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Claudio Arezzo

Title: CMC foliations and Apparent horizons in Cauchy data for Einstein Equations.

Abstract: We first review the existence theory of CMC foliations started by Huisken-Yau and Neves-Tian. We will then show how to use some new extension of this theory to adapt a classical construction described by S.Wolpert in Teichmuller Theory, to construct new examples of Cauchy data for the Einstein Constraint Equations (possibly with cosmological constant) and an arbitrary number of apparent horizons with nontrivial topology. Joint work with L. Mazzieri and S. Lancini.

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Alice Chang

Title: Conformal gap theorems on S^4 and CP^2

Abstract: An important conformal invariant quantity on a 4-manifold is the integral of the Chern-Gauss-Bonnet formula module the L^2 of the Weyl curvature part. In the talk, I will first survey some earlier works (joint with M.Gursky and P. Yang) where we characterized 4-sphere using this invariant quantity; then report some recent work (joint with M. Gursky and Siyi Zhang) where we derive a conformal gap theorem for the 4-sphere and characterize manifolds in a neighborhood of CP^2 in terms of the same quantity. The main tool used in the proof is a study of a fully non-linear PDE of Monge-Ampere type and the Bach equation.

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Jingyi Chen

Title: Regularity of Hamiltonian stationary Lagrangian submanifolds

Abstract: A Hamiltonian stationary Lagrangian manifold is a critical point of the volume functional under Hamiltonian variations. It is locally determined by fourth order elliptic equations. We show that any C^1 Hamiltonian stationary Lagrangian manifold is smooth. This is joint work with Micah Warren.

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Min-Chun Hong

Title: Finite time blowup of the n-harmonic flow on n-manifolds

Abstract: In this talk, we generalize the no-neck result of Qing-Tian to show that there is no neck during blowing up for the n-harmonic flow as $t\to\infty$. As an application of the no-neck result, we settle a conjecture of Hungerb\"uhler by constructing an example to show that the n-harmonic map flow on an n-dimensional Riemannian manifold blows up in finite time for $n\geq 3$. This is my joint work with Leslie Cheung.

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Slawomir Kolodziej

Title: Holder continuous solutions of Monge-Ampere equations on compact Hermitian manifolds

Abstract: This is joint work with C. N. Nguyen. Let (X; \omega) be a compact Hermitian manifold of complex dimension n. We consider the complex Monge-Ampere equation: (\omega + dd^c\varphi)^n = cd\mu. We show that a positive Borel measure d\mu of finite total mass, admits a Holder continuous solution (for some positive constant c) if and only if it is dominated locally by Monge-Ampere measures of Holder continuous plurisubharmonic functions.

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Chi Li

Title: On the Yau-Tian-Donaldson conjecture for singular Fano varieties

Abstract: I will talk about a recent work on the Yau-Tian-Donaldson's conjecture for any Q-Fano variety that has a log smooth resolution of singularities such that the discrepancies of all exceptional divisors are non-positive. We will show that if such a Fano variety is K-polystable, then it admits a K\"ahler-Einstein metric. This extends the previous result for smooth Fano varieties to this class of singular Q-Fano varieties. This is a joint work with Gang Tian and Feng Wang.

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Jiayu Li

Title: Canonical metrics and The Hermitian-Yang-Mills flow on reflexive sheaves

Abstract: In this talk, we will introduce our recent work on the existence of canonical metrics, Bogomolov type inequalities and the limiting behavior of the Hermitian-Yang-Mills flow on reflexive sheaves. These are joint work with Xi Zhang and Chuanjing Zhang.

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Xiaonan Ma

Title: Bergman kernels on punctured Riemann surfaces

Abstract: We consider a punctured Riemann surface endowed with a Hermitian metric which equals the Poincare metric near the punctures and a holomorphic line bundle which polarizes the metric. We show that the Bergman kernel can be localized around the singularities and its local model is the Bergman kernel of the punctured unit disc endowed with the standard Poincare metric. As a consequence, we obtain an optimal uniform estimate of the supremum norm of the Bergman kernel, involving a fractional growth order of the tensor power.

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Richard Melrose

Title: K\"ahler metrics metrics and cohomology.

Abstract: I will discuss two rather different classes of natural K\"ahler metrics and the harmonic forms for the associated Laplace-Beltrami operators. Joyce and Nakajima introduced complete hyper-K\"ahler metrics on the planar Hilbert schemes and I will describe how to extend the results of Hitchin and Carron to obtain the reduced L^2 cohomology as derived through physical arguments by Vafa and Witten. The Weil-Petersson metrics on Riemann moduli spaces are incomplete but nevertheless the Laplacian is essentially self-adjoint and in recent work with Jesse Gell-Redman, based in turn on earlier results

with Xuwen Zhu, the harmonic forms have been identified with the cohomology of the Deligne-Mumford compactifications.

