Advanced Materials Research Institute

Name: Weilie Zhou

Interests: Nanomaterials Synthesis for Solar Cells, Piezo-Pototronics, and Highly Sensitive Sensors

Student projects: The student will synthesize one-dimensional nanowire arrays using chemical vapor deposition (CVD) integrated with pulsed laser deposition (PV) for photovoltaic device, piezo-photontronics detector and different sensor fabrication. The nanomaterials will be characterized using X-ray diffraction, scanning and transmission electron microscopy, and devices and sensors will be integrated through lithography technique.

Web page: http://www.uno.edu/amri/faculty-staff/zhou.aspx

Department of Biological Sciences

Name: Nicky Anthony

Interests: molecular ecology, evolutionary biology and conservation genetics.

Student projects: Isolation and characterization of MHC and other immunity genes in reptiles; understanding the evolutionary diversification of central African rainforest mammals and frogs; characterizing the species composition and phylogenetic diversity of dung beetle fauna of the Cameroonian highlands; ecological genomics; identification of candidate genes under selection; behavioral ecology of wild primates

Web page: http://www.anthonylab.org

Name: Joel Atallah

Interests: Comparative developmental biology, Drosophila genomics, bioinformatics, and the computational analysis of biological datasets

Student projects: A comparison of the maternal-zygotic transition in embryos of closely related insect species; Deciphering gene regulation at the transcriptional and post-transcriptional levels; Analyzing the role of transposable elements in evolution

Name: Charles (Chuck) Bell

Interests: molecular systematics and evolution of plant, phylogenetics and biogeography.

Student projects: Molecular systematics of plants including Valerianaceae, Symphoricarpos, Linanthus, Leptosiphon, and others; Determining the wild relatives of the sweet potato; Divergence time estimation; computer simulation studies; RADseq and GBS methods.
Name: Simon Lailvaux
**Interests:** Sexual selection, physiological and evolutionary ecology, whole-organism performance. My research interests are in the broad areas of ecology and evolution, but I focus in particular on sexual selection (how animals obtain mates) and on functional ecology (understanding how animal performance capacities such as jumping, running or biting allow animals to overcome environmental challenges).

**Student projects:** Pinching force and claw allometry in fiddler crabs; interspecific competition in Anolis lizards; Dung beetle courtship; Context-dependent male combat in house crickets; and the evolution of bite force in Anolis.

**Web page:** [http://fs.uno.edu/slailvau/index.html](http://fs.uno.edu/slailvau/index.html)

Name: Zhengchang Liu
**Interests:** Signal Transduction Pathways in Yeast. My laboratory is interested in understanding the mechanisms by which cells sense their internal and external environments by focusing on three signal transduction pathways, mitochondria-to-nucleus signaling, the TOR (target of rapamycin) signal transduction pathway, and the SPS (Ssy1-Ptr3-Ssy5) amino acid sensing pathway. We are addressing these questions by using genetic, molecular, and biochemical approaches in the model organism *Saccharomyces cerevisiae*.

**Web page:** [http://fs.uno.edu/zliu5/](http://fs.uno.edu/zliu5/)

Name: Carla Penz
**Interests:** evolution, comparative morphology, and general biology of butterflies.

**Student projects:** Using collection specimens, students can study butterfly color patterns and / or morphology. Examples would be: the study of wing shape as associated with flight behavior, or how color patterns differ between various butterfly species.

**Web page:** [http://fs.uno.edu/cpenz](http://fs.uno.edu/cpenz)

Name: Barney Rees
**Interests:** Fish physiology, biochemistry, and molecular biology; biochemical adaptation to environmental changes, especially changes in dissolved oxygen.

**Student projects:** Students are involved with routine characterization of responses of fish to environmental stress, in particular decreased oxygen concentration. Former students have measured changes at the organismal level (behavior, oxygen consumption), tissue level (blood oxygen-carrying capacity, tissue enzyme activities), and molecular level (specific proteins and mRNAs). Live animal handling and husbandry might be involved depending upon the student and the project.

Name: Wendy Schluchter
**Interests:** Microbial physiology; cyanobacterial photosynthesis; biosynthesis of light-harvesting proteins and environmental influences on gene expression. Cyanobacteria alter the composition of their light-harvesting proteins for photosynthesis (phycobilisomes) in response to light intensity, light quality, and
nutrient availability. Their phycobilisomes (PBS) are composed primarily of phycobiliproteins (PBP). Phycobiliproteins range in color from yellow to red to purple to blue, depending upon which of a combination of four possible chromophores called bilins are covalently attached to these proteins.

