Titles and Abstracts

Green's function and C0 estimate of Monge-Ampere equation

Damin Wu
University Connecticut

We construct on any complete Riemannian manifold a positive Green's function for the Laplacian minus one. The Green's function can be applied to derive a C0 bound for the negatively curved Kähler-Einstein potential on quasi-projective manifolds.
This is based on the joint work with Henri Guenancia.

The Lp-Minkowski Problem

Jiakun Liu
University of Wollongong

In this talk we first give a brief introduction to the Lp-Minkowski problem. Then we focus on the uniqueness results and show that in dimensional two, either when or when $0<p<1$ in addition to a pinching condition, the solution must be the unit ball. This partially answers a conjecture of Lutwak, Yang and Zhang about the uniqueness of the Lp-Minkowski problem in dimension two. Moreover, we give an explicit pinching constant depending only on p when $0<p<1$.
This is a recent joint work with Yong Huang and Lu Xu.

Several special complex structures and their deformation properties

Sheng Rao
Wuhan University

Using a generalized extension formula and an iteration method developed by Liu-Sun-Yau, we obtain several results on deformation invariance of Hodge numbers, especially Popovici-Ugarte's invariance of (0, 1)-type Hodge numbers on sGG manifolds. Inspired by the works of Fu-Xiao and Popovici, we will describe the Gauduchon cone on any compact complex manifold. By use of this and Demailly's regularization, we obtain an inclusion of the limit of the Gauduchon cones of the general fibers of a complex analytic family of Kähler manifolds.
This is a joint work with Quanting Zhao.

Some recent results on minimal surfaces with free boundary

Man chun Martin Li
Chinese University of Hong Kong

Minimal surfaces with free boundary are solutions to a nonlinear geometric Neumann boundary value problem for minimal surfaces. Such minimal surfaces are naturally related to an extremal Steklov eigenvalue problem for surfaces with boundary by the work of Fraser and Schoen. In this talk, we will discuss some recent results concerning the existence, regularity and the moduli space

of minimal surfaces with free boundary.

Some Analytic Aspects of Elliptic Genera

Fei Han
National University of Singapore

Elliptic genera are important topological invariants taking values in modular forms. They are formally equivariant indices of Dirac operators on free loop spaces. In this talk, I will briefly explain these higher invariants, their generalizations (modular eta invariants) and some applications (for example, to positive curvature problems).

Scattering Operators for Conformally Compact Einstein manifolds

Fang Wang
Shanghai Jiaotong University

On a conformally compact Einstein manifold, scattering operators are defined to be a family of conformally covariant pseudo-differential operators on the boundary, which provide a bridge to transfer the information between the interior Einstein metric and the boundary conformal geometry. Here I will mainly talk about the question about how to read the interior from the boundary.

The Kähler Ricci flow on Fano manifolds (I)

Bing Wang
University of Wisconsin-Madison

As a generalization of Cheeger-Colding-Tian theory for non-collapsed Einstein manifolds, we develop the compactness of the moduli of non-collapsed Calabi-Yau spaces with mild singularities. Based on this compactness, we set up a structure theory for polarized Kähler Ricci flows with proper geometric bounds. As applications, we prove the Hamilton-Tian conjecture and the partial-C0-conjecture of Tian.
This is a joint work with X.X. Chen.

Regularity of Convex Hypersurfaces with Vanishing Gauss Curvature

Qirui Li
Australian National University

Abstract: In this talk, we will discuss the regularity of convex hypersurfaces with vanishing Gauss curvature. This is equivalent to solving a homogeneous Monge-Ampere equation, i.e., the right hand side is identically zero. The solution is the convex envelope of the boundary function, and its C1,1 regularity was known by Trudinger-Urbas and Caffarelli- Nirenberg-Spruck. We will focus on the higher regularity under proper conditions. We will also present examples to show that one cannot expect C2 solution if our conditions are violated.

1/4-Pinched Contact Sphere Theorem

Jian Ge
Peking University

In this talk I will present a proof of 1/4-pinched sphere theorem, which says if the curvature of a contact 3-manifold with compatible Riemannian metric is 1/4-pinched, then the contact structure is universal tight. We also have some results for open manifolds.
This is a joint work with Yang Huang.

Log Canonical Multiplicity and Characteristic Indicatrix

Chen-Yu Chi
National Taiwan University

Log canonical threshold (lct) is an important index measuring how singular an analytic subspace of a complex manifold is at a point. It appears in many aspects of complex analytic/algebraic geometry, such as the theory of multiplier ideal sheaves. In this talk, we will introduce an index accompanying lct and talk about its possible relation to multiplier ideal sheaves and to the global geometry of the ambient manifold.

