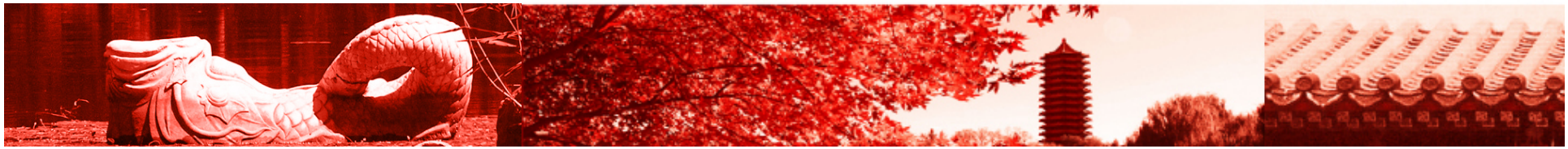
北京大学

PEKING UNIVERSITY



北京国际数学研究中心

BEIJING INTERNATIONAL CENTER FOR MATHEMATICAL RESEARCH

- **An overview of Beijing International Center for Mathematical Research (BICMR)**
- **People at BICMR**
- **Academic activities at BICMR**
- **International co-operations at BICMR**

Beijing International Center for Math Research

- BICMR is a mathematical research institute located on the campus of Peking University.
- BICMR was created in 2005 with strong government support.

BICMR's missions and goals

- To provide a platform for scientific exchange and cooperation among mathematicians around the globe.
- To be a first-class mathematical research and education institute (the Peking version of The Institute for Advanced Study).
- To reinforce the application of mathematics in science and technology.

- BICMR conducts its academic activities either independently or in association with other institutions, especially with School of Mathematical Sciences, Peking University.
- The main office buildings include seven Chinese classical houses with gardens on the north shore of the Wei-ming Lake. The site was a part of the royal Yuan-ming Palace, and is the most beautiful part of Peking University campus.

People at BICMR

- **Faculty：** 29

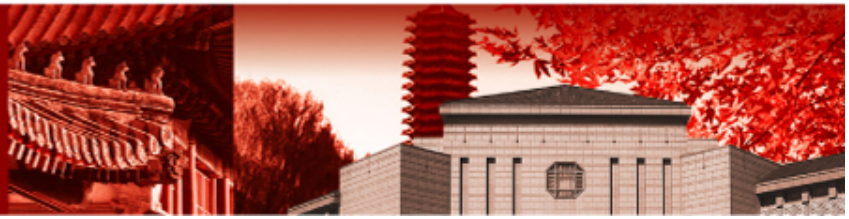
  (including 2 members of Chinese Academy of Sciences, 15 professors, 4 associate professors and 10 assistant professors)

- **Postdoctoral Fellows：** 14

  (including 4 Simons Fellows, 3 in pure mathematics)

- **Ph.D. Students：** 39

- **Administrative Staff：** 9



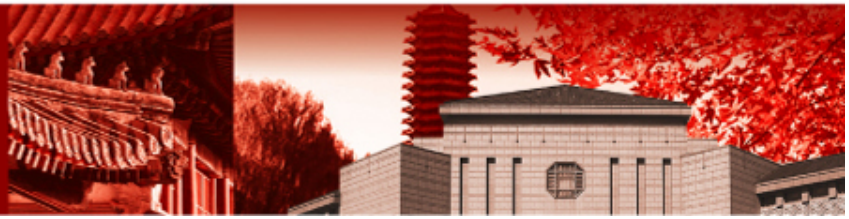
Pure Mathematics at BICMR

- Pure mathematics is the largest research group at BICMR with a strong research strength.
- Excellent pure mathematics research works in areas including :

  Geometry, Topology, Algebra,

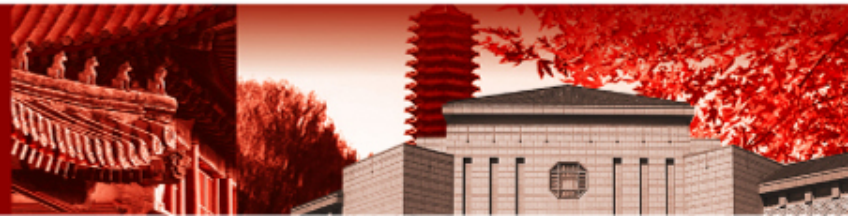
  Algebraic Geometry, Number Theory,

  Differential Equation, Mathematical Physics.



