

Research Opportunities 2012-2013

Supervised Research for Juniors & Seniors
ABIO 399-499



Course Highlights

Learn scientific investigation skills; Carry out directed experimental research; Analyze/present data in a research paper, and in a poster or oral format.

YOUR WORK, YOUR RESULTS!

Course may fulfill 1 lab or elective requirement (see page 2)

Review the Research Projects (page 4):

- **Meet with a Supervisor**
- **Agree on a Project**
- **Complete the Permission Form**
- **Obtain a Permission number**
- **Register**

Department of Biological Sciences
University at Albany

Robert Osuna, Coordinator 591-8827
rosuna@albany.edu

Blanche Feck, Staff Assistant 442-4337
bfeck@albany.edu

Supervisors at UAlbany include Biology, Chemistry, Psychology, Nano; Off-Campus supervisors are at Albany Medical College, Wadsworth Center, Axelrod Institute and NYS Museum.

Syllabus / Supervisor Grading Information

ABIO 399/499 (Z) Supervised Research For Juniors & Seniors

ABIO 399/499 Supervised Research for Juniors (1-3 credits) Seniors (1-4 credits) Individual, independent research on selected topics in biology. Critical analysis of selected research papers. Junior/Senior majors in Biology apply for this course through the prospective research adviser. Students taking two or more semesters of ABIO 399, 399Z, 499, or 499Z will make a poster or oral presentation at the April Research Symposium. A copy of the final report of each semester's work (typewritten in journal format) is kept on file in the department.

Dr. Robert Osuna, Coordinator ~591-8827 ~ rosuna@albany.edu ~ LS 2062

Course Objectives

ABIO 399 & ABIO 499 (or Z components) are intended to engage students in a specific field of research by using the scientific method of investigation, so they may research a topic, develop an argument, organize supporting details, and produce coherent texts within common college-level written forms.

Pre-Requisites

ABIO 399 & 499 do not have stated pre-requisites, *however*, individual supervisors may request that students have completed course work in specific areas such as genetics, molecular bio, chemistry etc.

ABIO 399Z/499Z Pre-Requisite is 2 prior credits of ABIO 399 or 499; supervisors may also request course work.

Course Fulfillment

4 credits over 2 semesters in ABIO 399/499 (or Z) may be used to fulfill B.S. 1 lab requirement OR
1 B.A. non-lab elective requirement.

ABIO 399/499 (and Z) may contribute a **total of 4 credits** toward the biology major.

A Maximum of **6 credits in ABIO 399/399Z and; 8 credits in ABIO 499/499Z** may be earned.

ACADEMIC INTEGRITY: See http://www.albany.edu/undergraduate_bulletin/regulations.html

Student Expectations

While not easy to evaluate this experience with a single letter grade, a level of consistency and fairness in grading may be achieved by considering, wherever possible, similar evaluation criteria.

- **TIME:** University regulations state: **3 hours of work/ per week/ per credit in the Fall/Spring Semester or 8-10 hours/ week/ credit in the Summer session.** At times during the semester, students may need more time to study for exams, which may temporarily affect their availability for research. However, students should discuss this with their supervisor, and plan to make up this time in other weeks.
- **TRAINING:** Students are expected to make reasonable progress in responding to lab training by learning and correctly executing the required laboratory techniques.
- **MOTIVATION:** Students are expected to show genuine interest in, and become intellectually involved, in their research problem. This may be demonstrated (among other ways) by:
 - Completing assigned readings for their research (e.g. advanced textbook chapters, published papers, lab theses, etc.)
 - Level of preparation for any lab presentations (at least one presentation per semester would be appropriate, where the student may receive feedback from the various lab members)
 - Frequency or kind of questions asked and interest in discussing the research with their supervisor.
 - Level of responsibility and dedication toward their experiments.
- **DATA COLLECTION:** Students are expected to maintain a well-kept lab notebook, containing accurate and detailed notes regarding each experiment, data collected, and conclusions arrived at. It should be organized, neat, and legible.

