



CalPolyPomona

College of Science Faculty Expertise for Advising

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Professional School Advisors

General Pre-Professional

(Pre-med, Pre-dent, Pre-pharmacy, Pre-optometry, Pre-PA, Pre-Nursing)



Dr. Yuanxiang (Ansel) Zhao

Dr. Zhao's research interest lies in human adult stem cells, which are considered the 'fountain of youth' in our body. Specifically, she and her students focus on understanding how human mesenchymal stem cells, a type of adult stem cells that can give rise to fat and bone cells, respond to environmental stimuli to turn into fat or bone cells, as well as how these cells change their behaviors upon exposure to certain pharmaceutical drug, dietary supplement or environmental chemical. She hopes her research could broaden our understanding of the basic biology of stem cell behavior and help shine light on issues such as obesity, aging, stem cell therapy and consumer product safety.

Pre-CLS (Clinical Laboratory Scientist)



Dr. Junjun Liu

This lab studies the regulation of mitosis, particularly the events regulated by mitotic kinases. The focus of the study is polo-like kinase 1 (Plk1), which plays a pivotal role in regulating the progression of mitosis and has recently emerged as a promising target for cancer therapy. Another area this lab is interested in is functional study of transcription factor Twist1 in tumorigenesis.

Pre-Veterinary



Jac Rivera, M.Ed.

Academic Advisor in the College of Agriculture
Animal Science & Pre-Veterinary

Pre-Physical Therapy & Pre-Occupational Therapy



Dr. Eddie Jo

Faculty member in Dept of Kinesiology and Health Promotion. My research serves to innovate and advance the application of exercise training methodologies, nutrient intake, and technologies for the optimization of human health and performance, energy metabolism, body composition, and endocrine function. Industry consultant for sport and exercise technologies, equipment, and nutritional products. Certified Strength and Conditioning Specialist (CSCS), Certified Personal Trainer (NSCA-CPT), & Certified Sports Nutritionist (CISSN).



Dr. Koyya Lewis-Trammell

Faculty member in Dept of Kinesiology and Health Promotion. Her technical background in Athletic Training and exercise physiology along with her expertise with personal technologies provides her with an exceptional and desirable perspective to health and wellness. Her clinical education is complimented with her experience conducting research related to public health, epidemiology, and comparative effectiveness. Her well-rounded experience equips me to advise and educate individuals and businesses on physical activity for improved health. Her research interests include physical activity promotion, wearable activity monitors and other exercise technologies, exercise prescription, and Exercise is Medicine.

Biological Sciences Faculty Expertise

General Biology



Dr. Steve Alas

Cancer Biology/Immune Response to Human Prosthetic Biometals. My laboratory studies the DNA damage response and DNA repair mechanisms in various tumor cell model systems, particularly breast cancer, colon cancer and leukemias. A major area of our studies is to examine genes that play a role in detecting damage to cells' DNA and whether mutations in those genes found in tumor cells contribute to resistance against chemotherapeutic drugs. The Breast Cancer 1 gene (BRCA1) and a family of death & survival genes (Bcl-2 family) are the central genes in our studies. Another avenue of research is the study of novel biometals, initially developed by the US Air Force, that may be new generation materials in the development of human implants and prosthetics. In collaboration with engineers at Cal Poly, our projects involve examining the immune response against the novel alloys,

bone degradation caused by activation of immune cells upon implant exposure, and also the ability of bacteria to colonize both tradition biometals used in human prosthetics (titanium, stainless steel) and the new generation alloys.



Dr. Peter Arensburger

Bioinformatics and genomics. My research focuses on exploring the regulatory roles of small RNAs in arthropod and mammalian genomes. Over the last several years small RNAs have been shown to play a critical role not only in gene regulation, but also in regulating other genomic features, such as transposable elements. Using high throughput sequencing experiments, it is now possible to measure not only small RNA levels but also whole gene expression in specific tissue and life stages. Understanding the relationship between small RNAs, gene expression, and transposable element movement in economically important species will help develop more efficient

transformation methods and may play an important role in the future of human gene therapy development.



Dr. Rachel Blakey

Wildfire is a natural process in the forests of the western US, and many species have evolved to tolerate, if not benefit from it. But wildfire is changing. The lab works on the effects of fire on mountain lions in the Santa Monica Mountains National Recreation Area. Also, in collaboration with scientists at the US Forest Service and the University of Missouri, the research team looks specifically at how goshawks use burned areas in the Plumas National Forest, California. Rachel's past research has focused on how disturbance patterns influence the movement, food webs and

community assembly of highly mobile predators (bats, owls, raptors) in regions prone to fire and drought.



Dr. Ed Bobich

Functional plant morphology. All plant structures and processes are affected by their environment. In our lab we try to link interesting and novel plant structures, like lignotubers in walnuts, or cells, such as gelatinous fibers in desert plants, to their function. Thus, our research often incorporates several different fields, usually plant anatomy, biomechanics, and physiological ecology. Students in the lab have studied plants in the local woodlands, coastal sage scrub, and the Sonoran Desert and have addressed some long-standing questions through their research.



Dr. Andrea Bonisoli-Alquati

There are multiple lines of research in the lab, with two common themes: (I) understanding variation (among individual birds and among bird species) in the effects of environmental pollutants, and (II) leveraging pollutants to understand ecological and evolutionary susceptibility and response to disturbance. We are analyzing the concentrations of lead, as well as per- and polyfluoroalkyl substances (PFAS), also known as 'forever chemicals', in a variety of species, by both (a) collecting and analyzing bird tissues, and (b) conducting meta-analytical studies.



Dr. Wendy J. Dixon

Microbiology, Cell and Molecular Biology; Elucidation of phosphorylation pathways involved in regulating cell-cycle genes and initiating DNA replication in budding yeast; Location, movement and interactions of DNA replication initiators during the cell cycle; Effect of over-expression of cell-cycle genes on cell growth and tumor formation.



Dr. Douglas Durrant

Research is focused on how immune responses are regulated within the central nervous system (CNS) during viral encephalitis. The lab is particularly interested in the role of dendritic cells (DCs), a specific type of immune cell, in regulating viral clearance and repair within the brain during viral encephalitis. To clarify the role of these cells, the lab currently studies West Nile virus, a neurotropic flavivirus, which has emerged as a significant cause of neuronal injury and inflammation in humans that can potentially result in death. Therefore, rapid, yet tightly controlled responses that restrict viral spread while limiting tissue damage within the brain are essential. In the brain, DCs are generally found within an area where they can effectively govern which immune cells enter the

CNS and what effector functions they will be armed with to clear the virus while protecting neuronal cells from any undue damage.



Dr. Jason Ear

My research interest includes generating cell-based and zebrafish models of human diseases. The diseases that my lab focus on are ones involving mutations with scaffold protein Daple, a regulator of Wnt and G-protein signaling. Mutations in Daple have been identified in patients with hydrocephalus, spinocerebellar ataxia, and some cancers. Generating these models will help to provide further insight into the underlying mechanisms of these diseases.



