College of Science Faculty Expertise for Advising

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Updated Fall 2025

Professional School Advisors

Undeclared, Exploratory and Pre-Health

Ashley Duran, M.S.
Location: Student Services Building, First Floor (Blue Counter)

Biological Sciences Faculty Expertise

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. 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. 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 longstanding questions through their research.

Dr. Andrea Bonioli 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. 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. Jeremy Claisse

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. Wendy 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 DNAreplication 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 (∆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. Suryatapa Jha

My research group at Cal Poly Pomona seeks to address these gaps by investigating:
A) How adverse conditions have contributed to the evolution of cellular complexity in plants, and
B) How can we comprehensively map the factors that drive the integration of cell-based information throughout the whole organism for developmental decision making.
To pursue these questions, we focus on the cellular physiology of the model plant Arabidopsis thaliana. Current projects examine the endomembrane system at distinct peripheral domains—including the plasma membrane, ER–membrane contact sites (ER-MCSs), and plasmodesmata—to uncover their roles in supporting growth and resilience under environmental stress.

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. A. 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. 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. Tatiane 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. 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. Junjun Liu

This lab investigates the molecular mechanisms governing the regulation of metastasis, with a particular focus on the role of epigenetic modifications. Specifically, we are studying how the ubiquitination and deubiquitination of histone H2A influence the migration and invasion of breast cancer cells. This project is conducted in collaboration with the City of Hope Cancer Research Institute and is supported by funding from the NIH.

Dr. Frances 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 (trogo= 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. 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.

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. Nicole Reynolds

I am a mycologist who is particularly interested in the more ancient groups of early-diverging fungi. My study of these groups focuses on the diversity, evolutionary history, basic biology, and ecology of these intriguing fungi. Many of the species I work with are involved in a variety of symbiotic associations, from living inside the guts of insects, to parasitizing other fungi and small animals, to endosymbiotic bacteria that dwell within fungal cells. I like to utilize both more "traditional" techniques (e.g. microscopy, culturing) as well as modern molecular tools (e.g. genomics and amplicon sequencing) in my research.

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 Shama

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 transition to flowering in plants.

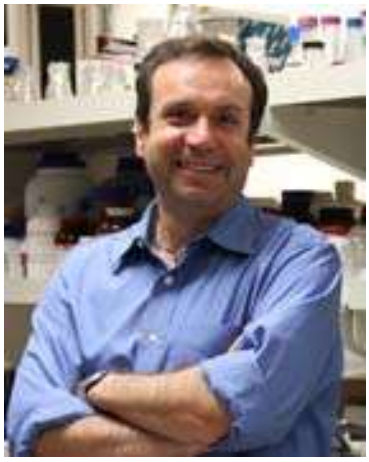
Dr. Jayson Smith

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.

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.



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.

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

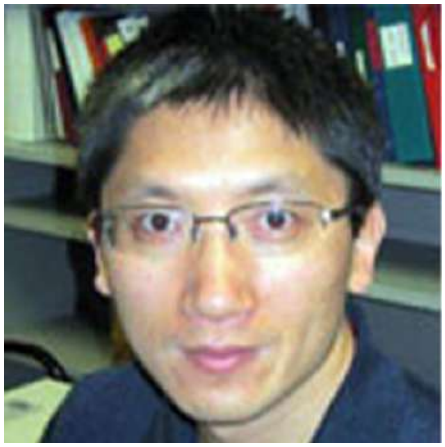
biology of stem cell behavior and help shine light on issues such as obesity, aging, stem cell therapy and consumer product safety.

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.

Dr. Stephanie L. Mora Garcia

The research group will investigate the reactions of diesel exhaust particulate matter with oxides of nitrogen to investigate the possible reintroduction of reactive nitrogen oxides into the atmosphere. Diesel exhaust particulate matter (DEPM) refers to the conglomerate carbonaceous particles that are formed from the exhaust of diesel operating vehicles and deposit on surfaces or stay airborne depending on size and phase. The lab will conduct laboratory studies of these heterogenous reactions of oxides of nitrogen with molecular models of DEPM to elucidate the atmospheric reactions in areas impacted by heavy diesel traffic in the hopes to better understand the change in air quality brought on by the increase in warehouses in disadvantaged communities.

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, NO1-, 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.

