SPRING UNDERGRADUATE SYMPOSIUM

Held each spring, the Undergraduate Research Symposium gives you the opportunity to share your research experience in poster or oral format. Attendees of the Symposium include faculty, other student researchers and guests. Monetary awards, which are given based on the quality of research and the communication of the research, are also presented at the Symposium. They include Glenn L. Bumpus Award, given to a graduating biology major and the Department of Biological Sciences Awards for Excellence in Research.

Participation in the Undergraduate Research Symposium is required after any two registrations in ABio 399 or 499

COURSE FULFILLMENT
• 4 credits over 2 semesters fulfills 1 B.S. degree lab requirement
• 4 credits over 2 semesters may fulfill 1 B.A. degree non-lab elective requirement

COURSE REQUIREMENTS
• Register for class (2-4 credits)
• Work 3 hours per week/per credit in the lab
• Write and submit a research paper to your supervisor for A-E grading
• Deliver the graded paper to Dr. Osuna by the last day of classes

HOW TO ENROLL
• Step 1: Select a supervisor
• Step 2: Complete a permission form
• Step 3: Complete online biosafety training
• Step 4: Obtain a permission number

APPLY NOW
Applications are located in the Biology Main Office (BIO 126) or online at albany.edu/biology/undergraduate-research
Research Description / Student Qualifications Supervisor Contact Information

University at Albany
1400 Washington Avenue
Albany, NY

Atmospheric and Environmental Sciences Research Center

James Schwab
jschwab@albany.edu
(518) 437-8754
251 Fuller Road, Albany, New York 12203

Research Description:
Requirements: Good math skills, statistics, computer literacy. Academic Majors: Environmental Science related (BIO, CHEM, ATM, etc.) Pre-requisites: Permission of instructor. Students interested in the atmosphere and the environment. 3-6 hours per week. Semesters: 1 or 2 semesters.

Student Qualifications:
Our group is involved in field measurements of atmospheric pollutant gases and particles. Students will be involved in one or more of the following: - Evaluation and calibration of instruments used for atmospheric measurements of particles and gases; - Preparation for deployment of instruments for field studies; - Collection and/or evaluation of field measurement data; - Advanced data processing and analysis of collected data.
Research Description / Student Qualifications Supervisor Contact Information 2018

**Biological Sciences**

**Marlene Belfort**  
mbelfort@albany.edu  
(518) 437-4466  
Life Sciences 2061

**Research Description:**  
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 anti-tuberculosis drugs based on inteins is one of the current interests of the laboratory.

**Student Qualifications:**  
Bio or Biochem majors; Pre-req: Genetics ABio 212Y; 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]

**Haijun Chen**  
hchen01@albany.edu  
(518) 591-8854  
Life Sciences 1039

**Research Description:**  
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.

**Student Qualifications:**  
Bio, Biochem majors; Pre-requisite Molecular Bio, basic lab skills; students interested in Med/Grad school [10 hrs/week]
### Paolo Forni
pforni@albany.edu  
(518) 442-4374  
Biology 310

**Research Description:**
We are interested in cellular and molecular mechanism at the base of neuronal migration. Our research focuses on particular neuronal populations that, during embryonic development, in all vertebrates, migrate from the developing nose to the brain. Some of these neurons (GnRH-1 Neurons) are known to be essential for pubertal onset and fertility. What molecules control the migration of these neurons and what other cell types play a role in this process are matter of investigation. To clarify these aspects and arrive to generate a cell census of the neurons forming in the nasal area a number genetically modified mouse models expressing reporter genes in cell selective fashion will be characterized using immunohistochemistry. Juniors with a strong commitment toward pursuing graduate studies in molecular biology and developmental biology. Course prerequisites: General Biology, Genetics, 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.

**Student Qualifications:**
Juniors with a strong commitment toward pursuing graduate studies in molecular biology and developmental biology. Course prerequisites: General Biology, Genetics, Developmental Biology. 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.

### Gabriele Fuchs
gfuchs@albany.edu  
(518) 442-3621  
Life Sciences 2033F

**Research Description:**
Ribosomes are large complexes responsible for the biosynthesis of proteins in cells. Although ribosomes are perceived as identical molecules, they differ in composition. Based on this finding it was proposed that ribosome composition is dynamic and that a ribosome code exists that regulates translation of cellular mRNAs. My research investigates how ribosome composition is altered in response to cell stress, e.g. viral infection or drug treatment using biochemical and molecular biology techniques.

**Student Qualifications:**
Juniors majoring in Biochemistry, Biology, or Chemistry with a strong commitment toward pursuing graduate studies in molecular biology and biochemistry. Course prerequisites: ABio 217. Co-requisites: Bio 365. Students should be able to devote 6+ hrs/week in blocks of 2-3h to lab work and should be willing to devote at least one year to the project.
Melinda Larsen  
mlarsen@albany.edu  
(518) 591-8882  
Life Sciences 1086

**Research Description:**
Students should have a strong interest in cell biology, developmental biology, imaging, and/or image processing. Preference will be given to students that have completed ABio 217 and ABio 303 and prerequisites and are considering an advanced degree. [10+hrs/week in the lab and willingness to commit to 2 semesters is necessary. Attendance and participation in weekly lab meeting is also required.]

**Student Qualifications:**
Branching morphogenesis is a process required for the development of many organs, including breast, prostate, lung, kidney, and salivary glands. Our laboratory investigates molecular mechanisms controlling branching morphogenesis using the salivary gland as a model system, to understand developmental processes and develop tissue engineering strategies. We use molecular and cell biology techniques to study development in 3D cell and organ culture models. To identify molecular pathways required for branching, we use siRNA knockdown and other techniques to disrupt signaling. We use cell biology and biochemistry methods to examine effects on cells.

