Undergraduate Research Seminar
Wednesday, July 6th, 2014 5:30 p.m.
Leigh 309

Dylan Holst

Synthesis of Novel Guanine Terminated Pi-Conjugated Oligomers

Organic photovoltaics (OPVs) are an important development in solar cell science, having higher flexibility, cost-effectiveness, and molecular tunability over conventional inorganic solar cells. However, OPVs suffer from relatively low efficiency, strength, and stability. Bulk heterojunction OPVs are constructed from a layer of blended electron donor and acceptor materials between the cathode and anode of the solar cell in order to facilitate charge transfer, but the random distribution of donor and acceptor molecules can result in charges becoming trapped in a donor or acceptor rich area. Hydrogen bonding entities will be introduced to create a highly ordered framework of donor and acceptor molecules in order to increase surface area distribution and optimize OPV efficiency. Guanine, one of the naturally occurring DNA nucleobases, can be used as a bio-inspired source of molecular selfassembly and charge transport. Guanine has been found to self-assemble into structures of four guanine molecules called G-quartets; this phenomenom can be used to create structured square grids within the donor acceptor interface through synthesizing molecules containing guanine functional units. Using simple versions of these molecules, self-assembling properties in both solid state and solution will be studied by sequential deactivation of hydrogen bonding locations and observing the effect on charge transfer and efficiency.

Jordan Zeldin
Dog Vaccination Campaigns Against Rabies: a modelling approach to determine best practices

Rabies virus has largely been controlled in the developed regions of the world, but remains rampant in developing countries, since these countries often lack the infrastructure and capital to both treat rabies and prevent it through canine vaccination. Thus, 59,000 people die per year, and 99% of these cases are transmitted via unvaccinated dogs. We construct a model of rabies in dog populations based on data from a survey in Kenya. With this model, we address if neutering/spaying dogs, age-selective vaccination, and/or vaccination campaigns at optimized intervals might allow for higher vaccine coverage with limited resources.