▪ **RESEARCH PAPER:**

- Students are **required to write a research paper for each registration** of this course and submit to the mentor for grading. Graded papers are sent to the Research Coordinator within 5 business days of the last day of each semester. Late papers may receive a grade of Incomplete *for one semester only*.
- There is no set length for this paper; it should follow a scientific publication format, and
- Must include:
 - Project Title and Author (student name)
 - Introduction (with cited references within the text)
 - Materials and Methods (with cited references within the text)
 - Results (including relevant data and figure legends)
 - Discussion (with cited references within the text)
 - References

▪ **APRIL SYMPOSIUM**

- After 2 registrations in the course (ABIO 399/499 (or Z components)) the student **must participate** in the April Symposium by making an Oral or Poster Presentations.

399Z / 499Z Writing Intensive Versions:

Supervisors: Please read before agreeing to this version. University Requirements include:

- *A Substantial Body of Finished Work:*
 - This is generally **expected to be a total of 20+ double-spaced pages in at least two, preferably more, submissions.**
- *Opportunity for Students to Receive Assistance in Progress:*
 - Such assistance may be visits to the Writing Center (HU 140) to **conferences with the instructor/supervisor.**
- *Opportunity to Revise Some Pieces:*
 - As revision is an essential characteristic of good writing, **students should be able to revise some portion of their work.**
- *Response to Student Writing:*
 - **It is expected that the instructor will respond in detail to some extended work of the student.**

Final Grade

- The final grade should take **all of the Student Expectations** into consideration. A grade inferior to A, is acceptable, if one or more of the criteria are less than excellent.
- However, a student's grade should not be strictly based on the results of their experiments.
- It is a good idea to discuss these and other expectations with a student at the beginning of each semester, and to discuss their progress regularly throughout the semester.
- Incomplete grades are discouraged, *but may be requested* of the Research Coordinator, prior to the last day to submit grades each semester.

Suggested Course Grade Range for ABIO 399/499 & Z components

Evaluation Criteria	Excellent (A)	Very Good (B+ to A-)	Good (B- to B)	Marginal (C- to C+)	Poor (E to D+)
Amount of Time Devoted					
Response to Training					
Motivation					
Data Collection					
Research Paper					

SUPERVISOR GRADING INFORMATION:

- **Use the chart above** to come to a suitable grade for the student's **Time, Motivation, Response to Training and Research Paper** (but not necessarily the results)
- **Enter the Grade** on the original blue application, sign and date the form
- **Submit to Blanche Feck or Robert Osuna, or** have the student bring to campus

University at Albany
1400 Washington Avenue
Albany NY 12222

Biological Sciences

Dr. Paul Agris pagris@albany.edu / 437-4448 / LS 1126

RNA, the macromolecule central to the control and expression of genes, is the new target of disease intervention and a molecular tool relevant to all of biology. We are interested in how the chemistry and structure of RNA allows it to function in protein synthesis, in the replication of HIV and in control of genes in pathogenic bacteria. Students will gain hands-on experience in the methods and instrumentation used to determine RNA structure/function relationships, apply those skills to a real problem in biology and with demonstrated motivation, have an opportunity to author one or more papers with members of the research group.

Please contact Caren Stark (cstark@albany.edu) to apply.

Bio, Biochem, Chem Majors: Pre-requisites Intro Bio & Chem, Organic Chem, Biochemistry recommended. Students should have a passion for science, and a strong interest in pursuing an advanced degree. [10 hr/week, 2 semesters preferred, plus a willingness to commit summers to research (stipend over the summer)]

Dr. Haijun Chen hchen01@albany.edu / 591-8854 / LS 2065

Ion channels are membrane proteins which allow ions across cell membranes in response to physical and/or chemical stimulations. They play a key role in electrical signaling of excitable cells such as neurons and cardiac myocytes. Dysfunction of ion channels could cause human neuronal, muscular, and cardiac disorders such as arrhythmia and epilepsy. Our goals are to understand how several subfamilies of potassium channels are gated and regulated in physiological and pathological conditions.