Gregory Lnenicka  
glnenicka@albany.edu  
(518) 591-8812  
Life Sciences 1038

**Research Description:**
The synaptic connections between nerve cells can be strengthened by increased use; this synapse strengthening plays an important role in the development of the brain, and in learning and memory in the adult. We study activity-dependent synapse strengthening in the fruit fly (Drosophila) where synapses are identifiable, accessible and amenable to genetic manipulations. Much of our work focuses on the role of intracellular Ca2+ in synapse strengthening. The following techniques are used in these studies: changes in intracellular Ca2+ levels are measured with fluorescent Ca2+ indicators; Western blots and immunocytochemistry are used to measure activity-dependent changes in specific proteins at the synaptic terminals; the levels of specific proteins are altered using transgenic Drosophila; and synaptic function is assayed using electrophysiology.

**Student Qualifications:**
I prefer students who have taken or are currently enrolled in ABio 341.
Robert Osuna  
rosuna@albany.edu  
(518) 591-8827  
Life Sciences 2062

**Research Description:**
Not Summer: We are investigating how Fis (Factor for -Inversion Stimulation), a DNA-binding protein in Escherichia coli, functions to regulate a number of different biological processes. Several proteins have recently been identified in E. coli whose expression is regulated by the Fis protein. We would like to understand the molecular mechanisms by which Fis regulates their expression. Fis itself is subject to an interesting regulatory pattern. It is highly expressed during early logarithmic growth phase and is repressed during late-logarithmic and stationary growth phases. To understand the molecular mechanisms involved in this process, we are currently investigating DNA sequences and DNA-binding proteins involved in the transcriptional regulation of Fis.

**Student Qualifications:**
Qualifications: Juniors with a strong interest in Molecular Biology and who have taken Bio 212 and are concurrently taking ABio 365. [At least 1 year commitment.]

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Cara Pager  
ctpager@albany.edu  
(518) 591-8841  
Life Sciences 2051

**Research Description:**
We study virus-host cell interactions. We are particularly interested in how single-stranded positive-sense RNA viruses interact with and take over the different cellular RNA metabolism pathways. Specifically, we are studying the way by which poliovirus, hepatitis C virus, Dengue virus and Zika virus undermine cellular translation, the microRNA and RNA post-transcriptional modification pathways, and cellular RNA granules involved in RNA storage and degradation. Current projects focus on the interactions and functions of cellular RNA-protein and RNA-RNA complexes in virus replication and virus assembly. Our research applies methods in molecular biology, RNA and microRNA biology, microscopy, biochemistry and virology.

**Student Qualifications:**
Biology or Biochem Majors interested in graduate, med or vet school. Pre-req: Biochem and/or Molecular/Cell Bio; basic lab skills. [10 hours/week for at least 2 semesters].
Prashanth Rangan  
prangan@albany.edu  
(518) 442-3485  
Life Sciences 2033D

**Research Description:**
The goal of the Rangan Laboratory is to understand how a stem cell fate is initiated, maintained and terminated. Stem cells have the capacity to both self-renew and differentiate. Improper differentiation or self-renewal of stem cells can result in a loss of homeostasis, which has been implicated in human afflictions such as cancer and degenerative diseases. We investigate germ line stem cells (GSCs) in the developmental context of the fruit fly, Drosophila melanogaster. In the developing embryo and ovary, we are able to study each aspect of the stem cell life cycle - initiation, maintenance, and differentiation. We are specifically interested in understanding the role of small RNAs, non-coding RNAs, and translational regulators within this system. Many mechanisms governing these processes have been shown to be widely conserved, thus making findings in our system broadly applicable.

**Student Qualifications:**
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 [10-15 hrs/week for 2 semesters]

Morgan Sammons  
masammons@albany.edu  
(518) 442-4326  
Life Sciences 2078

**Research Description:**
Our lab studies how transcription factors decode and transmit information stored on DNA. We are particularly interested in how one such transcription factor, p53, reads DNA information in the context of chromatin/DNA structure. p53 is the most commonly mutated gene in cancer, and loss of p53 activity is the strongest predictor of cancer development in mammalian systems, including humans. We use genetic, molecular, and genomic technologies to explore the relationship between how DNA information is stored and how that information is read and acted upon by the p53 transcription factor.

**Student Qualifications:**
Students should be able to devote a minimum of 10 hrs/week to lab work and should be willing to devote two semesters to the project. Previous undergraduate research experience is required.
Annalisa Scimemi  
ascimemi@albany.edu  
(518) 442-4367  
Biology 329  

**Research Description:**  
The brain regulates every aspect of our daily life, yet many of the fundamental mechanisms underlying its function remain unclear. How do neurons in the brain exchange information among each other? How is their activity conveyed across neurons in different brain regions and how is it shaped by astrocytes? In our lab, we are interested in understanding the functional properties of central synapses, the specialized structures that convert the electrical activity of a neuron into a chemical signal for its target cells. We want to understand how individual molecules are distributed within the synapse and how their spatial arrangement influences the properties of neurotransmitter release. We want to know how neurotransmitters diffuse outside of the synapse and generate long-distance signals to different cells. Our ultimate goal is to gain insights into the functional consequences of changes in synaptic function associated with the onset of different neuropsychiatric and neurodegenerative disorders. To perform our studies, we use a combination of experimental and theoretical approaches, including electrophysiology, optogenetics, two-photon imaging and reaction-diffusion computer simulations. We are eager to learn and develop novel experimental approaches and research tools!  

**Student Qualifications:**  
Students in Biology; Pre-Requisite in Cell Bio preferred; students from Psychology, Physics, and Chemistry are eligible.