Dr. Juanita Jellyman

Cannabis may affect birth weight by changing maternal physiology, placental function, or the growth of the offspring. The objective of the current study is to develop a chick embryo model of embryonic growth to study the effects of marijuana THC (Δ^9 -Tetrahydrocannabinol) on Cardiovascular Function; The effects of a high-fat diet during pregnancy on offspring growth and pancreatic function; Diabetes Prevention Through Lifestyle Changes.



Dr. Glenn Kageyama

Enzyme histochemistry, Electron microscopy. Developmental plasticity of central nervous system synapses. Development and plasticity of oxidative and glycolytic pathways in the central nervous system.



Dr. Craig LaMunyon

Our research investigates the control of sperm activation. The timing of sperm activation is incredibly important – delays cause a lag in the race to fertilize the eggs, and premature activation reduces stored energy before it can be used in the race. In *C. elegans*, an activating molecule stimulates a signaling pathway that downregulates a number of "brake" proteins, allowing activation. During this process, the spherical spermatids undergo a dramatic cellular reorganization to produce an amoeboid, crawling cell – all within about 2 minutes! We have identified several genes that encode the brake proteins. One is *spe-4*, a homolog of the human protein Presenilin1, which when mutated causes early onset Alzheimer's Disease. Another gene is *spe-46*, which we will be describing in an upcoming paper. *spe-46* mutants have prematurely activated sperm, but they also have numerous other sperm defects including chromosomal segregation problems that cause aneuploidy. A third gene that we have identified as encoding a brake protein actually associates with mitochondria. It is very unusual for a gene expressed only in sperm to associate with mitochondria – studies of this gene, and a paralog, are ongoing. We are also investigating numerous additional brake protein mutants.



Dr. Kristopher Lappin

The unifying theme of my research is the evolutionary ecomorphology of animals. In this field, one seeks to understand how the form and function of animals relates to how they interact with their environment. On the one hand, techniques in functional morphology, biomechanics, and physiology are used to study how animals work. On the other, animal-environment relationships, such as predator-prey interactions and social behavior, can be studied using techniques in behavioral ecology. The deciphering of the relationships between form/function and ecology/behavior can be achieved quantifying relevant animal performance measures, such as sprinting speed, jumping distance, and, my favorite, bite force. The characterization of animal performance, an emergent property of animal form and function, is a fundamental component of ecomorphological research. When ecomorphological patterns are examined in a comparative phylogenetic

framework, one can test hypotheses of how the form and function of animals have evolved with regard to their behavioral ecology.



Dr. Francis Mercer

Our lab investigates mechanisms of immunity to vaginal trichomonad parasites. We use molecular and cell biology approaches to determine the surface and subcellular players in neutrophil trogocytosis (trogocytosis = to nibble) of *Trichomonas vaginalis*, the causative agent of the 3rd most prevalent STI in the US, and a neglected infection. Our work is currently funded by the National Institutes of Health and The CSU Agricultural Research Institute. Students are trained in methods such as leukocyte and parasite culture, flow cytometry, fluorescence microscopy, molecular biology, and CRISPR/Cas9 gene editing.



Dr. Erin Questad

Research questions in my lab relate to global change and the conservation of plant species diversity. My interests span several fields, including plant community ecology, restoration ecology, and invasion ecology. Three main questions of emphasis are: 1) How does environmental heterogeneity affect species diversity and conservation? 2) How has global change altered the interactions between native and invasive species? 3) How can plant functional traits guide the restoration of ecosystem processes?

An ongoing project in the lab addresses ecosystem restoration and endangered plant reintroduction in Hawaii and Southern California. A second project explores the impact of nitrogen deposition on invasion,

restoration, and fire management in a grassland community in Southern California.



Dr. Elizabeth Scordato

We investigate the effects of anthropogenic activity on the behavior, ecology, and evolution of wildlife. We use a variety of tools to ask these questions, including next-generation sequencing and genomic analysis, behavioral observations, and long-term ecological and climatic datasets. We currently have two major projects in the lab: examining how long-term human landscape modification has shaped the evolutionary history of commensal swallows in Southeast Asia and Oceania; and assessing wildlife biodiversity and habitat use in complex agroecosystems in Southern California.



Dr. Bharti Sharma

Reproductive success in plants is dependent on many factors but the precise timing of flowering is certainly among the most crucial. Perennial plants often have a vernalization or over-wintering requirement in order to successfully flower in the spring. The lab studies Developmental and Molecular Changes Underlying the the transition to flowering in plants.



Dr. Tatiane S. Lima

The lab research focuses on understanding the cellular and molecular interactions between the intracellular parasite *Toxoplasma gondii* and the neutrophil immune cell. The goal of our research is to define mechanisms of *T. gondii* immune evasion of human neutrophil-mediated host defense.



Dr. Christos Stathopoulos

Medical Microbiology; Molecular Biotechnology; Bacterial Pathogenesis; Vaccine Development. Current research projects in my laboratory focus on various aspects of the secretion of virulence factors in gram-negative bacterial pathogens and their role in microbial pathogenesis. The majority of our efforts are spent on (i) the elucidation of the molecular mechanism of autotransporter secretion across the gram-negative bacterial cell envelope (Type V secretion), (ii) the identification and characterization of novel virulence factors of *Yersinia pestis*, the causative agent of plague, and (iii) the identification of novel protective antigens for the development of vaccines against plague and infectious diseases caused by pathogenic *E. coli* strains.



Dr. Andrew Steele

The neurobiology of food anticipation; Researchers in the field of circadian rhythms have coined the term "food anticipatory activity" (FAA) to describe the phenomenon that animals will show activity and wakefulness in anticipation of scheduled meals--even when those meals occur during a time of day when they would normally be asleep. Neural circuit level understanding of food anticipatory activity is at a primitive stage. The work of our laboratory has implicated the dopamine neuromodulatory system as a mediator of food anticipatory activity but there's much work to be done in order to shore up these findings.



Dr. Robert Talmadge

Primary research interests include identification of cellular mechanisms involved in skeletal muscle adaptation following chronic alterations in muscle activity, such as spinal cord injury, space flight, exercise and disease states such as muscular dystrophy and congestive heart failure. Other research interests include age-associated sarcopenia, comparative muscle physiology, regulation of muscle growth and neural adaptation of the spinal cord locomotor networks following spinal cord injury.



Dr. Ángel Valdés

Valdés' research focuses on the systematics and biogeography of opisthobranch mollusks. Opisthobranch mollusks, or seaslugs, are a diverse group of almost exclusively marine, hermaphroditic organisms. Sea slugs are closely related to pulmonate gastropods (terrestrial snails and slugs) and display remarkable adaptations to different environmental conditions in the ocean. About 6,000 species are known worldwide but new species are constantly been discovered and named. A particularly rich source of new species is the deep sea, which remains largely unexplored.

