Faculty Research in Chemistry at UCA

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Analytical Chemistry

Dr. Robert Mauldin conducted research in a variety of topics in environmental chemistry, including the fate of herbicides, the study of pollution brought about by the combustion of coal, and the production of ground-level ozone. Lately, his interests have expanded to include the development of new teaching labs and mechanisms to assess learning in chemistry and the sciences. In 2006, he co-authored the book, Understanding Scientific Reasoning. He is currently working on incorporating the principles of scientific reasoning as outlined in this book in the education of science journalists. For more information please see his faculty page.

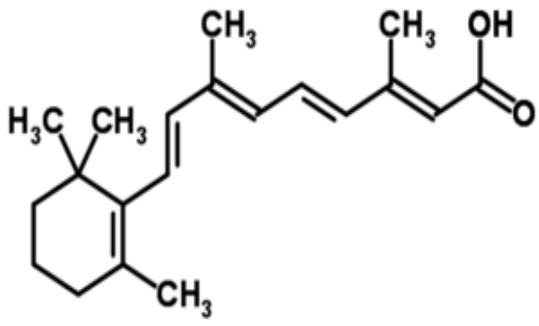
Dr. Karen Steelman is an Analytical Chemist passionate about the field of Archaeological Chemistry - using chemistry to help archaeologists answer questions about the past. Her research laboratory develops sample preparation methods for accelerator mass spectrometry radiocarbon dating, including plasma oxidation, supercritical carbon dioxide cleaning, and traditional chemical methods. For more information please see her website.

Dr. Faith Yarberry was trained as an analytical chemist. Her primary current interest is in the field of chemical education. She is interested in developing new laboratory exercises and works with secondary educators to improve the preparedness of students entering college chemistry courses. For more information please see her faculty page.

Biochemistry

Dr. Dunlap graduated from UCA in 2007 and went on to receive her PhD in Molecular and Cellular Biochemistry from the University of Kentucky. Her research studies the changes in calcium concentrations can transmit messages within a cell. The protein calmodulin can translate these calcium messages. When calcium concentration increases, calmodulin binds to and changes the shape of other proteins. The change in shape of calmodulin's target proteins changes their function, turning them on or off depending on the protein and cell type.

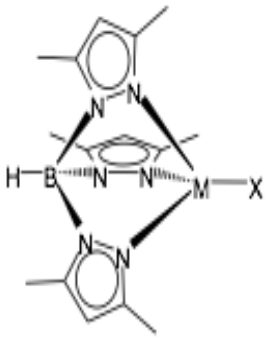
Dr. Lori Isom specializes in the elegant, intricate field of Biochemistry. Her research involves the computational analysis of 3D biomacromolecular structures including proteins, DNA, RNA as well as protein/DNA complexes. The primary focus of her research is the investigation of the effect of cation (positively-charged atoms or molecules) binding on macromolecular structure. Such influence on nucleic acid and/or protein structure promotes proper folding and activity of the macromolecule and may be involved in cellular processes such as gene activation, DNA replication and repair, all of which are components that when malfunctioning can lead to the development of cancer and other diseases. For more information please see her website.



Dr. Melissa Kelley is a biochemist. Her research interest is in the field of retinoid metabolism. Vitamin A (retinol) and its analogs, retinoids, are essential for many critical life processes including regulating cellular communication. Abnormal cellular communication culminates in various disease states including cancer, Alzheimers, and rheumatoid arthritis.

Retinoid metabolism is an integral part of regulating cellular communication. Although the communication cascades are well defined, the particular molecules responsible for prompting these cascades remains poorly defined. The Kelley laboratory focuses on identifying the biologically active metabolites of retinol that mediate cellular adhesion and proliferation. For more information please see her website.

Inorganic Chemistry



Dr. Patrick Desrochers and his research students study the coordination chemistry of metal ions. These include early and late transition metals from chromium and molybdenum, through iron and rhodium, to nickel, copper, and zinc. When properly controlled, these ions elicit desirable behavior like amino acid selectivity (nickel), heterogeneous polymerization catalysis (rhodium), interesting magnetic characteristics (iron), and reversible binding of small molecules and substrates (CO, NH3, BH4, HCCH; nickel, copper, chromium) of interest in industrial reactions and hydrogen-rich storage materials. This control results from using facial scorpionate chelates that are specifically designed for electronic, steric, and reusable ultility. Most recently work in my lab has focused on anchoring these chemical systems to plastic substrates to improve their recyclability and use in applications ranging from protein purification to small-molecule sensors, reusable heterogeneous catalysts, and tailored magnetic materials. For more information please see his website.

Dr. Lei Yang's research seeks to the development of synthetic inorganic functional molecules and materials: (1) Model complexes of the active sites of metal containing enzymes; (2) Transition metal compounds with novel structural features and spectroscopic properties; (3) Small molecular activation by transition metal complexes. Currently, his research program focuses on the nitrous oxide and carbon dioxide activation and construction of dynamic coordination polymer materials. The general approach is design and synthesize organic ligand systems to support transition metal ion to obtain the materials with novel functions. Students have opportunities to learn organic/inorganic synthesis, X-ray crystallography, spectroscopic characterization (NMR, FT-IR, UV-vis, CV, MS and EPR) and Schlenk line techniques. For more information please see his website.

Organic Chemistry

Dr. Carter specializes in bioorganic chemistry. His research interests include investigating the role played by free radical intermediates in the damage of biologically important molecules such as DNA and proteins. These radical intermediates can be generated by photochemical activation of chemically synthesized precursor molecules. For more information please see his faculty page.

Dr. Gregory Naumiec, an organic chemist, joined the chemistry faculty at UCA in 2015, filling the vacancy left open by the passing of Dr. Jerry Manion. Greg plans to involve undergraduate students in laboratory research at UCA, with an emphasis on the development of drug candidates to treat tropical diseases. For more information please see his website.

Dr. Richard Tarkka has historically focused his research on developing methods to synthesize polymers with uniform size distribution. Currently, he is collaborating with Prof. Patrick Desrochers of the UCA Chemistry Department. Their project focuses on the synthesis of new solid-supported organic ligands, and the use of these systems, when coordinated with metal ions, in the selective binding of specific amino acids and peptide sequences. The ultimate goals of the project are new methods for protein purification and quantification of sulfur-containing amino acids. For more information please see his faculty page.

Physical Chemistry

Dr. Dooley is a physical chemist with a special interest in the area of atmospheric chemistry. She received a BS in Chemistry and Mathematics from UCA in 2004, and a PhD in Chemistry from Texas A&M University in 2009. Her research involves the measurement of aerosol optical properties using pulsed laser cavity ring-down spectroscopy.

Dr. Bill Taylor is trained in the areas of physical chemistry and instrumentation design. His research focuses on the chemistry of gas phase ions with a variety of small molecules. In particular, He is interested in fundamental parameters influencing the product formation in reactions involving the activation of bonds by gas phase metal ions. The essential goal of this work is to gain an understanding of factors influencing reaction outcomes; however, these processes also have potential implications with respect to catalysis. For more information please see his faculty page.