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Hua Shi  
hshi@albany.edu  
(518) 591-8840  
Life Sciences 2050  

**Research Description:**  
We create and apply molecular devices to understand and control biological processes in vivo and in real time. A general strategy employed is to figure out fundamental questions in diseases-related situations, in particular cancer and viral infection, and to approach them in a facile experimental vehicle, such as bacteria, yeast, or mammalian cell culture. Research projects focus on two key biological processes that occur in a regulatory succession: cellular signaling and transcription control. One set of molecular devices being developed is RNA-based reagents and aptamers, from which, self-assembling supramolecular aggregates and synthetic gene circuits are generated and used to study and modulate protein functions. Undergraduate projects will be defined and negotiated according to student’s interest and aptitude.  

**Student Qualifications:**  
Bio, Biochem or Chemistry, majors preferred At least a junior, seniors preferred, w/ at least a “B” average and an avid interest in pursuing graduate studies in molecular biology. Students in the honors program are welcome. Course prerequisites: ABio 212Y, ABio 365, ABio 425 and some lab research experience. [At least 15hr/week blocks of 4-5hours); one year (two semesters), two years preferable for juniors.
Research Description:
My research program combines bioinformatic and molecular evolutionary 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 African primate species; and (3) studying the evolution of the lysozyme multigene family in the mammals, especially as related to fertilization. At present, our research is primarily computational.

Student Qualifications:
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 pre-med/graduate studies is preferred. (~9-12 hrs/week; minimum 2 semesters, prefer more)

Ben Szaro
bszaro@albany.edu
(518) 591-8852
Life Sciences 1059

Research Description:
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.

Student Qualifications:
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]
Research Description / Student Qualifications

Wendy Turner
wcturner@albany.edu
(518) 442-4208
Biology 327

Research Description:
The Turner lab studies the ecology and evolution of wildlife diseases, with a current focus on anthrax transmission in herbivorous African wildlife. Wildlife hosts contact the bacterium, Bacillus anthracis, by foraging on grasses growing at anthrax carcass sites. I seek an undergraduate researcher to extract ecological data from photographs. These photos come from a camera trap study in Etosha National Park, Namibia, that continuously monitored carcass and control sites to record animal presence and behavior over three years. This virtual safari will require recording data on vegetation characteristics and the behavior of individual animals from photographs.

Student Qualifications:
Bio majors. Pre-requisites: ABio 320 Ecology. Must be attentive to detail, motivated and enthusiastic; interests in wildlife ecology, disease ecology and/or foraging ecology. 10 hours/week for 1-2 semesters.

Alex Valm
avalm@albany.edu
(518) 442-4324
Biology 327

Research Description:
The Valm laboratory studies the systems level spatial structure of the human microbiome, with an emphasis on the oral cavity. Preliminary studies of the spatial structure of oral microbial communities have led to a fascinating discovery: that oral microbes assemble into complex, multi species structures that are orders of magnitude larger than any individual cell in the community. We use a variety of cutting edge techniques including next generation DNA sequencing with an emphasis on fluorescence and confocal microscopy. Students will gain hands on experience with DNA extraction, bioinformatics, fluorescence and confocal microscopy, cultivating fastidious anaerobic bacteria, and bacterial genetic manipulation and mutagenesis. Opportunities for scientific computing and math/algorithm development. Students will make high impact contributions to the field of microbiome research.

Student Qualifications:
BIO, or Biochem majors. Pre-requisites Bio 212 Genetics preferred. Students interested in graduate, medical, veterinary and dental school. Highly motivated individual with interest in molecular bio and microbiome. Computer and math skills welcome. [10 hrs/week over 2 semesters].
**Research Description / Student Qualifications Supervisor Contact Information 2018**

**Sho-Ya Wang**  
[sywang@albany.edu](mailto:sywang@albany.edu)  
(518) 591-8829  
Biology 232

**Research Description:**  
We study the structure-function relationship of voltage-gated sodium channels. We combine site-directed mutagenesis and computation modeling approaches. In our research, we use various bioactive ligands including channel blockers and activators as tools to probe the structure of the sodium channel permeation pathway.

**Student Qualifications:**  
Bio Major; Pre-requisites: Genetics & Cell Bio; students interested in molecular bio or medical school [10 hrs/week over 2 semesters]

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**Chemistry**

**Daniele Fabris**  
[dfabris@albany.edu](mailto:dfabris@albany.edu)  
(518) 437-4464  
Life Sciences 1109

**Research Description:**  
Our laboratory is dedicated to the investigation of the structure-function relationships of protein-nucleic acid complexes involved in the lifecycle of viruses responsible for infectious diseases. In particular, we are interested in elucidating the mechanism by which the 5’-untranslated region (5’-UTR) of genomic RNA controls exclusive functions in HIV-1 and other retroviruses, including genome packaging, translation, and reverse transcription. We have developed approaches based on chemical crosslinking and mass spectrometric detection, which enable the structural characterization of ribonucleoproteins in vitro, as well as in intact virions and infected cells. Applied in vitro, these approaches provide the spatial constrains necessary to model the 3D structure of isolated target assemblies. Applied to targets immersed in their typical viral/cellular environments, they enable also the proteome-level identification of any viral/host factor that may be situated in direct contact with the RNA of interest. In this way, it is possible to draw direct correlations between specific RNA domains and their cognate partners, thus revealing the factors that determine how signals associated with specific regions of genomic RNA mediate actual processes of the viral lifecycle. In retroviruses, the same RNA strand can act both as a genome that is packaged into new viral particles during replication, or as an mRNA that is spliced and translated into viral proteins. We are investigating the hypothesis that HIV-1 5’-UTR may act as a possible riboswitch that coordinates between alternative processes. The switch may involve the rearrangement between different folds of the 5’-UTR higher-order structure, which may be induced by the binding of specific viral or host factors. Elucidating this mechanism will provide valuable insights for developing more effective therapeutic strategies and will reveal new targets for drug screening operations underway in our laboratory.

