc.uky.edu/surgery/

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Research area and interests: Chronic lung diseases are now the third leading cause of death in America, claiming the lives of over 400,000 annually with a cost of $154 billion[1]. As chronic lung disease reaches end stage, lung transplantation becomes the only choice for effective treatment. With the scarcity of suitable donor lungs, however, the average time on the waiting list is 12.4 months with 14% of patients dying on the waiting list. A narrow window of opportunity exists for lung transplantation in any patient who is sick enough to benefit from the operation, but healthy enough to survive the months of waiting for a donor lung and subsequent surgery. Thus, there is a critical need for a respiratory support strategy which can serve as a bridge to lung transplantation. Unfortunately, no suitable long-term ambulatory bridge to lung transplantation exists. Recent success in the use of ambulatory ventricular assistance has stimulated research toward the development of a device to serve as a bridge to lung transplantation. In this application, a new artificial lung (AL) will be developed for long-term respiratory support. The fibers in the new AL will be coated with an ultra-thin PTFE membrane layer which will result in better gas exchange performance and lower blood resistance. The new AL will also have an even blood flow pattern to eliminate blood stagnancy, thereby reducing the occurrence of thrombosis. The significance of this project is that a new AL will be developed that will provide long-term ambulatory respiratory support for bridge to lung transplant use. Furthermore, completion of this research will also result in an AL prototype ready for clinical testing.

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