Lecture Series in Algebraic Geometry

Sep 16 – 20, 2019

Morningside Center of Mathematics CAS

Sponsors:

Academy of Mathematics and System Sciences, CAS,

Morningside Center of Mathematics,

National Science Foundation of China

Contents

1. Useful Information
   - Registration Date & Location
   - Conference Time
   - Conference Venue
   - Website
   - QR code of the conference
   - Contact
   - Conference Staff
   - Location
2. Invited Speakers
3. Organizers
4. Conference Schedule
5. Titles & Abstracts
6. WIFI
7. More Lectures

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 16, 2019, 8:30-9:30, MCM Building 1 Floor reception

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

地址：北京市海淀区中关村东路 55 号

Conference Time: September 16-20, 2019

Conference Venue: MCM Building 110

Address: No. 55, Zhongguancun Eest 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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Location


Liaoning International Hotel
BANK OF CHINA
Youth Apartment, No 2 Building
MCM Building
WUKE Restaurant
South Building
Junma Hotel
AGRICULTURAL BANK OF CHINA
Walmart Supermarket
Zhongguancun South 4th Street
Zhongguancun East Road
Zhongguancun South 3rd Street
Zhongguancun South 2nd Street
Zhongguancun South 1st Street
Academy Science South Road
Zhongguancun South Road
Fourth Ring Road
Subway, Line 13
Zhongguancun Street

Invited Speakers

Stéphane Druel	Université Claude Bernard Lyon 1
Katsuhisa Furukawa	Tokyo University
Jun-Muk Hwang	Korea Institute for Advanced Study
Keiji Oguiso	University of Tokyo
Zhiyu Tian	Peking University
Qizheng Yin	Peking University
Fedor Zak	CEMI RAS

Organizers

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

Conference Schedule

September 16, 2019 (MCM 110)		
08:30-09:30	Registration：MCM Building First Floor reception	
09:30-10:30	Stéphane Druel	Codimension one foliations with numerically trivial canonical class on singular spaces(Ⅰ)
10:30-10:45	Coffee break, Group Photos (in front of the MCM building gate)	
10:45-11:45	Jun-Muk Hwang	Infinitesimal neighborhoods of submanifolds(Ⅰ)
11:45-13:30	Lunch	
13:30-14:30	Keiji Oguiso	Finite generation problem of the discrete automorphism group of a smooth projective variety(Ⅰ)
14:45-15:45	Qizheng Yin	On the topology of Lagrangian fibrations(Ⅰ)
15:45-16:00	Coffee break	
16:00-17:00	Katsuhisa Furukawa	Cubic hypersurfaces with positive dual defects
September 17, 2019 (MCM 110)		
09:30-10:30	Fedor Zak	Defective hypersurfaces of low degree
10:30-10:45	Coffee break	
10:45-11:45	Stéphane Druel	Codimension one foliations with numerically trivial canonical class on singular spaces(Ⅱ)
11:45-13:30	Lunch	
13:30-14:30	Jun-Muk Hwang	Infinitesimal neighborhoods of submanifolds(Ⅱ)
14:45-15:45	Keiji Oguiso	Finite generation problem of the discrete automorphism group of a smooth projective variety(Ⅱ)
15:45-16:00	Coffee break	
16:00-17:00	Zhiyu Tian	Arithmetic of rationally connected varieties over function fields and Brauer group(Ⅰ)
17:30-20:00	Banquet	

