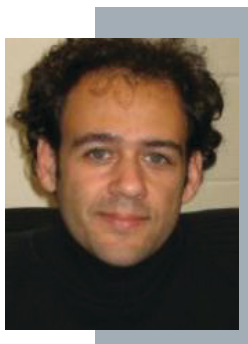
AUGUSTA UNIVERSITY
COLLEGE OF SCIENCE AND MATHEMATICS

Welcome to the Fall 2017 Materials Science Research Seminar Series!

SCIENCE HALL, W1002, SUMMERVILLE CAMPUS



FRIDAY, SEPTEMBER 1, 2017, 1-2 p.m.

Ordered materials, geometry, topology and defects: (active) nematic liquid crystals on toroidal surfaces

ALBERTO FERNANDEZ-NIEVES, PHD, ASSOCIATE PROFESSOR OF PHYSICS
Georgia Institute of Technology, Atlanta, GA

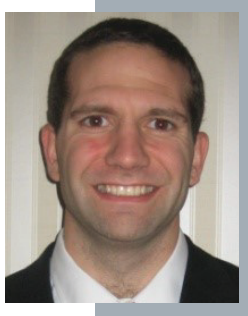
In this talk, we illustrate how we can use soft materials to address fundamental physics problems pertaining to the way an ordered medium, like a crystal or a liquid crystal, organizes itself when confined to a closed curved surface, like the sphere or the torus. We will focus on nematics and tori and start by briefly discussing how we make toroidal droplets and how we stabilize them against surface tension instabilities. We will then discuss our recent results with active nematics on toroidal surfaces and show that, despite the activity, we see the theoretically predicted defect unbinding for inactive nematics. By comparing the experiments with numerical simulations, we unravel the role of activity and perform defect microrheology, which enables us to extract, for the first time, the material properties of the active nematic liquid crystal.

FRIDAY, SEPTEMBER 8, 2017, 1-2 P.M.

Local injection of pure spin current generates electric current vortices

YAROSLAW BAZALIY, PHD, DEPARTMENT OF PHYSICS AND ASTRONOMY
University of South Carolina, Columbia, South Carolina

Electrons carry charge and spin, and thus their motion may induce both electric and spin currents. The former is familiar to all, while the latter is more exotic. We will discuss generation and manifestations of spin current, its interplay with electric currents, and then focus on a specific effect where pure spin current generates electric currents in a device that is not connected to any outside source or sink of charge. We further discuss how the generation of such electric currents enhances spin diffusion.



FRIDAY, NOVEMBER 3, 2017, 1-2 P.M.

Synthesis of Energetic Materials for Propellant, Explosive, and Pyrotechnic Applications

JESSE J. SABATINI, PHD, TEAM LEADER-ENERGETIC MATERIALS SYNTHESIS GROUP
Energetics Technology Branch, US Army Research Laboratory

The goal of any US Army energetic materials-based research program should be the transitioning of technology, with ultimate aim of delivering new technologies to the soldiers in uniform. From a synthetic chemist's point of view, this is done by making high-performing propellant and explosive ingredients in a cost-effective manner. A successful method from our group centers around making materials based on consulting with formulation chemists to identify needs and technology gaps. Syntheses of new energetic plasticizer and explosive materials will be discussed, as well as their sensitivities and performances. The potential applications of these molecules for further formulation development will also be discussed in detail. From the view of a pyrotechnician, the development of new percussion primer formulations are of high importance. The EPA has imposed tight regulations on lead. This affects many primer formulations since most in-service primary explosives are lead-based materials. Hence, the development of high-performing lead-free primer formulations is important to maintain environmental compliance. Of similar importance with respect to environmental compliance to the pyrotechnics chemist is the development of illuminating formulations of various colors. Such formulations should be high in emission intensity, while being free of heavy metals, perchlorates, and/or chlorinated organic materials. Such formulations will be described, as well as their potential applications in both military and civilian pyrotechnics.

Seminar series organizers:
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augusta.edu/scimath/chemistryandphysics/materials-thursday.php