

Lecture Series in Algebraic Geometry

Sep 23 – 27, 2019

Morningside Center of Mathematics CAS

Sponsors:

Academy of Mathematics and System Sciences, CAS,

Morningside Center of Mathematics,

National Science Foundation of China

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The conference “Lecture Series in Algebraic Geometry” will be held at **Morningside Center of Mathematics**, which was founded by Chinese Academy of Sciences in 1996 and **Professor Shing-Tung Yau** has been serving as the director of the center.

Registration Date & Location:

September 23, 2019, 8:30-9:30, MCM Building 1 Floor reception

Address: No. 55, Zhongguancun East Road, Haidian District, Beijing

地址：北京市海淀区中关村东路 55 号

Conference Time: September 23-27, 2019

Conference Venue: MCM Building 110

Address: No. 55, Zhongguancun East Road, Haidian District, Beijing

地址：北京市海淀区中关村东路 55 号

Website: www.mcm.ac.cn/activities/programs/2019LSAG

QR code of the conference:



Contact: Xiao Luo (罗潇)

Email: mcmoffice@math.ac.cn



WeChat QR code:



Conference Staff:

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Invited Speakers

Yalong Cao	University of Tokyo
Yunfeng Jiang	University of Kansas
Yukinobu Toda	University of Tokyo

Organizers

Baohua Fu	Morningside Center of Mathematics
Yujiro Kawamata	University of Tokyo / MCM
Shigeru Mukai	RIMS / MCM

Conference Schedule

September 23, 2019 (MCM 110)		
08:30-09:30	Registration: MCM Building First Floor Reception	
09:30-10:30	Yukinobu Toda	On moduli spaces of stable objects on Calabi-Yau 3-folds (I)
10:30-10:45	Coffee break, Group Photos (in front of the MCM building gate)	
10:45-11:45	Yalong Cao	Introduction to Donaldson-Thomas theory for Calabi-Yau 4-folds (I)
11:45-13:30	Lunch	
13:30-17:00	Free discussion	
September 24, 2019 (MCM 110)		
09:30-10:30	Yunfeng Jiang	Virtual signed Euler characteristics, Vafa-Witten invariants and S-duality (I)
10:30-10:45	Coffee break	
10:45-11:45	Yukinobu Toda	On moduli spaces of stable objects on Calabi-Yau 3-folds (II)
11:45-13:30	Lunch	
13:30-14:30	Yalong Cao	Introduction to Donaldson-Thomas theory for Calabi-Yau 4-folds (II)
14:45-15:45	Yunfeng Jiang	Virtual signed Euler characteristics, Vafa-Witten invariants and S-duality (II)
15:45-16:00	Coffee break	
16:00-17:00	Yukinobu Toda	On moduli spaces of stable objects on Calabi-Yau 3-folds (III)
17:30-20:00	Banquet	

September 26, 2019 (MCM 110)		
09:30-10:30	Yunfeng Jiang	Virtual signed Euler characteristics, Vafa-Witten invariants and S-duality (III)
10:30-10:45	Coffee break	
10:45-11:45	Yalong Cao	Introduction to Donaldson-Thomas theory for Calabi-Yau 4-folds (III)
11:45-13:30	Lunch	
15:45-16:00	Free discussion	

Yalong Cao (University of Tokyo)

Introduction to Donaldson-Thomas theory for Calabi-Yau 4-folds

Donaldson-Thomas theory on Calabi-Yau 4-folds is a complexification of Donaldson theory on real 4-manifolds. In these lectures, I will review its definition and talk about applications to points/curves counting on Calabi-Yau 4-folds. This is based on my previous joint works with Conan Leung, Martijn Kool, Davesh Maulik and Yukinobu Toda.

Yunfeng Jiang (University of Kansas)

Virtual signed Euler characteristics, Vafa-Witten invariants and S-duality

Motivated by the S-duality conjecture in physics by Vafa-Witten, Tanaka-Thomas have developed a theory of Vafa-Witten invariants for projective surfaces; and proved that the generating series of the Vafa-Witten invariants are modular forms. This proved the S-duality conjecture of Vafa-Witten in many cases. The definition of the Vafa-Witten invariants uses virtual signed Euler characteristics by Jiang-Thomas.

Tanaka-Thomas's theory on the Vafa-Witten invariants are the gauge group $SU(r)$ -invariants. Vafa-Witten actually predicted that the S-transformation sends the partition function of $SU(r)$ -invariants to the Langlands dual group $SU(r)/Z_r$ -invariants. In this series of talks we first review the general theory of virtual signed Euler characteristics. In the second talk we will talk about the Vafa-Witten invariants of projective surfaces and surface DM stacks. And in the third talk we will restrict our interest to a special type of surface DM stacks—etale gerbes over smooth surfaces and talk about how to use etale gerbes on surfaces to define the $SU(r)/Z_r$ -Vafa-Witten invariants, and prove the S-duality conjecture of Vafa-Witten in several cases.