**Student Qualifications:**
No prior experience/requirements necessary: projects will be commensurate to the experience/interest of the student. For this reason, a preliminary interview will be necessary.
Research Description / Student Qualifications / Supervisor Contact Information 2018

Igor Lednev
lednev@albany.edu
(518) 591-8863
Biology 344

Research Description:
Our lab is interested in the formation mechanisms and structure of amyloid fibrils. We use modern microscopy, state-of-the-art laser spectroscopy, and advanced statistical analysis to characterize amyloid fibrils prepared in vivo and in vitro. Specifically we compare the structure of amyloid fibrils extracted from brain tissue and prepared in vitro from the same or analogous proteins. The projects available involve studying Alzheimer’s disease tissue with fluorescence and Raman microscopy. Students will have the opportunity to learn methods of fluorescence and Raman microscopy.

Student Qualifications:
Bio, Biochem or Chemistry Majors: Pre-requisites: ABio 130, ABio 131 and/or ABio 212Y Genetics, preferred. Basic laboratory skills, experience in microscopy preferred. Students interested in medical school or PHD. Highly motivated individual with interest in molecular biology and/or biospectroscopy. Computer skills welcome. [10 hrs/week over 2 semesters].

Jan Halamek
jhalamek@albany.edu
(518) 442-4447
Chemistry 316

Research Description:
The Halamek Lab currently focused on two areas of research – blood and fingerprints. Specifically, our research revolves around the biochemical composition (enzymes and/or metabolites) of forensically relevant biological evidence. We have focused on these areas because there is a lack of comparable techniques that rapidly analyze such samples at a crime scene.

Undergraduate students who join the Halamek lab will work under the mentorship of current graduate students on projects related to the ones described above. Undergraduates will be responsible for analysis of authentic fingerprint or human serum samples, optimization of chemical or enzymatic assays, data treatment of the UV-VIS absorbance data, as well as other tasks related to their assigned project as they arise.

Student Qualifications:
Biology, Chemistry, Biochem and Human Biology Majors must have good math skills and be highly motivated. No previous research experience is required. Interests in Graduate School, Medical School, Research & Development and Academia. (3 hours per credit per week and a minimum of 2 semester)
## Research Description / Student Qualifications / Supervisor Contact Information 2018

**Maksim Royzen**  
*mroyzen@albany.edu*  
(518) 442-4400  
Life Sciences 1136

**Research Description:**  
The Royzen research group is interested in developing new synthetic and imaging tools for RNA research. The interdisciplinary work on these project involves chemical synthesis of nucleoside analogs, characterization of their photophysical properties, solid phase synthesis of RNA strands containing unnatural nucleosides and live cell imaging. Together with an industrial collaborator, Shasqi, Inc. we are developing a bio-orthogonal chemistry-based approach capable of concentrating and activating small molecules at a location of choice. The approach facilitates concentration of cytotoxic agents at the tumor site and, in contrast to existing targeted therapies, does not rely on endogenous cellular or environmental markers.

**Student Qualifications:**  
Undergraduate students interested in hand-on research that includes elements of chemistry and biology. Course prerequisites: Organic Chemistry I and II (AChm 220 and AChm 221). 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.

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**Jia Sheng**  
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(518) 437-4419  
Life Sciences 2033B

**Research Description:**  
My lab is doing RNA chemical modification and nucleic acid X-ray crystallography. The students in my lab will learn how to chemically make the unnatural nucleosides, nucleotides and oligonucleotides, as well as how to grow RNA crystals and solve their structures. Specifically, they will do organic synthesis, DNA/RNA solid phase synthesis, DNA/RNA cleavage and deprotection, HPLC purifications, crystallization with different methods, x-ray diffraction data collection, and structure determination.

**Student Qualifications:**  
Juniors with a strong commitment toward pursuing graduate studies in biochemistry related area. Course prerequisites: AChm 220, 221 (organic chemistry). Students with nucleic acid research experience are especially encouraged to apply. Student should be able to devote 10 hrs/week to lab work and should be willing to devote at least one year to the project.
## Jun Wang
**Contact Information:**
- jwang34@albany.edu
- (518) 442-4400
- Chemistry 120

**Research Description:**
Our group is developing multiplex biotechnologies based on nanotechnology and microfluidics, specifically barcode arrays, for disease diagnostics and forensic investigation. Multiplex biosensors are advantageous to these fields in that they allow simultaneous detection of multiple genes or proteins. Technologies we are developing include single-cell microchips for generating mRNA and protein expression profiles and self-assembling microparticle sensors. It is our goal to use these multiplex tools in combination with biological and physical principles to investigate communication between cancer cells, generate single-cell secretome profiles, and observe signaling pathways in real time. The student will carry out the project of fabricating a new type of biosensor and performing the test on animal cells.

**Student Qualifications:**
The prospective undergraduate researcher should have an intended major in biology, chemistry, or a related field aligned with the research conducted in our laboratory. While no prior research, experience and course pre-requisites are necessary, prior experience in a laboratory setting would be advantageous. Students should have research interest in cancer biology, immunology and the engineering aspects of biology. Students should be able to devote 10+ hrs/week to lab work and should be willing to devote at least half year to the project.