Bio, Biochem majors; Pre-requisite Molecular Bio, basic lab skills; students interested in Med/Grad school [10 hrs/week]

Dr. John Schmidt js213@albany.edu / 442-4309 / Bio 121C

We are investigating how connections develop between the eye and the brain in zebrafish, which has clear embryos. Specifically, we study the formation of the retinotopic map and the role of activity in stabilizing synapses to sharpen the map. We use time-lapse imaging to watch retinal arbors form, after labeling single cells with a fluorescent dye and pharmacologically manipulating signaling pathways, or alternatively using expression vectors to express Green Fluorescent Protein fused to a target protein to be manipulated. Involves DNA injection into eggs, microscopy for screening and imaging, and computer analysis of images of arbors.

Prefer Sophomores or Juniors with a strong commitment toward pursuing graduate studies in neuroscience, but will accept dedicated premed students. Suggested Course prerequisites: Cell Biology, Physiology, Neurobiology or Histology. Students with superior computer skills are encouraged to apply. [10-12 hrs/week lab work and at least two semesters to the project.]

Dr. Caro-Beth Stewart cs812@albany.edu / 591-8832 / LS 2060

My research program combines bioinformatic and molecular methods to study the evolution of mammalian genes and genomes, with an emphasis on the primates. Our current projects include: (1) identifying genetic changes unique to the human and chimpanzee lineages; (2) understanding the genetic basis of SIV/HIV resistance in certain primate species; and (3) studying the evolution of the lysozyme multigene family in the mammals.

Students from Biology, BCAMB, Anthropology/Human Biology, and Computer Science will be considered. Completion of BIO 212 or equivalent is required, and a desire to pursue graduate studies is preferred. [~9-12 hrs/week]

Dr. Ben Szaro bgs86@albany.edu / 591-8852 / LS 1059

Our laboratory studies the molecular basis of axon development and regeneration in the central nervous system. We are particularly interested in the molecular genetic mechanisms that neurons use to control the expression of structural proteins used to build an axon. We use the frog, *Xenopus laevis*, as our primary model system. This organism is ideal for studying early neural development, plus it has the remarkable ability to regenerate central nervous system axons. We believe that understanding how this happens can give us insights into how to improve our own nervous system's ability to repair itself. We use histochemistry, microscopy, cell and embryo culture, protein biochemistry, and molecular biology in our research.

Students in BIO-BS or BCHM; Pre-requisites Biochem or at least 3 crs of Mole Cell or Development Function elective; General Chem & Bio Lab; interest in grad, med or vet school. [10 hrs/week (3 crs) minimum of 2 semesters, 4 preferred]

Biology

Dr. Marlene Belfort

mbelfort@albany.edu / 437-4466 / LS 2061

We study regulation of gene expression in a variety of microbes, particularly under conditions of environmental stress. Our work is highly interdisciplinary, invoking genetics, biochemistry, structural biology and chemical engineering. First, we study the biology of introns, dynamic sequences that interrupt genes and can therefore disrupt the flow of genetic information. The work runs the gamut from answering fundamental questions about how introns function and how they are removed from RNA to preserve genetic integrity (RNA splicing), through how introns might have evolved, to ways in which they could be exploited in biotechnology. Second, unraveling the structure and function of inteins, a type of intervening sequence that is remarkable for splicing at the protein level, is another focus of the Belfort laboratory. The practical applications of inteins are explored too, and we hold patents for the use of both introns and inteins in biotechnology. Both elements can be used to facilitate protein purification, while inteins, which are found in critical genes of human microbial pathogens, are promising targets for development of novel antibiotics. Developing intein-base anti-tuberculosis drugs is one of the current interests of the laboratory.

Bio or Biochem majors; Pre-req: Genetics; Experience basic lab skills, recombinant DNA techniques preferred. Students interested in a PHD, highly motivated person w/interest in molecular biology [10 hrs/week for 2 semesters]

Chemistry

Dr. Carla Theimer

ctheimer@albany.edu / 591-8875 / LS 1147

The focus of our laboratory and the primary emphasis of our experimentation is the investigation of RNA biophysics and biochemistry. Specifically, how do the thermodynamic and structural features of an RNA (including interconversion between conformations) influence their biological function and their interactions with other biologically relevant molecules (proteins, nucleic acids, small molecule ligands, monovalent and divalent cations)? Currently, we are investigating several different RNA systems, including both coding (RNA riboswitches, influenza virus coding sequences) and non-coding RNAs (telomerase RNA, sxRNAs) using a variety of biophysical methods and instrumentation (NMR, UV-VIS, CD and fluorescence spectroscopy, isothermal titration (ITC) and differential scanning (DSC) calorimetry).