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Jie Qing

Title: On Hypersurfaces in Hyperbolic Space

Abstract: In this talk I will report our recent works on convex hypersurfaces in hyperbolic space. To study hypersurfaces in hyperbolic space analytically, one needs to find ways to parametrize it, preferably globally. We consider two parametrizations: vertical graph and hyperbolic Gauss map. To get a global parametrization, one needs understand the interrelation of convexity and embeddedness. It is also important to understand the asymptotic of the geometry at ends. In this talk I will report some of our recent works on global and asymptotic properties of hypersurfaces with nonnegative sectional curvature or Ricci curvature in hyperbolic space.

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Tristan Riviere

Title: The cost of the Sphere eversion and the 16 \pi Conjecture

Abstract: TBA

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Natasa Sesum

Title: Ancient solutions to the mean curvature flow

Abstract: I will present joint work with Angenent and Daskalopoulos in which we show unique precise asymptotics of any closed noncollapsed ancient solution with symmetry. After that, using the asymptotics we show the uniqueness of those solutions.

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Jian Song

Title: Compactness for Kahler-Einstein manifolds of negative constant scalar curvature

Abstract: We discuss compactness results for Kahler-Einstein manifolds with negative first Chern class and geometric Kahler-Einstein metrics on smoothable log canonical models.

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Neil Trudinger

Title: From optimal transportation to conformal geometry.

Abstract: In this talk we will show the connection between boundary value problems arising in optimal transportation and geometric optics and nonlinear Yamabe problems with boundary in conformal geometry. The latter concerns the existence of conformal metrics on a Riemannian manifold with boundary so that given nonlinear symmetric functions of the eigenvalues of the Schouten tensor and the curvatures of the boundary are prescribed. This is a byproduct of joint work with Feida Jiang on oblique boundary value problems for augmented Hessian equations and leads in particular to the resolution of an open problem to relax an umbilic boundary hypothesis for second derivative estimates in the prescribed boundary mean curvature case.

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Jeff Viaclovsky

Title: Type II degeneration of Ricci-flat metrics on K3 surfaces.

Abstract: I will discuss a construction of collapsing sequences of Ricci-flat metrics on K3 surfaces with Tian-Yau and Taub-NUT metrics occurring as bubbles. This is joint work with Hans-Joachim Hein, Song Sun, and Ruobing Zhang.

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Chenyang Xu

Title: Volume and stability of singularities

Abstract: One guiding principal for the class of kawamata log terminal

(klt) singularities is that it is the local analogue of Fano varieties. In this talk, I will discuss our work (joint with Chi Li) on establishing an algebraic stability theory, which is the analogue to the K-stability of Fano varieties, for a klt singularity. This is achieved by using Chi Li's definition of normalised volumes. As an application, we prove that the intermediate semistable cone of the metric tangent cone of a klt singularity appearing on the GH limit of Kahler-Einstein Fano manifolds is only determined by the algebraic structure of the singularity but independent of the local metric, which confirms a conjecture by Donaldson-Sun. If time permits, I will discuss other applications of this, e.g. constructing KE metric on Fano manifolds etc.

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Guangbo Xu

Title: Gauged linear sigma model in the geometric phase

Abstract: In this talk I will discuss the mathematical construction of Witten's gauged linear sigma model (GLSM) using methods from symplectic geometry. I will present how to use the moduli space of gauged Witten equation to define a Gromov--Witten type invariant. If time permits, I will also explain the relation between the GLSM invariants and the ordinary Gromov--Witten invariants via adiabatic limit. This is a joint work with Gang Tian.

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Paul Yang

Title: CR invariant surfaces and curves in the Heisenberg

Abstract: We describe several CR invariant energy for surfaces and curves in the Heisenberg. The critical surfaces and curves include the Clifford torus and the chains of Cartan. One energy arises as the coefficient of the logarithm term in the renormalized volume expansion associated to the analogue of the Lowner-Nirenberg equations in the Heisenberg.

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Zhenlei Zhang

Title: Kahler-Ricci flow on smooth minimal elliptic surfaces of Kodaira dimension one

Abstract: It is conjectured since Song-Tian work that the Kahler-Ricci flow on a smooth minimal model of Kodaira dimension one would converge in the Gromov-Hausdorff topology to the generalized Kahler-Einstein metric on its canonical model. Much effort has been made by Song-Tian, Fong-Zhang (Zhou Zhang) etal. In this talk I will present a confirmation to the conjecture. It is a joint work with Professor Tian.

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Aleksey Zinger

Title: Virtual fundamental class: an overview

Abstract: The aim of this mostly expository talk is to give a neutral perspective on the development of and motivation behind virtual fundamental class constructions for moduli spaces in gauge theory with nice deformation-obstruction theory. I will recall the original topological construction, touch on some of its later interpretations and useful extensions, and bring up some related geometric questions.