Faculty members in Pure Mathematics

James A. Carlson, Bohan Fang, Renjie Feng,
Xiang Fu, Jian Ge, Qing Han,
Yi-zhi Huang, Baoping Liu, Ruochuan Liu,
Xiaobo Liu, Yi Liu, Jie Qing,
Yongbin Ruan, Gang Tian, Chenyang Xu,
Wenyuan Yang, Jun Yu, Jiping Zhang



Research groups in pure mathematics

- Algebra group:

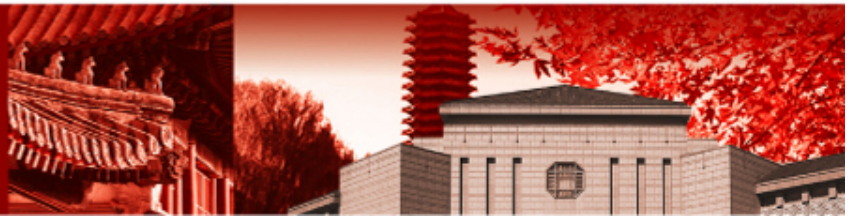
  Xiang Fu, Yi-zhi Huang, Wenyuan Yang,
  Jun Yu, Jiping Zhang

- Algebraic geometry group:

  Bohan Fang, Chenyang Xu,

- Analysis and PDE group:

  Qing Han, Baoping Liu



- Geometry and Topology group:

  James Carlson, Renjie Feng, Jian Ge,

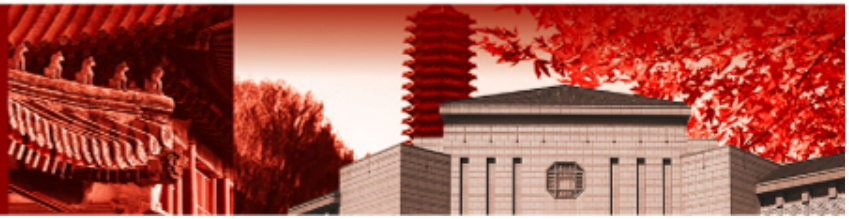
  Yi Liu, Jie Qing, Yongbin Ruan, Gang Tian

- Mathematical Physics group:

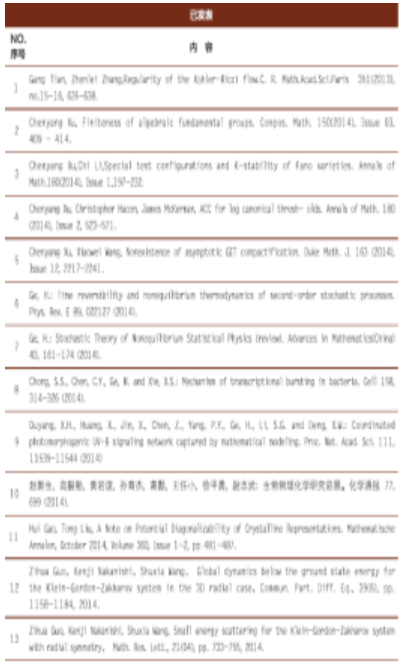
  Yi-zhi Huang, Xiaobo Liu

- Number theory group:

  Ruochuan Liu, Jun Yu



Over 100 research articles authored by faculty members and postdoctoral fellows at BICMR were published every year, more than half of them were in pure mathematics, most of which were in leading journals in their respective fields.



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Gang Tian

Tian's proof of the YTD conjecture

As a leading authority in geometric analysis, Tian has made significant contributions leading to the solutions of a number of conjectures in Kähler geometry, one of them is the YTD conjecture.

Tian was the first to prove that if a Fano manifold M is K-stable, then it admits a Kähler–Einstein metric. This result was recently published in *CPAM*.

Tian's recent paper in JAMS

Together with Bing Wang, Tian has shown that the limit space of a sequence of almost Einstein manifolds has most properties which are known for the limit space of Einstein manifolds.

This result has profound implications in differential geometry and was recently published in *JAMS*.

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On the structure of almost Einstein manifolds

Authors: Gang Tian and Bing Wang
Journal: J. Amer. Math. Soc.
MSC (2010): Primary 53Cxx; Secondary 35Jxx
Published electronically: June 17, 2015

Abstract: In this paper, we study the structure of the limit space of a sequence of almost Einstein manifolds, which are generalizations of Einstein manifolds. Roughly speaking, such manifolds are the initial manifolds of some normalized Ricci flows whose scalar curvatures are almost constants over space-time in the L^1-sense, and Ricci curvatures are bounded from below at the initial time. Under the non-collapsed condition, we show that the limit space of a sequence of almost Einstein manifolds has most properties which are known for the limit space of Einstein manifolds. As applications, we can apply our structure results to study the properties of Kähler manifolds.