## John Welch
**Contact Information:**
- jwelch@uamail.albany.edu
- (518) 442-4455
- Chemistry 309 B

**Research Description:**
1. 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 the synthesis of beta lactams for use in the preparation of novel anticancer compounds. 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 beta lactam. 2. Mutant Sirtuin 6 analogs will be prepared by site-directed mutagenesis. These histone deacetylase mutants will be utilized in biochemical assays to establish the role of the mutated residue on the binding of the antituberculous agent pyrazinamide. The student will design primers for alanine substitution of the native DNA. The substituted gene will be incorporated in a protein expression system. The student research assistant will be expected to isolate the mutated protein on a preparative scale. 3. Genetically engineered polypeptides will be prepared for use in light absorbing materials. These optical antenna will be constructed using de novo designed materials. The student research assistant will amplify the synthetic gene, express the product peptide and measure the fluorescence spectra of the peptide.

**Student Qualifications:**
Minimum 10-15 hrs/week, in addition to weekly research group meeting; 2 semesters preferred.
Mehmet Yigit
myigit@albany.edu
(518) 442-3002
Life Sciences 2099

Research Description:
My research program is at the interface of chemistry, nanotechnology, materials science and cancer biology. My goal is to use novel nanotechnology platforms and oligonucleotide chemistry to address the complications in therapy and early-detection of different cancer types. I have both a strong chemistry and materials science background, which I have successfully applied to biomedicine, and I am keen to use materials science for various biological questions. My lab is interested using graphene and iron oxide nanoparticles for detection overexpressed miRNA in breast cancer for early diseases diagnostics. The undergraduate student will work with my graduate student, Neil Robertson, to improve our recently published results (Bioconjugate Chemistry 2015 and ACS App. Mater and Interfaces 2014) by increasing the sensitivity and specificity of the nanodevices using enzyme amplification.

Student Qualifications:
9 hours of hands-on lab work per week is required. I do not require any course work. The student is interested in going to medical school therefore having hands-on experience on translational biomedical research will benefit the student. He also will attend the weekly group meetings.

Qiang Zhang
qzhang5@albany.edu
(518) 442-4400
Life Sciences 2099

Research Description:
Our research is focusing on chemical synthesis of biologically important peptides and proteins. The novel methodologies will be developed during the course of study. We are currently investigating a unique aqueous dimerization observation and generating the reaction scope.

Student Qualifications:
Bio, Biochem and Chemistry majors are eligible, 3 credit course.
Environmental & Sustainable Engineering

Yanna Liang  
Yliang3@albany.edu  
(518) 437-4979  
Biology 317/318

**Research Description:**
My lab focuses on using biological processes to solve problems in environment and energy. In particular, we are interested in recovering rare earth elements from various low value or waste materials. For this purpose, we are investigating the approach of bioleaching. Students involved in this research will have the opportunity to learn about cultivating cells in aerobic and anaerobic conditions, designing experiments using statistical approach, be proficient in operating ICP-MS for metal analysis, HPLC and GC/MS for metabolite analysis and data analysis.

**Student Qualifications:** Biology, Biochem, or Chemistry majors. No Pre-requisites Bio 212 Genetics preferred. Students with lab research experience and interest in graduate school. [10 hrs/week over 2 semesters].

Physics

Keith Earle  
kearle@albany.edu  
(518) 442-4758  
Physics 112

**Research Description:**
Fall & Spring only Contact Supervisor for details

**Student Qualifications:**
Contact supervisor for specifics
Research Description:
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.

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

**Maria Basanta Sanchez**  
mbasantasanchez@albany.edu  
(518) 591-8815  
Life Sciences 2020A

## Research Description:

Our lab is interested in the analysis of RNA biology and its structure function relationships within living organisms. In particular, this project is focused on the study of RNA posttranscriptional modifications. These are known to give RNA structural stability as well as the control over regulatory and molecular processes in the cell. To study the presence of RNA modifications in RNA that are of interest as per their regulatory function, RNA needs to be separated and purified from total RNA. The projects available involve RNA extraction from cells, separation of RNA into different classes, purification, enzymatic digestion of RNA to nucleoside level and identification of RNA modifications. Applications include viral infection and progression, stem cell differentiation and the role and mechanism of RNA modifications in neurodegenerative diseases. Students will have the opportunity to learn and explore methods of molecular biology, biochemistry, analytical and biophysical techniques and methodologies.

## Student Qualifications:

Bio, Biochem or Chemistry Majors: Pre-requisites: ABio 130, ABio 131 and/or ABio 212Y Genetics, Biochemistry preferred. Laboratory skills, cell culture preferred. Students interested in medical school or PHD. Highly motivated individual with interest in molecular cell biology and/or cancer biology. Computer skills welcome. [10 hrs/week over 2 semesters].

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**Bijan Dey**  
bdey@albany.edu  
(518) 591-8849  
Life Sciences 2020

## Research Description:

The goal of my laboratory is to investigate the role of non-coding RNAs (microRNAs and novel small/long non-coding RNAs) in skeletal muscle stem cell biology, cardiac muscle biology, muscle regeneration, and muscle degenerative disease including Duchenne Muscular Dystrophy (DMD) and DMD-associated cardiomyopathy. DMD is a devastating X-linked childhood muscle degenerative disease. The progressive skeletal muscle wasting and weakness in DMD are followed by cardiac dysfunction, known as DMD-associated cardiomyopathy. The DMD affected children become non-ambulatory within the first decade and die within the third decade of life. Thus far, no effective treatment is available for DMD. We are particularly studying the microRNA-mediated fundamental molecular mechanism of muscle stem cell biology and pathophysiology of DMD. We use a variety of cutting edge molecular cell biology, stem cell biology, genetics, epigenetics techniques, and animal models to understand muscle physiology and pathophysiology. Our findings will make a significant impact developing a new therapeutic platform for DMD.

