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**RUSTUM CHOKSI**, McGill University

*Geometric Variational Problems with Nonlocal Interactions: Gamow's Liquid Drop Problem and Beyond*

The liquid drop (LD) model, an old problem of Gamow for the shape of atomic nuclei, has recently resurfaced within the framework of the modern calculus of variations. The problem takes the form of a nonlocal isoperimetric problem on all 3-space with nonlocal interactions of Coulombic type. In the first part of this talk, I will present the current state of the art for the existence and nonexistence of minimizers of the LD problem. I will then focus on the LD problem on a finite domain, and its relation to the Ohta-Kawasaki theory for self-assembly of diblock copolymers. I will discuss the fundamental problem of addressing the intrinsic periodicity of minimizers. In the second part of the talk, I will consider minimizers of a geometric problem based solely on competing interaction potentials of algebraic type. The problem is directly related to a wide class of self-assembly/aggregation models for interacting particle systems (eg. swarming).