Biochem, Chem, Bio Major; [9 hrs/week (3 credits) and multiple semesters]

Dr. John Welch

jwelch@uamail.albany.edu / 442-4455 / Chem 309B

Pentafluorosulfanyl allyl acetates will be prepared for transformation into pentafluorosulfanylated amino acids. In particular the student researcher will learn how to prepare and purify pentafluorosulfanylated building blocks, will utilize those materials in nucleophilic displacement reactions and will transform those adducts into amino acids. The student will master not only basic laboratory skills but also will learn to do multinuclear magnetic resonance to characterize the products. The final work product should be bench scale samples of the target amino acid.

Minimum 10-15 hrs/week, in addition to weekly research group meeting; 2 semesters preferred.

Physics

Dr. Keith Earle

kearle@albany.edu / 442-4521 / PH 112

Fall & Spring only Contact Supervisor for details

CONTACT SUPERVISOR FOR SPECIFICS

Psychology**Dr. Ewan McNay**

emcnay@albany.edu / 437-4404 / Center for Neuroscience LS 1003H

My work has evolved from an early interest in the modulation of cognitive processes by glucose (given either in the form of a drink, to humans, or via injection into rodents) to a current set of related foci on the cognitive and neurochemical impacts of diabetes, aging, and Alzheimer's disease; the links between insulin and amyloid and hence between diabetes (especially type 2 diabetes) and Alzheimer's disease; and the role of insulin within the brain, specifically in modulation of cognitive processes. In general, studies in my lab involve a combination of cognitive testing (primarily using a range of maze tasks) with in vivo neurochemical measurements and manipulations. We work primarily in rats, although hippocampal cell culture experiments are currently being set up to allow for in vitro companion studies. Manipulations - variables of interest - can be either acute (e.g. administration of drug treatments into the hippocampus, or induction of hypoglycemia to simulate type 1 diabetic patients overdosing on insulin) or longer-term (dietary changes, aging, or recurrent hypoglycemic experience, for example). Students are involved in all aspects: design, animal handling and surgery, behavioral testing, and sample collection/post mortem analyses.

Undergraduates with a strong interest in behavioural neuroscience research are encouraged to discuss working in the lab. Students should have taken APSY 214 and 314 and/or Molecular Bio. [Minimum 1 year commitment to the lab is required (including summer), 12/hrs week.]

Dr. Christine Wagner

cwagner@albany.edu / 591-8836 / LS 1037

Psych & Bio Majors [9-10 hours week and at least 2 semesters] Interest in grad/medical school a plus.

Gen*NY*sis Center for Excellence in Cancer Genomics
1 Discovery Drive East Campus
Rensselaer NY 12144-2345

Cancer Research Center

Dr. Ramune Reliene rreliene@albany.edu / 591-7152 / CRC 216

The lab is studying cancer prevention using plant-based natural products, the role of DNA damage repair in cancer, and genetic toxicology of engineered nanomaterials. The projects available involve studying the role of dietary pomegranate intake on breast cancer using genomic, cellular and whole animal approaches. Another available project includes studies on genotoxicity of metal and metal oxide nanoparticles used in a variety of new generation consumer products, in particular, for antimicrobial properties or sunscreen protection. Initial studies will be carried out in primary mouse cells in vitro and later experiments will be performed in whole mice in vivo. Students will have an opportunity to learn methods in cell and molecular biology and genetics, tumor biology and experiment with transgenic animals.

