andlinger center for energy+the environment

2016 summer high school projects

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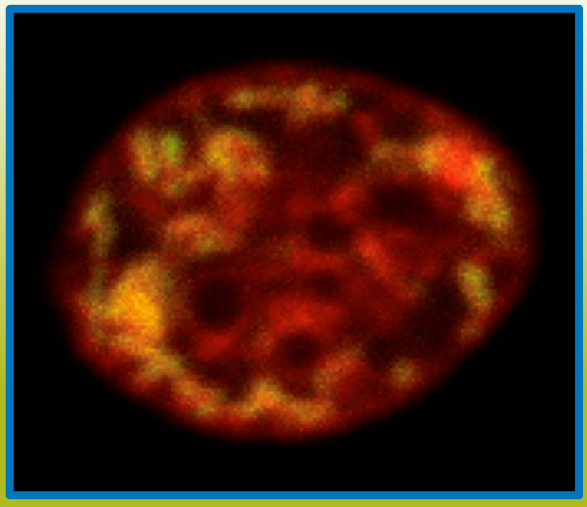
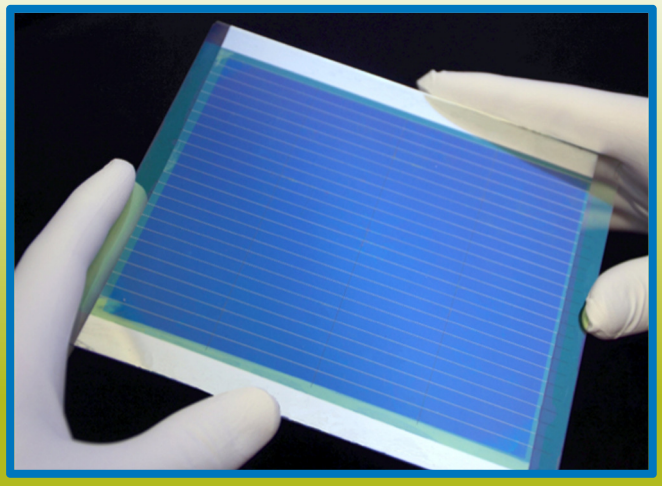
Assistant Professor Jose Avalos

Civilization emits around 34 billion tons of CO_2 into the atmosphere annually. In comparison, photosynthetic organisms fix nearly 260 billion tons of CO_2 each year, mostly in the form of sugars. If we could tap into only a small fraction of this biomass, we would be able to provide significant amounts of renewable energy and materials. This project involves the genetic engineering of yeast (a unicellular fungus) to rewire its metabolism for the production of compounds of interest from sugars. We use cutting edge technologies in molecular biology, microbiology, and bioengineering. Multiple projects are available in this area, including for the sustainable production of biofuels, bioplastics, chemicals, and drugs.





Assistant Professor Barry Rand

Thin film solar cells represent a new paradigm for enabling large area deployment of photovoltaic energy conversion. One emerging type of thin film solar cell is based upon organic semiconducting materials, which have their own unique way of operating, not all aspects of which are fully understood. The student will characterize organic solar cell performance by learning how to take sensitive measurements of the mechanism by which light is converted to free charges in organic solar cells. Through these measurements, we hope to better understand fundamental operating mechanisms of these devices. In addition, more traditional solar cell performance metrics will also be studied through conventional current-voltage measurements.

Assistant Professor Claire White

Did you know that cement, which is used to make concrete, is responsible for 5-8% of human-made CO_2 emissions? And concrete is the 2nd most used resource after water? So how can we make concrete less taxing on the environment? We are investigating a new type of concrete containing no cement that reduces CO_2 emissions by up to 80-90%. The project consists of analyzing experiment data of this new building material using computer software. The results will be used to determine the smaller length scale properties of this important material and contribute to our overall understanding of cementitious materials behavior.