SPECIAL ISSUE
SUMMER RESEARCH 2008
IN THE ST. OLAF FNSM

APPLICATION DEADLINE IS February 15

PLEASE NOTE DIFFERENT START DATES AND DIFFERING PERIODS OF TIME (typically 8-10 weeks) THESE MAY BE SUBJECT TO CHANGE

PLEASE CHECK BACK FOR ADDITIONAL PROJECTS

BIOLOGY Department

Dianne Angel – Surveying Shrikes
Loggerheaded shrikes (*Lanius ludovicianus*) are a threatened species in Minnesota and we are fortunate here at St. Olaf to be only several miles away from what is a hot spot of shrike nesting habitat. Shrikes are large, grey and white insectivorous birds. Along with many other animal and plant species, this bird has declined as landscapes have been transformed for agricultural purposes. Formal surveys of this species are more than ten years old and those surveys found only small, dispersed populations of shrikes in Minnesota. We will use a variety of techniques to quantify populations and locate nesting pairs of shrikes in and around eastern Rice County. Observations on nest locations and characteristics will be collected along with observations on nesting and foraging behavior. Potential researchers need to be patient and enthusiastic about observing wildlife. Access to a car is an advantage and you need to be independent and motivated!
** Anticipated start date May 27.*

Eric Cole – Two Projects
Tetrahymena Gene Stream
In this project we are seeking to identify and characterize genes whose products participate in creating the nuclear exchange junction (during cell mating) and a unique organelle called the "conjusome" that may be involved in genome remodeling late during the conjugation process. Techniques involve cell culture, cell fractionation, SDS-PAGE for protein separation, and a suite of molecular techniques including PCR, gene cloning, GFP-tagging and fluorescence microscopy. Collaborators are Doug Beussman (Chemistry) Doug Chalker (Washington U., St. Louis), and our molecular work at St. Olaf is supervised by Erica Zweifel, Research Associate.

The Hurricane Oyster Project
This project involves an exploration of factors that determine gender during growth and development of the Scaly Pearl Oyster. Techniques involve paraffin histology for light microscopy (to determine the gender and sexual maturity of pearl oysters collected from the Caribbean), and water chemistry assessment tools to evaluate oyster habitat. Collaborators include John Schade, Paul Roback (Math) and Steve Freedberg.
** Anticipated start date May 27.*

Kevin Crisp – Cell Death Following Focal Ischemia in the Earthworm Central Nervous System

Because it has a vascularized nerve cord and a high potential for regeneration following injury, the earthworm offers unique advantages for studies of focal ischemia in the nervous system. Surgical manipulations that disrupt blood flow to a portion of the earthworm nerve cord have been shown to correlate with cell death and morphological changes when re-examined after several months. It is not known when cell death begins after these manipulations, but ischemia-induced necrosis may begin within hours to days following vascular insult. Now that the pattern of blood flow in the earthworm nerve cord has been characterized in my lab, I am looking for a student to lesion specific segmental arteries perfusing the ganglia and monitor the time course of neuronal cell death using a variety of microscopy techniques. If time permits, I would like this student to treat worms with neuroprotective agents that may decrease the rate and/ or extent of cell death. This work will be conducted at the University of Minnesota during the Summer of 2008.
** Anticipated start date May 27.*

Steve Freedberg – Evolutionary Biology and Population Genetics
Sex-ratio evolution in reptiles
I am interested in the evolution of sex ratios and sex determining systems. In many reptiles, sex is determined by the temperature of the nest during incubation and thus the offspring sex ratio can be heavily influenced by local climatic variation and mothers' nest site choice. Studying the factors affecting maternal nest-site choice can be critically important in understanding both the evolutionary dynamics of the population sex ratio and the conservation implications of human-induced changes in the environment. This study seeks to examine the role of maternal nesting behavior on the sex ratios of local populations of freshwater turtles. Specifically, we will monitor and analyze temperatures, sex ratios, and genetic profiles of natural nests. Coupled with laboratory incubation studies, this work can provide valuable insight into the factors affecting sex ratios. I am looking for one student who would be interested in field, laboratory, and molecular analysis.

