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General Information
Mathematical gauge theory studies partial differential equations on connections of fiber bundles. Since the ground-breaking work of Donaldson in 1982, gauge theory has been successfully applied to the study of low dimensional topology, symplectic topology, and algebraic geometry. In the late 1980s, Floer combined the ideas from gauge theory and Morse theory and developed homological invariants for three-manifolds which are now called Floer homology groups. Gauge theory and Floer theory have now become essential tools in low dimensional topology, and a major topic of current research.

The workshop will have four mini-courses on different aspects of recent developments of gauge theory and Floer theory. In addition, there will be review sections guided by junior researchers. The goal of the workshop is to bring together students and researchers at all levels interested in these areas to share recent developments of the field and stimulate further collaborations.
## Timetable

Lecture room: 1114 Room, Sciences Building No. 1 (理科一号楼 1114 教室)

<table>
<thead>
<tr>
<th>Time</th>
<th>December 19 (Thursday)</th>
<th>December 20 (Friday)</th>
<th>December 21 (Saturday)</th>
<th>December 22 (Sunday)</th>
<th>December 23 (Monday)</th>
<th>December 24 (Tuesday)</th>
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<tr>
<td>9:00-9:50</td>
<td>Restration &amp; Opening Remark (9:00-9:30) (9:30-9:50)</td>
<td>Alexander Doan</td>
<td>Alexander Doan</td>
<td>Zhenkun Li</td>
<td>Francesco Lin</td>
<td>Siqi He</td>
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<tr>
<td>10:10-11:00</td>
<td>Yi Xie (9:50-10:40)</td>
<td>Dan Cristofaro-Gardiner</td>
<td>Dan Cristofaro-Gardiner</td>
<td>Francesco Lin</td>
<td>Francesco Lin</td>
<td>Siqi He</td>
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<td>11:00-11:20</td>
<td>Photo &amp; Coffee Break (10:40-11:10)</td>
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<tr>
<td>11:20-12:10</td>
<td>Boyu Zhang (11:10-12:00)</td>
<td>Dan Cristofaro-Gardiner</td>
<td>Zhenkun Li</td>
<td>Francesco Lin</td>
<td>Siqi He</td>
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<tr>
<td>12:10-14:00</td>
<td>Free Lunch</td>
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<td>14:00-14:50</td>
<td>Dan Cristofaro-Gardiner</td>
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<td>14:50-15:10</td>
<td>Coffee Break</td>
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<td>15:10-16:00</td>
<td>Alexander Doan</td>
<td>Boyu Zhang</td>
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<td>Donghao Wang</td>
<td>Donghao Wang</td>
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<td>16:00-16:20</td>
<td>Coffee Break</td>
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<td>16:20-17:10</td>
<td>Alexander Doan</td>
<td>Yi Xie</td>
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<td>Siqi He</td>
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<tr>
<td>17:30</td>
<td>Banquet</td>
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Talks

Mini-Course Speakers:

**Length and volume in four-dimensional symplectic geometry**
(Dan Cristofaro-Gardiner, *University of California, Santa Cruz*)

Abstract: Symplectic capacities are measurements of symplectic size. They are often defined in terms of lengths of certain closed orbits of a canonical vector field, and so connect symplectic embedding problems with dynamics. The goal of this course is to explain a "volume formula" recovering the volume of many four-dimensional symplectic manifolds from a family of symplectic capacities, called "ECH capacities". We will also discuss some applications of this formula to dynamics; for example we will explain recent notable work by Asaoka-Irie proving a $C^\infty$ closing lemma for certain flows on surfaces.

**Yang-Mills theory and algebraic geometry**
(Alexander Doan, *Columbia University*)

Abstract: The goal of the mini-course is to explore the relationship between gauge theory and algebraic geometry. While the majority of the course will focus on Donaldson theory of complex surfaces, I will also briefly mention some recent developments in gauge theory on higher-dimensional complex manifolds. Plan of the lectures: (i) Twistors and the ADHM construction of instantons on the four-sphere, (ii) The Donaldson-Uhlenbeck-Yau correspondence between instantons and stable holomorphic vector bundles on complex surfaces, (iii) Moduli spaces of stable bundles, (iv) Applications to differential topology of complex surfaces

**The Geometry of the Hitchin Equations**
(Siqi He, *Simons Center*)

Abstract: We will talk about the Hitchin equations over a Riemann surface. In the first lecture, we will discuss the background of the Hitchin equations and the Higgs bundle. In the second lecture, we will discuss the hyperkahler geometry and topology on the Hitchin moduli space. In the third lecture, we will discuss the asymptotic behavior of the Hitchin equations and discuss the ends of the Hitchin moduli space. In the fourth lecture, we will introduce two special subsets of the Hitchin moduli space, the Teichmuller components and the Beilinson-Drinfeld opers and discuss their relationship.

**An introduction to monopole Floer homology**
(Francesco Lin, *Columbia University*)

Abstract: In this lecture series, we’ll define monopole Floer homology, which is an invariant of three-manifolds obtained by studying “infinite dimensional Morse theory”. After discussing its original motivation as a tool for understanding gluing formulas for Seiberg-Witten invariants of four-manifolds, we’ll introduce the relevant notions of differential geometry and
topology needed in the construction. Finally, we’ll discuss its definition, trying to highlight the analogies and differences between Morse and Floer theory.