Organic Chemistry

Dr. Rohit Bhide

To enhance the recovery of photocatalysts, our lab will create methods to covalently attach molecular photocatalysts to various substrates, such as cotton, glass wool, glass beads, and silica nanoparticles. Anchoring photocatalysts to these substrates will aid in their separation from the reaction mixture using common techniques of filtration or centrifugation. Moreover, we will perform the detailed characterization of our substrate-bound photocatalysts using well-established spectroscopic techniques. Results from the spectroscopic analyses will help us determine the effect of structure and properties of our photocatalysts on their catalytic performance and recovery. This work will be key in the development of the next-generation photocatalysts for the sustainable synthesis of complex organic compounds.

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.

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. 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 crosselectrophile 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 steps. We aim to harness the power of carbon-carbon bond forming reactions with oxetane motifs to rapidly install new carbon-carbon bonds.

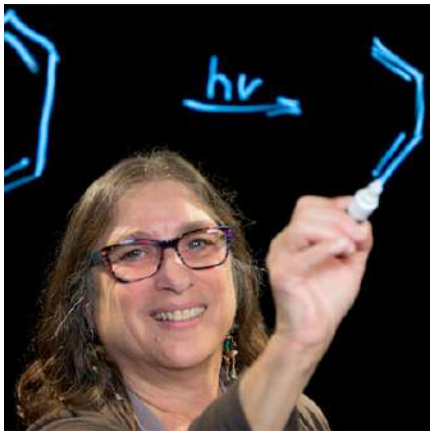
Physical Chemistry

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. Matt Capobianco
Two major issues facing humanity are developing alternative energy generation and water supply remediation. My research program will utilize spectroscopic techniques to study emerging materials that have applications in energy science and green chemistry. Projects will include optimizing solar cells' efficiencies and the pollutant degradation ability of different constructs of MoS2.

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



Dr. Joyde 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 | Website

Expertise: Android security, network security, malware analysis and detection, embedded system virtualization and security, anomaly detection, machine learning classifiers

Dr. Tingting Chen | Website

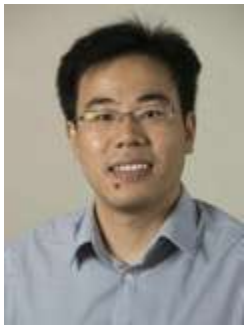
Expertise: Big data security and privacy, health informatics, and cybersecurity in general

Dr. Mohammad Husain | Website

Expertise: Systems and network security, digital forensics in embedded systems and cloud computing, smartphone security and social applications, power-aware secure computing

Dr. Fatemeh Jamshidi | Website

Expertise: Artificial intelligence, computer science education, computer music, machine learning and deep learning in music, game AI, game music, XR and mixed reality, large language models in music, human-AI cooperation



Dr. Hao Ji | Website

Expertise: Big data analysis, high performance computing, large-scale linear algebra

Dr. John Korah | Website

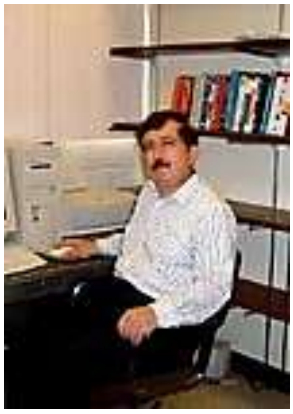
Expertise: Parallel & distributed algorithm design, high performance computing, large & dynamic network analysis, computational social systems, cybersecurity, parallel/distributed information retrieval, modeling & simulation

Dr. Ericsson Santana Marin | Website

Expertise: Cyber-threat intelligence, social network analysis, network science, machine learning, data mining, artificial intelligence

Dr. Amar Raheja | Website

Expertise: Image processing, computer vision, machine learning, multidimensional data analysis and visualization, applied AI (biomedical, agriculture, controls, geology)



Dr. Salam Salloum | Website

Expertise: Fault tolerant computing, computer architecture (arithmetic, sorting networks, interconnection networks), algorithm design, software engineering, database theory & design, information security

 **Dr. Wendy Shi**

Expertise: Human-computer interaction, computing education, collaborative and social computing, learning analytics, educational data mining, AI in education, data visualization, future of work

 **Dr. Ben Steichen | Website**

Expertise: Human-centered computing, personalization, adaptive information retrieval & visualization, web & data science, multilingualism

 **Dr. Yu Sun | Website**

Expertise: Software engineering, cloud computing, mobile computing, software entrepreneurship