**Student projects:** Students would be involved in cloning and expressing cyanobacterial proteins inside *E. coli* to recreate the entire biosynthetic pathway for each phycobiliprotein.

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**Department of Chemistry**

**Name:** Steve Rick  
**Interests:** Computational studies of aqueous processes, polymers, and proteins.  
**Student projects:** Our group uses molecular dynamics computer simulations to study a variety of interesting material and biological systems. The advances in computer technology and the methods to utilize this technology have greatly enhanced our ability to have an impact in these areas. Specific current projects include the development and application of new efficient models for stimuli-responsive polymers, ionic liquids, and amphiphilic macromolecules. We are also interested in host-guest binding and biological ion channels.  
**Web Page:** [http://www.uno.edu/cos/chemistry/rick.aspx](http://www.uno.edu/cos/chemistry/rick.aspx)

**Name:** Matthew Tarr  
**Interests:** Nanocomposite materials for photocatalysis and photovoltaics  
**Student projects:** In this project, we prepare various nanocomposite materials using wet chemical, templated electrochemical, and photochemical methods. The work focuses on producing nanoscale composites of metal oxides (such as TiO₂) with metals (such as Au, Ag, Cu, etc). These nanocomposite materials are characterized and then tested for their photocatalytic and photovoltaic properties.  
**Web page:** [http://www.uno.edu/cos/chemistry/tarr.aspx](http://www.uno.edu/cos/chemistry/tarr.aspx)

**Name:** Mark L. Trudell  
**Interests:** Development and Optimization of New Methods for Drug Synthesis  
**Student projects:** The research project will involve the development and optimization of new synthetic methods for the synthesis of novel compounds targeted for potential medication development. The pharmacological targets include drug addiction, pain and depression.  
**Web page:** [http://www.uno.edu/cos/chemistry/trudell.aspx](http://www.uno.edu/cos/chemistry/trudell.aspx)

**Name:** Viktor Poltavets  
**Interests:** Discovery of new battery, catalytic and magnetic materials (solid state and materials chemistry). The research program is focused on the rational design of novel solid-state phases and establishing how crystal structure, spin and oxidation
state correlates to the magnetic, electronic, catalytic, and electrochemical properties of materials.

**Student projects:** Syntheses of known and novel transition metal nitrides and investigation of the compounds activity as catalysts for ammonia decomposition will be undertaken. Storing renewable energy by ammonia synthesis is attractive due to the low pressure of ammonia liquefaction. However, ammonia decomposition requires expensive catalysts such as ruthenium or platinum. Therefore, ternary nitrides containing cheap and earth-abundant transition metals will be investigated. The student will learn methods for preparation of air sensitive solid-state compounds, and employ powder X-ray diffraction as well as thermogravimetric analysis for the compounds characterization. The catalytic activity will be measured utilizing fixed-bed catalytic reactor by determining gas composition by high-pressure gas chromatography. Studying known compounds for new application guarantees success of the project and positive student experience, while attempts to synthesize new compounds will provide an additional challenge and expose a student to principles of material design.

**Name:** John B. Wiley  
**Interests:** Synthesis and Characterization of Nanoscrolls  
**Student projects:** The student will utilize low temperature reaction strategies to modify various layered compounds so as to create nanoscrrolled materials. High temperature synthesis, followed by exfoliation, will be used in the formation of the nanoscrolls. Various oxide and non-oxide compounds will be investigated and in some cases, nanoparticles will be captured so as to make nanopeapod structures. The student will learn about the methods used in synthesis, simple crystallography, and electron microscopy.  
**Web page:** [http://fs.uno.edu/jwiley/](http://fs.uno.edu/jwiley/)

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**Department of Computer Science**

**Name:** Dr. Shaikh Arifuzzaman  
**Interests:** Big Data, Graph (Network) Mining, Parallel Algorithms, High Performance Computing (HPC), Social Network Analysis, Data Science  
**Student projects:**  
- Network Data Visualization  
- Designing MapReduce-based Parallel Algorithms for Big Data  
- Designing GPU-based Algorithms for Big Data  
- Analyzing Large-scale Biological Data  
- Mining and Analysis of Large Social Networks (e.g., Facebook, Twitter)  
- (Or, any similar Topics Involving scalable computing and big data)  
**Web page:** [www.cs.uno.edu/~arif/](http://www.cs.uno.edu/~arif/)
Name: Md Tamjidul Hoque

Interests:

**Bioinformatics:** Disordered protein prediction, Energy function development, DNA/RNA/Protein binding region prediction, Protein Design and Structure Prediction and phi/psi Angle fluctuation prediction, Fold-recognition, Optimized Metabolic Network based Biofuel Production in Algae.

