

MATH

Tiger tiger burning bright
In the forests of the night
What immortal hand or eye
Could frame thy fearful symmetry?

POP-UP SALON

In what distant deeps or skies
Burnt the fire of thine eyes?

In what flags burst the flame
In what harrows hid the name?

NOV. 28, 2020

What the hammer? what the chain?
In what furnace was thy brain?
What the anvil? What dread grasp
Dare its deadly terrors clasp?

Eiichi Bannai, What is a Design? (EN)

Jiarui Fei, Monstrous Moonshine (EN)

Bangxian Han, Starting with Change of Variable (EN)

Cheng Zheng, Counting Integral Points via Dynamics (EN)

Zhiyun Cheng, Why Knot? (CN)

Xuejun Guo, Cohen-Lenstra Heuristics (CN)

Ge Xiong, Ellipsoid and Isoperimetric Problem (CN)

Fei Ye, Fractional Statistics in Physics (CN)

*Onsite Venue:

Room 4-101, East Middle Hall, Minhang Campus

*Live Stream:

Zoom Meeting: 95455520076, Password: 599018

School of Mathematical Sciences
Shanghai Jiao Tong University

Math Pop-up Salon (V)

Venue | 地点: Room 4-101 East Middle Hall | 东中院 4-101
Time | 时间: Nov. 28, 2020

Zoom Info. | Zoom 信息

Meeting ID | 会议号: 954 555 20076
Meeting PW | 会议密码: 599018

Schedule | 日程

- 09:15 – 10:05 Eiichi Bannai | 坂内英一 (Kyushu University)
What is a design? | 什么是设计?
chaired by Yuehui Zhang, English talk
- 10:15 – 11:05 Jiarui Fei | 费佳睿 (SJTU)
Monstrous moonshine | 月光下的魔群
chaired by Jiyou Li, English talk
- 11:15 – 12:05 Bangxian Han | 韩邦先 (USTC)
Starting with change of variable | 从积分换元谈起
chaired by Yihu Yang, English talk
- 13:05 – 13:55 Cheng Zheng | 郑骋 (SJTU)
Counting integral points via dynamics | 格点计数与动力学
chaired by Dongmei Xiao, English talk
- 14:05 – 14:45 Zhiyun Cheng | 程志云 (Beijing Normal University)
Why knot? | 为何打结?
chaired by Youlin Li, Chinese talk

- 14:50 – 15:30 Xuejun Guo | 郭学军 (Nanjing University)
Cohen–Lenstra heuristics | 对称性越丰富，出现概率越小!
chaired by Fan Qin, Chinese talk
- 15:45 – 16:25 Ge Xiong | 熊革 (Tongji University)
Ellipsoid and isoperimetric problem | 椭球与等周问题
chaired by Deliang Hsu, Chinese talk
- 16:35 – 17:15 Fei Ye | 叶飞 (Southern Univ. of Science and Technology)
Fractional statistics in physics | 物理学中的分数统计
chaired by Daming Li, Chinese talk

Abstract | 摘要

What is a design? | 什么是设计?

09:15

Eiichi Bannai | 坂内英一

I will explain what are spherical designs and combinatorial designs, and what I am interested in design theory, including our recent work on unitary designs.

Why knot? | 为何打结?

14:05

Zhiyun Cheng | 程志云

给绳子打结，是我们日常生活中非常常见的一种行为。数学里有一种与其相映成趣的研究方向，叫纽结理论。与日常生活中关心如何打结略有不同，纽结理论主要关心一个线圈是否是打结的。这个报告里，我将简单介绍纽结理论的研究内容，研究方法和发展历程。

Monstrous moonshine | 月光下的魔群

10:15

Jiarui Fei | 费佳睿

Almost every mathematician has his/her own monster, but when it comes to "the Monster" it refers to the biggest finite simple group. In 1970's J. McKay made a mysterious observation but J. Conway thought it was "moonshine"! However, since then McKay's observation was always in Conway's mind, and as time went by Conway together with others collected more and more evidence and connections. R. Borcherds, a student of Conway, continued this journey for over ten years, and finally got great breakthrough. To explain McKay's observation, we will start by discussing some basic representation theory of finite groups and modular functions.

On the occasion of Borcherds's birthday I dedicate this talk to J. Conway, who just passed away this April.

也许几乎每个数学家都有属于自己的魔兽，但这里的魔兽特指那个最大的有限单群。J. McKay 在 70 年代做出了一个神秘的观察，却被 J. Conway 认为荒诞至极。尽管如此，McKay 的观察却一直萦绕 Conway 心头，随着时间的推移 Conway 和其他数学家掌握了越来越多的证据和联系。他的学生 R. Borcherds 继而又探索了十余年，终获大成。为了解释这个神秘的观察，我们会从最基础的有限群表示和模函数讲起。

在 Borcherds 的生日之际我将此讲演献给今年四月过世的 Conway。

Cohen-Lenstra heuristics | 对称性越丰富，出现概率越小!

14:50

Xuejun Guo | 郭学军

Cohen-Lenstra 猜想 (Cohen-Lenstra heuristics) 是由 Cohen 和 Lenstra 在 1984 年基于对二次数域理想类群分布规律的研究而提出来的一系列猜想, 其背后的哲学是爱森斯坦在十九世纪发现的规律——“一个代数对象的自同构越多, 它出现的就越少。” 我将简单介绍一下这个猜想在理想类群, 代数 K-群, 随机整数矩阵等领域的应用。

Starting with change of variable | 从积分换元谈起

11:15

Bangxian Han | 韩邦先

I will introduce Monge's problem by some basic examples, and explain how it connects optimal transport theory, Ricci curvature, and geometric measure theory.

Ellipsoid and isoperimetric problem | 椭球与等周问题

15:45

Ge Xiong | 熊革

In this talk, we will introduce the role of ellipsoid in the study of reversed isoperimetric problems. The extremal intersection problem of cubes and the celebrated Busemann-Petty problem will also be addressed.

我们介绍如何利用椭球来研究逆向等周问题。我们还将介绍立方体的极值截面问题和著名的 BP 问题。

Fractional statistics in physics | 物理学中的分数统计

16:35

Fei Ye | 叶飞

In quantum mechanics, the identical particles cannot be distinguished. We need to introduce the “statistics” of these particles in order to understand correctly the associated physical phenomena. There are two kinds of the statistics in the usual sense. One is the exchange statistics: the many-body wave-function acquires a phase factor $e^{(1-\alpha)\pi}$, when one performs a positively oriented exchange between two particles, with α as the exchange parameter ($\alpha = 0$ for fermions, $\alpha = 1$ for bosons, in-between for anyons). Anyons can only exist in one or two dimensional space. Another one is the Haldane’s exclusion statistics, characterized by the parameter g measuring the effective interaction among particles occupying the identical or different states in the Hilbert space. For a single species of particles $\Delta D = (g - 1)\Delta N$, with D as the Hilbert space dimension and N as the total particle number, where $g = 0$ for fermions and $g = 1$ for bosons. In this talk, we give a brief introduction to the statistics of identical particles, the relation between the two kinds of statistics, and their possible physical implications.

Counting integral points via dynamics | 格点计数与动力学

13:05

Cheng Zheng | 郑骋

How many integral points are in a disk, or a hyperboloid, or etc? Here we will discuss various problems about counting integral points and explain how dynamics can help us study these problems.

一个圆盘中有多少个整数点？一个双曲面中又有多少个整数点？这里我们将介绍一些有关整点计数的问题，并介绍动力系统是如何帮助我们研究这些问题。

Participants

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