Bio or Biochem Majors; Pre-requisites Bio 120/123Z and/or BIO 212 preferred; basic lab skills, tissue culture preferred. Students interested in med school or PHD; [10 hours week over 2 semesters]

Dr. Martin Tenniswood mtenniswood@albany.edu / 591-7231 / CRC 304

Inflammatory breast cancer (IBC) is the most aggressive and lethal form of breast cancer. Despite its lethality, very little research is focused on understanding the origins of inflammatory breast cancer or development of targeted treatments. Recent studies by our laboratory using cell lines derived from IBC, have identified a non-toxic drug, CG-1521, that is capable of inducing dramatic tumor cell death in cell culture and in animal models of IBC. Microarray analyses of the changes in the expression of microRNAs and mRNAs indicate that CG-1521 targets numerous pathways including: cell cycle progression and cell-to-cell adhesion. Strikingly, the molecules pertinent to the spindle assembly checkpoint are significantly altered, suggesting that CG-1521 disrupts the formation of the mitotic spindle and induces mitotic catastrophe. The next step in the research, which will involve undergraduate students, is to validate the changes in mRNA and microRNA expression using Real-Time PCR and Western analysis. In addition we will use immuno-histochemistry of proteins implicated in spindle checkpoint arrest and mitotic catastrophe, both in cell culture and in tissue sections from orthotopic tumors grown in nude mice.

Juniors with a strong interest in cancer biology, and interested in cell and molecular biology. Course prerequisites: Bio 212. Students with superior computer skills are especially encouraged to apply. Students should be able to devote 10+ hrs/week to lab work and should be willing to devote at least one year to the project.

Dr. JoEllen Welsh jwelsh@albany.edu / 591-7232 / Rm 122G

Our lab studies nutrition, nuclear receptors, genomics and cancer in relation to several types of cancers, including breast, prostate, skin and colon. Our specific focus is to identify molecular mechanisms by which dietary-derived nuclear receptor ligands reduce the risk of cancer development and progression. Students will contribute to NIH funded research on nuclear receptor signaling and cancer. Projects may include defining the mechanisms by which vitamin D and other nutrients reduce the risk of breast cancer, studying how different cells interact in complex tissues to alter cancer development, analysis of normal and tumor tissue by histochemical methods, or characterization of stem cell differentiation in vitro. Students will work alongside graduate students and/or post-doctoral fellows and may utilize cellular, molecular or whole-animal models as experimental approaches.

AVAILABLE SPRING 2013: Biology or Biochem Majors at sophomore level or above with interest in cell biology, physiology, or molecular biology. Lab experience and/or courses in Cell Biology, Physiology or Molecular Genetics preferred. Ability and/or interest in working with mice (transgenics or knockouts) is required for some projects. [10 hrs per week to the project, preferably in half day blocks. Successful students will be invited to continue work over the summer and in subsequent semesters]

Nanoscale Science & Engineering
255 Fuller Road
Albany NY 12203

Dr. Thomas Begley tbegley@albany.edu / 437-8683 / NFE4905

Alkylating agents are a major class of chemotherapeutics used to induce apoptosis and treat cancers of the blood, brain and breast. The Begley laboratory studies the genetic determinants that modulate the effects of chemotherapeutic alkylating agents. We employ global systems biology based experiments, computational modeling and targeted molecular analysis of signaling pathways to gain insight into mechanisms of chemotherapeutic resistance.

Majors in Biology, Biochemistry, Computer Science, Chemistry and Physics who have taken Bio212 Genetics. Juniors with a strong commitment toward pursuing graduate studies or medicine. [10+ hrs/week and at least one year, with two years preferable]

Dr. Magnus Bergkvist mbergkvist@uamail.albany.edu / 956-7382 / NFS 300

My research is cross-disciplinary and cover areas from nanoscale surface chemistry/surface engineering to "bionanofabrication." Bionanofabrication involve the use of biological systems to fabricate nanoscale structures, and take advantage of naturally occurring biological structures, such a two-dimensional self-assembled protein crystals and viral components, where the aim is to create multi-functional nanohybrid materials and structures from these scaffolds. We also work with nanoparticle science at the biological/chemical interface. We study nanoparticle synthesis on a fundamental level as well as how nanoparticle interacts with biological systems. Other areas of fundamental interest include biological problems such as self-assembly, cell/surface interactions and research in surface chemistry.