**Artificial Intelligence:** Machine learning, evolutionary algorithms, optimizations and search algorithms and reinforced learning.

**Image Processing:** Algorithm development for cellular image processing and analysis; non-iterative and fast algorithm development for object detection and segmentation (including 3D).

**Algorithm Development:** Divide-conquer based fast partitioning algorithm, Heuristics for non-deterministic algorithm, Degree constrained minimum spanning tree (MST) by nondeterministic approach.

**Student projects:**

- Disordered protein prediction: we have developed one of the best predictor ‘DisPredict’ ([http://cs.uno.edu/~tamjid/TechReport/DisPredict.pdf](http://cs.uno.edu/~tamjid/TechReport/DisPredict.pdf)). Undergraduate student can work with the graduate student to assist and learn the next stage of the development and study applications towards cancer and cardiovascular diseases.
- Energy Function: We have developed the best energy function 3DIGARS ([http://cs.uno.edu/~tamjid/Software.html](http://cs.uno.edu/~tamjid/Software.html)). Undergraduate student working with the graduate student can assist and learn.
- Fold-recognition: Given the outline student will need to develop a fold-recognition software.
- Binding-region of protein: Given the outline (peptide) binding predictor will be developed.
- SVM with GA: SVM (support vector machine) classifier with grid-search is impractical for larger problems, we need to integrate our efficient Genetic Algorithm (GA) with SVM. SVM with auto-windowing; Theoretical underpinning of GA
- Gene-Regulatory-Network (GRN) based study in optimizing metabolic network for biofuel production in algae: data-analysis and tools development
- Degree constrained minimum spanning tree (MST) development by nondeterministic approach

Web page: [http://cs.uno.edu/~tamjid/](http://cs.uno.edu/~tamjid/)

Name: Ben Samuel

Interests: AI-Driven Game Design, Social Simulation, Computationally Assisted Theatre

Student Projects:

- Assisting in the production and release of an Artificial Intelligence system meant to simulate characters with rich personalities and social histories.
- Assisting in the creation of a general role-playing-game playing agent
- Assisting in generalizing a framework that combines procedural content generation and live improvisational performance so that it might be distributed the world over.

**Website:** ben-samuel.com

**Name:** Christopher Summa  
**Interests:** Protein structure refinement, simulation of macromolecules, statistical analysis of protein structures, computational design of water-soluble membrane proteins, and optimization and analysis of molecular energy functions.  
**Student projects:** Students would work on a problem involving refinement of protein structure, simulating macromolecules, performing statistical analysis of protein structures, computational design of water-soluble membrane proteins, or optimization and analysis of molecular energy functions.

**Web page:** [http://www.cs.uno.edu/~csumma](http://www.cs.uno.edu/~csumma)

**Name:** Shengru Tu  
**Interests:** Service-oriented architecture (SOA), Web services for GIS, testing for Web services, enterprise software integration, and semantic framework supporting computer science education.  
**Student projects:**  
- Web Application Development for Education on Computational Thinking  
- Web Mash-up Frameworks  
- Web Enable the Louisiana Oyster Growth Model Database


**Name:** Stephen G. Ware  
**Interests:** Generating interesting stories automatically for video games, training simulations, and intelligent tutoring systems.  
**Student projects:** Designing rooms for an intelligent interactive narrative sandbox game with the look and feel of a Medieval RPG. Extensive library of 3D models provided; no previous 3D modeling experience necessary.

**Web page:** [http://nil.cs.uno.edu](http://nil.cs.uno.edu)

**Name:** Minhaz F. Zibran  
**Interests:** Software Engineering with particular focus on source code analysis and manipulation, empirical studies, tool support for aiding software development and maintenance.  
**Student projects:** Program Analysis, Code Visualization.

