

Elena Galoppini Laboratory

Research conducted in my laboratory focuses on the modular design and synthesis of organic molecules that harvest sunlight. These compounds, when bound to thin films made of nanostructured semiconductors (titanium dioxide, zinc oxide) form interfaces or electrodes that can find applications in solar cells, catalysts for solar fuels, sensors, and other devices. My group is interested in controlling the surface binding and electronic processes at the interface through careful design of each component of the light-harvesting molecules. As an example, we might add useful properties to the linker units that form the covalent attachment to the semiconductor surface. Students working in my group will learn the synthesis of organic and inorganic compounds, a variety of purification techniques, and numerous characterization methods including spectroscopies. Each synthesis can be broken down into smaller steps and adapted to emphasize synthesis, spectroscopy, semiconductor studies, or a combination of all these, depending on the aptitude and interests of the Beckman Scholar. The research goal has a direct connection to renewable energy, and we collaborate with physical chemistry groups at other institutions, including major universities and national laboratories. This exposes the students to collaborative research and expands opportunities.

While gradually learning laboratory skills, the Beckman Scholar will also be developing presentation skills, will learn scientific writing through monthly reports, and will become accustomed to presenting and discussing research results during group meetings. In the laboratory, the Beckman Scholar will be paired with a graduate student as the day-to-day laboratory supervisor. In addition to regular group meetings, the student will meet with me every week to discuss the results and plan monthly written lab reports will help to ensure that the research is on track, and help the student to organize, interpret, and discuss the results, plan future work, and learn scientific writing.

Like all other students in my group, the Beckman Scholar is expected to be a co-author of any scientific publication involving the Beckman Scholar's research work and to present the results during poster sessions at local and national scientific meetings and conferences. American Chemical Society National meetings, Materials Research Society Meetings, Rutgers – Newark's Honors College Research Day, and William Paterson University's Undergraduate Poster Session, are examples of meetings, from very large and international to small and local, where undergraduate research is presented. Visits to the laboratory of collaborators, together with the graduate student mentor, may be arranged to allow the Scholar to expand skills, visit other labs and universities, and explore professional opportunities.