 **Dr. Daisy Tang | Website**
Expertise: Robotics, AI, human-robot interaction, machine learning, multi-agent systems, educational robotics

 **Dr. Yunsheng Wang | Website**
Expertise: Wireless networks and mobile computing, AIoT, connected and autonomous vehicles, edge computing, cybersecurity

 **Dr. Mingyan Xiao | Website**
Expertise: Privacy preserving, mobile crowdsourcing, system security

 **Dr. Lan Yang | Website**

Expertise: Big data analytics, cloud computing, web-based software development, parallel and distributed computing, computer architecture

 **Dr. G. S. Young | Website**

Expertise: Parallel and distributed computing, computer networks, parallel computer architecture, supercomputing, scheduling, combinatorial optimization

Geology Faculty Expertise

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 waterrock reactions in subsurface environments.

 **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

 **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.

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. Gyasmine George-Williams

Dr. Gyasmine George-Williams is the sports justice alchemist of academia — blending scholarship, soul, and strategy to revolutionize how we understand sport, education, and liberation. As a tenured professor of Race, Sport, and Social Justice at California State Polytechnic University, Pomona, she is the visionary creator of SportsCrit™, a groundbreaking pedagogy that merges critical race theory, athlete activism, and intersectional justice to challenge dominant narratives in sport and society.

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. Zakkoyya Lewis-Trammell

Dr. Koyya joined Cal Poly Pomona in August 2019 in Kinesiology and Health Promotion. She teaches undergraduate and graduate courses within the department exercise science track including Health and Well-being, Movement Anatomy & Kinesiology, Sports Medicine, and Exercise Prescription & Fitness Testing. Her research interests include physical activity promotion, wearable activity monitors and other exercise technologies, exercise prescription, and Exercise is Medicine.

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.

 **Dr. Chloe Simpson**

Assistant Professor, Kinesiology and Health Promotion B.S., California State University, Sacramento, 2015; M.S., Oregon State University, 2018; Ph.D., West Virginia University, 2022.

Mathematics Faculty Expertise

Name	Emphasis	Research Areas	Email:
Dr. Manuchehr Aminian	Applied Mathematics, Statistics	Time series; Omics data; Mathematical data science; Mixing in fluids; Data science for social justice	maminian@cpp.edu
Dr. Stacy Brown	Mathematics Education	Learning and learning environments in advanced undergraduate mathematics, with a focus on students' enculturation to the practice of proving; Spatial noticing in the context of 2-D and 3-D mathematical artifacts; The role of professional development on K-6 teachers' mathematical knowledge for teaching and its impact on student outcomes.	brown@cpp.edu
Dr. J. Arlo Caine	Mathematics	Mathematical Physics; Poisson Geometry; Lie Groups; Functional Analysis	jacaine@cpp.edu
Dr. Jillian Cannons	Applied Mathematics	Optimization; Robotics	jlcannons@cpp.edu
Dr. Anne Cawley	Mathematics Education	DEI; Sense of belonging; Students’ experiences in math courses; Math faculty instructional practices; Professional development of math faculty	acawley@cpp.edu

Dr. Briana Foster-Greenwood	Pure Mathematics	Graph Theory; Reflection Groups; Noncommutative Algebra	brianaf@cpp.edu
Dr. Berit Givens	Pure Mathematics	Algebra; Combinatorics; Number Theory	bngivens@cpp.edu
Dr. Emily Heath	Pure Mathematics	Combinatorics; Graph Theory	eheath@cpp.edu
Dr. He Jiang	Statistics	Clustering; Mixture Modeling; Computational Statistics	hejiang@cpp.edu
Dr. Peter Kagey	Pure Mathematics	Combinatorics; Discrete Probability; Algorithms; Experimental Mathematics; Group Theory	pkagey@cpp.edu
Dr. Hoon Kim	Statistics	Bayesian Inference; Hierarchical Modeling; Cancer Mortality Rate; Statistical Consulting	hoonkim@cpp.edu
Dr. Adam King	Statistics	Discrete Time Survival Analysis; Bayesian Statistics; Machine Learning; Statistical Software Development	king@cpp.edu
Dr. Alan C. Krinik	Applied Mathematics, Pure Mathematics, Statistics	Explicit transient and steady state solutions of Markov chains and processes (solving various types of Gambler's Ruin problems in different settings and exploring queueing theory models using duality theory combined with various eigenvalue and eigenvector matrix representation); Combinatorics; Real Analysis	ackrinik@cpp.edu