Bioinformatics/population genetics
In both plants and animals, males frequently exhibit higher migration rates than females. For instance, while ovules are often restricted in their mobility, pollen can travel long

distances to enter non-native populations. While theoretical studies of population genetics allow for predictions of molecular diversity based on gene frequencies, they do not account for this asymmetry in migration rates. Such asymmetry, in theory, could lead to an inflation of genetic diversity since the immigrant male gametes will be restricted to fertilizing unrelated resident females, producing an inflated level of outbreeding. I am interested in developing computer simulation models of this phenomenon and quantifying the effects of such scenarios on standard molecular diversity indices. I am looking for one student with programming experience who would be interested in developing simulation and population genetic models.

Kim Kandl – Back to the Yeast: developing *in vivo* models to support *in vitro* data

The long-term goal of work in my lab is to clarify the role that the actin cytoskeleton plays in translation (protein synthesis) by identifying and characterizing the interactions between individual components of the translation machinery and actin. To do this, we use the budding yeast, *Saccharomyces cerevisiae*, as a model organism. One link between the actin cytoskeleton and protein synthesis is through the eukaryotic Elongation Factor 1A (eEF1A) that delivers aminoacyl-tRNAs to the elongating polypeptide at the ribosome. eEF1A has been shown to bind and bundle actin *in vitro*, and our recent work has used biochemical techniques to learn how this bundling is affected by both mutations in the actin protein and the presence of another elongation factor, eEF1Ba. *In vitro* data are important, but it is also desirable to know what effect these changes in actin or the eEF1Ba protein have on the cell. Students who work on this project should expect to use a number of techniques including cloning, PCR, fluorescence microscopy, yeast transformation and protein purification. If you have an interest in genetics, molecular biology, cell biology and/or biochemistry and would like to know more about this project, please come see me.

** Anticipated start date May 27.*

John Schade – Ecosystem and Polar Research

Nutrient cycles and consumer-resource interactions.

My current research interests center on studying feedbacks between multiple nutrient cycles and consumer-resource interactions. I am currently involved in a project in which we ask where and when are biotic interactions and biological stoichiometry important determinants of nutrient transport and retention in river networks, and what are the consequences for downstream communities? I am looking for 1 or 2 students to participate in a project studying these processes in a network of streams at the Angelo Coast Range Reserve in Northern California. Students would be responsible for developing a research project and assisting in the lab and field. They will also gain valuable experience in fieldwork involving collection of water, algae and stream invertebrate samples, as well as exposure to standard and novel approaches to studying stream ecosystems. In addition, this project will provide opportunities to interact with collaborators at the University or California-Berkeley and from the University of Minnesota.

The Polaris Project: Rising Stars in the Arctic

The Polaris Project is a multifaceted effort that includes a field course and research experience for undergraduate students (rising stars) in the Siberian Arctic; several new arctic-focused undergraduate courses taught by project Co-PIs (also rising stars) at their respective colleges across the United States and in Russia; the opportunity for Co-PIs to initiate research programs in the Siberian Arctic; and a wide range of outreach activities. The unifying scientific theme of the Polaris Project will be the transport and cycling of carbon and nutrients as they move with water from terrestrial uplands to the Arctic Ocean. I am looking for 1 student to travel to the Northeast Science Station in Cherskiy in the Siberian Arctic for three weeks in July. In addition, this student will have the opportunity to work with me to develop a research project and curriculum materials during the month of June to prepare for the field course. This student must be enrolled in BIO 391: **Arctic Ecosystems: An Analysis of Global Change** to attend the field course. In addition, interested students must discuss this opportunity with me and must complete a separate application (see www.thepolarisproject.org for more information).

Kathy Shea – Prairie Biomass/Forest Restoration

My research will focus on biomass production in prairies and forest ecology. We will study experimental plots planted last summer to analyze variation in biomass production with variation in plant diversity. We will also study biomass from restored prairies of different ages, as well as soil nutrient levels, organic content and C/N ratios of prairie soils. From the data we hope to make recommendations about factors that lead to maximum biomass production. Our eventual goal is to examine potential biofuel production from restored prairies.

We have also studied methods of restoration and factors affecting the growth of trees in the St. Olaf Natural Lands. New data, including tree size, soil characteristics, and understory characteristics will be collected and added to the existing database. Because part of the emphasis will be on data analysis, interests/background in statistics would be helpful. Students working during the summer will be encouraged to use some of this research as the basis for an independent research project during the academic year.
** Anticipated start date May 27.*

Charles Umbanhowar, Paul Jackson, and Meg Ojala – Imaging and imagining changes in the landscape of southern Minnesota described by the J.N. Nicollet expedition of 1838.

