

# ABSTRACTS

**Jun-Muk Hwang** (*KIAS*) ..... July 27th (Tue), 16:00–17:00

## **Deformation of the space of lines on the 5-dimensional hyperquadric**

Let  $F^5$  be the space of lines on the 5-dimensional hyperquadric  $Q^5 \subset \mathbb{P}^6$ .  $F^5$  is a 7-dimensional homogeneous projective manifold. We show that a projective manifold which arises as a deformation of  $F^5$  is biholomorphic to either  $F^5$  itself or the  $G_2$ -horospherical variety  $X^5$  studied by Pasquier-Perrin. The key point of the proof is to show that a 7-dimensional Fano manifold of second Betti number 1 with the variety of minimal rational tangents isomorphic to a certain Hirzebruch surface is biholomorphic to  $X^5$ . A main new ingredient in the proof is a study of the Cartanian geometry of the geometric structure determined by such a Hirzebruch surface: the construction of a Cartan connection and the investigation of its curvature. This geometric structure is associated to a non-reductive graded Lie algebra and has not been studied classically.

**Marco Kühnel** (*Otto-von-Guericke-Universität Magdeburg*) ..... July 30th (Fri), 10:45–11:45

## **Asymptotics of Complete Ricci-flat Kähler metrics on open manifolds**

With respect to the classification problem of complete Kähler-Einstein manifolds least is known about complete Ricci-flat manifolds. The seminal constructions of Ricci-flat complete Kähler metrics on complements of smooth, ample divisors by Tian/Yau and Bando/Kobayashi will serve as a starting point for an inquiry into asymptotics of this kind of metrics.

**Changzheng Li** (*KIAS*) ..... July 26th (Mon), 13:30–14:30

## **Functorial relationships between $QH^*(G/B)$ and $QH^*(G/P)$**

In this talk, I will show a natural filtration on quantum cohomology  $QH^*(G/B)$  of a complete flag variety  $G/B$ , which respects the quantum product structure. When the quantum parameter goes to zero, this specializes to the filtration on  $H^*(G/B)$  from the Leray spectral sequence associated to the fibration  $P/B \rightarrow G/B \rightarrow G/P$ . This is a recent joint work with Conan Leung.

**Kentaro Nagao** (*Nagoya University*) ..... July 27th (Tue), 13:30–14:30

## **Vertex operators in Donaldson-Thomas theory**

I will introduce vertex operators to compute the generating function of Donaldson-Thomas invariants of a 3-dimensional toric Calabi-Yau variety. The commutator relation of the vertex operators gives the wall-crossing formula of Donaldson-Thomas type invariants.

**Hiraku Nakajima** (*RIMS, Kyoto University*) ..... July 26th (Mon), 16:00–17:00

## **Donaldson = Seiberg-Witten from Mochizuki's formula and instanton counting**

Mochizuki's formula express Donaldson invariants in terms of Seiberg-Witten invariants and certain integrals over Hilbert schemes of points. We write the latter by the instanton counting partition function of the theory with a fundamental matter. We then compute the partition function in terms of elliptic integrals associated with Seiberg-Witten curves for this theory. For the case of Mochizuki's formula,

the Seiberg-Witten curve becomes singular, and everything become explicit. We then prove Witten's conjecture and Marino-Moore-Peradze's superconformal simple type condition (for projective surfaces). This is a joint work with Lothar Göttsche and Kota Yoshioka.

**Yong-Geun Oh** (*University of Wisconsin–Madison*) . . . . . July 26th (Mon), 9:30–10:30  
**Counting embedded curves in Calabi-Yau threefolds and Gopakumar-Vafa invariants**

**Hiroshi Ohta** (*Nagoya University*) . . . . . July 26th (Mon), 10:45–11:45  
**Lagrangian Floer theory and mirror symmetry for toric manifolds**

I will talk about a version of mirror symmetry for smooth toric manifolds via Lagrangian intersection Floer theory. This is based on my joint work with K. Fukaya, Y.-G. Oh and K. Ono:

- 1) Lagrangian Intersection Floer Theory –Anomaly and Obstruction–. AMS/IP Studies in Advanced Math. vol 46-1, 46-2. (2009).
- 2) Lagrangian Floer theory on compact toric manifolds I. *Duke Math. J.* vol 151, 23–175. (2010). arXiv:0802.1703.
- 3) Lagrangian Floer theory on compact toric manifolds II: Bulk deformations Preprint. arXiv:0810.5654.
- 4) Lagrangian Floer theory and mirror symmetry on compact toric manifolds. in preparation.