Biotechnology



Dr. Nancy Buckley

Investigating the Role of cannabinoids and cannabinoid receptors on mouse resistance to yeast infections. Cannabinoids are known to suppress resistance to bacterial, viral and protozoan infections. In our laboratory, we are investigating the effect of the psychoactive component of marijuana, Δ -9-tetrahydrocannabinol (THC) on the resistance of yeast infections. Recently, we reported that THC suppresses mouse resistance to a secondary, but not a primary, systemic *Candida albicans* infection (Blumstein et al, 2014). Our goal is to determine whether cannabinoids such as delta-9-

tetrahydrocannabinol (THC) alter mouse resistance to systemic and/or mucocutaneous yeast infections. Since the peripheral cannabinoid receptor (CB2R) is known to be expressed in cells of the immune system, we also aim to investigate the role of CB2R during this type of infection.



Dr. Wei-Jen Lin

Microbiology and bacterial pathogenesis. Molecular mechanisms of pathogenesis of bacteria and their toxins. Including biochemistry of bacterial toxins, antimicrobial controls, and regulation of gene expression.



Dr. Jamie Snyder

The lab is interested in viruses that infect organisms living in extreme environments. I focus on viruses infecting archaeal hosts living in high temperature (70-90C) and low pH (pH 1-4) environments. In my lab, we are working towards describing in detail the first complete archaeal virus replication cycle. We study two viruses that infect *Sulfolobus*, STIV1 and STIV3. These viruses are very similar to each other; however, they infect different species of *Sulfolobus* and have different lifestyles within the host. We have developed genetic systems for both viruses, so we can make mutations and determine the phenotypes of the mutant viruses. We are also working to determine what cellular proteins the virus utilizes during its infection of the host cell.

Environmental Biology



Dr. Jeremy Claisse

Quantitative marine ecologist with broad research interests mostly focusing on the life history and ecology of marine organisms associated with reef ecosystems, including California rocky reefs and kelp forests, coral reefs in Hawaii and the Caribbean, and anthropogenic reef habitats and restoration (e.g., artificial reefs, breakwaters, submerged structures of oil platforms and renewable energy developments). Most of the work has an applied focus with an emphasis on marine conservation, fisheries ecology and marine protected areas.



Dr. Joan Leong

Plant-insect interactions; pollination ecology, agricultural crop pollination; biology and ecology of native bees, foraging behavior of bees, conservation and restoration of vernal pool habitats; plant reproductive biology.



Dr. Jayson Smith

Dr. Smith is a marine conservation ecologist with particular interest in anthropogenic disturbances on ecosystem functioning and community structure of coastal habitats. Given the high population of humans in southern California, urban coastal ecosystems are subjected to numerous human impacts. Work in Smith's lab attempts to understand how these systems are changing and functioning in the face of these disturbances. Smith applies his conservation interests mostly to rocky intertidal ecosystems, focusing on invasive seaweeds; effects of human visitation; long-term change in community structure and dynamics; effects of climate change; restoration ecology, and environmental policy and management (such as Marine Protected Areas). The research questions addressed have implication in policy making decisions, particularly with current emphasis being placed on

Ecosystem Based Management. Recently, focus has been placed on introduced seaweeds, including determining their impact on community structure, how they fit into native food webs, and examination of transport vectors.

Biology Education



Dr. Paul Beardsley

My research interests include K-12 science education and botany. In scientific research, my developing lab focuses on collaborative research in monkeyflowers (plants in the genera *Mimulus*, *Erythranthe*, and *Diplacus*). Current projects involve research in systematics and the genetics of species differences and rare plants. I am interested in recruiting graduate students interested in plant genetics.

In science education, one major goal of my work is to develop, contribute, and rigorously study sustainable partnerships with local schools to improve levels of achievement for all students and improve teacher's effectiveness in science. A second more specific goal of my work is rigorous educational research, curriculum development, and advocacy focusing on student learning and teaching methods in evolutionary biology. Current projects involve studying the impact of inquiry-based teaching on middle school student learning in genetics and evolution. I am also developing curriculum supplements with the Smithsonian Institution's National Museum of Natural History for AP Biology that focus teaching evolution using human examples.



Dr. Janel Ortiz

We are most interested in work relating to population monitoring, particularly involving non-native species, behavior, habitat use through the use of GIS and remote sensing techniques and field surveys, human attitudes and perceptions towards wildlife. One of our goals is to establish a remote camera monitoring program in San Gabriel Valley, CA to document the urban wildlife community composition from an urban to rural gradient. In collaboration with the Urban Wildlife Information Network (UWIN), we are implementing a standardized study design that has been replicated in multiple urban centers to compare urban wildlife presence, distribution, and seasonality as it relates to landscape

composition and configuration.

Regarding Biology Education, I am most interested in exploring the training and preparation of K-12 teachers in environmental literacy, ecological knowledge, and perceptions of real-world issues related to the environment and conservation.

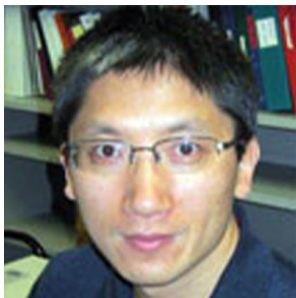
Chemistry Science Faculty Expertise

Analytical Chemistry



Dr. Gregory Barding

The Barding Lab is interested in elucidating the complex biochemical mechanisms responsible for organism survival by monitoring changes in metabolite levels (metabolite profiling) in the presence and absence of the stressors. By incorporating a variety of analytical techniques, including liquid and gas chromatography coupled with mass spectrometry, nuclear magnetic resonance, and UV/Vis spectroscopy, a broad representation of metabolites can be quantitatively measured, including TCA cycle intermediates, glycolysis intermediates, and amino acids. Understanding how metabolism and energy flux changes during the presence or absence of stress will aid in our understanding of the stress response of the organism. The Barding Lab is currently working on several projects related to metabolomics and organism stress, including biofuel production, crop production, soil toxicity, and probiotic-containing ruffage.



Dr. Yan Liu

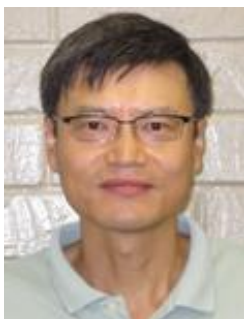
Dr. Liu's research interests include the development of miniaturized analysis system for biological and environmental applications. This type of analyzer can integrate sample collection, injection, separation, and detection on a single microfluidic device.



Dr. Peng Sun

My research interest is in the electrochemical characterization of chemical process or materials in mesoscopic dimension (dimension varies from 10 to 1000 nm, 1 nm= 10^{-9} m), such as electrochemistry of a single nanoparticle, charge transfer across a nanometer-sized liquid/liquid or liquid/solid interface. These studies can help us to develop ultrasensitive electrochemical sensors or novel sensing strategies.