Joseph Nicollet was a French astronomer and was hired by the U.S. Gov. to survey the Upper Mississippi drainage, and he is noted for his detailed (and sympathetic) descriptions of the landscape and its people. In the Fall of 1838, he and the others in his expedition traveled from Fort Snelling south to present-day Northfield (crossing the Cannon at Waterford), then on to the current location of Faribault and eventually on to Spirit Lake in Iowa.

We will be working with three students (8 weeks only) to document the path of Nicollet's travels by reconstructing the landscape and 1838 and today. Students will be engaged in activities ranging from photographing the modern landscape, exploring documents

related to the expedition at the Library of Congress and Smithsonian in Washington, D.C. sampling water from the various lakes visited by the expedition as well as extracting lake sediments that were deposited in the 1830s and 1840s. Student working with Umbanhowar will have primary responsibility for lake sediment coring and analysis of sediments for charcoal, P, and biogenic silica. Student working with Jackson will be focused on caffeine and pharmaceuticals in lake water and student working with Ojala will be responsible for landscape photography and photographing and/or scanning historical documents.
** Anticipated start date May 27.*

Charles Umbanhowar – Climate change and responses of Manitoba tundra lakes
This project is focused on understanding lake and terrestrial responses to climate change in the low arctic tundra. I am looking for a student to assist with preparations for trip and then join expedition of 7 faculty and students from 4 institutions for three weeks of field work in northern Manitoba in July. Students must be willing to fly in float planes, work long hours and deal abundant biting flies and insects.
** Anticipated start date June 9.*

CHEMISTRY Department

Doug Beussman – Summer 2008 research opportunities
All projects will rely to a large extent on the use of mass spectrometry, as well as on various separation methods.

One project includes collaborating with Dr. Cole in the Biology Department and a research group at Drake University on the identification of proteins isolated from *Tetrahymena thermophila*, using proteomic methods. These proteins will be digested and analyzed using mass spectrometry techniques with the MALDI-TOF/TOF instrument and screened against a database. Peptides from potentially identified proteins will be fragmented in the mass spectrometer in order to sequence the peptides for confirmation of protein identification.

A second opportunity for summer research involves developing sensitive and selective forensic science methods for the analysis of date rape drugs in beverage residues, using mass spectrometry. The residues may be the final few drops of liquid in the bottom of a glass, or the dried remains of these drops. This project will use the LC-MS to attempt to identify and quantitate different drug residues from a variety of beverage samples.
** Anticipated start date May 27.*

Bob Hanson – Mathemetical Chemistry

Project 1: The Structural Biology of Quaternions
Working in collaboration with Andrew Hanson (Department of Computer Science, University of Indiana), this student will explore the application of quaternions to the study of protein and nucleic acid structure and folding. I'm looking for a student who is

either a double major in chemistry and either mathematics or computer science, or a biology or chemistry major with a strong interest in mathematics, or a mathematics or computer science major with an interest in applying mathematics to the area of structural biology. See http://www.stolaf.edu/people/ceumb/SummerResearch/1hiv_qy.jpg

** Anticipated start date May 27.*

Project 2: Application of Markov Chains to Chemical Reactivity

This project involves exploring the use of Markov chains to describe the probabilities of fluctuation in chemical equilibrium and its relation to kinetics, chemical reactivity, and entropy. I'm looking for a student who is either a double major in chemistry and either mathematics or computer science or a mathematics or computer science major with an interest in applying mathematics to the area of theoretical chemistry.

Paul Jackson, Charles Umbanhowar, , and Meg Ojala – Imaging and imagining changes in the landscape of southern Minnesota described by the J.N. Nicollet expedition of 1838.

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Gary Miessler – Transition Metal Dithiolene Complexes and Clusters

My main research interests are in the organometallic chemistry of molybdenum and tungsten. For example, I hope to develop syntheses of new compounds of these metals that contain dithiolene ligands (bidentate ligands coordinating to metals through two sulfur atoms) in addition to organic ligands such as CO and η^5-C_5H_5. Some important molybdenum- and tungsten-containing enzymes have dithiolene ligands, and I hope to prepare compounds that might serve as models for the metal sites.