September 19, 2019 (MCM 110)		
09:30-10:30	Qizheng Yin	On the topology of Lagrangian fibrations(Ⅱ)
10:30-10:45	Coffee break	
10:45-11:45	Fedor Zak	Varieties of small codimension: multisecants and normality
11:45-13:30	Lunch	
13:30-14:30	Stéphane Druel	Codimension one foliations with numerically trivial canonical class on singular spaces(Ⅲ)
14:45-15:45	Jun-Muk Hwang	Infinitesimal neighborhoods of submanifolds(Ⅲ)
15:45-16:00	Coffee break	
16:00-17:00	Keiji Oguiso	Finite generation problem of the discrete automorphism group of a smooth projective variety(Ⅲ)
September 20, 2019 (MCM 110)		
09:30-10:30	Zhiyu Tian	Arithmetic of rationally connected varieties over function fields and Brauer group(Ⅱ)
10:30-10:45	Coffee break	
10:45-11:45	Qizheng Yin	On the topology of Lagrangian fibrations(Ⅲ)
11:45-13:30	Lunch	
13:30-17:00	Free discussion	

Stéphane Druel (Université Claude Bernard Lyon 1)

Codimension one foliations with numerically trivial canonical class on singular spaces

In these lectures, I will present the structure of codimension one foliations with canonical singularities and numerically trivial canonical class on varieties with terminal singularities, and sketch the proof.

Katsuhisa Furukawa (Tokyo University)

Cubic hypersurfaces with positive dual defects

The dual defect of a projective variety X in P^N is the difference between N-1 and the dimension of the dual variety X^* of X. Zak classified cubic hypersurfaces X with positive dual defects in the case when X^* is smooth. Hwang gave a characterization of secants of Severi varieties in terms of cubic hypersurfaces with nonzero Hessians and nonzero prolongations. I will talk about structures of contact loci and singular loci of cubic hypersurfaces X with positive dual defect, without the assumption that X^* is smooth.

Jun-Muk Hwang (Korea Institute for Advanced Study)

Infinitesimal neighborhoods of submanifolds

We discuss the rigidity problem of infinitesimal neighborhoods of compact submanifolds of complex manifolds, which goes back to a question of Nirenberg and Spencer whether a finite-order infinitesimal neighborhood determines the germ of a submanifold when the normal bundle is positive. Following Hirschowitz's approach, we consider a geometric condition in terms of deformations of the submanifold, replacing the condition on the positivity of the normal bundle. This leads to a reformulation of the problem in terms of families of infinitesimal neighborhoods of submanifolds. We explain some results on this problem with several examples.

Keiji Oguiso (University of Tokyo)

Finite generation problem of the discrete automorphism group of a smooth projective variety

It is natural to ask if the quotient group of the automorphism group of a smooth projective variety by the identity component is finitely generated, or more specifically, the automorphism group of a smooth projective variety is finitely generated if it is discrete or not.

The answer is clearly affirmative in dimension one and is known to be affirmative for long time for minimal surfaces (in the classical sense) over the complex number field, but it is quite recent that negative answers are given in higher dimension, first in dimension 6 by Lesieutre (by using some special rational surface) and then by Dinh and me in any dimension ≥ 2 (by using some special K3 surface).

In the three lectures, I would like to explain our negative answer and further progress (eg. some sensitive relation with field of definition in positive characteristic, real form problems) with background materials and proofs.

Zhiyu Tian (Peking University)

Arithmetic of rationally connected varieties over function fields and Brauer group

This talk is an overview of a geometric approach to the study of arithmetics of rationally connected varieties over function fields with an eye towards applications to Brauer groups, in particular, the period-index problem.

Qizheng Yin (Peking University)

On the topology of Lagrangian fibrations

I will present a new connection between the topology of (holomorphic) Lagrangian fibrations and the Hodge theory of compact hyper-Kähler manifolds. As consequences we recover (and improve) previous results of Matsushita and Oguiso on the cohomology of the base and the fibers of Lagrangian fibrations. I will give detailed constructions which uses perverse sheaves, the decomposition theorem, and an action of the Looijenga-Lunts-Verbitsky Lie algebra on the cohomology of compact hyper-Kähler manifolds. I will also discuss applications to the enumerative geometry of K3 surfaces, and motivations coming from the P=W conjecture in nonabelian Hodge theory. Joint work with Junliang Shen, and with Andrew Harder, Zhiyuan Li, and Junliang Shen.

