RESEARCH WORKSHOP

TRENDS IN COMPLEX GEOMETRY

SCHEDULE

All the talks will be given remotely, Live, over Zoom. All shown times are local times (Khiva, Uzbekistan).

Zoom link for all the talks:

https://us02web.zoom.us/j/7389135247?pwd=OU8rUW1xeWNBUkM2U29EUk1NTkR5QT09

Saturday 30th October 2021

- **1 pm–2 pm**: **Anna Fino**

  Pluriclosed Metrics and Kähler-like Conditions on Complex Manifolds

- **2:15 pm–3:15 pm**: **Mario Garcia Fernandez**
  $(0,2)$ Mirror Symmetry on Homogeneous Hopf Surfaces

- **3:30 pm–4:30 pm**: **Duong H. Phong**

  A Priori Estimates for the Complex Monge-Ampère Equation

Sunday 31st October 2021

- **1 pm–2 pm**: **Franc Forstnerič**

  Hyperbolic Domains in Real Euclidean Spaces

- **2:15 pm–3:15 pm**: **Hajime Tsuji**
  Adiabatic Limit of Kähler-Ricci Flow

- **3:30 pm–4:30 pm**: **Sławomir Dinew**

  Invitation to Quaternionic Potential Theory and Geometry

TITLES and ABSTRACTS

- **Anna Fino**

Title: *Pluriclosed Metrics and Kähler-like Conditions on Complex Manifolds*

Abstract: *A Hermitian metric on a complex manifold is called strong Kähler with torsion (SKT) or pluriclosed if the torsion of the associated Bismut connection is closed. I will present some general results on pluriclosed metrics in relation to symplectic geometry, the pluriclosed flow and Kähler-like curvature conditions.*

- **Mario Garcia Fernandez**

Title: $(0,2)$ *Mirror Symmetry on Homogeneous Hopf Surfaces*

Abstract: *I will present recent joint work with Luis Álvarez-Cónsul and Andoni De Arriba de La Hera in arXiv:2012.01851, where we find first examples of $(0,2)$ mirror symmetry on compact non-Kähler complex manifolds. For this we follow Borisov's approach to mirror symmetry using vertex algebras and the chiral de Rham complex. Our examples of $(0,2)$ mirrors are given by pairs of Hopf surfaces endowed with a Bismut-flat pluriclosed metric. Requiring that the geometry is homogeneous, we reduce the problem to the study of Killing spinors on a quadratic Lie algebra and the construction of associated $N = 2$ superconformal structures on the superaffine vertex algebra, combined with topological T-duality.*

- **Duong H. Phong**

Title: *A Priori Estimates for the Complex Monge-Ampère Equation*

Abstract: *The complex Monge-Ampère equation is a fully non-linear second order partial differential equation, which corresponds in Kähler geometry to finding a form of given volume in a given Kähler class. As such, it is essential to geometric problems involving the Ricci curvature. The solvability of the equation depends in an essential way on the existence of a priori estimates. We provide a survey of these a priori estimates, from their motivation and Yau's classic 1976 estimates in his proof of the Calabi conjecture, to Kolodziej's L^∞ estimates in the mid 1990's using pluripotential theory, and to a very recent PDE proof of Kolodziej's estimates (joint work with B. Guo and F. Tong).*

- **Franc Forstnerič**

Title: *Hyperbolic Domains in Real Euclidean Spaces*

Abstract: *In a recent joint work with David Kalaj, we introduced a Finsler pseudometric on any domain in the real Euclidean space $\mathbb{R}^n$, $n \geq 3$, defined in terms of conformal harmonic discs, by analogy with Kobayashi's pseudometric on complex manifolds which is defined in terms of holomorphic discs. On the unit ball of $\mathbb{R}^n$ this minimal metric coincides with the classical Beltrami–Cayley–Klein metric. In this talk, I will describe several sufficient conditions for a domain in $\mathbb{R}^n$ to be (complete) hyperbolic, meaning that the minimal pseudometric is a (complete) metric. (Joint work with Barbara Drinovec Drnovsek, University of Ljubljana.)*

- **Hajime Tsuji**

Title: *Adiabatic Limit of Kähler-Ricci Flow*

Abstract: *I would like to present how to localize the Kähler-Ricci flow on the ambient space of a proper Kähler-family. This enables us to relate the Kähler-Ricci flow on the ambient space to the Kähler-Ricci flow on a fiber. We apply this method to prove invariance of plurigenera.*

- **Sławomir Dinew**

Title: *Invitation to Quaternionic Potential Theory and Geometry*

Abstract: *Pluripotential theory has proven to be a very far reaching subject with numerous applications in complex dynamics and complex geometry. In this talk I will sketch the basics of analogous theory in the quaternionic setting and hint some applications in hypercomplex geometry. The emphasis will be on the differences from the complex setting. Time permitting I will also discuss several open questions in the field.*