Biochemistry



Dr. Xiao-Chuann (Sean) Liu

One of my research interests is to investigate what other factors could affect the formation HbA1c. For example, studies have indicated a higher concentration of HbA1C in smokers as compared with nonsmokers. However, the exact substance in the cigarette smoke responsible for this higher concentration of HbA1C has not been investigated. Our study indicates that nicotine may be responsible for the elevated HbA1C level in smokers with diabetes mellitus. Another area of my research is to study various chemistry for quantifying HbA1C. Measurement of HbA1C is very important in the diagnosis and management of patients with diabetes mellitus. Clinical labs use a number of different analytical systems to determine A1c levels that include boronate affinity chromatography, ionic exchange chromatography, immunoassay, and enzymatic assay. The third area of my research is related to two-dimensional stationary phases for liquid chromatographic separations. This research was undertaken to create stationary phases that could be used in HPLC columns for separation of biomolecules.



Dr. Kathryn McCulloch

Organisms have not evolved in a vacuum – instead, they have interacted with their environment, competed for resources with other species, and collaborated with other organisms to thrive. These various forces have led to the evolution of complex pathways that produce signaling molecules, secondary metabolites, or otherwise provide the organism with an evolutionary advantage. To date, these pathways offer both the opportunity to develop new therapies, such as antibiotics, and offer potential targets for defeating pathogens or promoting human health. The McCulloch group aims to understand the chemistry of enzymes found within specific pathways. Currently, we are studying oxidoreductases (enzymes that catalyze either oxidations or reductions) encoded within the bile acid induced operon of some gut bacteria. We use a recombinant approach to overexpress each protein, and then use a combination of X-ray crystallography and *in vitro* biochemical assays to develop a molecular understanding of their structures and chemical reactivities.



Dr. Rakesh Mogul

My laboratory conducts research in molecular microbiology, with a focus on the biochemistry of survival in extreme conditions. Our work focuses on the microorganisms and microbial communities found in the assembly facilities for spacecraft, ancient permafrost, and desert soils. Our overall aim is to understand and characterize the enzymes and metabolic features that support survival in these extreme environments. Specifically, we are interested in learning (a) how microorganisms survive in the cleanroom facilities where spacecraft are assembled, (b) how the biochemical signatures of life change over thousands of years in ancient arctic permafrost, and (c) how the biochemistry and microbial communities change during the early development of biological soil crusts. To conduct this research, we use a multi-disciplinary approach including microbiology, proteomics, metabolomics, protein purifications, enzyme assays, chemical kinetics, lanthanide chelation chemistry, and bioinformatics.

Inorganic Chemistry



Dr. Joe Casalnuovo

Coming soon...

Long-time SEES advisor



Dr. Chantal Stieber

The Stieber Lab focuses on solving problems related to small molecule activation through complementary efforts in synthetic inorganic chemistry, spectroscopy and computational chemistry. Current directions in the group include: 1) Expanding the scope of X-ray emission spectroscopy to allow for identification of small molecules (eg. NO, NO⁻, NO₂) bound to transition metal centers. Results of this work will be applied to understanding how biological systems reduce and capture airborne pollutants; 2) Synthesis of novel first-row transition metal complexes for benchmarking spectroscopic signatures of small molecules bound to metal centers; 3) Development of first row transition metal catalysts for transformations such as C-C bond formation and polymerizations; 4) Crystallography; 5) Multiplet calculations of f-block systems.



Dr. Taylor A. Thane

The development of greener synthetic methods that provide access to complex molecules is of increasing importance to the fine chemical and pharmaceutical industries. Cross-coupling and cross-electrophile coupling reactions have greatly advanced the field of synthetic organic chemistry by allowing for the efficient synthesis of new carbon-carbon bonds. Additionally, dicarbofunctionalization reactions are being realized for their potential to quickly form two new carbon-carbon bonds in a single step. We aim to harness the power of carbon-carbon bond forming reactions with oxetane motifs to rapidly install new carbon-carbon bonds.

Organic Chemistry



Dr. Alex John

Our research group is developing methods for incorporating biomass-derived molecules in chemical processes. Research in the group scours different inter-related aspects like, (a) developing synthetic methods that use renewables, (b) converting bio-derived molecules into platform chemicals, and (c) developing sustainable plastics sourced from biomass. The first two projects involve developing efficient transition-metal catalyzed processes thus offering cost-minimization and waste reduction and hence, adhere to the principles of '*Green Chemistry*'. Another frontier that is being explored is transforming platform chemicals obtained from biomass into value-added chemicals by engaging them in tandem reactions. Current projects along these lines are based on developing efficient molybdenum catalysts for effecting the deoxydehydration reaction and using vanadium catalysts for oxidative lignin cleavage.



Dr. Adaickapillai Mahendran

With strong synthetic, analytical and medicinal chemistry backgrounds, Dr. Mahendran specialties are:

- Medicinal chemistry
- Design and synthesis of histone deacetylase enzyme inhibitors
- Target analysis and molecular modeling
- Physical organic chemistry
- Multi-step organic synthesis
- Production of milli-gram to multi-gram amounts of target compound
- Characterization of intermediates and products using a full scope of instrumentation
- Modeling reaction mechanism with computational DFT calculations (Gaussian-09)
- Mentoring graduate and undergraduate students to their success in research
- Method development (HPLC, GC and LC-MS-TOF)
- Fiber-optic guided site-specific drug delivery



Dr. Thomas J Osberger

Synthetic organic chemistry has matured as a field considerably over the last 100 years, and it is now possible to envision applying the tools of this discipline to address the construction of any number of extremely complex targets – large molecules presenting complex architectures containing many rings, functional groups, and stereocenters, for example. However, one of the central challenges facing modern organic chemistry is the development of new strategies and techniques to rapidly build up molecular complexity. Novel and direct transformations can maximize the complexity generation of each synthetic step while minimizing waste, which increases the overall efficiency of a synthesis. The research envisioned in the Osberger Group broadly aims to address this challenge through the development and application of modern methods in organic synthesis and catalysis to achieve the construction of complex, biologically active molecules in efficient synthetic sequences, with the ultimate aim of collaboratively exploring their function.

Physical Chemistry



Dr. Samir J. Anz

Samir Anz Receives Outstanding Faculty Advisor Award: Professor Samir Anz from the Department of Chemistry and Biochemistry was chosen by the College of Science to receive the Outstanding Faculty Advisor Award for his support of student success.



Dr. Timothy Corcoran

We develop novel spectroscopic imaging techniques and instrumentation, mostly visible or near-infrared laser-based. Several projects are under way: 1) High-speed fluorescence spectroscopy for flowing capillary analysis of biomaterials with multiple fluorescent tags. 2) Raman imaging microscopy, finding the chemical fingerprints of surfaces. 3) Rapid, compact fluorescence confocal microscopy, aiming for 3D imaging of biological samples easily and cheaply. 4) Hyperspectral imaging for agricultural applications, helping farmers make best use their water. 5) Digital filter functions for immediate analysis of large spectroscopic data sets.



