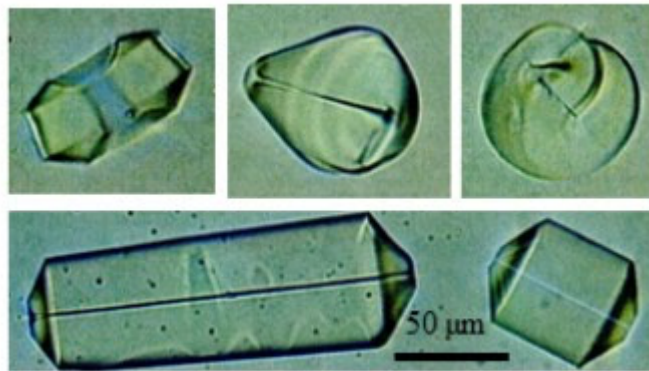


Graduate Mathematics Seminar

Self-assembly in chromonic liquid crystals

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Abstract: Liquid crystal molecules are endowed with a partial order - an attribute that classifies them as a distinct state of matter. Liquid crystals also manifest sensitivity to temperature, concentration, and electric or magnetic fields. Such properties make liquid crystals essential to many optical and biological applications. Chromonic liquid crystals, which can be used to model confined DNA, are composed of disc-like molecules that tend to stack on top of each other when dispersed in water. When a threshold concentration is reached, the columns formed bend into rings, and these in turn aggregate into interesting geometrical shapes. Among the shapes that these phase-separated inclusions adopt are toroidal droplets with relatively large sizes, providing detailed observation through experiments. Our goal is to analyze the geometry of these toroids as it pertains to liquid crystal concentration in addition to interfacial and elastic parameters. We model this setup as an energy minimization problem subject to material and geometrical constraints. In presenting our results, we will highlight how simple mathematical tools can be used to deal with the constraints and how numerical simulations can help expand the range of parameters deduced from experiments. This is joint work with M. C. Calderer, M. Espanol, L. Xu, and L. Zhao.

When: Monday, April 12, 2021, 6:00 – 7:00 pm

Where: Zoom

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