A reaction discovered last summer was between a molybdenum dithiolene complex and $Ru_3(CO)_{12}$ to generate a variety of clusters, in which sulfur forms bridges between different metals. These clusters have very interesting symmetries—visually quite appealing, at least to a chemist! I would like to have students explore reactions using different CO complexes to examine how broad this range of chemistry might be and how far the "isolobal analogy," which can be used to draw analogies between inorganic and organic chemistry, can be carried in understanding this chemistry.

Students participating in this work will gain experience in vacuum line synthesis and purification techniques and will also use a variety of spectroscopic methods, especially NMR, mass spec (APCI and MALDI), IR, and UV-vis. Crystal structures of new compounds will be determined by the University of Minnesota X-ray crystallography lab.
** Anticipated start date June 9.*

Greg Muth – Design and Synthesis of Conformationally Constrained RNA Oligonucleotides

Small, highly structured fragments of RNA have been shown to play important roles in numerous biological processes. For example, specific genes can be turned off by the presence of small interfering RNA, and the presence of small RNA molecules has also been shown to disrupt the binding of the nucleocapsid protein to HIV-1 RNA or the binding of the Rex fusion protein to its target in human T-cell leukemia virus type 1. While the sequence of these RNA fragments plays a role in their binding, we hypothesize that the overall three-dimensional structural architecture of these RNA fragments is also a vital component. To address this, we have designed a series of novel compound that mimic biologically relevant backbone conformations and made them suitable for synthetic incorporation into short sequences of RNA. The resulting novel oligonucleotides will be tested for biophysical attributes such as protein binding, conformational flexibility and nuclease resistance by a variety of methods such as nuclease digestion, gel-shift, various protein binding assays and calorimetry.

This project is suitable for students who have completed organic chemistry and are interested in pursuing research in synthesis as well as biochemistry and biophysical chemistry.

Janice Pellino – SRNA C0067

The recent identification of the RNA interference pathway has highlighted the fundamental role of small, non-coding RNAs (sRNAs) in post-transcriptional gene regulation. Although bacteria lack an analogous RNA interference pathway, it is becoming clear that these small RNAs, previously thought to be "junk," serve a critical role in gene regulation. Hundreds of sRNAs have been identified in prokaryotes, although for many their function remains unknown. This research project will focus on the uncharacterized sRNA C0067 in *Escherichia coli,* in an attempt to identify its gene target and mechanism of regulation. This project will rely on interdisciplinary techniques from biochemistry, molecular biology, and bioinformatics.

MSCS Department

Center for Interdisciplinary Research
Funding will be available for about 4 students in statistics to participate on interdisciplinary research teams in summer 2008. The Center for Interdisciplinary Research (CIR) brings together undergraduate statistics students supervised by statistics faculty and students from other disciplines to share in the excitement and challenge of working across the traditional academic boundaries to collaborate on research. Ideal candidates would be students who have taken Statistical Modeling (Stat 272) and who are working toward a statistics concentration.

Dick Brown Beowulf cluster computing.

A Beowulf cluster consists of numerous commodity computers that are networked together in order to perform high-performance computations. St. Olaf's Beowulf cluster project is now entering its third year, and our two clusters have supported over a dozen research initiatives in the biological sciences, physics, computer science, mathematics, and chemistry (see http://www.cs.stolaf.edu/projects/beowulf). We seek students to continue this work during Summer 2008. Goals include: development of interdisciplinary applications and software libraries to support such applications; installation and testing of software systems that take advantage of cluster technology; creation of "HiPerCiC" user interfaces for accessing those systems; and development/deployment of system management procedures for the two clusters. Students with Software Design backgrounds are encouraged to apply; "core" CS courses and background in the natural sciences are assets. ** Anticipated start date May 27.*

Tina Garrett –Enumerative Combinatorics
Enumerative Combinatorics is an area of study that uses advanced counting techniques to understand the properties of a wide variety of combinatorial objects used in Mathematics, Statistics and Computer Science. These objects include permutations, tableaux, tilings and partitions. I am looking for 1-2 students to work on one (or both) of the following projects.

Project #1 Investigate permutation statistics that are preserved by the insertion algorithm for certain Young tableau developed by Killpatrick and Cameron. No experience in Combinatorics is necessary, but successful completion of Abstract Algebra is preferred.

Project #2 Recent work by Andrews, Garvan and Ono indicate an exciting new class of partition congruences relating to smallest part may exist. Recently, St. Olaf students developed an algorithm to generate several new such conjectures. This project will focus on developing methods to prove the existing congruences. Experience in Combinatorics is preferred, but an aptitude for problem solving and a willingness to work with Mathematica (computer algebra package) is necessary.