Neckpinch singularities in geometric flows

Haotian Wu
University of Oregon

Abstract: Geometric flows such as Ricci flow and mean curvature flow are nonlinear parabolic PDEs that tend to develop singularities in finite time. An interesting class of finite-time singularities are the so-called neckpinches. One may seek rigorous and detailed examples of neckpinch singularities in order to understand how fast the curvature can blow up and what geometric shapes a neckpinch can have. In this talk, we will survey results on the precise asymptotic profiles of neckpinch singularities in Ricci flow and mean curvature flow.

Title: Results on curvature flow

Pak Tung Ho
Sogang University

In this talk, I will first talk about Q-curvature flow. Then I will talk about Yamabe flow and CR Yamabe flow, which were introduced to study the Yamabe problem and the CR Yamabe problem respectively. If time permits, I will also talk about the study of Nirenberg's problem by using the curvature flow method.

On rigidity problem in geometry and topology of submanifolds

Juanru Gu

Mathematical Center Zhejiang University

We mainly discuss the geometric, topology and differential rigidity problem for submanifolds in space forms, and prove some rigidity theorems for compact submanifolds under Ricci curvature pinching condition.

The infinitesimal equivariant index formula in the noncommutative geometry framework

Yong Wang
Northeast Normal University

We establish an infinitesimal equivariant index formula in the noncommutative geometry framework. We compute the limit of the infinitesimal equivariant Chern-Connes character when the time goes to zero. Then we extend these theorems to the family case. We also define the infinitesimal equivariant eta cochain and prove its regularity and establish the noncommutative infinitesimal equivariant index formula for manifolds with boundary.

Modified Futaki Invariant and Equivariant Riemann-Roch Formula

Bin Zhou
Peking University

In this talk, we will discuss a new version of the modified Futaki invariant for a test configuration associated to the soliton action on a Fano manifold. Our version will naturally come from toric test configurations defined by Donaldson for toric manifolds. As an application, we show that the modified K-energy is proper for toric invariant Kähler potentials on a toric Fano manifold. Our method can be also used to study the conical Kähler-Ricci solitons on such a manifold. This is a joint work with Feng Wang and Xiaohua Zhu.

On the blow-up of harmonic maps

Hao Yin
University of Science and Technology of China

In this talk, we shall discuss the blow-up process of a sequence of harmonic maps with uniformly bounded (rescaled) energy. In particular, we review the construction of bubble tree, which is well known if the domain manifold is of dimension two and generalize it to the higher dimensional case.

The Kähler Ricci flow on Fano manifolds (II)

Bing Wang
University of Wisconsin-Madison

As a generalization of Cheeger-Colding-Tian theory for non-collapsed Einstein manifolds, we develop the compactness of the moduli of non-collapsed Calabi-Yau spaces with mild singularities. Based on this compactness, we set up a structure theory for polarized Kähler Ricci

flows with proper geometric bounds. As applications, we prove the Hamilton-Tian conjecture and the partial-C0-conjecture of Tian.
This is a joint work with X.X. Chen.

Curvature and Riemannian submersions

Xiaoyang Chen
University of Macau

We will talk about the structure of Riemannian submersions from positively curved manifolds. In particular, we will discuss a diameter rigidity theorem and some nonexistence theorems.

Singular Riemannian foliation, isoparametric foliation and exotic smooth structure

Jianquan Ge
Beijing Normal University

Singular Riemannian foliation (SRF) is a singular foliation where any geodesic perpendicuar to one leaf intersects perpendicularly to each leaf. Isoparametric foliation is a SRF of codim 1 whose regular leaves have constant mean curvature. In this talk, we introduce our recent study about these, namely,
1) Classify closed simply connected 4-manifolds with SRF
2) Establish 1-1 correspondence between SRF of codim 1 (or isoparametric foliation) in any homotopy sphere and in standard sphere
3) Application to the existence of exotic smooth structures.

Hypersurfaces of nonnegative scalar curvature

Damin Wu
University Connecticut

We prove that if a closed hypersurface in Euclidean space has nonnegative scalar curvature, then the hypersurface is mean convex. Examples will be given to show that the same conclusion does not hold if the scalar curvature is replaced by the higher order mean curvatures.
This is based on the joint work with Lan-Hsuan Huang.

Cheng-type isoperimetric inequalities and their applications

Jing Mao
Harbin Institute of Technology at Weihai, China and Instituto Nacional de Matematica Pura e Aplicada, Brazil

In this talk, we would like to give some Cheng-type isoperimetric inequalities for the first Dirichlet eigenvalue of the Laplacian and the -Laplacian ($1<p<\infty$) on complete n-manifolds ($n\geq 2$) with radial curvature bounded, which can be seen as a generalization of the classical Cheng's eigenvalue comparison theorems. Moreover, some geometric applications will also be introduced.
The talk is based on a joint-work with Prof. Pedro Freitas and Prof. Isabel Salavessa in CVPDE

and another work of me in JMPA.