## Student Qualifications:

Juniors with a strong commitment toward pursuing graduate studies in cutting edge molecular biology, stem cell biology, developmental biology, regenerative medicine, genetics and biochemistry. Students should have basic knowledge in some of these areas. Course prerequisites: ABio 212Y. Co-requisites: ABio 365 and ABio 312. Students should be able to devote 12+ hrs/week to lab work and should be willing to devote at least one year to the project.
Ken Halvorsen  
khalvorsen@albany.edu  
(518) 591-8816  
Life Sciences 2020A

**Research Description:**  
Our lab is interested in the interactions that occur between and within biological molecules, and in developing new tools to study these interactions. Specifically, we are continuing development of the centrifuge force microscope, a new instrument designed to study the structure and function of individual molecules. We are also continuing development of DNA based nanoswitches that can be used to detect and quantify biological molecules in solution, and to measure the kinetics of binding and unbinding pairs of molecules. We additionally employ tools and strive to improve upon other analytical techniques including calorimetry and spectrophotometry. These tools are largely employed in the context of studying the structure and function of complex RNA molecules with regulatory functions in biology. Depending on their interests and expertise, students can work on different aspects of technology development, or they can work on more traditional research projects that involve answering specific biological questions using more established techniques.

**Student Qualifications:**  
Pre-requisites: Intro biology, chemistry and physics courses. Preferably also any of the following: calculus, statistics, biochemistry, thermodynamics. Highly motivated individual with interest in pursuing research beyond undergraduate level. Should have an interest in technology development or using advanced analytical techniques in biology. Tinkerers welcome. Would like 10 hours per week for 2 semesters.

Douglas Conklin  
dconklin@albany.edu  
(518) 591-7154  
Health Sciences Campus CRC 308

**Research Description:**  
Our research is focused on genomic approaches to cell survival and proliferation in cancerous human cells. The many diseases known as cancer all share inappropriate cell proliferation as a fundamental cause. Despite decades of studies of the external signals and the machinery that cells use for division, the basic, intrinsic physiological cues that instruct cells to undergo division are poorly understood. Functional genomics, in which the effects of mutating large numbers of genes can be tested in parallel allows us to identify new genes that are important in breast and other cancers. A variety of projects are available. Students will have the opportunity to learn methods of molecular biology, biochemistry, tumor biology and in vivo model systems of cancer progression.

**Student Qualifications:**  
Bio, Biochem or Chemistry Majors: Pre-requisites: A Bio120, 121 and/or ABio 212Y Genetics, preferred. Basic laboratory skills, tissue culture preferred. Students interested in PHD. Highly motivated individual with interest in molecular cell biology and/or cancer biology. Computer skills welcome. [10 hrs/week over 2 semesters].
Magdia De Jesus  
*mddejesus2@albany.edu*  
(518) 402-2510  
Health Sciences Campus GEC 100  

**Research Description:**
The focus of the De Jesus laboratory is to understand the early events of how antigens (micro and nanoparticle delivery vehicles) and microbes (fungi such as Candida albicans and Candida tropicalis) are sampled by the intestinal mucosa. We are particularly interested in the how immune system cells within intestinal Peyer’s patches (PPs) capture, process and yield a specific immune response to these antigens and microbes. We have recently identified a specific dendritic cell (DCs) subset called Langerin+ DCs within Peyer’s patches that can capture a variety of micro and nanoparticles, fungi, algae and peanut antigens. Our aim is to understand why these DCs can sample such a variety of antigens and microbes and how do these contribute to intestinal immunity. Students in the De Jesus laboratory would be involved in projects such as 1. Understanding the relationship between the fungal microbe C.albicans and PP Langerin+ DCs in immune competent and immune compromised hosts. 2. Designing oral based colorectal cancer vaccines and therapeutics using micro and nanoparticle delivery vehicles. 3. Understanding the role of PP Langerin+ dendritic cells (DCs) in sampling of peanut antigens implicated in food allergies. Students will learn a variety of techniques such as basic microbiology, sterile technique, PCR, advanced microscopy, ELISA, flow cytometry, working with mice, cryosectioning and microparticle design. Students will also learn how to use scientific software such as graph pad prism, Cell Quest, Fiji-Image J and Photoshop. Since the De Jesus laboratory is located at the Wadsworth Center, NYSDOH students will have access to advanced core facilities. Students should reach out to Dr. De Jesus in advance as paperwork internal to the Wadsworth Center must be filled out at least one month before student can begin work.

**Student Qualifications:**
Requirements include general biology (BIO 120 and 121), Intro to Biological Investigations (BIO 201 and Bio 202) and general chemistry (CHM 120 and 121). Students that have taken any additional courses in Molecular Biology (BIO 425), Cell Biology (BIO 217), Microbiology (BIO 314) and Immunology (BIO 335) will be highly considered. Prior laboratory experience is not required, students will be trained. We are looking for students who are seriously looking to pursue a career in biomedical sciences.

Keith Derbyshire  
*keith.derbyshire@wadsworth.org*  
(518) 473-6079  
David Axelrod Institute  

**Research Description:**
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.

**Student Qualifications:**
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]
Research Description / Student Qualifications Supervisor Contact Information 2018

Jason Herschkowitz
jherschkowitz@albany.edu
(518) 591-7204
Health Sciences Campus CRC 342

Research Description:
The research in my laboratory involves integrative approaches, utilizing multidisciplinary techniques including methods in molecular biology, cell biology, mouse models, histology, microscopy, flow cytometry, genomics, bioinformatics and systems biology to elucidate the molecular mechanisms involved in breast cancer progression and therapeutic resistance. Evidence from our laboratory and others has shown that there exist cells within tumors that have an intrinsic resistance to radiation and chemotherapeutics compared to the bulk of the tumor. These cells, often referred to as cancer stem cells (CSCs) or tumor initiating cells may also be responsible for metastatic dissemination and tumor dormancy and recurrence. Breast CSCs can have an epithelial to mesenchymal transition (EMT) phenotype and inducing EMT in human mammary epithelial cells can confer on them the properties of stem cells. In addition, we identified an aggressive molecular subtype of breast cancer that is enriched for CSCs. In recent years it has been appreciated that along with protein coding genes, much of our genome encodes tens of thousands of functional RNAs that do not make proteins. This includes small RNAs called microRNAs which have been very well studied as well as a large class of long noncoding RNAs (lncRNAs) the functions of which still very much need to be explored. We hypothesize that lncRNAs play a critical role in an EMT gene expression program governed in part by RNA-mediated epigenetic regulation leading to resistance to conventional therapies in breast cancer. Our goal, using several model systems, is to first identify and then investigate the mechanisms of action of lncRNAs that regulate the EMT/CSC phenotype of claudin-low breast tumors using siRNA or antisense knockdown, CRISPR genome engineering, and lentiviral overexpression in cell culture and in animal models.