Schedule and hours per week will be negotiated depending on available funding.

Olaf Hall-Holt: The Palantir Project
Are you interested in graphics, 3D visualization, and measurement sensors? Do you have some familiarity with the C++ programming language? The Palantir project is an on-going team effort that is currently focused on extracting 3D information from video sequences. Given digital video clips taken with two synchronized cameras, our challenge is to find patterns in the data that allow us to infer information about the shape and position of objects in the scene. We will build on work from the last two summers on image analysis, and use our newly operational stereo robotic cameras. This is a joint project with Gary Muir in psychology, who will be applying the new tools to study the way that rats navigate through space. * *Anticipated start date May 27.*

Steve McKelvey – Sudden Oak Death (SOD)
Sudden Oak Death (SOD) is a serious disease, recently introduced to North America, that has the potential to destroy most of the oak forests in the United States. For the moment, the organism that causes the disease, Phytophora ramorum, appears to be isolated to the Pacific coastal forests, areas west of the Cascade and Sierra Nevada mountains.

With funding from the USDA Forest Service, this mathematical modeling project supports federal efforts to prevent the spread of this organism to eastern oak forests. Mathematical ideas that will be important to this project include probability, optimization, stochastic simulation, network flow analysis and possibly differential equations. I do not expect summer researchers to be experienced in all, or even some, of these areas. What I will be looking for is someone well along in the mathematics major, with demonstrated interest in applied mathematics, whose academic record indicates an ability to learn new ideas quickly. Computer programming experience of any type is a plus, but not required. * *Anticipated start date May 27.*

Paul Roback – Statistical Modeling and the Tuberculosis Genome
The prediction of operons (sets of genes that function together) in *Mycobacterium tuberculosis* (MTB) is a first step toward understanding the regulatory network of this pathogen. Along with researchers from the University of Seattle, we are developing statistical models to predict operons in MTB, using information such as intergenic distance, promoter and terminator indicators, and gene expression data from nearly 900 microarray experiments with MTB RNA. Our goal is to build an improved genome map for this human pathogen. Funding is available for two students to work on statistical aspects of this project this summer; ideal candidates would have taken Statistical Modeling (Stats 272), be working toward a statistics concentration, and have interest in genetics (and potentially even relevant coursework in biology).

PHYSICS Department

Brian Borovsky – The Molecular Origins of Friction - A study across velocity regimes of phosphonate monolayers on alternative MEMS-type surfaces.

I am interested in studying what gives rise to the force of friction. What are the microscopic interactions that determine the frictional force opposing the sliding of one surface over another? How does this force generate heat at the interface? By pressing a high-resolution force probe onto a vibrating surface, we create a microscopic high-speed contact subject to friction. The speeds and contact sizes involved are the same as those encountered in working devices such as computer hard drives and micromachines. We are embarking on a collaborative effort, with investigators from Luther College and Auburn University, to investigate a class of monolayers called alkanephosphonates that may be effective coatings for micromachines assembled from metal oxides rather than silicon. We will be studying lubricant films consisting of a single layer of chain-like hydrocarbon molecules. Our goal is to determine how the length of the lubricant molecules and the choice of substrate affect the levels of friction. Current models point to the importance of mutual interactions among the molecules in establishing a well-ordered layer with a minimum number of pathways for energy dissipation.
** June 2 anticipated start date*

James Cederberg – Molecular beam spectroscopy.
The molecular beam spectrometer in SC150-152 was obtained from Harvard University in 1981, and has been in use here at St. Olaf ever since. The project involves using the spectrometer to record data on the molecules, and developing and using software for the analysis of the data. The purpose is to measure molecular properties that quantify the interactions between the molecular and external electric and magnetic fields and the nuclear spins.

During the summer of 2007 two students, Charlie McEachern and Bjorn Paulson, continued an investigation of KI begun the previous summer. With their work we have added five significant figures to the parameters beyond what was known from previous measurements elsewhere, and are in the process of preparing a manuscript for publication in the Journal of Chemical Physics on both KI and KBr. Charlie and Ben McDonald (who worked on the project in 2006) presented talks on the project at the International Symposium on Molecular Spectroscopy at Ohio State in June of 2007.