Dr. Fernando Lopez-Garcia	Pure Mathematics	Functional inequalities in Sobolev spaces, such as Poincaré type inequalities, where the geometry of the domain plays a fundamental role. These results are used in the variational analysis of certain partial differential equations and the numerical analysis of their solutions. The spaces considered to study these inequalities are Sobolev spaces on bounded Euclidean domains, spaces with variable exponents, and graphs.	fal@cpp.edu
Dr. Ioana Mihaila	Pure Mathematics	Analysis; Problem Solving (competitions and math journals)	imihaila@cpp.edu
Dr. Chris Jungwon Mun	Statistics	Repeated Measurements, Nonlinear Models, Semiparametric Regression, Mixed Effect Models	jmun@cpp.edu
Dr. Stacy Musgrave	Mathematics Education	Mathematics Education	smmusgrave@cpp.edu
Dr. Laurie Riggs	Mathematics Education	Preparing mathematics teachers; Use of technology in the mathematics classroom	
Dr. Jimmy Risk	Statistics	Computational Statistics; Machine Learning; Gaussian Processes; Actuarial Science; Financial Mathematics; Mortality Modeling	jrisk@cpp.edu
Dr. John A. Rock	Pure Mathematics	Pedagogy of real analysis; Complex analysis; Topology; Measure theory; Functional	jarock@cpp.edu

		analysis from the perspective of arbitrarily close; Fractal Geometry	
Dr. Amber Rosin	Pure Mathematics	Recreational math (math related to games and dice)	arrosin@cpp.edu
Dr. Cristina Runnalls	Mathematics Education	Mathematics for Culturally and Linguistically Diverse Students; Pre-service and In-service Teacher Education; Social Justice in Mathematics	ccrunnalls@cpp.edu
Jill Shirley	Applied Mathematics; Mathematics Education	Mindset GPS in the Business Calculus Classroom	jshirley@cpp.edu
Dr. Randall Swift	Applied Mathematics, Pure Mathematics, Statistics	Probability Theory; Stochastic Processes; Functional Analysis; Differential Equations; Mathematical Modeling; Mathematical Epidemiology; Statistical Inference	rjswift@cpp.edu
Dr. Jennifer Switkes	Applied Mathematics	Mathematical Modeling	jmswitkes@cpp.edu
Dr. Ryan Szypowski	Applied Mathematics	Applied Analysis and Numerical PDEs	rsszypowski@cpp.edu
Dr. Noe Vidales	Statistics	Consistent variance estimators for serially correlated data; Clustering algorithms; Statistics applied to social science problems; Markov chains	nvidales@cpp.edu

Dr. Hubertus von Bremen	Applied Mathematics	Computational methods for nonlinear dynamical systems; Structural dynamics; Control of structures	hfvonbremen@cpp.edu
Dr. Greisy Winicki-Landman	Mathematics Education	Mathematical thinking; Visualization in mathematics learning; Mathematics teacher education; Philosophy of mathematics	greisyw@cpp.edu
Dr. Weiqing Xie	Applied Mathematics	Differential Equations	wxie@cpp.edu
Dr. Hyunkyoung Yoon	Mathematics Education	Generative AI in teaching and learning; Teacher education; Quantitative reasoning	hkyoon@cpp.edu

Physics Faculty Expertise

Astronomy & Astrophysics

Shohreh Abdolrahimi
Professor Abdolrahmi 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.
Email: sabdolrahimi@cpp.edu

Breanna Binder
Professor 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.
Website: https://www.cpp.edu/faculty/babinder/index.shtml

Matthew Povich
Professor 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 was 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 involving star formation rates, H II regions, massive stars, protoplanetary disks, stellar wind bow shocks, citizen science, and SETI.
Website: https://www.cpp.edu/faculty/mspovich/index.shtml

Coral Wheeler
Professor Wheeler's research involves running and analyzing the next generation of high resolution cosmological hydrodynamic galaxy simulations to make testable predictions for low mass (10^2 M_{Sun} < M^* < 10^7 M_{Sun}) galaxies that can be used to answer important questions about the Universe by looking no further than the neighborhood near our own Milky Way, where these tiny galaxies reside. The high dark matter content and shallow potential wells of these objects make them excellent testbeds for differing theories of galaxy formation. I simulate these low-mass galaxies at high enough resolution to test the extreme end of galaxy formation physics, investigate challenges to our current cosmological paradigm, and improve galaxy formation models. Armed with these theoretical tools and a wealth of observational data, my primary research objective is to answer important questions about our Universe such as: What is the nature of dark matter? What were the conditions of the early Universe? Do our galaxy formation models accurately describe all galaxies?
Email: cwheeler@cpp.edu