Dr. Bohdan Schatschneider

Dr. Schatschneider earned his PhD from UCR in 2008 working on molecular dynamics in molecular crystals under extreme conditions. In his postdoc, he conducted single molecule FRET investigations on HIV protease. He moved to Cal Poly Pomona where his NSF-funded research focuses on physicochemical properties of organic materials.

Chemistry Education



Dr. Michael Page

Associate Dean of the College of Science and former Chair of the Chemistry & Biochemistry Department. Research Dealing with Fatty Acid Methyl Esters (FAME) has a special niche at a polytechnic university. Alternative fuel research blends hands-on education with emerging technologies. Seed oils from plants consist of triglycerides that have demonstrated utility in the synthesis of Biodiesel. Value can be added to this budding industry by using organic chemistry to repurpose FAMEs as a feedstock in the synthesis of polymeric “Green” plastics and urethanes. Through our partnership with the USDA ARS, our goal to provide addition avenues for the use of biodiesel in consumer products in place of petroleum-based compounds.



Dr. Laurie Starkey

My research interests lie in the areas of both Chemical Education and Organic Synthesis. My main focus in Chem. Ed. Research is the utilization of technology in teaching and learning, especially in the Organic teaching labs. Recent activities include the creation of online pre-lab quizzes, online lab tutorials/demonstrations, and the use of “clickers” in the classroom (student response systems). Student research projects could involve the development of new online tools, or measuring the impact of such resources on student learning. My laboratory research projects involve the development and optimization of new experiments for the undergraduate Organic teaching labs. The goals of any new experiment include discovering interesting synthetic transformations and laboratory techniques, while being learning-centered, safe, time-efficient, cost-efficient, environmentally friendly (green), and inquiry-based.



Dr. Jodye Selco

My research has been focused upon Chemical Education. We have been studying the effectiveness of instructional methods and curriculum on the learning success of students. I have been working with Rialto USD to develop "Common Laboratory" experiences for students at each grade. These experiments are aligned with the Next Generation Science Standards and all involve doing science to learn science. Now that these experiments are being used district-wide, we need to examine how well the students are learning from these experiences.

I have also been involved in Physical Chemistry research; as an experimentalist I have examined the spectroscopy, photochemistry, and kinetics of small organic molecules (e.g. pyridine). Most recently we investigated natural products as a source of compounds that could be used as sunblock.

Computer Science Faculty Expertise



Dr. Abdelfattah Amamra

Dr. Amamra received the Ph.D. degree in Computer Science and Information Security from University of Quebec School of Higher Technology, and a Master of Engineering degree in Computer Engineering from Concordia University. His research topics include Smartphone Security, Network Security, Data Driven Cyber Security and Machine Learning.



Dr. Tingting Chen

Dr. Chen graduated with a Ph.D. degree from Computer Science and Engineering Department, at State University of New York at Buffalo, in June 2011. From August 2011 to June 2014, I worked as an assistant professor in Computer Science Department, Oklahoma State University.

My current research interests include big data security and privacy, health informatics and cybersecurity in general. My work has been supported by National Science Foundation, Microsoft Inc, California State Polytechnic University, Oklahoma Center for the Advancement of Science and Technology, Amazon Inc, and Oklahoma State University. I am the director of [NSF REU Site in Big Data Security and Privacy](#) at Cal Poly Pomona. It is now accepting applications from undergraduate students for summer 2020. To apply, please visit [here](#).



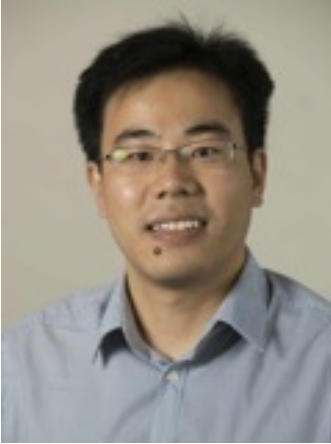
Dr. Markus Eger

The SlothLab website is now online. (More) content will be added soon. SlothLab is the name of the research group under the direction of Dr. Markus Eger at the University of Costa Rica. We do research on AI in games, mainly to study the interaction of the players with the game and how it can be improved.



Dr. Mohammad Husain

Dr. Husain is a Professor and the Inaugural Director of the PolySec Cyber Lab, a Center for Cyber Security and Forensics Education, Research, and Outreach in the Department of Computer Science at the California State Polytechnic University, Pomona (Cal Poly Pomona), CA. He has over five years' experience in leadership, development, and administration of Computer Science and Cyber Security academic and co-curricular programs at a comprehensive university. He has significant leadership experience in extramural funding, graduate program, financial and strategic planning, assessment and accreditation, faculty governance, and building academic vision in diverse academic environments. His academic vision and leadership skills have resulted in state and national-level programs and diverse academic settings across multiple institutions.



Dr. Hao Ji

Dr. Ji is currently an Assistant Professor in the Department of Computer Science at California State Polytechnic University, Pomona. His research interests include Adversarial Machine Learning, Computer Vision, and High-Performance Computing. His research projects have been supported by NSF, XSEDE, and California State Polytechnic University, Pomona. He received the Modeling and Simulation research fellowship from the Virginia Modeling, Analysis and Simulation center at Old Dominion University. He received the Gene Newman awards for excellence in Modeling and Simulation research at Old Dominion University in 2014 and 2015, respectively, and the Provost's Teacher-Scholar Awards at California State Polytechnic University, Pomona from 2018 to 2021, respectively.



Dr. John Korah

Dr. Korah is in the Department of Computer Science at Cal Poly Pomona. Research topics include:

- **High Performance Computing:** Large and dynamic social network analysis using anytime anywhere algorithms
- **Health Policy Modeling:** Modeling complex human decision making in cross-border disease spread and information dissemination of health care guidelines
- **Big Data Analytics:** Parallel/Distributed processing frameworks for time and resource bound information retrieval applications in large and dynamic search spaces
- **Cyber Security:** Insider threat modeling in cyber systems utilizing computational behavioral modeling and machine learning techniques for threat detection
- **Computational Social Systems:** Modeling complex real-world scenarios such as political instability, and social resilience
- **Performance Modeling & Analysis:** Network load and performance modeling in network centric systems



Dr. Ericsson Santana Marin

I earned a Ph.D. in Computer Science from [Arizona State University](#), USA (2020), where I proposed a hacker-centric perspective to empower cyber-defense. I have worked from 2001 until 2010 in my own software factory [Marin Solutions](#), where my team designed custom-built, requirements-oriented, high-performance software solutions for different type of companies.

My current research interests are in the proactive cyber-threat intelligence area, where I apply artificial intelligence, machine learning, and social network analysis into cybersecurity to predict future cyber-threats against organizations. Feel free to check all information provided in this website, especially my current research projects. I am also the director of the Cyber Adaptive Learning Systems Laboratory ([CALSys Lab](#)) at Cal Poly Pomona. It usually offers research assistant positions for undergraduate and graduate students interested in gaining real-world research experience.