For the summer of 2008 two students (including one new to the project) can decide whether to begin studying a new molecule or to continue work that others had begun earlier on RbBr and RbOH. The students are colleagues in the whole process, helping to decide what molecules to examine and what data to take, analyzing the data, maintaining the apparatus, writing software, and writing the papers for publication. In so doing they can learn about the quantum mechanics of molecular structure, vacuum techniques, electronic interfacing and control, programming in Visual C++, and the statistical analysis of data. ** Anticipated start date May 27.*

Jason Engbrecht – Positron Research Group
This summer the positron research group will continue its work in both fundamental and applied positrons physics. We are currently developing a positron beam for use in a number of experiments. These will include the development of positron trapping techniques and the formation of a positronium beam. This beam will allow us to explore

positronium interactions at energies that have previously been unavailable anywhere in the world. Additionally, we will continue our work on positronium interactions in a gas environment. Finally, we will apply positron spectroscopy techniques to study materials supplied by Anne Walter and/or the University of Minnesota. This wide variety of experiments will allow students to participate in all aspects of experimental work including design and construction of apparatus as well as collection and analysis of data. A number of experiments are near fruition and the opportunity for publication of results with student collaboration is quite likely. Please stop by and see Jason Engbrecht if you are interested in this work.
** June 9 anticipated start date*

Robert Jacobel and Brian Welch - Summer Research with the Center for Geophysical Studies of Ice & Climate (CEGSIC)
The world's glaciers and ice sheets are a critical element in the global climate system now undergoing major change. Our group uses ice-penetrating radar and satellite imagery to examine the surface, interior and base of ice sheets and glaciers. The characteristics of internal ice layers and basal geology that we measure with the radar give us information about the evolution of the ice and enable us to study the relationship between ice flow and climate change.

Currently we are involved in the second season of an Antarctic traverse that is taking place during the International Polar Year (IPY), 2007-2009. Summer research in 2008 will focus on data analysis and interpretation from this traverse. It is also possible that we may be able to send someone to Sweden for part of the summer to do research on one of the large Swedish glaciers with our colleague Rickard Pettersson. Students involved in our group will use existing software to analyze ice-penetrating radar data and satellite imagery as well as learn to write new code in Matlab. We also work with GPS, GIS, and remote sensing software/data to establish a spatial context for our radar results. Our work is supported by grants from the Office of Polar Programs, National Science Foundation.
** June 9 anticipated start date*

PSYCHOLOGY Department

Shelly Dickinson – behavior and neurochemistry adolescent mice
Previous work in the lab using the place conditioning technique has determined that adolescent mice do not show a preference for environments associated with a moderate dose of alcohol, although adult animals do. In addition, sensitivity to alcohol's aversive effects seems to be different in adolescent mice. So far, all of our work has been conducted with an inbred mouse strain and one project this summer will be to repeat these studies in an outbred mouse population to determine how generalizable our findings are. From a genetic standpoint, these studies will be very important! In addition to looking at alcohol-related behaviors in adolescent mice, I'm interested in understanding the neurobiological differences between adolescents and adults that may be involved in the behavioral differences. To do this, we can use the technique of electrochemistry to determine the functionality of various transporter proteins in the brains of adolescent and adult mice, both under baseline conditions and after alcohol injection. Students will start

at the beginning with experimental design and will learn animal handling and injection techniques, and will gain experience analyzing the data. Ideally some initial training would happen during the spring semester so that current students can pass on their wisdom. Participation beyond the summer is desired with regard to manuscript preparation, and continued work during the academic year doing independent research is encouraged.
** June 9 anticipated start date*

Gary Muir – The Neural Basis of Navigation
My research program is guided primarily by questions about the neural mechanisms of spatial cognition and navigation. The firing activity of "head direction" cells is thought to represent the animal's perceived "sense of direction," or orientation, but how is information contained in the firing activity of these cells used by the animal when solving a spatial task? I am also particularly interested in how learning a spatial task may alter the firing activity of these cells to represent the animal's newly acquired knowledge. To answer these questions, students will have the opportunity to observe a "behaving" brain in action by recording the activity of single neurons while freely-moving rats perform spatial tasks. How does this neural activity relate to the animal's navigational decision-making behavior? Students will be involved in all stages of the project: designing the experiment; small animal handling, surgery, and training; single-unit electrophysiological data collection and analysis; and public presentation of the results. Students interested in continuing the project into the academic year as independent research are especially encouraged to apply.
** June 9 anticipated start date*