Yukinobu Toda (University of Tokyo)

On moduli spaces of stable objects on Calabi-Yau 3-folds

The moduli spaces of stable sheaves (or more generally Bridgeland stable objects in derived categories) on algebraic varieties are important research subjects, not only for algebraic geometry but also for representation theory and mathematical physics. So far they are especially studied for varieties with dimensions less than or equal to two. From geometric point of view, they provide interesting examples of algebraic varieties, i.e. such moduli spaces on K3 surfaces are holomorphic symplectic manifolds by Mukai. From enumerative point of view, they are used in defining invariants such as Donaldson invariants. However these moduli spaces are more difficult to understand in higher dimension, e.g. for Calabi-Yau 3-folds, due to the singularities on them. In this talks, I will talk about new birational geometric approach toward understanding such moduli spaces on CY 3-folds via shifted symplectic geometry. I will also develop categorical invariants of them, which I call categorical Donaldson-Thomas theory, which may categorify enumerative DT invariants on CY 3-folds. Then I will describe some wall-crossing formula of categorical DT theories, and explain its relation to Bondal-Orlov, Kawamata's D/K conjecture in birational geometry.

WIFI

- ❑ Open your wifi and connect the SSID (wifi name) **AMSS**.
- ❑ Open a browser window and type any website address.
- ❑ It will redirect to a register form. Fill the form with Conference ID **MCM826**.

网络接入申请单 – Step 1 of 4

- 1 选择用户类型 (Select User Type)
- 2 用户验证 (User Validation)
- 3 接入申请 (Access Request)
- 4 完成申请 (Complete application)

选择用户类型 (Select User Type)

如果您之前有提交过非参会网络接入申请，可以点击右上角查看处理进度。

If you have previously submitted a non-participation network access request, you can click on the top right corner to view the progress.

1、本院职工 (Staff of AMSS)

2、本院学生和博士后 (Students and postdocs of AMSS)

3、访问学者 (Visiting scholars)

4、会议代码 (Meeting id)

1. select “会议代码(Meeting ID)”

2. click “继续(continue)”

继续 (Continue) →

网络接入申请单 – Step 2 of 4

- 1 ✓ 选择用户类型 (Select User Type)
- 2 用户验证 (User Validation)
- 3 接入申请 (Access Request)
- 4 完成申请 (Complete application)

用户验证 (User Authentication)

申请人姓名 (Applicant's name) *

3. write your name here

会议代码 (Meeting ID) *

MCM826 4. write code “MCM826”

5. click “继续(continue)”

← 后退 (Back) 继续 (Continue) →

More Lectures

First week: 26th-30th August

	Monday	Tuesday	Wednesday (S202)	Thursday
9:30-10:30	Claire Voisin (I)	Junyan Cao (III)	9:45-10:45 Zhizhong Huang(I) 11:00-12:00 Luc Illusie(I)	Thomas Peternell(II)
10:45-11:45	Junyan Cao (I)	Claire Voisin (II)		Ya Deng (II)
13:30-14:30	Ya Deng (I)	Mails Reid (II)	Free discussion	Thomas Peternell(III)
14:45-15:45	Mails Reid (I)	Junyan Cao (II)		Zhizhong Huang(II)
16:00-17:00	Thomas Peternell(I)	Claire Voisin (III)		Ya Deng (III)

Second week: 2nd-6th September

	Monday	Tuesday	Wednesday	Thursday
9:30-10:30	Conan Leung / Ying Xie(I)	Zhiyuan Li (II)	Free discussion	Laurent Manivel (II)
10:45-11:45	Junyi Xie (I)	Laurent Manivel (I)		Yoshinori Namikawa(III)
13:30-14:30	Zhiyuan Li (I)	Yoshinori Namikawa (II)		Junyi Xie (III)
14:45-15:45	Yoshinori Namikawa(I)	Junyi Xie (II)		Zhiyuan Li (III)
16:00-17:00	Shilin Yu	Conan Leung / Ying Xie(II)		Laurent Manivel(III)

Third week: 16th-20th September

	Monday	Tuesday	Thursday	Friday
9:30-10:30	Stéphane Druel (I)	Fedor Zak (I)	Qizheng Yin (II)	Zhiyu Tian (II)
10:45-11:45	Jun-Muk Hwang (I)	Stéphane Druel (II)	Fedor Zak (II)	Qizheng Yin (III)
13:30-14:30	Keiji Oguiso (I)	Jun-Muk Hwang (II)	Stéphane Druel (III)	Free discussion
14:45-15:45	Qizheng Yin (I)	Keiji Oguiso (II)	Jun-Muk Hwang (III)	
16:00-17:00	Katsuhisa Furukawa	Zhiyu Tian (I)	Keiji Oguiso (III)	

Fourth week: 23th-27th September

	Monday	Tuesday	Thursday	Friday
9:30-10:30	Yukinobu Toda (I)	Yunfeng Jiang (I)	Yunfeng Jiang (III)	Free discussion
10:45-11:45	Yalong Cao (I)	Yukinobu Toda (II)	Yalong Cao (III)	
13:30-14:30	Free discussion	Yalong Cao (II)	Free discussion	
14:45-15:45		Yunfeng Jiang (II)		
16:00-17:00		Yukinobu Toda (III)		