

# March Workshop of the Special Semester in Several Complex Variables

(Schedule)

Date and Place	Time	Title	Speaker
<b>2014.03.15</b> <b>(Saturday)</b>  <b>Room 712 of</b> <b>Si Yuan Building</b>	9:00—10:00	On the lower bounds of the curvatures in a bounded domain	Qi-Keng Lu
	10:00—10:30	Teatime	
	10:30—11:30	$L^2$ extension problem and strong openness conjecture	Qi'an Guan
	15:00—16:00	Oka manifolds	J.E. Fornæss
	16:00—16:30	Teatime	
	16:30—17:30	Some new results in discrete local holomorphic dynamics	Feng Rong
<b>2014.03.16</b> <b>(Sunday)</b>  <b>Room 712 of</b> <b>Si Yuan Building</b>	9:00—10:00	Hyperbolicity of moduli space of Kähler-Einstein manifolds of non-positive scalar curvature	Sai Kee Yeung
	10:00—10:30	Teatime	
	10:30—11:30	The $C^2$ estimates for complex Monge-Ampère Type equation	Xi-Nan Ma
	15:00—16:00	Curvatures and Differential Harnack Estimates on Kähler Manifolds	Yanyan Niu
	16:00—16:30	Teatime	
	16:30—17:30	On the optimal constant in the Ohsawa-Takegoshi-Manivel extension theorem	Langfeng Zhu
<b>2014.03.17</b> <b>(Monday)</b>  <b>Room 712 of</b> <b>Si Yuan Building</b>	9:00—10:00	On Convergence Sets of Formal Power Series	Daowei Ma
	10:00—10:30	Teatime	
	10:30—11:30	On the squeezing function and squeezing properties	Liyu Zhang
	15:00—16:00	On the $L^p$ -estimates and existence theorems of the $\bar{\partial}$ operator on complete Kähler manifolds	Xiangdong Li
	16:00—16:30	Teatime	
	16:30—17:30	Proper holomorphic mappings between invariant domains in $\mathbb{C}^n$	Jiafu Ning

## Abstracts

**1. Title:** On the lower bounds of the curvatures in a bounded domain.

**Speaker:** Prof. Qi-Keng Lu (Institute of Math., AMSS, CAS).

**Abstract:** Numerous authors have given the upper bounds of the holomorphic sectional curvature and Ricci curvature of the Bergman metric on a bounded domain  $D$  in  $\mathbb{C}^n$  such that

$$Sect(z, \xi) \leq 2 \text{ and } Ricci(z, \xi) \leq n + 1,$$

where  $z = (z^1, \dots, z^n) \in D$  and  $\xi = (\xi^1, \dots, \xi^n)$  a tangent vector at  $z$ . It is tried in this article to give their lower bounds.

**2. Title:**  $L^2$  extension problem and strong openness conjecture.

**Speaker:** Dr. Qi'an Guan (Peking University).

**Abstract:** In this talk, we'll present some recent results about  $L^2$  extension problem with optimal estimate with some applications and our solution of Demailly's strong openness conjecture. Our solutions of some related problems (i.e. conjectures posed by Demailly-Kollár and Jonsson-Mustata, etc.) will also be presented. This is joint work with Professor Xiangyu Zhou.

**3. Title:** Oka manifolds.

**Speaker:** Prof. J.E. Fornæss (Univ. of Michigan).

**Abstract:** I will talk about recent joint work with Erlend Fornæss Wold. Oka manifolds appear naturally in complex analysis. We show that they also appear naturally in complex dynamics.

**4. Title:** Some new results in discrete local holomorphic dynamics.

**Speaker:** Prof. Feng Rong (Shanghai Jiao Tong University).

**Abstract:** Discrete local holomorphic dynamics studies the asymptotic behavior of holomorphic maps near fixed points under iterations. First we give a brief overview of the one-dimensional theory. Then we focus on the two-dimensional case and discuss quasi-parabolic maps and maps tangent to the identity. For quasi-parabolic maps, we will talk about the linearization problem and various conditions for the existence of attracting regions. For maps tangent to the identity, we will talk about some new local invariants associated with such maps.

**5. Title:** Hyperbolicity of moduli space of Kähler-Einstein manifolds of non-positive scalar curvature.

**Speaker:** Prof. Sai Kee Yeung (Univ. of Purdue).

**Abstract:** The main purpose of the talk is to introduce the notions and explain a result on hyperbolicity of moduli spaces of Kähler-Einstein manifolds of negative scalar curvature. Algebraic geometrically, these are moduli spaces of canonically polarized algebraic manifolds. It is a classical fact from the work of Ahlfors, Royden and Wolpert that the Weil-Petersson metric on a moduli space of hyperbolic Riemann surface has holomorphic sectional curvature bounded from above by a negative constant and hence is Kobayashi hyperbolic. A natural question is whether similar properties hold in a higher dimensional analogue. I would explain a joint work with Wing-Keung To on the construction of a negatively curved Finsler metric on any moduli space of Kähler-Einstein manifolds with negative scalar curvature, from which Kobayashi hyperbolicity follows naturally. We would also mention a corresponding recent work with Wing-Keung To on hyperbolicity of moduli space of Kähler Ricci flat manifolds.

