UNL Department of Physics and Astronomy presents:

Structuring Liquids

PRESENTED BY

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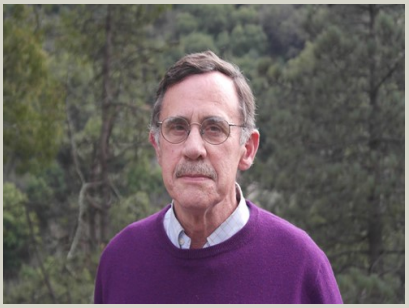

THURSDAY

SEPT 23

4:00 PM

VIA ZOOM

ABSTRACT

The ability to manipulate and lock-in the shape of one liquid in a second, i.e structuring the liquids, allows the generation of unique materials that have the dynamics and mobility of liquids but the structural integrity of a solid. Key to the design of this unusual state of matter is the interfacial formation and assembly of nanoparticle (NP) surfactants at the interface, such that shape changes of the liquids results in the jamming of the NP-surfactants at the interface as the system attempts to minimize the interfacial area. The assemblies of NP-surfactants assume in-plane mechanical properties that range from liquid-like to solid-like behavior, depending on the areal density of the assemblies. By using paramagnetic NPs, the interfacial jamming of the NP-surfactants generates ferromagnetic liquid droplets that have a remnant magnetization when the applied field is removed. In addition, the interfacial interactions of the paramagnetic NPs allow the number of NP-surfactants to exceed the limit where spontaneous emulsification should occur, quenching the system into a highly non-equilibrium states, so that, upon removal of the field, an explosive spontaneous emulsification occurs. Imbedding the paramagnetic NPs in assemblies of non-magnetic NP-surfactants or polycationic-polyanionic coascervates enables the generation of all-aqueous liquid robotic systems that can, using an external field, change shape and be guided to perform specific tasks and function.