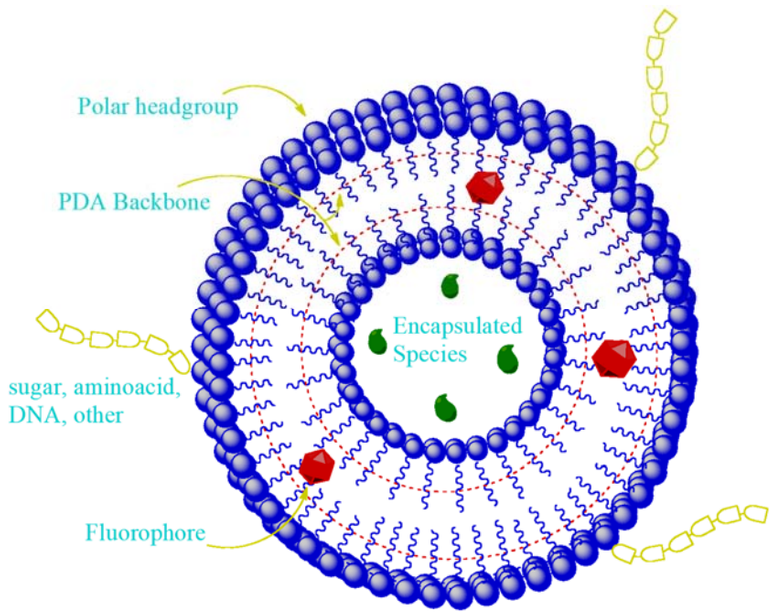
FURMAN

**Chemistry Department**
**2021 Summer Research Program**

# Timothy Hanks Research Group

The Hanks group is interested in the fundamental processes of self-assembly and in the construction of functional materials from highly conjugated polymers. We are currently focused on two major areas:




1) **Polydiacetylene liposome for pathogen detection and drug delivery:**

   Liposomes are nanometer scale spheres consisting of a thin bilayer membrane and an aqueous interior. The membrane of our liposomes can be polymerized, which not only greatly stabilizes the structure, but turns the liposomes bright blue. When they are placed under stress, they change to a bright red color. By chemically derivatizing the outside of the structure, we can specify the environmental changes that cause the color change. Of most interest to us right now is the detection of bacteria. Another feature of liposomes is that molecules can be trapped in the aqueous interior or in the hydrophobic bilayer. We can take advantage of this for drug delivery and biomedical imaging.

2) **Conducting polymer composites for tendon adhesion to metal implants and for biofouling resistance:**

   Biofouling is the unwanted accumulation of biological materials on any surface in prolonged contact with water. We are developing inexpensive, surface-modified coatings made from electrically conducting polymers that will reduce or prevent the fouling of ocean-going vessels, potable water systems and medical implants. Conversely, other surface-modification techniques can improve the adhesion of organic tissue, particularly tendons, to titanium implants used for joint reconstruction.