Geometric Problems in PDEs
Problèmes géométriques pour les EDP
(Org: **Lia Bronsard** and/et **Kenneth DeMason** (McMaster University))

ALMUT BURCHARD, University of Toronto

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TIZIANA GIORGI, The Univesity of Alabama

COLIN GRANT, McMaster, MSc student

PENGFEI GUAN, McGill University
An inverse-curvature-type hypersurface flow in space forms

We study an inverse-curvature-flow in hyperbolic space and the hemisphere. We introduce explicit initial radial-slope conditions under which smooth admissible star-shaped hypersurfaces evolve for all time and converge exponentially to a geodesic sphere. These first-order conditions are compatible with nonconvex admissible hypersurfaces and are implied by the corresponding horo-convexity assumptions for radial graphs. The monotonicity of quermassintegrals along the flow yields sharp geometric inequalities, with equality precisely for geodesic spheres. This is a joint work with Junfang Li.

FANG HONG, McGill University
Santaló's Problem and Minkowski-Type Inequalities in Cartan-Hadamard Three-Manifolds

The classical Minkowski inequality states that spheres minimize total mean curvature among convex surfaces of prescribed area in Euclidean three-space. In hyperbolic space, the corresponding problem, posed by L. A. Santaló, exhibits a richer geometry. In this talk, we will survey Minkowski-type inequalities in Cartan–Hadamard three-manifolds and present a refinement of

Ghomi–Spruck's inequality. We will then discuss Santaló's minimization problem and recent results on the geometry of its minimizers.

LUANA JOST, Institut de Mathématiques de Toulouse

SIYUAN LU, McMaster University
Recent progress on Hessian quotient equations

Hessian quotient equations are closely related to convex geometry, complex geometry and special Lagrangian geometry. In this talk, I will discuss some recent progress on Hessian quotient equations from analytic point of view, including rigidity of entire solutions and a priori estimates.

GUANYING PENG, Worcester Polytechnic Institute

RÉMY RODIAC, Université Côte d'Azur

REGINA ROTMAN, University of Toronto

ALINA STANCU, Concordia University

DOMINIK STANTEJSKY, Institut Élie Cartan de Lorraine IECL

HUNTER STUFFLEBEAM, Johns Hopkins University

IHSAN TOPALOGLU, Virginia Commonwealth University
Minimality and stability of the ball in the liquid drop model with screened interactions

I will present on the volume-constrained minimization of a functional given the sum of the perimeter functional and a nonlocal repulsive term defined through the Yukawa kernel. In this functional the competition between surface tension and repulsion is governed by two independent quantities: the screening rate and the volume. For this problem, above an explicit critical screening rate, minimizers exist at every volume, and below an explicit volume threshold minimizers exist for every screening rate. Moreover at small volume the ball is the unique minimizer up to translation, uniformly in the screening rate. Finally, there exists a sharp volume threshold, depending on the screening rate, for the ball to be a stable volume-constrained critical point. This is a joint work with Lia Bronsard and Kenneth DeMason.

CHONG WANG, Washington and Lee University