Juniors or Seniors with a strong interest in science and cross-disciplinary research. Course PreReqs: General Bio/Chem courses. Bio. and Chem. lab experience i.e., Bio 367, Chm 352 Phys chem. lab or other similar bio./chem lab course. Students with hand-on laboratory skills are encouraged to apply. Contact supervisor for more detail. [9 hrs/week in lab work and at least 6-12 month]

Dr. Nathaniel Cady ncady@uamail.albany.edu / 956-7354 / 4405 NanoFab East

We are interested in developing methods to study biological processes at the nano- and micro-scale. To study these systems, we focus on the development of biosensors and novel biological detection technologies. Beyond our research in biosensors, we also focus on basic nanobioscience research. We are particularly interested in how living cells interact with their environment at the nanoscale and how they adhere to, move along, and penetrate different surfaces. By better understanding how cells interact with their physical environment, we hope to provide insight for bioengineering applications such as materials biocompatibility, prosthetics and medical device design.

SPRING 2012 Sophomore, junior or seniors; Majors in biology, chemistry, biochemistry or one of the physical sciences. [8-10 hours per week]

Dr. Yubing Xie Yxie@uamail.albany.edu / 956-7381 / NFE 4098

We aim at applying nanotechnology to stem cell research in order to create stem cell-based platform for understanding adipogenesis and breast cancer. Recent studies have shown that the microenvironment influenced stem cell fate decisions. Using nanotechnology we are able to manipulate stem cell microenvironments and direct stem cell behaviors. Currently, we are investigating the stem cell-microenvironment interaction in an in vivo-like, 3-D setting. In particular, we are examining the role of biomaterials, surface chemistry, and bio-patterning in the maintenance and differentiation of embryonic stem cells. The students will perform biomaterials fabrication and characterization, stem cell culture, immunocytochemistry, Western blot analysis, PCR, optical and fluorescence microscopy, and spectrophotometry depending on the project assigned.

Fall & Spring Only: Bio/Biochem/Chem Majors Course prerequisites: Bio 212. Co-requisites: Bio 365 and Bio 312. Students with basic lab skills or prior research experience [10 hrs/week and 2 semesters]

Cell Cycle & Cytoskeleton

Dr. Janet Paluh

JPaluh@albany.edu / email / NanoFab East 4424

The intersection of biology with manmade synthetics will drive improved medical therapies and nonmedical industrial applications. Understanding interfaces and communication networks at the nanoscale is critical to these goals. We are interested in harnessing biology towards three main areas of research, 1) Nanomotors, biological polymers and self-assembling and regulating machines, 2) stem cells and tissue engineering platforms for repair, replacement or biomimicry of human physiology, and 3) biosensing for toxin monitoring or in point of care medical applications. To study these complex areas we apply tools, materials and principles of nanotechnology, polymer engineering, biology/biochemistry and modeling. Students will have the opportunity to learn critical scientific thinking, experimental design and troubleshooting with a variety of experimental approaches and biological questions.

Students interested in research w/strong bio or biochem background OR materials science/physics with a biology interest. Strong foundation in molecular, cell bio or genetics would be helpful as well as mathematical/analytical strengths; and ability to write well. Previous lab experience helpful. [Students are required to enroll in NNSE 397 for access to CNSE labs and facilities. 9-10 hours/week; but 15-20 hrs/week encouraged that may include early eve./weekends; at least 2-3 years in the lab including summer] Research done daily interspersed between class time & dependent on student schedule. If class load is very heavy you will not have time for research.

Nanobioscience

Dr. Susan Sharfstein

ssharfstein@uamail.albany.edu / 437-8820 / Nano Fab East

Our lab focuses on effects of culture conditions and cell physiology on growth, metabolism, and recombinant protein production from industrially relevant organisms (mammalian cells and bacteria). We apply the tools of modern biology including genomics, proteomics, genetic and metabolic engineering along with the engineering tools including bioreactor design and culture substrate design for optimization of production of recombinant proteins and sugars and tissue engineering applications. Projects include analysis of rapidly growing micro-organisms, understanding the effects of hyperosmotic stress on recombinant protein production, and epigenetic analysis of industrial cell lines.