**Web page:** [http://www.cs.uno.edu/~zibran](http://www.cs.uno.edu/~zibran)
Department of Earth & Environmental Sciences

Name: Ioannis Y. Georgiou
**Interests:** Hydrodynamic controls in river-dominated systems, Deltaic sedimentation processes, Sediment dynamics in semi enclosed systems, marsh-edge erosion due to waves, circulation and transport dynamics in coastal systems, physical transport processes on barrier islands, regional sediment transport mechanisms.

**Student projects:**
- Fine sediment dynamics in Lake Pontchartrain
- Lateral accretion of tidal bars with and without fluvial input
- Coupled response on tidal inlet-bay systems
- Understanding marsh edge erosion in coastal wetlands
- Use of historic discrete salinity measurements and recent CTD profiles to establish a short-term and long-term salinity gradient in the Pontchartrain estuary
- Coastal morphodynamic response to tropical and extratropical storms
- Sedimentation in river-dominated wetlands

**Web page:** [https://sites.google.com/site/ioannisgeorgiougroup/](https://sites.google.com/site/ioannisgeorgiougroup/)

Name: Mark Kulp
**Interests:** The Coastal Research Laboratory has potential undergraduate research projects in stratigraphy and geomorphology of the Mississippi River delta plain.

**Student projects:**
- Mapping of geomorphologic change across the northern Gulf of Mexico through the use of historical and recently acquired imagery
- Correlation of stratigraphic units to better understand the framework of the Louisiana shelf
- Documentation of the shallow stratigraphy below modern barrier islands
- Investigations of the relative sea level change across the northern Gulf of Mexico

Name: Martin O’Connell
**Interests:** The Nekton Research Laboratory (NRL) has many potential undergraduate research projects for students in spring 2015. Our research interests include studying the ecology of local freshwater and marine fishes with the hopes of improving the management and conservation of these species. The NRL has a history for recruiting undergraduate researchers and volunteers, some of whom continue on as graduate students either in the NRL itself or elsewhere.

**Student projects:**
- Processing and identification of larval fishes and invertebrates as related to measuring their responses to possible settlement cues;
- Assessing the interaction of non-native Rio Grande cichlids (*Herichthys cyanoguttatus*) and native fishes in Bayou St. John and City Park;
• Determining if Louisiana populations of sheepshead minnows (*Cyprinodon variegatus*) practice inter- and intra-species cleaning behavior or lepidophagy;
• A survey for populations of southern redbelly dace (*Phoxinus erythrogaster*) in stream of Louisiana’s Florida parishes;
• Recapture of radio tagged red drum (*Sciaenops ocellatus*) from Bayou St. John for growth and otolith analyses;
• A survey for juvenile tarpon (*Megalops atlanticus*) and assessment of potential habitats in southeastern Louisiana; and
• Surveying for non-native channeled apple snails (various species) in southeastern Louisiana.

Web page: [http://www.uno.edu/nekton-research-laboratory/](http://www.uno.edu/nekton-research-laboratory/)

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**Department of Mathematics**

**Name:** Ken Holladay  
**Interests:** (1) Eigensystems of distance matrices, (2) Decomposition properties of shapes composed of tiles of a regular tessellation, (3) Using geotechnical methods such as radar or electromagnetic induction profiling to examine the subsurface of structures such as levees.  
**Student projects:** Develop a Mathematica program to take a description of a tessellation in terms of its symmetries and interconnections and produce a graph of a section of the tessellation. We will then use this program to illustrate all (forty some) tessellations with two symmetry orbits, one a triangle and the other a quadrilateral.

**Name:** Linxiong Li  
**Interests:** My research focuses on both theoretical and applied statistics with applications in various fields including biomedicine, engineering, financial industry, etc. Currently, I am working on a project funded by the USDA about cotton fiber length estimation.  
**Student projects:** Use basic statistics and software to analyze data.

**Name:** Jairo Santanilla  
**Interests:** Stochastic and deterministic modeling. These topics include stochastic, fractional, and deterministic differential equations in different areas including actuarial, financial, biological, and engineering problems.  
**Student projects:**  
- To study fractional calculus and eventually fractional differential equations.  
- To study specific stochastic differential equation in connection with one of the areas mentioned above.  
- To compare specific models using stochastic tools vs. deterministic ones.  
- To collect and analyze data to support actuarial models.
Name: Ralph Saxton
Interests: Nonlinear analysis and its applications to field theories. Some problems involve harmonic mappings, nematic liquid crystals, phase transitions, fluid dynamics and elasticity. Each of these produces surprisingly interesting equations to study. Equations are to mathematics something like planets to astronomy or species to biology; new ones are as exciting to discover as their properties are to uncover.