Dr. Amar Raheja

I am a Professor in the Department of Computer Science in the College of Science at California State Polytechnic University, Pomona. My research interests are in the area of image processing, computer vision and the applications of soft computing methods such as neural networks, fuzzy logic, genetic algorithms, etc. I also have some interest in bioinformatics. I am a member of the [IEEE](#) Engineering in Medicine and Biology Society, Computer Society and the [ACM](#) .



Dr. Salam N. Salloum, Professor

Fields of Research and Interest--Algorithm Design, Database, Fault-Tolerant Computing and Systems, Discrete Optimization, Software Engineering, Interconnection and Sorting Networks, Computer Architecture(High-Speed Arithmetic, Residue-Number System), and Information Security.



Dr. Ben Steichen

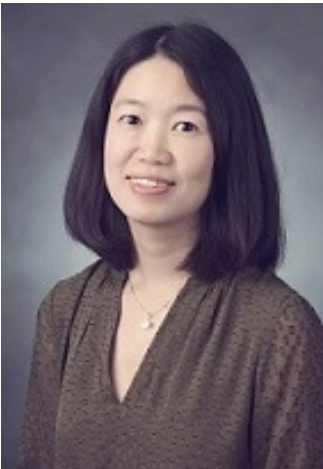
Dr. Steichen is interested in Human-Centered Computing and Personalized Information Access, which involves techniques and concepts from the fields of HCI, Information Retrieval & Visualization, and Web & Data Science.

Before moving to CPP, he was an Assistant Professor at [Santa Clara University](#). Prior to this, he was a Postdoctoral Research Fellow at the [University of British Columbia](#). He received his PhD from [Trinity College Dublin](#) (TCD), an M.Sc. degree in Computer Science from TCD, and a First Class Honours B.Sc. degree in Computing Sciences from the [University of East Anglia](#).



Dr. Adam J. Summerville

My research focuses on Games and Artificial Intelligence. This ranges from critical studies of games, to the algorithmic learning and creation of content for games, to the development of artificial intelligence techniques to enable new and creative game experiences. I received my PhD from UC Santa Cruz in 2018 under the wonderful advisement of Michael Mateas and Noah Wardrip-Fruin.



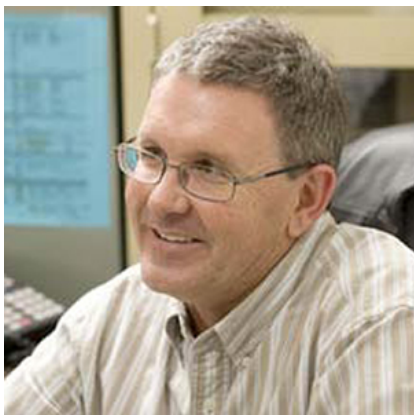
Dr. Fang Tang

Robotics and AI, especially multi-robot systems, human-robot interaction, machine learning, multi-agent systems, and educational robotics.

My research vision is to build a complex human-robot system, in which humans and robots can cooperate seamlessly in the real world, with robot assisting humans to accomplish tasks, learning from experience, and adapting to new situations. My current research aims towards building multi-robot coalitions to accomplish complex applications. With the assistance from human operators, the overall human-robot team can achieve the robustness, effectiveness, and flexibility of the team solution in uncertain and dynamic situations.

Geology Faculty Expertise

Geology Sciences



Dr. Jonathan Nourse

Specialties: Structural Geology, Tectonics, Mineral Exploration, Engineering Geology, GIS Applications, Hydrogeology. Research projects include (1) Proterozoic basement geology of the NW Sonora-SW Arizona border region, (2) Geological mapping and fault reconstructions in the San Gabriel Mountains and NE Los Angeles basin, (3) Stream flow and hydrogeology of the San Gabriel Mountains, (4) Miocene and Pliocene conglomerates exposed near Puddingstone Lake and in the San Jose Hills, (5) Tertiary extension in northern Sonora, Mexico, and (6) Late Jurassic pull-apart basins in northern Sonora and southern Arizona.



Dr. Bryan Murray

My research generally focuses on how tectonic processes influence the depositional record of sedimentary and volcanic rocks in ancient basins. My research is primarily field-based, combining detailed geologic mapping, sedimentology, stratigraphy, physical volcanology, and structural geology with a variety of laboratory techniques including provenance analyses, petrography, and geochronology. My research areas include the northern Altiplano (Bolivia), the northern Sierra Madre Occidental (Chihuahua, Mexico), and the Calico Mountains (Mojave Desert, CA).



Dr. Stephen Osborn

Specialties: Hydrogeology, Aqueous Geochemistry, Groundwater Remediation, Energy and Environment. My research interests broadly consist of utilizing elemental and isotopic analyses of multiple substrates (gas, rock, and water) to address fundamental questions of fluid and solute transport, biogeochemistry of solutes and radionuclides, microbial processes, and diagenetically induced water-rock reactions in subsurface environments.



Dr. Polet, Jascha

Specialties: Seismology, Geophysics, Hazards Assessment, Tsunami. My main research interests are in the field of observational seismology: learning about the Earth's structure and earthquake source processes from records of ground motion, as well as shallow subsurface geophysics, especially as related to fault detection and characterization. Because Geophysics is not a well-known field, especially in undergraduate programs, I have put together some information on [what Geophysics is all about](#) (with a pretty obvious bias towards my own field of seismology).



Dr. Nicholas Van Buer

Specialties: Petrology, Geochronology, Field Geology, Tectonics, Geographic Information Systems. I investigate a broad variety of tectonic problems using petrology, geochemistry and geochronology, in concert with geologic mapping. Many of my research advisees learn to use our department's X-ray fluorescence spectrometer, rock fabrication and mineral separation equipment, or GIS or petrological modeling software. Current Focus: Tectonic Evolution of the Western Mojave

Geology Education



Dr. Jeffrey Marshall

Specialty areas are geomorphology, neotectonics, geologic hazards, watershed restoration and coastal geology. Recent research projects have included (1) Tectonic geomorphology and paleo-river terraces of the Río Ora Valley, Nicoya Peninsula, Costa Rica, (2) Variations in tectonic uplift patterns based on stream length gradient indices, Nicoya Peninsula, Costa Rica, (3) Digital terrain analysis of an active tectonic landscape using ArcGIS, Nicoya Peninsula, Costa Rica, (4) Tectonic geomorphology of mountain front alluvial fans with implications for basinward fault propagation, San Antonio Canyon area, San Gabriel Mountains in Southern California.



Dr. Jessica Perez

Dr. Perez earned her bachelor's degree in geology from Cal Poly Pomona, is faculty in the Geological Sciences Department and a faculty member of electromechanical engineering technology. She specializes in qualitative research to understand how people see engineering, has studied women in various stages of their engineering education, and analyzes engineering gatekeeper courses. Since women earn bachelor's degrees in engineering at a rate of less than 17 percent at public universities in California, the study was completed to understand how women experience undergraduate engineering programs.