Student Qualifications:
Bio, Biochem Majors at the junior level or above. Pre-requisites: ABio120, 121 and/or A Bio212Y Genetics, preferred. Basic laboratory skills, tissue culture preferred. Students interested in PHD. Highly motivated individual with interest in molecular cell biology and/or cancer biology. Computer skills welcome. [10 hrs/week over 2 semesters (and/or summer)].

William Lee
lee@wadsworth.org
(518) 473-3543
David Axelrod Institute

Research Description:
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.

Student Qualifications:
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]
**Research Description / Student Qualifications / Supervisor Contact Information 2018**

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<th>Research Description</th>
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| **Martin Tenniswood**  
  mtenniswood@albany.edu  
  (518) 591-7231  
  Health Sciences Campus CRC  
  **Research Description:**  
  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.  
  **Student Qualifications:**  
  Juniors with a strong interest in cancer biology, and interested in cell and molecular biology. Course prerequisites: ABio 212Y. 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. |
| **JoEllen Welsh**  
  jwelsh@albany.edu  
  (518) 591-7232  
  Health Sciences Campus 304D  
  **Research Description:**  
  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.  
  **Student Qualifications:**  
  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 (transgenic 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] |
### Immunology and Microbial Disease

#### Mario Canki
  - Email: cankim@mail.amc.edu
  - Phone: (518) 262-6070

**Research Description:**
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.

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

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#### Jonathan Harton
  - Email: hartonj@mail.amc.edu
  - Phone: (518) 262-6750

**Research Description:**
Similar to Toll-like receptors (TLR), proteins of the NLR family serve as intracellular pathogen sensors and regulators of immune responses. Invading bacteria such as those causing the plague, tularemia, and food poisoning are detected by NLRs. Some NLRs normally drive inflammatory responses when macrophages are infected by activating transcription factors such as NF-κB and MAPK as well as inducing production of inflammatory proteins like IL-1. They can also promote programmed cell death to help limit infection. Mutations within select NLRs are involved in a number of inflammatory diseases including Crohn’s Disease and Muckle-Wells Syndrome. One project currently seeks to understand NLR regulation. A second project considers a large protein, CIITA. Unlike other NLRs, CIITA is a transcription factor controlling expression of Major Histocompatibility Class (MHC) II genes. MHC II is absolutely critical to the normal functioning of both cellular and humoral immunity. Understandably, CIITA plays a role in multiple disease states ranging from arthritis and immunodeficiency to AIDS and cancer. Utilizing a wide array of molecular, cellular, biochemical, and animal based approaches we are advancing our understanding of the underlying molecular basis for how these proteins work in both health and disease. Previous students (depending on the project and the student’s skills/interest) have performed bioinformatics, cell culture, cloning, eukaryotic cell transfection, flow cytometry, gene expression assays, immunofluorescence microscopy, PCR, protein assays, and tumor growth/rejection studies. Undergraduate researchers will have the opportunity to interact with technical staff as well as postdoctoral and graduate students.

**Student Qualifications:**
Juniors or Seniors in Biology, Biochem, or Chemistry majors with a strong commitment toward pursing graduate studies in molecular biology, immunology, genetics, biochemistry or related field. Pre-requisite: A course in molecular or cellular biology and/or immunology; previous lab experience helpful but not required. [3-4 credits = 10 to 12 hours/week in the lab; and willing to devote at least two semesters to the project.]
Neuroscience and Experimental Therapeutics

Damian Shin
shind@mail.amc.edu
(518) 262-8627

Research Description:
My lab aims to identify how aberrant neuronal signaling and information processing occurs in the basal ganglia and connected brain areas at the cellular and network level in Parkinson's disease (PD). We also investigate the underlying therapeutic mechanism(s) underlying deep brain stimulation for PD. Findings from our research endeavors will help reveal novel treatment paradigms and/or improve current options for PD. To accomplish these aims, the lab employs a variety of electrophysiological techniques to monitor ion channel activity in brain slices and from multiple brain regions as single-unit spiking activity and oscillations from anesthetized or freely moving animals. As adjunct to the neurophysiological recordings, we also use a variety of behavioral tests such as the limb-use asymmetry test, the step test, the rotarod, elevated plus maze and open field test to assess motor function and state-dependent behavior. Immunohistochemistry and gene-silencing technology are part of the lab’s research armamentarium to identify alteration in protein expression and modulate neural function, respectively.

Student Qualifications:
Student needs to have high motivation and interest in Neuroscience. Major academic requirement is at least one undergraduate course in Biology. Neuroscience courses are not required but preferred. No prior research experience is necessary. Students interested in a PhD and/or MD. It is expected that the student is in the lab for 10 hours/week to fulfill requirements for course credits.

Regenerative and Cancer Cell Biology

Michelle Lennartz
lennarm@mail.amc.edu
(518) 262-5651

Research Description:
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.

