



Department of Chemistry
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Emerging Chemists Workshop – Project List

01- Photodynamic Therapy for Cancer Treatment (Organic Chemistry)

Photodynamic Therapy involves light, a photosensitizer, and oxygen to destroy cancer cells. When activated by light, the photosensitizer absorbs the light energy, and transfers this energy to oxygen. The oxygen becomes transformed into a reactive oxygen species which ultimately destroys the tumor cells. For this experiment, you will see the chemical reaction used to generate the photosensitizer, and then will analyze the reaction mixture and purify the material.

02- How to Study Proteins by Mutagenesis (Biochemistry)

We are studying the different roles of individual amino acids in a protein. After we find amino acids that we hypothesize are important, we mutate them and analyze whether the protein activity was affected. For this experiment, you will purify by electrophoresis the gene that produces our protein, and how we can find with computational methods candidates for mutagenesis.

03- Molecular Modeling of Oxygen Escape Pathways from Globins (Computational Chemistry)

We are studying the pathways by which oxygen can escape from a monomeric globin molecule. For this experiment you will use a molecular modeling program on our computer cluster and the results of molecular dynamics simulations to understand more about how the protein functions due to its motions.

04- The Synthesis and Characterization of Gold Nanoparticles (Nanoscience A)

We are studying the different synthetic methods of gold nanoparticles and how these methods affect the size of the nanoparticles. For this experiment, you will perform two different synthetic methodologies to prepare gold nanoparticles and characterize their size differences by UV/visible spectroscopy.

05- How to Decipher the Atomic Structure of a Protein (Biochemistry B)

We are studying lactonases, which are enzymes that regulate cell-to-cell communication signals in bacteria. To understand their function, we obtain a 3D map of the atomic structure using X-ray diffraction methods. For this experiment, you will briefly see the Gryphon crystalliation robot before converting X-ray data into a 3D map of atoms within the enzyme.

06- Scanning Electron Microscope Analysis of Nanocrystals (Nanoscience B)

We are studying how nanometer sized crystals diffuse through solution and grow off surfaces such that they can be used in advanced solar cells. For the experiment, you will utilize a scanning electron microscope to view the nanocrystals prepared under different growth conditions.

07- Confocal Microscopy of Retina Formation in Zebrafish (Biology)

We are studying retina formation during development using a zebrafish as our model system. By altering the genes expressed by the fish we can examine their importance towards the retinal developmental process. For this experiment you will look at the retinal neuron formation in zebrafish using fluorescent confocal microscopy.