Student projects: We would examine the theories behind waves. Waves are everywhere, in sound, in water, underground (in earthquakes), in light - they can be produced, and behave, in very different ways. We discover how waves are propagated through their medium.

Name: Tumulesh Solanky
Interests: Statistics. In particular, deriving sampling strategies where the sampling cost is high, such as in clinical trials where the subjects are human beings. The overall goal is to achieve a precise estimation of key parameters based on a smallest possible sample.

Student projects:
- I am looking at the data for some clinical trials for selected antipsychotic drugs, which have been approved by FDA and have gone through independent clinical trials. The goal would be to see if using the current research methodologies, one could achieve the same precision as in the published studies, based on a smaller sample.
- Data collection and statistical analysis of the data on the effectiveness of non-profit organizations and its impact on crime reduction efforts in New Orleans.

Department of Physics

Name: Juliette W. Ioup
Interests: Acoustic, geophysical, and aerospace signal analysis and processing; deconvolution, mathematical digital filtering, and spectral estimation; Fourier and wavelet transforms; higher order correlations and spectra; underwater acoustics and bioacoustics; modeling and simulation; computational physics.

Student projects:
- Analysis of underwater acoustic signals from the northern Gulf of Mexico
- Analysis of musical signals
- Analysis of whale and dolphin clicks

Name: Ashok Puri
Interests: condensed matter optics, surface optics, electronic properties of semiconductors, nonlinear problems in applied mathematics
Recent past research includes: the optical response of rough surfaces, nonlinear pulse propagation through fibers, thin films, second harmonic generation, resonant tunneling through quantum well heterostructures and quantum chaos.

Student projects:
- Investigating characteristics of fluid flow through a porous medium using both analytical and numerical techniques.
- Numerical investigation of Non-Fickian diffusion with generalized source.
- Investigation of dynamics of biological films using numerical methods.

Name: Leonard Spinu
Interests: Dr. Spinu is an experimental condensed matter physicist who is interested in the magnetic and electronic properties of nanostructured materials, high frequency characterization of magnetic and dielectric materials, spin-dependent transport, and tunneling magnetoresistance. He also performs mathematical modeling and computer simulations on magnetization processes in fine particle systems micromagnetics.

Student projects:
- Micromagnetic Simulations of Magnonic Crystals
- Ultra-Low Temperature Properties of Strongly Correlated Materials

Web page: http://fs.uno.edu/lspinu/home.html

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Name: Elliott Beaton
Interests: At the Stress, Cognition, and Affective Neuroscience (SCAN) Laboratory, we study how the physiological effects of stress shape development in children at high risk for mental illness in adulthood. To this end, we use a variety of methods to study children including interviews and questionnaires, computer-based cognitive games, brain imaging, hormone and immunological analyses, and reactive physiological measures such as heart rate and blood pressure.

Student projects:
- Spatial sound detection study.
- MRI diffusion tensor image processing and analyses.
- Portable EEG system and mindfulness training validation study.

Web page: www.SCANLaboratory.org

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Name: Christopher Harshaw
Interests: The Mechanisms Underlying Sociality (MUS) Laboratory focuses on gaining a better understanding of the physiological, neural, and molecular mechanisms underlying social behavior. Most of our current work is focused on the relationship between body temperature regulation and social behavior in mouse models of Autism Spectrum Disorders (ASDs). That is, we study mice with behavioral and physiological quirks to try to learn about mechanisms that might also be at play in
generating differences in humans. We employ a variety of methods, including behavioral assays of social and emotional behavior, manual and automated scoring of behavior, infrared thermography, hormone and other physiological assays, as well as surgical implantation of telemetry sensors for continuous monitoring of temperature.

**Student projects:**
- Infrared thermography of the face and social cognition in humans
- Ambient temperature and mouse social-emotional behavior
- Oxytocin, brown adipose tissue, and mouse social behavior

Web page: [http://www.muslab.co](http://www.muslab.co)