

Workshop on Complex Algebraic Geometry

January 18-20, CUHK

Titles and Abstracts

- **BONDAL, Alexey (Kavli IPMU) (Steklov Mathematical Institute)**

Title: (TBA)

- **CHEN, Meng (Fudan)**

Title: On explicit birational geometry of 3-folds of general type

Abstract: I will report some new advances on the birational geometry of 3-folds of general type. This is a joint work with Jungkai Chen.

- **CHEN, Yunxia (CUHK)**

Title: ADE bundles over complex surfaces

Abstract: (Affine) ADE bundles can be naturally constructed over (i) surfaces with rational singularities, (ii) surfaces with singular elliptic curves in Kodaira's classification, (iii) del Pezzo surfaces, ruled surfaces, etc. When the surface X is semi-Fano, then the deformability of the (affine) ADE bundles detect the geometric structures on X .

- **FAN, Huijun (Peking)**

Title: Explicit isomorphisms between pairings in quantum singularity theory

Abstract: In this talk, I will explain the construction of some explicit isomorphisms between different pairings appeared in the quantum singularity theory. Those pairings includes intersection pairing between Lefschetz thimbles, residue pairing, integration pairing and Witten index. Some knowledges of the deformation of Schroedinger equations, which is based on my recent work, will be used in the construction. This is the joint work with Yefeng Shen.

- **FU, Baohua (CAS)**

Title: A construction of minuscule varieties

- **HU, Wenchuan (Sichuan)**

Title: On additive invariants of actions of additive and multiplicative groups

Abstract: Let X be an algebraic variety with an action of either the additive or multiplicative group. We calculate the additive invariants of X in terms of the additive invariants of the fixed point set, using a method given by Bialynicki-Birula. The method is also generalized to calculate certain additive invariants for Chow varieties. As applications, we obtain results on the Hodge polynomial of Chow varieties in characteristic zero and the number of points for Chow varieties over finite fields. As applications, we obtain the l -adic Euler-Poincaré characteristic for the Chow varieties of certain projective varieties over a field of arbitrary characteristic.

- **LIU, Melissa (Columbia)**

Title: The Yang-Mills equations over Klein surfaces

Abstract: In “The Yang-Mills equations over Riemann surfaces”, Atiyah and Bott studied Yang-Mills functional over a Riemann surface from the point of view of Morse theory, and derived results on topology of the moduli space of algebraic bundles over a complex algebraic curve. In this talk, I will discuss Yang-Mills functional over a Klein surface (a 2-manifold equipped with a dianalytic structure) from the point of view of Morse theory, and derive results on topology of the moduli space of real or quaternionic vector bundles over a real algebraic curve. This is based on joint work with Florent Schaffhauser.

- **ZHANG, Yi (Fudan)**

Title: Smooth toroidal compactifications of Siegel variety from the viewpoint of Kähler-Einstein metrics

Abstract: We try to understand the Kähler-Einstein property in algebraic geometry. In particular we study smooth toroidal compactifications of the Siegel variety $A_{g,\Gamma}$ through the unique Kähler-Einstein metric on $A_{g,\Gamma}$. We first get a global volume formula. By this formula we then deduce that the Kähler-Einstein metric on $A_{g,\Gamma}$ ($g > 1$) endows some restraint combinatorial conditions for all toroidal smooth compactifications $\overline{A_{g,\Gamma}}$ of $A_{g,\Gamma}$ such that the boundary divisor $D_\infty := \overline{A_{g,\Gamma}} - A_{g,\Gamma}$ is normal crossing. We also study the asymptotic behaviour of logarithmical canonical line bundle on any smooth toroidal compactification of $A_{g,\Gamma}$. We find that the logarithmical canonical bundle degenerates sharply even though it is big and numerically effective.

- **ZHANG, Youjin (Tsinghua)**

Title: On the genus two free energies for semisimple Frobenius manifolds

Abstract: For a semisimple Frobenius manifold the genus $g > 0$ free energies are defined by recursively solving the associated loop equation, in particular one can obtain an explicit formula of the genus two free energy. However, this formula is given in terms of canonical coordinates of the Frobenius manifold and is not convenient for applications. In this talk we present, for semisimple Frobenius manifolds associated to simple singularities and to the extended affine Weyl groups of ADE type a conjectural formula for the genus two free energy given in terms of sixteen dual graphs of genus two stable curves with marked points, each dual graph is associated in a simple way a function represented in terms of the flat coordinates and the potential of the Frobenius manifold.

- **ZHOU, Jian (Tsinghua)**

Title: Curve counting in local Calabi-Yau geometries

Abstract: We will report on some recent results on the Gopakumar-Vafa invariants of the canonical line bundles of toric surfaces. We express their generating series as quasimodular forms and relate them to the Hilbert schemes of the algebraic surfaces. We regard such results as three-dimensional analogue of Göttsche-Yau-Zaslow formula.