Geometric Partial Differential Equations
Équations différentielles partielles géométriques
(Org: **Siyuan Lu** and/et **Yi-Lin Tsai** (McMaster University))

KENNETH DEMASON, McMaster University
A Strong Form of the Quantitative Wulff Inequality for Crystalline Norms

The anisotropic perimeter is a natural functional appearing in the mathematical framework for determining equilibrium states of crystals in media. As with the usual isotropic perimeter there is an analogous anisotropic isoperimetric inequality, known as the Wulff inequality, where minimizers of the volume constrained anisotropic perimeter problem, known as Wulff shapes, are characterized. In view of statistical mechanics, almost-minimizers are the most likely observable states; as such their identification is just as important as that of the absolute minimizers. In this talk we will explore a recent result by the speaker which proves quantitative control on almost-minimizers in an H^1 sense when the Wulff shape is a polytope, an upgrade from the previous L^1 control via the so-called Fraenkel asymmetry.

ROBERT HASLHOFER, University of Toronto
Singularities of mean curvature flow in $\mathbb{R}^4$

I will first survey the theory of mean curvature flow through singularities in $\mathbb{R}^3$. Then, I will discuss our recent classification of all noncollapsed singularities in $\mathbb{R}^4$. This is joint work with Kyeongsu Choi.

LORENZO SARNATARO, University of Toronto
The Allen—Cahn equation and free boundary minimal surfaces

In recent years, the combined work of Guaraco, Hutchinson, Tonegawa, and Wickramasekera has established a min-max construction of minimal hypersurfaces in closed Riemannian manifolds, based on the analysis of singular limits of sequences of solutions of the Allen—Cahn equation, a semi-linear elliptic equation arising in the theory of phase transitions. In this talk, I will describe some recent boundary regularity results for such limit-interfaces, which provide the first step towards an Allen—Cahn min-max construction of free boundary minimal hypersurfaces in Riemannian manifolds with boundary. This is based on joint works with Akashdeep Dey, Wenkui Du, Martin Li, and Davide Parise.

FREID TONG, University of Toronto
Calabi-Yau metrics and optimal transportation

Many recent works in Kahler geometry have revealed a close relationship with the theory of optimal transport. In this talk, we will discuss some recent developments in the regularity theory for optimal transport maps and its relationship to questions in Kahler geometry. Based on joint works with T. Collins and S.-T. Yau.

YULUN XU, University of Toronto
viscosity solution to complex Hessian quotient equation.

We prove the existence of viscosity solutions to complex Hessian equations on compact Hermitian manifolds, assuming the existence of a strict subsolution in the viscosity sense. The results cover the complex Hessian quotient equations. This generalizes our previous results, where the equation must satisfy a determinant domination condition. This is a joint work with Prof. Jingrui Cheng.