Experimental Physics

Nina Abramzon
Professor Abramzon studies the effects of atmospheric pressure plasmas on surface modification. The applications of the surface treatment work studied in the our lab include biofilm growth prevention, enhancement of the binding of antibodies to glass surfaces, and reduction of bone cement failure. She uses optical emission spectroscopy to study different plasma characteristics, such as composition and temperature in order to understand the mechanisms beyond the plasma process. She collaborates on these projects with faculty from Biology, Physics and Material Science. Some of the instruments in the 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.
Website: https://www.cpp.edu/faculty/nabramzon/index.shtml

Ertan Salik
Professor Salik specializes in the development of fiberoptic sensors, which can be used in physical, chemical, and biological detection. These sensors, referred to as single mode-multimode-single mode (SMS) fiber sensors in the literature, are highly sensitive to temperature and stress changes, making them ideal for structural health monitoring. Dr. Salik has also developed SMS sensors as biosensors capable of detecting proteins, viruses, and bacteria, with applications spanning medical diagnosis, food safety, environmental monitoring, and biodefense. Dr. Salik's lab is an interdisciplinary one, hosting students from diverse fields such as Physics, Biology, Electrical Engineering,

and Mechanical Engineering. The lab is equipped with an array of advanced instruments, including: multiple optics tables, numerous opto-mechanical and optical components, lasers, laser controllers, and optical spectrum analyzer (350-1700 nm), optical fiber components (couplers, amplifiers, polarization controllers, modulators, etc) , a 3D printer, oscilloscopes, function generators, a refrigerator/freezer, analytical balances, fume hood, microcentrifuge, hybridization oven.
Website: https://www.cpp.edu/faculty/esalik/index.shtml

Krishna Sigdel
Professor 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
Email: kpsigdel@cpp.edu

Kurt Vandervoort
Professor Vandervoort has used both scanning tunneling and atomic force microscopes in a variety of investigations. His most recent work involves studying the surface of moth eyes at the sub-micron scale. These surfaces consist of hexagonal arrays of cone shaped bumps about 100 nm in height, that inhibit light reflection, thus enhancing light absorption. This field of study has attracted significant interest due to many potential applications, for example, in micropatterning thin films to enhance the efficiency of solar cells.
Email: kvandervoort@cpp.edu

Optics and Biophysics

Siyu Li
Professor Li's research focuses on understanding biological assembly and membrane morphology through theoretical calculations and computational simulations. Dr. Li is particularly interested in how mechanical properties influence virus assembly, membrane budding, and elastic shell morphology. To explore these phenomena, Dr. Li has developed models to simulate the dynamics of macromolecular aggregation across various time scales to construct functional membrane structures. Dr. Li’s work has several applications, including the design of responsive shells to enhance the

functionality of nanoreactors, packaging of macromolecules for gene delivery, controlled protein assembly, and the development of principles for assembling microcompartments for biochemical or energy applications.
Email: siyul@cpp.edu

Ertan Salik
Professor Salik develops fiberoptic biosensors for detection of proteins, viruses, and bacteria for applications in medical diagnosis, food safety, environmental monitoring, and biodefense. Dr. Salik's lab is a truly interdisciplinary place filled by students majoring in various disciplines, such as, Physics, Biology, Electrical Engineering, and Mechanical Engineering. Dr. Salik's lab is equipped with instruments and supplies to conduct his interdisciplinary research. Some of the instruments in the lab include multiple optics tables, numerous opto-mechanical and optical components, lasers, laser controllers, and optical spectrum analyzer (350-1700 nm), optical fiber components (couplers, amplifiers, polarization controllers, modulators, etc) , a 3D printer, oscilloscopes, function generators, a refrigerator/freezer, analytical balances, fume hood, microcentrifuge, hybridization oven.
Website: https://www.cpp.edu/faculty/esalik/index.shtml

Krishna Sigdel
Professor 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
Email: kpsigdel@cpp.edu

Physics Education Research

Qing Ryan
Professor Ryan has the following research interests:

- Development of web-based computer coaches to improve students' physics problem-solving skills, at both the high school and college level.
- Studying student difficulties in upper-level physics courses.
- Understanding student difficulties of using mathematics in junior level E&M problem-solving.