Kinesiology Faculty Expertise



Dr. Laura Chase

Specialty: Socio-Cultural. She is currently an active member of the North American Society for the Sociology of Sport, the North American Society for Sport History, the International Sociology of Sport Association and the Western Society for Physical Education of College Women (WSPECW). Dr. Chase predominately publishes in the areas of sociology and history of sport and exercise with a focus on issues of the body, physicality, obesity and the social construction of fat and fatness. Dr. Chase competed in both soccer and ice hockey at the university level in Canada. She still plays ice hockey, mountain bikes and has two Siberian huskies.



Dr. Kristine Fish

Specialty: Health Promotion. Her work focuses on teaching people how to permanently adopt healthy behaviors, building up emotional resilience, understanding the importance of the mind body connection, and improving overall health and well-being. Dr. Fish's passion, educational training, and teaching experience are in the area of developing, implementing, and evaluating effective and comprehensive health education programs, especially those pertaining to stress management and emotional resilience. Her primary research interest lies in the area of online learning and stress management.



Dr. Ken Hansen

Specialty: Education/Pedagogy. Areas of special interest include Affective Teaching and Learning, Cultural Diversity in Physical Education and Qualitative Research Design.



Dr. Mai Jara

Specialty: Movement Disability. Her research Interests are Attitudes and perceptions towards people with disability, Quality of life through exercise, Academic success through Student Service Learning program in higher education, Exercise intervention with people with disabilities, Gait & Balance analysis in people with disabilities.



Dr. Lara Killick

Specialty: Socio-Cultural. My research is located with the broad discipline of Sociology of health, with a specialty in Sport Studies. I contribute to the body of knowledge around (young) people's embodied understandings of sports injury, pain, risk and health.



Dr. Minhyuk Kwon

Specialty: Biomechanics/Motor Control. Studies Neuromuscular Control of Movement. Experience includes motor control & learning, as well as sports science. Teaches Introduction to Biomechanics (KIN3040), Biomechanics Lab (KIN3040L), and Dimensions of the Aging Process (KIN3650).



Dr. Srdjan Lemez

Specialty: Socio-Cultural. I completed my PhD in the Lifespan Health and Performance Laboratory in the School of Kinesiology and Health Science, at York University, Canada. I am currently working as an Assistant Professor at California State Polytechnic University, Pomona within the Kinesiology and Health Promotion Department. My research program explores health, wellness, and development through sport and exercise using the biopsychosocial framework, with a specific focus on (i) epidemiology (i.e., mortality and morbidity in elite/retired athletes); (ii) psychosocial constraints and outcomes associated with sport participation (e.g., self-identity, participation biases in youth sport), and; (iii) skill acquisition in athletes and athletes with disabilities.



Dr. Michael Liang

Specialty: Exercise Science

Co-authored the textbook, “Exercise Prescription for Healthy Living.” The textbook introduces practical approaches to improving and maintaining physical capacity and health through exercise. Exercise Prescription for Healthy Living includes useful prevention approaches to lower the risk of chronic diseases such as heart attack, cancer, lung disease, diabetes, etc.



Dr. Andrea Metzker

Specialty: Education/Pedagogy. Dr. Metzker’s passion is moving, teaching people to move to their best potential and teaching students to teach students to move! “I am so lucky to be able to spend each day doing what I love.” Many of my classes have an "S" designation which is for service-learning. I am actively involved with working with I-Poly high school and my students frequently get to teach the high school students as a part of my classes.

Mathematics Faculty Expertise

Name	Emphasis	Research Areas
Dr. Charles F. Amelin	Mathematics	Fredholm Theory, Index Theorems, Commutators of Linear Operators
Dr. Stacy Brown	Math Education	Mathematics Education
Dr. J. Arlo Caine	Mathematics	Mathematical Physics, Poisson Geometry, Lie Groups, and Functional Analysis
Dr. Jillian Cannons	Mathematics	Applied Mathematics, Optimization, Robotics
Dr. Dhanwant Singh Gill	Probability/Statistics	Multivariate Analysis, Data Analysis, Sample Surveys
Dr. Briana Foster-Greenwood	Mathematics	Reflection Groups, Noncommutative Algebra (deformations of skew group rings), Graphs in Abstract Algebra (Cayley graphs, graph splines)
Dr. Berit Givens	Mathematics	Topology, Set Theory, Semigroups
Dr. Michael Green	Probability/Statistics	Stochastic Calculus, Markov Processes
Dr. Patricia Hale	Math Education	Mathematics Education, Women in Math, Science & Engineering
Dr. Hoon Kim	Probability/Statistics	Bayesian Inference, Hierarchical Modeling, Statistical Consulting
Dr. Adam King	Probability/Statistics	Survival Analysis, Bayesian Computation, Machine Learning, Statistical Programming Languages and Software Development
Dr. Alan C. Krinik	Probability/Statistics	Queueing Theory, Applied Probability, Random Processes
Dr. Mits Kobayashi	Mathematics	Number Theory
Dr. Fernando Lopez-Garcia	Mathematics	Analysis: Function Spaces, Poincaré and Related Inequalities, Weighted Estimates
Dr. Ioana Mihaila	Mathematics	Complex Analysis, Knot Theory
Dr. Chris Jungwon Mun	Probability/Statistics	Repeated Measurements, Nonlinear Models, Semiparametric Regression, Mixed Effect Models
Dr. Stacy Musgrave	Math Education	Mathematics Education
Dr. Martin M. Nakashima	Mathematics	Mathematical Physics
Dr. Kamta Rai	Probability/Statistics	Dose-Response Models, Risk Assessment, Survival Analysis
Dr. Laurie Riggs	Math Education	Math and Statistics Education, Teacher Professional Development, Use of Technology
Dr. Jimmy Risk	Probability/Statistics	Computational Statistics, Machine Learning, Gaussian Processes, Actuarial Science, Financial Mathematics, Mortality Modeling
Dr. John A. Rock	Mathematics	Fractal Geometry, Dynamical Systems, and Multifractal Analysis

Dr. Amber Rosin	Mathematics	Noncommutative Rings and Semigroups
Dr. Randall Swift	Probability/Statistics	Harmonizable Processes, Birth-Death Processes and Queueing Theory, Differential Equations
Dr. Jennifer Switkes	Mathematics	Mathematical Modeling
Dr. Ryan Szymowski	Mathematics	Applied Analysis and Nonlinear PDEs
Dr. Hubertus von Bremen	Mathematics	Dynamical Systems, Computational Biology, Feedback Control of Structural Systems
Dr. Greisy Winicki-Landman	Math Education	Mathematics Education, Teacher Education, Proof of Problem Solving
Dr. Weiqing Xie	Mathematics	Differential Equations, Applied Mathematics
Dr. Harriet Lord	Mathematics	Categorical Topology
Dr. Alan Radnitz	Mathematics	Functional Analysis
Dr. Lilian Metlitzky	Mathematics	Coordinator of the Early Assessment Program

Physics Faculty Expertise

Astronomy & Astrophysics



Dr. Shohreh Abdolrahimi

Works on theoretical gravitational physics and computational general relativity. She studies black holes. Black holes are powerful enough that they warp the fabric of spacetime and serve as a natural experiment where researchers can theoretically "test" the validity of Einstein's general relativity, and investigate alternative theories. Some of Dr. Abdolrahimi's favorite topics include classical and quantum gravity, black hole physics, large extra dimensions and black hole production at the Large Hadron Collider (LHC), quantum field theory in a curved spacetime, and quantum effects in accelerated frames. Students working with Dr. Abdolrahimi study different aspects of black holes, such as the black hole properties, study the images of the black holes, and investigate the motion of charged test particle which is the basis for understanding the influence of the magnetic fields on the accretion phenomena into a black hole.