**6. Title:** The  $C^2$  estimates for complex Monge-Ampère Type equation.

**Speaker:** Prof. Xi-Nan Ma (University of Science and Technology of China).

**Abstract:** We review the main technique for the  $C^2$  estimates on the complex Hessian equations and some other Monge-Ampère type equation, then we mention some recent developments.

**7. Title:** Curvatures and Differential Harnack Estimates on Kähler Manifolds.

**Speaker:** Prof. Yanyan Niu (Capital Normal University).

**Abstract:** In this talk, we will first review some differential harnack estimates on Riemannian manifolds and Kähler manifolds. Then we will discuss the sharp Li-Yau-Hamilton type differential Harnack inequalities for positive solutions of the Hodge Laplacian heat equation on Kähler manifold.

**8. Title:** On the optimal constant in the Ohsawa-Takegoshi-Manivel extension theorem.

**Speaker:** Dr. Langfeng Zhu (Wuhan University).

**Abstract:** In this report, we will discuss the optimal constant problem in the  $L^2$  extension theorem of high codimension in the framework of the Ohsawa-Takegoshi-Manivel  $L^2$  extension theorem. This is a joint work with Professor Xiangyu Zhou.

**9. Title:** On Convergence Sets of Formal Power Series.

**Speaker:** Prof. Daowei Ma (Wichita State University).

**Abstract:** We consider the convergence sets of formal power series of the form  $f(z, t) = \sum_{j=0}^{\infty} p_j(z)t^j$ , where  $p_j(z)$  are polynomials. A subset  $E$  of the complex

plane  $\mathbb{C}$  is said to be a convergence set if there is a series  $f(z,t) = \sum_{j=0}^{\infty} p_j(z)t^j$  such that  $E$  is exactly the set of points  $z$  for which  $f(z,t)$  converges as a power series in  $t$ . A quasi-simply-connected set is defined to be the union of a countable collection of polynomially convex compact sets. We prove that a subset of  $\mathbb{C}$  is a convergence set if and only if it is a quasi-simply-connected set. We also give an example of a compact set which is not a convergence set.

**10. Title:** On the squeezing function and squeezing properties.

**Speaker:** Prof. Liyou Zhang (Capital Normal University).

**Abstract:** We will present the notation of squeezing function on bounded domains in  $\mathbb{C}^n$  and talk about some related properties and applications.

**11. Title:** On the  $L^p$ -estimates and existence theorems of the  $\bar{\partial}$  operator on complete Kähler manifolds.

**Speaker:** Prof. Xiangdong Li (Institute of Applied Math., AMSS, CAS).

**Abstract:** In 1965, Hörmander, Andreotti and Vesentini independently established the  $L^2$ -estimates and existence theorems of the  $\bar{\partial}$  operator on pseudo-convex domains and complete Kähler manifolds. Since then, the  $L^2$ -estimates of  $\bar{\partial}$  have played an important role in complex analysis and complex geometry. In this talk, we present some recent results on the  $L^p$ -estimates and existence theorems of the operator on complete Kähler manifolds for  $1 < p < \infty$ . We can see that there is a significant difference between the  $L^2$ -theory and the  $L^p$ -theory for  $p \neq 2$ .

**12. Title:** Proper holomorphic mappings between invariant domains in  $\mathbb{C}^n$ .

**Speaker:** Jiafu Ning (Institute of Math., AMSS, CAS).

**Abstract:** Let  $K_1$  and  $K_2$  be two compact Lie groups, which act linearly on  $\mathbb{C}^n$  and  $\mathcal{O}(\mathbb{C}^n)^{K_j} = \mathbb{C}$ , for  $j=1, 2$ . Let  $0 \in \Omega_j$  be a bounded  $K_j$ -invariant domain in  $\mathbb{C}^n$  for  $j=1, 2$ . If  $f: \Omega_1 \rightarrow \Omega_2$  is a proper holomorphic mapping, then  $f$  extends holomorphically to an open neighborhood of  $\overline{\Omega_1}$ , and in addition if  $f^{-1}(0) = \{0\}$ , then  $f$  is a polynomial mapping. We also prove that if  $0 \in \Omega$  is a  $K_1$ -invariant pseudoconvex domain in  $\mathbb{C}^n$  with  $\mathcal{O}(\mathbb{C}^n)^{K_1} = \mathbb{C}$ , then  $\Omega$  is orbit convex.