Steklov Eigenvalues on Annuli

Chengjie Yu
Shantou University

In this talk, we will first survey some results about extremal problems for Steklov eigenvalues on surfaces. Then, we will present a recent joint work with Xu-Qian Fan and Luen-Fai Tam on the extremal values of all Steklov eigenvalues on annuli with rotationally conformal metrics. Finally, some open problems for extremal values of Steklov eigenvalues on surfaces are presented.

Submanifolds of constant Jordan angles

Ling Yang
Fudan University

A new geometric concept, submanifolds in Euclidean space with constant Jordan angles (CJA), will be introduced, which is a generalization of constant angle curves and surfaces. By exploring the second fundamental form of submanifolds with CJA, we give a local existence result for CJA surfaces in 4-dimensional Euclidean space and make a complete classification for complete CJA surfaces. In conjunction with the algebraic properties of octonions, we can characterize the Lawson-Osserman's cone from the viewpoint of Jordan angles, which is an important example of coassociative submanifolds and has a close relationship with the Bernstein problem for minimal submanifolds of higher codimension.

Geometric properties of "totally" conjugate cut points

Shicheng Xu
Capital Normal University

We will talk about a small improvement of the well-known Lemma in Riemannian geometry by Klingenberg on the exsistance of geodesic loops, which has been widely used in injectivity radius estimate. Klingenberg's lemma says that for any local minimum point x0 of the distance function d(p, ·) in the cut locus Cp of p, either p and x0 are conjugate along a minimal geodesic from p to x0, or there is a geodesic loop at p that smoothly goes through x0. We can show that if there is no geodesic loop, then they must be "totally" conjugate, that is, they are conjugate along any minimal geodesic connecting them. The proof is not direct, and it is necessary to consider a more general case. Some geometric applications will also be talked about.

Scattering rigidity versus lens rigidity

Haomin Wen
Max Planck Institute of Mathematics

Scattering rigidity of a Riemannian manifold allows one to tell the metric of a manifold with boundary by looking at the directions of geodesics at the boundary. Lens rigidity allows one to tell

the metric of a manifold with boundary from the same information plus the length of geodesics. There are a variety of results about lens rigidity but very little is known for scattering rigidity. I will discuss the subtle difference between these two types of rigidities and prove that they are equivalent for a large class of two-dimensional manifolds including all simple manifolds. In particular, this implies that two-dimensional simple manifolds (such as the at disk) are scattering rigid since they are lens/boundary rigid (Pestov-Uhlmann, 2005).

Brezis-Merle type concentration-compactness theorem for super Liouville equations

Chunqin Zhou
Shanghai Jiaotong University

In this talk, I will consider the super Liouville equations which is a natural generalization of the Liouville equation. I'll describe geometric and anlytic aspects of the system. In particular, I will analyze the formation of singularities in detail. At last, I will show the Brezis-Merle type concentration-compactness theorem for this system.

Non-CSC HCMU metrics with conical and cusp singularities

Yingyi Wu
School of Mathematics Sciences, UCAS

We consider on compact Riemann surfaces singular extremal metrics whose Gauss curvatures have nonzero umbilical Hessians, which are usually called HCMU metrics. The singular sets of these HCMU metrics consist of conical and cusp singularities, both of which are finitely many. We show that these metrics exist with the prescribed singularities if and only if so do certain meromorphic 1-forms on the Riemann surfaces, which only have simple poles with real residues and whose real parts are exact outside their poles.
The talk is based on a joint work with Qing Chen and Bin Xu.

A probabilistic method for gradient estimates of some geometric flows

Xin Chen
Shanghai Jiaotong University

In general, gradient estimates are very important and necessary for deriving convergence results in different geometric flows, and most of them are obtained by analytic methods. In this paper, we will apply a stochastic approach to systematically give gradient estimates for some important geometric quantities under the Ricci flow, the mean curvature flow, the forced mean curvature flow and the Yamabi flow respectively. Our conclusion gives another example that probabilistic tools can be used to simplify proofs for some problems in geometric analysis.
The talk is based on a joint work with Li-Juan Cheng and Jing Mao.

Ricci curvature type lower bounds for sub-Riemannian structures on Sasakian manifolds

Paul Woon Yin Lee
Chinese University of Hong Kong

In this talk, we introduce a type of Ricci curvature lower bound for a natural sub-Riemannian structure on Sasakian manifolds and discuss various consequences under this condition.