Fedor Zak (CEMI RAS)

Lecture1:Defective hypersurfaces of low degree

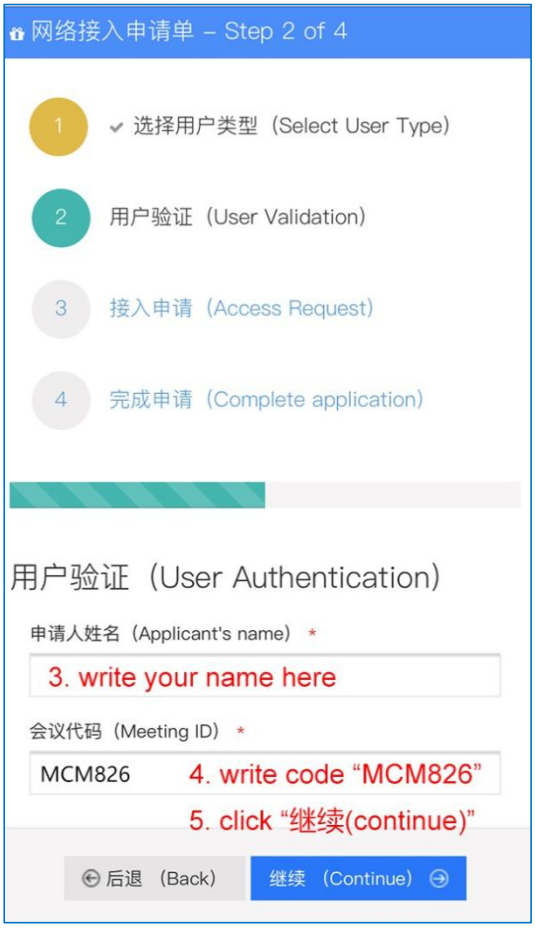
There is no hope to classify all hypersurfaces of degree higher than 2. However, hypersurfaces naturally arise as dual varieties, and their singularities carry important information. For a hypersurface X of degree d in P^N, not a cone, let n be the dimension of its dual (the image of X under the Gauss map). The number Def(X)=N-n-1 is called the (dual) defect of X. We show that Def(X) does not exceed (d-2)(N+1)/d, and the larger the defect the fewer hypersurfaces have it. In general, for small d there is some hope to classify defective hypersurfaces, at least those with large defect. The problem is hard, even for d=3, but examples for d=3 and d=4 (the duals of Severi and Legendrian varieties) hint that hypersurfaces with large defect might be very interesting from several points of view.

Lecture2:Varieties of small codimension: multisecants and normality

According to Hartshorne's conjecture, the only nonsingular varieties whose codimension is smaller than half of the dimension are complete intersections. Complete intersections have many nice properties. For example, they are projectively normal, and in codimension 2 (in which Hartshorne's conjecture is most plausible) the converse is also true: projective normality implies being a complete intersection. More generally, it makes sense to study higher order normality of nonsingular varieties of small codimension. It turns out that if the codimension is small enough and the expected multisecant lines exist, then being m-normal reflects in the properties of (m+2)-secant lines. Using this, one can prove m-normality of nonsingular projective varieties of sufficiently small codimension.

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.**



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)	Thomas Peternell(Ⅱ)
10:45-11:45	Junyan Cao (Ⅰ)	Claire Voisin (Ⅱ)	**11:00-12:00** Luc Illusie(Ⅰ)	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	Yunfeng Jiang (Ⅰ)	Yunfeng Jiang (Ⅱ)	Yukinobu Toda (Ⅲ)	Free discussion
10:45-11:45	Yalong Cao (Ⅰ)	Yukinobu Toda (Ⅱ)	Yalong Cao(Ⅲ)	
13:30-14:30	Yukinobu Toda (Ⅰ)	Yalong Cao (Ⅱ)	Yunfeng Jiang (Ⅲ)	