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**Geometric Partial Differential Equations**  
**Équations géométriques différentielles partielles**  
(Org: **Tristan Collins** (MIT) and/et **Robert Haslhofer** (University of Toronto))

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**PAULA BURKHARDT-GUIM**, NYU Courant

*ADM mass for  $C^0$  metrics and distortion under Ricci-DeTurck flow*

We show that there exists a quantity, depending only on  $C^0$  data of a Riemannian metric, that agrees with the usual ADM mass at infinity whenever the ADM mass exists, but has a well-defined limit at infinity for any continuous Riemannian metric that is asymptotically flat in the  $C^0$  sense and has nonnegative scalar curvature in the sense of Ricci flow. Moreover, the  $C^0$  mass at infinity is independent of choice of  $C^0$ -asymptotically flat coordinate chart, and the  $C^0$  local mass has controlled distortion under Ricci-DeTurck flow when coupled with a suitably evolving test function.

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**SHIH-KAI CHIU**, Vanderbilt University

*Special Lagrangian spheres in adiabatic limits*

In a seminal paper, Harvey and Lawson defined special Lagrangians as certain calibrated submanifolds in Calabi-Yau manifolds. Special Lagrangians have since played a significant role in mirror symmetry, including the SYZ conjecture and stability conditions in Fukaya categories. In this talk, we will discuss the construction of special Lagrangian 3-spheres in a collapsing Calabi-Yau 3-fold that admits a K3 fibration. As the ambient manifold collapses to the base, these special Lagrangians themselves collapse into geodesic segments within the base. This is joint work with Yu-Shen Lin.

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**BIN GUO**, Rutgers - Newark

*Geometric estimates in Kähler geometry*

We will discuss the role of complex Monge-Ampere equations as auxiliary equations in deriving sharp analytic and geometric estimates in Kähler geometry. By studying Green's functions, we will explore how to derive estimates for diameters and establish uniform Sobolev inequalities on Kähler manifolds, which depend only on entropy of the volume form and are independent of the lower bound of the Ricci curvature. This talk is based on joint works with D. H. Phong, J. Song, and J. Sturm.

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**SPIRO KARIGIANNIS**, University of Waterloo

*A special class of  $p$ -harmonic maps inducing calibrated fibrations*

Let  $(M, g)$  be a Riemannian manifold equipped with a calibration form  $\alpha$ . In earlier work with Cheng and Madnick (AJM 2021), we introduced a special class of  $p$ -harmonic maps into  $M$  satisfying a first order nonlinear PDE, whose images are  $\alpha$ -calibrated submanifolds of  $M$ . In new joint work with my PhD student Anton Iliashenko, we have obtained analogous results for maps out of  $M$ . More precisely, we define a special class of  $p$ -harmonic maps out of  $M$ , satisfying a first order nonlinear PDE, whose fibres are  $\alpha$ -calibrated submanifolds of  $M$ . I will also discuss very speculative potential future applications to existence of calibrated fibrations and the Strominger-Yau-Zaslow conjecture.

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**SIYUAN LU**, McMaster University

*Curvature estimates for semi-convex solutions of Hessian equations*

In this talk, we will discuss curvature estimates for Hessian equations with general right hand side. Such equations arise naturally from the study of convex geometry. We will first review the literature of this problem and analyze the difficulty. We will then present our recent work towards this problem.

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**NICHOLAS MCCLEEREY**, Purdue University  
*Singularities of  $m$ -subharmonic Functions*

We report on some work in progress, concerning measuring the singularities of  $m$ -subharmonic functions in  $\mathbb{C}^n$  along linear subspaces. We discuss two new quantities, which correspond to the Lelong number and the relative type of Rashkovskii for psh functions. Compared to previous work, our invariants are local in nature.

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**TRISTAN OZUCH**, MIT  
*Selfduality along Ricci flow and instabilities of Einstein metrics*

Einstein metrics and Ricci solitons are the fixed points of Ricci flow and model the singularities forming. They are also critical points of natural functionals in physics. Their stability in both contexts is a crucial question, since one should be able to perturb away from unstable models.

I will present new results and upcoming directions about the stability of these metrics in dimension four in joint works with Olivier Biquard, and with Keaton Naff. They rely on selfduality, a specificity of dimension four.

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**MARCIN SROKA**, CRM  
*On the conjecture of Alesker-Verbitsky*

We will discuss a geometric PDE, called quaternionic Monge-Ampere equation, introduced 15 years ago by Alesker and Verbitsky. This is the equation which solvability is needed for the version of the Calabi conjecture for hypercomplex manifolds to be true. Some new phenomena, regarding higher order estimates, occurs for this equation in comparison to its more classical counterparts of real and complex Monge-Ampere equations. We will focus on outlining this differences.

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**BRUNO STAFFA**, University of Toronto  
*Generic density of geodesic nets*

Let  $(M^n, g)$ ,  $n \geq 2$  be a Riemannian manifold and let  $\Gamma$  be a weighted multigraph. Stationary geodesic nets are embeddings  $f : \Gamma \rightarrow (M^n, g)$  which are stationary with respect to the length functional induced by the metric  $g$ . They arise from Almgren-Pitts Morse theory on the space of 1-cycles  $\mathcal{Z}_1(M, g)$  on  $(M, g)$ . During the talk, we will discuss the following result: for a Baire-generic set of Riemannian metrics on a fixed closed manifold  $M^n$ , the union of all stationary geodesic nets is dense in  $M$ . This is a joint work with Yevgeny Liokumovich.

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**FREID TONG**, Harvard University  
*On a free boundary Monge-Ampere equation and complete Calabi-Yau metrics*

In this talk, I will discuss a new free-boundary Monge-Ampere equation that arise from the study of complete Calabi-Yau metrics. This is based on joint work with T. Collins and S.-T. Yau.

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**XINRUI ZHAO**, MIT  
*Unique continuation problem on RCD spaces*

In this talk we will sketch the proof of the unique continuation property of harmonic functions and caloric functions on any RCD(K,2) spaces and a counterexample for the strong unique continuation property of harmonic function on an RCD(K,4) space. This characterizes one of the significant differences between RCD spaces and smooth manifolds. We will also talk about some related open problems. The talk is based on joint works with Qin Deng.