Undergraduate Research Seminar
Wednesday, July 2nd, 5:30 p.m.
Leigh 390

Margarita Hernandez

"Floral and Pollinator Evolution in Polemoniaceae"

The wide diversity of floral variation results in part from pollinator-mediated selection. Flowers are often characterized by a given suite of traits, historically coined pollinator syndromes, which are associated with certain types of pollinators. These traits can include characters such as flower size, color, and overall morphology. Although a correlation between certain floral characters and specific pollinators is still debated, it is clear that understanding morphological traits, such as flower color and size, and their association with pollinators will deepen our understanding of the biology of specific interactions and will ultimately contribute to a refined view of pollinator syndromes. Furthermore, a strong phylogenetic framework will provide a solid foundation on which to map floral characteristics and establish relationships between morphological adaptations and genetic mechanisms. Here we present a new phylogenetic analysis of Polemoniaceae, with samples from 90% of the nearly 400 species. Using this phylogeny, we evaluate the evolution of flower color and flower size in the context of known pollinators. Analyses suggest over 40 transitions in flower color, with both color gains and losses observed. Flower size (length and width) was measured from herbarium specimens, with several accessions used per taxon when available. Analyses were conducted using continuous data, as well as binning into discrete groups. Many transitions result, with overall flower size increasing and decreasing in certain genera. Further analyses are needed to investigate the role that flower size plays in attracting specific pollinators. This project lays the foundation for ongoing projects on the genetic mechanisms involved in the evolution of flower color and flower size in Polemoniaceae.

Nhi Tran

"Comparing Lipid Dynamics in Animal Derived and Synthetic Pulmonary Surfactant using 2H and 31P NMR"

Pulmonary surfactant (PS) is a lipoprotein mixture found in the alveoli of the lungs and allows for proper lung function by lowering the surface tension at the alveolar air-water interface. Of the four proteins found in PS, surfactant protein B (SP-B) is the only one required for survival. Infants born prematurely often lack mature PS, which leads to respiratory distress syndrome (RDS). The prevailing treatment for RDS is the application of exogenous PS, which is derived from bovine or porcine sources, to the lungs of the afflicted individual. Due to the immunologic risks associated with this treatment, a synthetic mimetic of PS is desired. Here we present the general concepts of 2H and 31P NMR used to observe lipid dynamics and apply these types of experiments to study the animal derived Infasurf®, which is the PS formulation used to treat infants with RDS, and a synthetic mimetic of Infasurf will be compared with and without the addition of SP-B1-25.

Kadeem Morrison

"Citrus Black Spot Disease and Spectral Imaging Abstract"

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Citrus Black Spot (CBS) is a disease caused by a fungi called Guignardia citricarpa in its sexual stage referred to as ascospores ("Citrus Black Spot," 2013). Ascospores spread fast and leads to symptoms such as hard spot, cracked spot, freckled spot, virulent spot and false melanose ("Citrus Black Spot," 2013). Each symptom makes the citruses have black spots on them ("Citrus Black Spot," 2013). Prevention of the disease can be costly and timely but spectral imaging has been used as an alternative because it leads to fast detection at cheaper rates (Bulanon, Burks, Kim, & Ritenour, 2013). Spectral imaging uses computer analysis of the reflectance off of the fruit (Bulanon, Burks, Kim, & Ritenour, 2013). Through this process, it has been seen that CBS infected citrus fruits have shorter wavelengths than healthy ones (Bulanon, Burks, Kim, & Ritenour, 2013). This fact has been tested by me and other students going down to Fort Pierce to help out with a six week project of actual diseased and healthy fruit. While there, we worked together taking pictures of all of the citrus fruits by both spectral and color imaging methods. Afterwards, the spectral imaging graphs were produced by MATLAB using a series of codes and then analysis of the results led to CBS infected fruit having shorter wavelengths than healthy ones.