Juniors/Seniors with a strong interest in science and applied cross-disciplinary research. Biology, Biochemistry, or Chemistry majors are all acceptable Prerequisites: General Biology/Chemistry courses. Microbiology and/or cell biology laboratory courses strongly encouraged; tissue culture experience preferred. Previous experience: Previous lab experience encouraged, but not required 6-10 hours/week; two semester commitment preferred

Wadsworth Center
Empire State Plaza PO Box 22022
Albany NY 12201-2002

Biomedical Sciences

Dr. Keith M. Derbyshire keith.derbyshire@wadsworth.org / 473-6079 / Center for Medical Science
150 New Scotland Ave CMS 5118
Albany NY 12208

Conjugation in mycobacteria. Mycobacterium tuberculosis accounts for more deaths worldwide than any other infectious agent. The development of new treatments for mycobacteria requires an understanding of the biology of these bacteria and the ability to manipulate their genomes to determine the genetic basis of pathogenesis and drug resistance. We are studying the process of DNA transfer by conjugation in the non-pathogenic species Mycobacterium smegmatis. In particular, we wish to identify the genes and DNA sequences required for DNA transfer and its regulation, as our current studies have shown that DNA transfer occurs by a novel mechanism. This research project will involve characterization of DNA transfer between strains of M. smegmatis and will involve a variety of molecular techniques including, transformation, electroporation, conjugation, cloning, DNA sequence analysis and transposon mutagenesis of mycobacteria and general bacterial genetics in E. coli.

Major Bio/BioChem; Pre-requisites: molecular biology or genetics preferred, but not essential; No experience required, lab courses beneficial; Students planning to attend graduate school and interested in a research career preferred. [Minimum 2 semesters; up to 15hrs per week]

Lab of Cellular & Molecular Basis of Disease

Dr. Sam Bowser bowser@wadsworth.org / 473-3856 /

Our laboratory is involved in charting the diversity and distribution of Antarctic protists, and the evolution of early eukaryotic lineages. A student in our laboratory will work either on characterizing environmental DNA samples for target protists by molecular genetic techniques, or on the motility of live protists returned from Antarctica. Molecular genetic techniques used include DNA purification/isolation, the polymerase chain reaction, and gel electrophoresis; motility experiments involve various forms of light and electron microscopy. We also merge art with science in communicating our findings, so students who think with both sides of the brain are welcome!

Academic major required: biology (or chemistry, physics, computer science) No prior experience or course work required. Students planning to attend graduate school preferred. [At least 2 consecutive half-days to complete experiments - up to 9hrs/wk]

Wadsworth Center/ David Axelrod Institute
120 New Scotland Avenue PO Box 22002
Albany NY 12201-2002

Immunological & Infectious Disease

Dr. William Lee leew@wadsworth.org / 473-3543 / Rm 5081

The laboratory engages in basic research designed to better understand and modulate immunological memory or general host defense. The two main projects we study are 1) the CD4 T lymphocyte which directs both cellular and humoral (antibody-mediated) immune responses. Stimulation of CD4 T cells and promoting their differentiation is a key element that underlies vaccination. 2) Bat immunity. Bats are currently the subject of intense interest due to their decimation by the disease White Nose Syndrome. Projects employ animal models and tissue culture, cellular immunology, flow cytometry, and immunochemical techniques to study immune cell development, activation, regulation, and function.

Bio/Biochem majors; Pre-req: Bio & Biochem is required; some course background in basic immunology & host defense. [10 hrs/week; fewer days of large blocks of time preferred over more days of few hours; 1-2 semesters]

Stratton VA Medical Center
113 Holland Avenue
Albany NY 12208

Ctr Cell Bio & Cancer Research

Dr. Michelle Lennartz lennarm@mail.amc.edu / 262-5217 / MC 165 Rm MS309

Macrophages play a major role in health and disease. Our research focuses on the cell biology of macrophages, using an IgG-phagocytosis system to model uptake and killing of pathogens and to study the underlying causes of heart disease. Using viral vectors to deliver signaling molecules to macrophages, we are studying the pathways linking the IgG receptor to gene activation. We use real time imaging to follow uptake of particles (pathogens or IgG-coated articles) and the movement of signaling molecules during this process. We also have an animal model that we are using to study the pathology of stroke and the role of macrophages and Fc receptors in plaque rupture. Techniques being used include immunofluorescence, electron microscopy, and confocal imaging. These projects use macrophages to bridge the fields of cell and molecular biology, immunology, microbiology, and medicine.