Student Qualifications:
Biology, Biochem or pre-med majors will be considered; Pre-req: Mole Bio, biochem, cell bio; Immunology preferred but not required. Interest in considering 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]
SUNY Polytechnic Institute  
255 Fuller Road  
Albany, NY

Nanobioscience

Thomas Begley  
tbegley@albany.edu  
(518) 956-7301  
Nanoscale & Engineering CESTM B250

Research Description:  
Alkylation 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.

Student Qualifications:  
Majors in Biology, Biochemistry, Computer Science, Chemistry and Physics who have taken ABio 212Y Genetics. Juniors with a strong commitment toward pursuing graduate studies or medicine. [10+ hrs/week and at least one year, with two years preferable]

Magnus Bergkvist  
mbergkvist@uamail.albany.edu  
(518) 965-7382  
Nanoscale & Engineering NFS 295

Research Description:  
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.

Student Qualifications:  
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., ABio 367, AChm 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]
**Research Description / Student Qualifications Supervisor Contact Information 2018**

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<th>Nanoscale &amp; Engineering NFE</th>
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<tr>
<td>J. Andres Melendez</td>
<td><a href="mailto:jmelendez@albany.edu">jmelendez@albany.edu</a></td>
<td>(518) 956-7360</td>
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**Research Description:**
Reactive oxygen species (ROS) are major contributors to numerous disease conditions including arthritis, atherosclerosis, cancer, ischemia-reperfusion injury, nervous system disorders and the process of aging. Studies in the laboratory focus on how mitochondrial-derived ROS and antioxidant enzymes regulate signaling transduction cascades, gene expression, cell growth, proliferation and ultimately, pathogen infection, tumor growth and metastases. We utilize state-of-the-art cell, biochemical, microscopy and molecular methodologies to perform these studies. Our ultimate goal is to develop antioxidant-based therapies for the prevention and treatment of infection and cancer. We are also applying technologies available at the College of Nanoscale Science and Engineering to develop nanodevices to assess cellular redox state, matrix destruction and perform high throughput screening. A Cadre of post-doctoral, graduate and undergraduate students and numerous outside collaborations are the foundation for these studies. Depending on the project, the student will perform cell culture, western blot analysis, PCR, plasmid construction, immunofluorescence microscopy and a variety of spectroscopic techniques.

**Student Qualifications:**

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<tr>
<td>Janet Paluh</td>
<td><a href="mailto:jpaluh@albany.edu">jpaluh@albany.edu</a></td>
<td>(518) 437-8686</td>
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**Research Description:**
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.

**Student Qualifications:**
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.
**Susan Sharfstein**  
ssharfstein@uamail.albany.edu  
(518) 437-8820  
Nanoscale & Engineering NFE  

**Research Description:**  
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, epigenetic analysis of industrial cell lines, and production of a bioengineered trabecular meshwork for testing of glaucoma therapeutics. For more information please see:  
http://www.sunycnse.com/AboutUs/FacultyStaff/Faculty/SusanSharfstein.aspx.

**Student Qualifications:**  
Juniors/Seniors with a strong interest in science and applied cross-disciplinary research. Biology, Biochemistry, or Chemistry Majors 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).

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**Yubing Xie**  
yxie@uamail.albany.edu  
(518) 956-7381  
Nanoscale & Engineering NFS  

**Research Description:**  
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.

**Student Qualifications:**  
Fall & Spring Only: Bio/Biochem/Chem Majors Course prerequisites: ABio 212Y. Co-requisites: Bio 365 and ABio 425 Students with basic lab skills or prior research experience (10 hrs/week and 2 semesters)
Wadsworth Center
5668 State Farm Rd
Slingerlands, NY

Griffin Laboratory

Laura Kramer
lkramer@albany.edu
(518) 485 6632

Research Description:
Our primary research interest is in understanding the interaction of arboviruses with their mosquito vectors, elucidating intrinsic and extrinsic factors that impact transmission intensity and viral evolution. Our work is largely lab-based, although there may be opportunity for field work in the summer. Currently, this research is focused principally on the mosquito-borne flavivirus, West Nile virus (WNV), and the tick-borne virus, Powassan. We are studying what leads to viral establishment and evolution following introduction to a new environment. In addition, we are studying the impact of passage in disparate hosts, mosquitoes and birds, the primary hosts of WNV in the enzootic transmission cycle, on viral genotype and phenotype, as well as the role of viral quasispecies in viral fitness. Various other related studies are ongoing on determining the factors contributing to heterogeneity in virus transmission and the impact of temperature. Molecular and classical virological techniques are employed, as well as work with live mosquitoes and viruses in a high containment laboratory.

Student Qualifications:
Pre-requisites: General Biology helpful; prior lab experience a plus [10+ hrs/week]

NYS Museum
222 Madison Ave
Room No 3126
Albany, NY 12230

Jeremy Kirchman
Jeremy.kirchman@nysed.gov
(518) 474-1441

Research Description:
Ongoing preparation of bird specimens at the New York State Museum is an opportunity for students to learn methods of vertebrate curation and the ways specimens are used in research. A recent die-off event of seabirds in the north Atlantic Ocean is an opportunity to also undertake specimen-based research concerning the potential causes of seabird die-offs. The student will come to the NYSM each week and learn to prepare bird specimens, and in doing so will gather necropsy data that may provide clues as to the causes of the die-off, and the ages and characteristics of the birds affected. The student also will conduct background research on seabird die-off events, and will solicit information on the 2017 die-off from other museums, birding clubs, and wildlife rehabilitators to characterize the geographic and temporal scope of the 2017 event.

Student Qualifications:
Bio and Environmental Sciences Majors. Course prerequisites: Gen Bio and Ecology. Students interested in Graduate School. No prior research experience [9 hrs/week and 1 semester]