**Review Section Speakers:**

**Zhenkun Li (Massachusetts Institute of Technology)**

Lecture 1: Seiberg-Witten invariants in dimension 4 and their applications.
Lecture 2: Spin structures and spin^c structures

**Donghao Wang (Massachusetts Institute of Technology)**

Lecture 1: Kahler Manifolds and Hodge Decomposition.
Lecture 2: Theorem and Riemannian Bilinear Relations.

**Yi Xie (Beijing International Center for Mathematical Research)**

Lecture 1: An overview of Donaldson theory.
Lecture 2: Homeomorphism classification of simply connected 4-manifolds.

**Boyu Zhang (Princeton University)**

Lecture 1: Contact structures, symplectizations, and J-holomorphic curves.
Lecture 2: Taubes’ s proof of the Weinstein conjecture.
**List of Participants**

<table>
<thead>
<tr>
<th>Name</th>
<th>University</th>
<th>Email</th>
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<tbody>
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Byungdo Park  
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Huadi QU  
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Peking University  

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Miaomiao Zhu
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Conference Information

1. Conference Venue
   1114 Room, Sciences Building No. 1 (理科一号楼 1114 教室)

2. Hotels
   Building No.9, Zhongguanyuan Global Village PKU (中关新园九号楼)
   Address: 126 Zhongguancun North Street, Haidian District
   Tel.: +86 10 62752288

   Meiri JingPin Hotel (每日精品酒店)
   Address: No. 46 Haidian Street, Haidian District, Beijing, China
   Tel.: +86 10 82169571, +86-185-1890-7183

   Check-in Time From 14:00
   Check-out Time To 14:00

   Please check in directly with your passport.

3. Registration
   Time: 9:00-9:30, December 19th
   Venue: 1114 Room, Sciences Building No. 1 (理科一号楼 1114 教室)

4. Meals
   Breakfrest
   December 19th-24th (6:30-10:00)
   Venue 1: B2 Floor, Building 6, Zhongguanyuan Global Village PKU (中关新园 6 号楼 B2 层)
   Venue 2: Meiri Jingpin Hotel (每日精品酒店)

   Lunch
   December 19th-24th (12:00-14:00)
   Venue: Shao Yuan Western Restaurant (B1 Floor, Building No.6)
   (勺园西餐厅地下一层)

   Dinner
   All participants will arrange dinner on own

   Banquet
   Time: 17:30-20:00, December 20th
Venue: Shao Yuan Chinese Restaurant (1st Floor, Building No.7)

All registered participants are provided with lunch coupons for 6 days,
Please submit the coupon to the staff of Restaurant when taking meals.

5. Traffic information

Transportation from airport to East Gate of Peking University Station

If you take the subway, please first take the airport fast line to Sanyuan Bridge Station (三元桥) .
The single way ticket is about RMB 25. Then buy a single way subway ticket and transfer to line
10 (direction to Sun Palace) to Haidian Huangzhuang Station (海淀黄庄) and transfer
to line 4 (direction to Anhe Qiaobei) and get off at East Gate of Peking University
Station (北京大学东门站), then walk out from Exit D to the ground.

Place of Sciences Building No. 1 and Building No. 9, Zhongguanyuan Global Village from
Exit D of East Gate of Peking University Station

You only need to walk from the east gate exit D of Peking University Station to these two places.
Transportation from airport to Meiri Jingpin Hotel

If you take the subway, please first take the airport fast line to Sanyuan Bridge Station (三元桥). The single way ticket is about RMB 25. Then buy a single way subway ticket and transfer to line 10 (direction to Sun Palacet 太阳宫) to Suzhou Street Station (苏州街站), then walk out from Exit C to the ground. It will take 15 minutes to walk to Meiri Jingpin Hotel (每日精品酒店).

Transportation between Southwest Gate of Peking University and Meiri Jingpin Hotel

It will take 10 minutes to walk to Southwest Gate of Peking University from Meiri Jingpin Hotel.
Place of Sciences Building No. 1 from Southwest Gate of Peking University Station

The most convenient way is to take a taxi at the Beijing International Airport and directly go to the two hotels. The taxi fee is about RMB100 to RMB130 depending on the traffic situation. You can show the map and the Chinese hotel name (北京大学中关新园9号楼 & 每日精品酒店，海淀) to the driver.
6. Map of Zhongguanyuan Global Village, Peking University

The entrance of Zhongguanyuan Global Village, Peking University, is on the Zhongguancun North Street.
General Information

1. Emergency Contacts
   Dr. FAN Huijun +86-135-5268-6981
   Dr. DAI Bo +86-135-5222-1035
   Ms. CHEN Pingping +86-184-0162-1500
   Ambulance: 120 Police: 110

2. Name Badge
   For identification purpose, badges are expected to be worn at all times during the conference.

3. Internet
   If you have an eduroam account, you will be able to get internet access in PKU.
   Free cable network is available in your room at Beijing Yanshan Hotel

4. Taxi
   The minimum charge is RMB13. After 3 kilometers, RMB2.3 is added every kilometer. The charge will be 20% higher after 15 kilometers or during the night time (11pm–5am). Please request a receipt from the taxi driver in case you leave belongings in the taxi.

5. Currency Exchange
   Most banks provide exchange service for foreign currency and traveler’s checks. Credit cards such as Mastercard, Visa, JCB, Diners are accepted in most hotels, shopping centers and restaurants. However, they may not be accepted at small shops or restaurants.

6. Tips & Tax
   Tip is not expected or commonly practiced in Beijing. Taxes are already included in the stated prices.
Map of PKU Main Campus