Riverbend Research Highlight Series

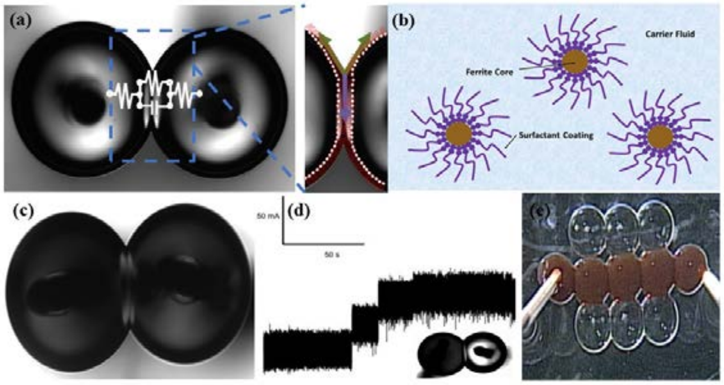
GEORGIA

A 30-minute forum for Riverbend Complex researchers to share exciting research highlights with their colleagues. These accessible, high-level presentations encourage cross-disciplinary communication and promote awareness of our diverse programs.

Droplet Interface Bilayer: The Rising Potential of a New Class of Magnetically Responsive Smart Materials

May 16, 2017 | **10:00 A – 10:30 A** | **Riverbend South Auditorium**

Self-assembled model lipid membranes are a popular platform for studying cellular transport. A recent advancement in the creation of these model membranes is the Droplet-Interface Bilayer (DIB) technique. Highly adaptable and robust, this technique allows for the construction of electrically-sealed, simplified model cellular membranes between low-volume, lipid-encased aqueous droplets in an oil immersion. Ongoing efforts focus on the use of these DIB networks as building blocks for the creation of a new class of biocompatible stimuli-responsive smart material with applications ranging from sensing to actuation. In these efforts the collective capabilities of the droplet networks scale with the complexity of their assembled structure. Here we present the use of ferrofluid drops as building elements for the creation of magnetically-responsive DIB structures further expanding the capabilities of this platform. Ferrofluid incorporation into DIBs has been studied by examining the membrane mechanical properties as well as the response of embedded pores. These structures may form the basis for the development of micro-magneto biocompatible sensors for a variety of applications.



The DIB technique has been used for channel recordings and membrane characterization as shown in (a). Meanwhile, ferrofluids-colloidal suspensions of coated magnetic cores (b) are a major component of microdevices. The combination of these platforms, achieved by (c) forming ferrofluid-based DIBs, can be used in the creation of a magnetically-responsive class of smart materials whose behavior is characterized on the single DIB level by (d) studying protein activity such as alpha-hemolysin; as well as on the collective level by (e) examining the response of networks to various perturbations.

Michelle Mansour received her Bachelor of Engineering in Mechanical Engineering from the Lebanese American University in Byblos in 2015, and is currently a second-year graduate student working with Professor Eric Freeman in the College of Engineering on developing and characterizing biomimicking lipid membranes (DIBs) and examining their applications. The research Michelle leads addresses key issues concerning the development of cellular-mimicking materials, characterizing interactions between nanoparticles and cellular membranes in aqueous environments, and drug delivery via stimuli-responsive liposomes and polymersomes.