Dr. Breanna Binder

Studies the births and deaths of massive stars, both in our own Milky Way and in nearby galaxies. She uses multiwavelength observations to study X-ray binaries — star systems composed of a black hole or neutron star that is gravitationally bound to a normal companion star, to better understand their formation and evolution. Students working with Dr. Binder have investigated black hole binaries, supernova "impostors," and the remains of binary merger events. Dr. Binder also collaborates with Dr. Matthew Povich to study massive star clusters and H II regions.



Dr. Matthew S. Povich

Studies the formation and evolution of massive star clusters/associations and their H II regions in our Milky Way Galaxy. His research involves the analysis of large astronomical datasets obtained primarily through survey observations in the X-ray, infrared, and radio. Dr. Povich is a core member of the GLIMPSE and MYStIX research collaborations and lead scientist for the Milky Way Project. He is the Associate Director of CAMPARE and the first Cal Poly Pomona faculty member to receive an NSF CAREER award. Students working with Dr. Povich have pursued a variety of research projects, including triggered star formation, protoplanetary disks, stellar wind bow shocks, citizen science, and SETI.

Optics and Biophysics



Dr. Krishna Sigdel

Uses Atomic force microscopy to probe the biomolecules in single molecule level. He studies the structure and dynamics of membrane proteins in near native environment and at physiological condition. Dr. Sigdel is currently developing his lab and will be installing an atomic force microscope to study membrane proteins. His research is fully interdisciplinary where student from Physics, Engineering, Chemistry/Biochemistry, and Biology can work. Dr. Sigdel also collaborates with Dr. Arthur Roberts from College of Pharmacy, University of Georgia, Athens to study membrane protein-drug interaction and Prof. Steve White at University of California Irvine for membrane protein-lipid interaction studies.



Dr. Alex Small

Studies two simple questions: How much information is carried by a beam of light, and how can we use this knowledge to extract information from a live cell? Dr. Small studies the fundamental limits to superresolution microscopy, a family of fluorescence techniques that enable imaging of cells at nanometer resolution, revealing details not accessible to a conventional light microscope. As a theorist, Dr. Small's work is mostly focused on understanding the theory that replaces Abbe's diffraction limit, understanding the ways in which image analysis algorithms work with superresolution and developing and benchmarking computational tools for superresolution. Additionally, Dr. Small has projects in light scattering (developing analytical and computational tools for studying scattering from particles in novel geometries) and percolation theory, focused on percolation in networks with novel structures applicable to new materials systems, and also applying some percolation insights to theoretical work on superresolution.



Dr. Nina Abramzon

Uses optical emission spectroscopy to study different plasma characteristics, such as composition and temperature. Dr. Abramzon studies the effects of atmospheric pressure plasmas on sterilization of biofilms, and spores. She also studies surface modification using gas discharge plasma. The applications of the surface treatment work include biofilm growth prevention on prosthetic replacements and enhancement of the binding of antibodies to glass surfaces. Dr. Abramzon collaborates on these projects with faculty from Biology, Physics and Material Science. Some of the instruments in Dr. Abramzon's lab include three SURFX atmospheric pressure plasma reactors and various spectrometers including Optics spectrometers HR 4000 Ocean and an Acton SP2156 Spectrometer with PIXIS100 CCD detector.



Dr. Kurt Vandervoort

Has collaborated with faculty in physics and biology to study the effects of gas discharge plasmas on bacterial biofilms. He works with student coworkers to use an atomic force microscope to image the bacteria before and after plasma treatment. In addition, the "probe" of this scanning probe microscope is used to ascertain the micromechanical properties of the individual bacterium. Along with instrumentation designed for other research (see [Solid State Physics](#)) Dr. Vandervoort's lab houses the Quesant atomic force microscope.

Physics/Astronomy Education



Dr. Homeyra Sadaghiani

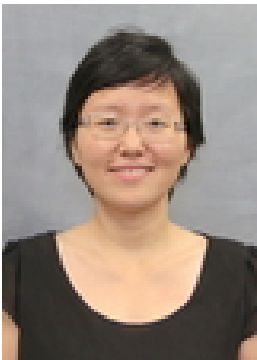
Has a broad range of research interests including:

- Studying student difficulties in upper level quantum physics in two paradigms: Spin First vs. position first
- Development & validation study of research-based assessments in upper-level quantum mechanics
- Measurement of scientific reasoning ability and conceptual understanding of physics content.
- Effectiveness of different range of scientific inquiry approaches in preparation of prospective and practicing k-12 teachers.
- Conceptual and mathematical barriers to students learning quantum mechanics.
- Design and implementation of web-based instructional technologies and study of Hybrid-online and flipped classroom formats.
- Effectiveness of different curricula, course transformations, and pedagogical strategies.



Dr. Alexander Rudolph

Conducts both AER and PER. His AER work has focused on learning in large, general-education (GE) astronomy classes, known collectively as Astro 101. He was part of a team led by Dr. Ed Prather of the [Center for Astronomy Education \(CAE\)](#) at the University of Arizona that conducted a national study of Astro 101 classes including over 4000 students in 69 classrooms at 31 universities. He has also studied the role of textbooks in the Astro 101 classroom. His PER research has focused on the introduction of interactive learning strategies into the French university physics classroom. While on sabbatical, he led a study of student learning in two large (many hundreds) enrollment introductory physics classes, second semester mechanics and introductory electromagnetism (E&M) at the Université Pierre et Marie Curie (UPMC) in Paris, France. He also conducts research in [Astronomy and Astrophysics](#), and is the Director of the [CAMPARE](#) research program for undergraduates.



Dr. Qing Ryan

Has the following research interests

- Students' use of diagrams in upper division problem-solving.
- How do social psychological variables affect students' performances.
- Studying student difficulties in upper-level physics courses.
- Development of research-based assessments in junior level E&M.
- Effectiveness of different range of scientific inquiry approaches in preparation of prospective and practicing k-12 teachers.

Her recent work involves studying how do students' interest relate to their performance in an introductory physics course. She also worked on the use of machine learning algorithms in predicting students' performance. Another project she is interested in working on is how to students use diagrams to solve physics problems in upper-division courses.