



上海交通大学
SHANGHAI JIAO TONG UNIVERSITY

数学科学学院

SCHOOL OF MATHEMATICAL SCIENCES

International Conference on Geometric Analysis

Conference Program

Shanghai Jiao Tong University, Shanghai, China

March 8-10, 2018

Organizers: Jürgen Jost Miaomiao Zhu

Local Organizers: Yihu Yang Chunqin Zhou Deliang Xu Miaomiao Zhu

Schedule

- ✧ Venue: Large Conference Hall (100-L), Math Building, SJTU
地点: 上海交通大学数学楼大会议室 (一楼)
- ✧ Address: No. 800, Dongchuan Road, Minhang District, Shanghai, China
地址: 上海市闵行区东川路 800 号上海交通大学闵行校区

March 8, Thursday: Large Conference Hall, Math Building	
Morning Session	
9:00-09:20	Registration
9:20-09:30	Opening
Chair	Jürgen Jost
9:30-10:30	Tristan Rivière Minmax Hierarchies and The Viscosity Approach to the Variational Construction of Minimal Surfaces
10:30-11:00	Tea Break
11:00-12:00	Stephan Luckhaus Christoffel's identity and geometric rigidity
12:00-14:00	Lunch Break
Afternoon Session	
Chair	Yihu Yang
14:00-15:00	Bo Guan Results on fully nonlinear elliptic equations on manifolds
15:00-15:30	Tea Break
15:30-16:30	Wilderich Tuschmann MODULI SPACES OF NONNEGATIVELY CURVED RIEMANNIAN METRICS
16:30-17:00	Tea Break
17:00-18:00	Xiaochun Rong Collapsed manifolds with Ricci local bounded covering geometry
18:00	Dinner

March 9, Friday: Large Conference Hall, Math Building	
Morning Session	
Chair	Stephan Luckhaus
9:30-10:30	Jürgen Jost Quantum field theory and geometric analysis
10:30-11:00	Tea Break

11:00-12:00	Ruijun Wu Symmetries of a nonlinear sigma model with gravitino
12:00-14:00	Lunch Break
Afternoon Session	
Chair	Yuanlong Xin
14:00-15:00	Guofang Wang Uniqueness of stable free boundary CMC hypersurfaces in a ball
15:00-15:30	Tea Break
15:30-16:30	Bernd Ammann The Yamabe invariant and surgery
16:30-18:00	Free discussion
18:00	Banquet

March 10, Saturday: Large Conference Hall, Math Building	
Morning Session	
Chair	Tristan Rivière
9:30-10:30	Gerhard Huisken Mean curvature flow with surgery for mean convex embedded 2-surfaces in 3-manifolds
10:30-11:00	Tea Break
11:00-12:00	Feng Zhou Isolated singular solutions for some nonlinear elliptic equations
12:00-14:00	Lunch Break
Afternoon Session	
Chair	Miaomiao Zhu
14:00-15:00	Jiayu Li Canonical metrics and The Hermitian-Yang-Mills flow on reflexive sheaves
15:00-15:30	Tea Break
15:30-16:30	Chong Song Yang-Mills-Higgs fields on Riemannian surfaces
16:30-18:00	Free discussion
18:00	Dinner

Abstracts

Titles and Abstracts

Bernd Ammann, University of Regensburg

Title: The Yamabe invariant and surgery

Abstract: In this talk I want to give an overview over some results about the (smooth) Yamabe invariant in joint work with M. Dahl and E. Humbert. We will see for example that the Yamabe invariant of a simply connected compact spin manifold of dimension 5 is between 45 and 79. In dimension 6 it is between 49.9 and 96.3. Similar estimates hold for 2-connected compact spin manifolds with vanishing index in higher dimensions.

Let us give some more details. The (conformal) Yamabe constant of a compact riemannian manifold (M, g_0) is defined as

$$Y(M, [g_0]) := \inf \int_M \text{scal}^g dv^g$$

where the infimum runs over all metrics g of volume 1 in $[g_0]$. The (smooth) Yamabe invariant of M is then defined as

$$\sigma(M) := \sup Y(M, [g_0])$$

where the supremum runs over all conformal classes $[g_0]$ on M .

These invariants are tightly related to the existence of metrics of constant scalar curvature in a given conformal class. The invariant $\sigma(M)$ is positive iff M carries a metric of positive scalar curvature. Despite of its simple definition, the Yamabe invariant is extremely difficult to calculate, and it is only known for very few manifolds.

We have proven a formula that estimates the behaviour of $\sigma(M)$ under performing surgery at M , namely if N is obtained by surgery of dimension $k \leq n - 3$ from M , then

$$\sigma(N) \geq \min\{\sigma(M), \Lambda_{n,k}\},$$

where $\Lambda_{n,k} > 0$ only depends on $n = \dim M$ and k .

The constants $\Lambda_{n,k} > 0$ arise as Yamabe constants of certain limit spaces which are products of rescaled spheres with the standard hyperbolic spaces.