- 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 student difficulties of using complex exponential math in junior level electrodynamics. She is also working on the development, validation, and statistical reliability tests for a new multiple-choice Electrodynamics Assessment Tool. Another project she is working on is the development of web-based computer coaches for high school physics.
Website: https://www.cpp.edu/faculty/qxryan/index.shtml

Homeyra Sadaghiani
Professor 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 and 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.

Her recent work involves comparing two different approaches in teaching quantum mechanics: “wave-function” (starting with continuous basis) vs. “spin first” (starting with discrete basis). She is also working on the development, validation, and statistical reliability tests for a new multiple-choice Quantum Mechanics Assessment Tool, which measures student learning of basic quantum topics. Her experimental techniques and analyses include student interviews, diagnostic tests, attitude and motivation surveys, exam question and video analysis.
Website: https://www.cpp.edu/faculty/hrsadaghiani/index.shtml

Theoretical Physics

Shohreh Abdolrahimi

Professor Abdolrahmi 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.

Jorge Botana Alcalde

Dr. Botana and his group of undergrad researchers have focused on the theoretical study of solid-state systems by using ab initio calculations. His group has studied the structural and chemical properties of crystalline matter under extreme conditions of pressure using density functional theory (DFT) calculations, aided by the systematic structure search algorithm PSO (Particle Swarm Optimization).
In their most recent work, they studied the thermodynamic instability of Fe-U compounds in the conditions in the Earth's inner core. However, U may exist as point defects within crystalline iron, effectively stabilizing specific iron phases, which could affect Earth's energy budget. They have also studied the high-pressure compounds and alloying of Fe with several light elements (S, O, C, H, Mg), which has implications in the Earth's inner core properties and the study of steel properties.
Their methods also have allowed Dr. Botana and his group to explore novel high-pressure chemistry, predicting unique chemical phenomena like new and counterintuitive oxidation numbers for elements like Li and Hg, and the existence of ionic crystals where individual electrons occupy ionic sites, independently from any atom.
Email: jorgeb@cpp.edu

Siyu Li

Professor Li's research focuses on understanding biological assembly and membrane morphology through theoretical calculations and computational simulations. Dr. Li is particularly interested in how mechanical properties influence virus assembly, membrane budding, and elastic shell morphology. To explore these phenomena, Dr. Li has developed models to simulate the dynamics of macromolecular aggregation across various time scales to construct functional membrane structures. Dr. Li's work has several applications, including the design of responsive shells to enhance the

functionality of nanoreactors, packaging of macromolecules for gene delivery, controlled protein assembly, and the development of principles for assembling microcompartments for biochemical or energy applications.
Email: siyul@cpp.edu

Sujoy Modak
Dr. Modak studies the foundation, intersection and phenomenology of quantum and gravitational theories. Dr. Modak uses a semi-classical approach where the background spacetime classical, described by a curved spacetime, while all matter fields get full quantum treatment. He has built theoretical models to understand the black hole evaporation and information problem, quantum origin of the seeds of cosmic structure in the very early universe, and particle creation in cosmological settings. In addition, he has worked on the foundation of quantum theory, specifically using the “objective collapse model” approach to better understand the division between the classical and quantum systems. Recently, Dr. Modak has made some proposals to indirectly test quantum gravity effects in low energy table-top experiments. He has published 35 research articles in the above topics, and some of them are co-authored by undergraduate students.
Email: smodak@cpp.edu

Coral Wheeler
Professor Wheeler's research involves running and analyzing the next generation of high resolution cosmological hydrodynamic galaxy simulations to make testable predictions for low mass (10^2 M_{Sun} < M_* < 10^7 M_{Sun}) galaxies that can be used to answer important questions about the Universe by looking no further than the neighborhood near our own Milky Way, where these tiny galaxies reside. The high dark matter content and shallow potential wells of these objects make them excellent testbeds for differing theories of galaxy formation. I simulate these low-mass galaxies at high enough resolution to test the extreme end of galaxy formation physics, investigate challenges to our current cosmological paradigm, and improve galaxy formation models. Armed with these theoretical tools and a wealth of observational data, my primary research objective is to answer important questions about our Universe such as: What is the nature of dark matter? What were the conditions of the early Universe? Do our galaxy formation models accurately describe all galaxies?
Email: cwheeler@cpp.edu