**Liviu Ornea** (*University of Bucharest*) . . . . . July 27th (Tue), 10:45–11:45  
**Transformation groups of locally conformal Kaehler manifolds**

After an introduction in locally conformal Kaehler geometry, I shall concentrate on (1) characterizing the existence of an automorphic potential on a Kaehler covering by the existence of a conformal and holomorphic circle action on the manifold itself and (2) describing various transformation groups acting in this geometry. The talk is based on results obtained with M. Verbitsky (1) and A. Moroianu (2).

**Jihun Park** (*Postech*) . . . . . July 28th (Wed), 10:45–11:45  
**Del Pezzo surfaces and Einstein metrics**

The global log canonical threshold on a Fano orbifold  $X$  is defined by the infimum of log canonical thresholds of effective  $\mathbb{Q}$ -divisors numerically equivalent to the anticanonical divisor of  $X$ . In this talk, I will explain how to compute the global log canonical thresholds of log del Pezzo hypersurfaces in weighted projective spaces. As an application, the existence of Einstein metrics on various simply connected 5-manifolds is implied by the global log canonical thresholds.

**Gábor Székelyhidi** (*Columbia University*) . . . . . July 27th (Tue), 9:30–10:30  
**On blowing up extremal Kähler manifolds**

We discuss recent progress on constructing extremal metrics on the blowups of extremal Kähler manifolds, building on the work of Arezzo-Pacard-Singer.

**Yukinobu Toda** (*IPMU, University of Tokyo*) . . . . . July 28th (Wed), 9:30–10:30

**Moduli spaces of stable quotients and the wall-crossing phenomena**

The moduli space of holomorphic maps from Riemann surfaces to the Grassmannian is known to have two kinds of compactifications: Kontsevich’s stable map compactification and Marian-Oprea-Pandharipande’s stable quotient compactification. Over a non-singular curve, the latter moduli space is Grothendieck’s Quot scheme. In this talk, I introduce the notion of ‘ $\varepsilon$ -stable quotients’ for a positive real number  $\varepsilon$ , and show that stable maps and stable quotients are related by the wall-crossing phenomena. I will also discuss Gromov-Witten type invariants associated to  $\varepsilon$ -stable quotients, and investigate them under the wall-crossing.

**Valentino Tosatti** (*Columbia University*) . . . . . July 29th (Thu), 16:00–17:00

**The Calabi-Yau equation on symplectic four-manifolds**

The Calabi conjecture, proved by Yau thirty years ago, says that on a compact Kähler manifold one can find a unique Kähler metric in every Kähler class with prescribed volume form. Donaldson recently conjectured that this theorem can be extended to symplectic forms with a compatible almost complex structure in 4 dimensions, and gave possible applications to the symplectic topology of 4-manifolds. I will discuss Donaldson’s conjecture and some recent developments (joint work with B. Weinkove and partly with S.-T. Yau).

**Bing Wang** (*Princeton University*) . . . . . July 29th (Thu), 13:30–14:30

**Space of Ricci flows**

This is a joint work with Xiuxiong Chen. Under the noncollapsing condition, we show that Ricci flows with bounded scalar curvature, bounded half dimensional curvature integral norm have weak compactness property. This weak compactness property has applications in the convergence of Kähler Ricci flows on Fano manifolds and the moduli space of Ricci solitons.

**Guofang Wang** (*Albert-Ludwigs-Universität Freiburg*) . . . July 29th (Thu), 9:30–10:30

**Sasaki Ricci flow on 3 dimensional Sasakian manifolds**

In this talk I will first introduce the Sasaki Ricci flow and then consider its convergence on 3 dimensional Sasakian manifolds.

**Takumi Yokota** (*RIMS, Kyoto University*) . . . . . July 29th (Thu), 10:45–11:45

**Manifolds with positive curvature operator of the second kind are space forms**

The Ricci flow is one of the powerful tools in recent Riemannian geometry. We can deform a given Riemannian metric satisfying a certain curvature condition to a rounder one by solving the Ricci flow equation. In this talk, we consider the condition that the curvature tensor defines a positive curvature operator acting on trace-free symmetric tensors, and prove that closed manifolds admitting such Riemannian metrics are spherical space forms. The proof relies heavily on the results of Böhm-Wilking and Brendle-Schoen.

**Xianhua Zhu** (*Peking University*) ..... July 27th (Tue), 14:45–15:45

**Variation solution of extremal metrics on toric manifolds**

In this talk, I will describe a minimizing solution to extremal metrics on toric manifolds as well as a result of the partial regularity for the solution.