We found an efficient method to control the Yamabe constants of products spaces provided that both factors are of dimension at least 3. This formula yields positive lower bounds for $\Lambda_{n,k}$ in the case $k \notin \{1, n - 3\}$, and also in the case $(n, k) = (6, 3)$. This provides the application in dimension 6 and higher. We also found a method to compare the conformal Yamabe constant of our model spaces with the conformal Yamabe invariant of spaces like $\mathbb{R}^2 \times S^2$, $\mathbb{R}^3 \times S^2$ and $\mathbb{R}^2 \times S^3$. The Yamabe constants of the latter spaces were recently calculated by Petean and Ruiz. This method is e.g. sufficient to control $\Lambda_{5,1}$ and $\Lambda_{5,2}$ and thus yields the explicit bound mentioned above for 5-manifolds.

Bo Guan, Ohio State University & Xiamen University

Title: Results on fully nonlinear elliptic equations on manifolds

Abstract: In this talk we report some recent results on estimates for fully nonlinear elliptic equations on real and complex manifolds. We consider the Dirichlet and Neumann problems as well as equations on closed manifolds. We try to understand roles of subsolutions and concavity condition in establishing estimates for second derivatives, and clarify relations between different notions of generalized subsolutions.

Gerhard Huisken, University of Tübingen & MFO

Title: Mean curvature flow with surgery for mean convex embedded 2-surfaces in 3-manifolds

Abstract: The lecture describes joint work with S. Brendle proving longtime existence and asymptotic behavior of embedded mean convex solutions of 2d mean curvature flow, interrupted by finitely many surgeries.

Jürgen Jost, Max Planck Institute for Mathematics in the Sciences

Title: Quantum field theory and geometric analysis

Abstract: TBA

Jiayu Li, University of Science and Technology of China

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 Chuan-jing Zhang.

Stephan Luckhaus, University of Leipzig

Title: Christoffel's identity and geometric rigidity

Abstract: TBA

Tristan Rivière, ETH Zürich

Title: Minmax Hierarchies and The Viscosity Approach to the Variational Construction of Minimal Surfaces

Abstract: TBA

Xiaochun Rong, Rutgers University & Capital Normal University

Title: Collapsed manifolds with Ricci local bounded covering geometry

Abstract: We will report a recent progress in extending nilpotent structures discovered by Cheeger-Fukaya-Gromov on collapsed manifolds with sectional curvature local bounded covering geometry to collapsed manifolds with Ricci local bounded

covering geometry. Our construction of local nilpotent structures does not rely on the work of Cheeger-fukaya-Gromov, which in particular gives a new approach when restricting to collapsed manifolds with bounded sectional curvature.

Chong Song, Xiamen University

Title: Yang-Mills-Higgs fields on Riemannian surfaces

Abstract: The Yang-Mills-Higgs fields are critical points of the Yang-Mills-Higgs functional which are defined for a pair consisting a section and a connection on a fiber bundle. In this talk, I will introduce some results on the Yang-Mills-Higgs field over a Riemannian surface, with focus on its existence, convergence and blow-up analysis.

Wilderich Tuschmann, Karlsruhe Institute of Technology

Title: MODULI SPACES OF NONNEGATIVELY CURVED RIEMANNIAN METRICS

Abstract: I will report on joint work with Michael Wiemeler. We study spaces and moduli spaces of Riemannian metrics with non-negative Ricci or non-negative sectional curvature on closed and open manifolds and construct, in particular, the first classes of manifolds for which these spaces have non-trivial rational homotopy, homology and cohomology groups. We also show that in every dimension at least seven (respectively, at least eight) there exist closed (respectively, open) manifolds for which the moduli space of Riemannian metrics with non-negative sectional curvature has infinitely many path components.

Guofang Wang, University of Freiburg

Title: Uniqueness of stable free boundary CMC hypersurfaces in a ball

Abstract: In this talk we will present a solution of a longstanding open problem: Any stable free boundary CMC hypersurfaces in a ball are umbilic. One of crucial ideas is a new weighted Minkowski identity for free boundary hypersurfaces. Our proof works also for capillary hypersurfaces in a ball in a space form. This is a joint work with Chao Xia (Xiaman).

Ruijun Wu, Max Planck Institute for Mathematics in the Sciences

Title: Symmetries of a nonlinear sigma model with gravitino

Abstract: We give a description of the main symmetries of a nonlinear sigma model with gravitino, sometimes known as supersymmetric nonlinear sigma model. The main idea is the metric dependence of the spin structures and the geometric quantities on the spinor bundle. The Weyl and super Weyl symmetry, the diffeomorphism symmetry and the degenerate supersymmetry in particular case are the main features of this model and they together give conserved currents which are holomorphic in two-dimensional case. We will also consider the implications of these symmetry properties, among which we focus on removable singularity, energy identities and stationary solutions.

Feng Zhou, East China Normal University

Title: Isolated singular solutions for some nonlinear elliptic equations

Abstract: In this talk, we will present some results on the isolated singular solutions for some nonlinear elliptic equations including the nonlinear Choquard equations or the Hardy- Leray potentials. We present some suitable distributional identities of the solution for the equation with Hardy-Leray potential and we obtain the qualitative properties for the minimal singular solutions. This is based on joint works with H. Y. Chen.