Self-Assembly of Chromonic Dyes. The Karukstis laboratory explores the self-assembly of amphiphilic molecules with dual hydrophilic and hydrophobic character to create complex hierarchical structure via intermolecular interactions. In contrast to conventional amphiphiles, we are currently interested in chromonic molecules which are aromatic structures with hydrophilic solubilizing groups positioned either on the periphery of a polyaromatic central core or as linking groups between aromatic rings. These molecules aggregate by stacking as concentration is increased within a solvent. The behavior of most chromonic systems with increasing concentration is consistent with an isodesmic (i.e., continual) nature of the aggregation process, however there is recent evidence of some chromonic molecules exhibiting multiple aggregation steps. Our spectroscopic studies of two chromonic molecules – Sunset Yellow FCF and pinacyanol acetate – suggest that the molecules aggregate in a continual fashion. We would like to conduct light scattering studies to directly monitor the increasing size of the aggregate with increasing concentration and confirm the nature of the stacking process.

Opportunities for Students

• **Spectroscopic studies (absorbance and fluorescence)** of increasing concentrations of chromonic dyes in aqueous solution. We will monitor the changes in absorption spectral shape and intensity as well as the shift in emission wavelength of an extrinsic fluorophore as dye concentrations are varied to reveal the nature of the aggregation process.

• **Light scattering studies** to measure the root-mean-square radius of the dye aggregate. The concentration dependence of the size of the aggregate will reveal whether self-assembly is a continuous process or requires a threshold concentration to initiate aggregation. Correlation of the nature of the stacking process with dye structure may provide insights into the mechanism of the self-assembly process.

![Prodan emission λ_max in aqueous pinacyanol acetate samples as a function of temperature.](image1)

![Emission λ_max values of an extrinsic fluorophore (Prodan) in aqueous Sunset Yellow samples.](image2)