Biology, Biochem or pre-med majors will be considered; Pre-req: Mole Bio, biochem, cell bio; Immunology preferred but not required. Interest in concsiering a research/medicine career; highly motivated, reliable and responsible. [2 half days flanking a full day; 12 hours for 4 credits but 16 hrs/week strongly encouraged; multiple semesters if acceptable to student/mentor]

Albany Medical College
47 New Scotland Avenue
Albany NY 12208-3479

NOTE: Students must register with Volunteer Services (Room E-136 near cafeteria) for orientation & medical clearance policy presentation.

The Supervised Research Permission Form must also be submitted.

Ctr Cell Bio & Cancer Research

Dr. Dorina Avram avramd@mail.amc.edu / 262-6731 / MC 349

Development of mature blood cells from hematopoietic stem cells occurs through processes of differentiation associated with reduction of developmental potentials of progenitors, and concluding in lineage commitment. Signal transduction pathways mediated by cytokines, growth factors, specific cell surface receptors and transcription factors regulate these processes. The long term goal of this laboratory is to understand how transcription factors control normal processes of proliferation and differentiation of mature cells from progenitors and how alterations in their function result in disease, particularly in leukemia and autoimmune diseases. BCL11A and BCL11B are two novel closely related zinc finger transcriptional regulators with crucial role in lymphoid lineage development. Translocations of the genes encoding BCL11 proteins result in development of leukemia. At molecular level, we found that BCL11 proteins are associated with nuclear complexes involved both in transcriptional repression and activation of gene expression. Using mouse models we found that BCL11 transcription factors play crucial role in B and T lymphocyte development. Our current research is oriented toward the following directions: (1) identifying target genes regulated by BCL11 proteins in lymphocytes, such as we can understand the cellular processes controlled by these proteins and decipher the mechanisms by which aberrant expression of BCL11 genes results in cellular transformation and leukemia; (2) understanding how BCL11 proteins associate in cells with transcriptional repression and activation complexes to regulated gene expression; (3) understanding the signals that control and integrate the function of BCL11 proteins in lymphocytes; (4) identifying novel translocations associated with these genes in leukemia. (5) with the use of the mouse models understand the role of these two transcription factors in B and T lymphocyte development. By extension we hope that our findings will apply to other transcription factors that are associated with neoplastic transformation and autoimmune diseases.

[at least 3 credits; 1 semester]

Ctr Immunology & Microbial Disease

Dr. Mario Canki cankim@mail.amc.edu / 262-6070 / MC-151

Our laboratory focuses on translational research of HIV-1 pathogenesis and mechanisms of virus inhibition by novel class of natural small molecules. We investigated a large number of natural products, and from *Sargassum fusiforme* we isolated and identified several new inhibitors that block virus during different stages of its replication life cycle. Palmitic acid, which binds to the CD4 receptor and blocks gp120-to-CD4 fusion and HIV-1 entry and infection, is being investigated in preclinical studies towards a microbicide application. Several other molecules are being studied to determine their activity and mechanisms of action.

Juniors with a strong commitment toward pursuing graduate studies in molecular biology and biochemistry. Course prerequisites: Bio 212 (genetics). Course corequisites: ABIO 365. [10+ hrs/week and 1 year to the project.]

Albany College of Pharmacy
1 Discovery Drive
Rensselaer NY 12144

Pharmaceutical Research Institute

Dr. Shaker Mousa shaker.mousa@acphs.edu / 694-7397 / Suite 238

1. Drug Discovery: a) Biotechnology – we are examining cellular and molecular mechanism in angiogenesis modulation, tumor progress, chemo resistance, vascular and cardiovascular disorders. B) Nanotechnology (nanomedicine) – we are developing novel site-directed delivery nano systems for early detections and treatment of vascular, oncological, and ophthalmological disorders; c) Pharmacology – we are studying mechanisms in thrombosis, angiogenesis, and inflammation using in vitro and in vivo modeling systems. 2. Drug Development: We are examining the pharmacodynamics and pharmacokinetics of various formulations. We are also doing drug delivery, formulation, and stability studies.

Any major; Pre-requisite Biochem, General Chem & Bio, some prior research in biochem/chemistry. Students interested in med school, biotechnology, pharmacology and/or drug discovery/development. [9-10 hrs/week]