- Much of Tian's earlier work was centred around the existences of Kähler-Einstein metrics on complex manifolds.
- Tian proved the existences of Kähler–Einstein metrics on compact complex surfaces with positive first Chern class, and showed that hypersurfaces with a Kähler–Einstein metric are stable in the sense of geometric invariant theory.
- Tian proved that a Kähler manifold with trivial canonical bundle has trivial obstruction space.

- Tian introduced the Analytical Minimal Model program which is known as the Tian-Song MMP theory in Birational Geometry.
- Tian (jointly with Jun Li) constructed the moduli spaces of maps from curves in both algebraic geometry and symplectic geometry and studied the obstruction theory on these moduli spaces.

【Jiping Zhang and his works in algebra 】

Jiping Zhang is a leading authority in finite groups and modular representation theory.

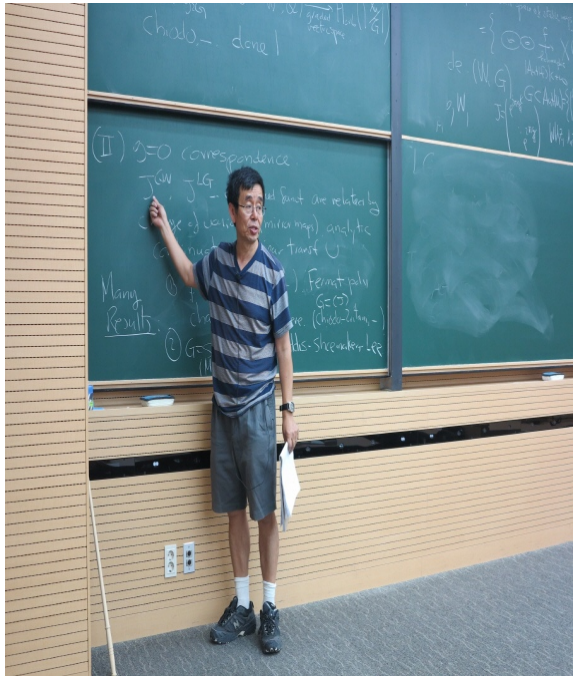
Zhang has made substantial contributions in areas such as defect groups of blocks (proving the Puig conjecture), finite linear groups (solving the Brauer 39 problem).

- Zhang was the first to find the necessary and sufficient conditions for a strong radical p-subgroup to be a defect group, and has subsequently generalized many basic results on defect-zero problems.
- Zhang has developed the arithmetic theory of finite groups. This theory has wide application in differential geometry and algebraic number theory, successfully resolving some long standing open problems, including the Huppert conjecture .

【Yongbin Ruan and his works in symplectic topology】

Ruan is a leading authority in symplectic topology and its applications in physics.

Together with Gang Tian, Ruan has shown that the quantum cohomology ring of a symplectic manifold is associative.

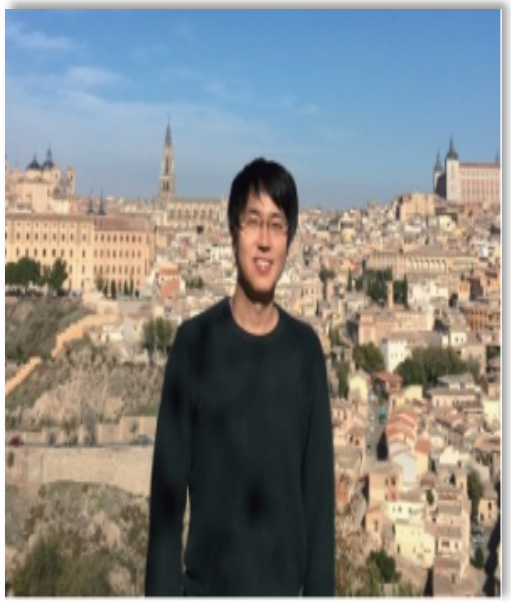


【Chenyang Xu and his works in algebraic geometry】

Xu has made significant contributions in a number of braches in algebraic geometry, with 3 papers published in *Annals of Mathematics*.

Xu is currently considered one of the most promising young mathematicians in China.

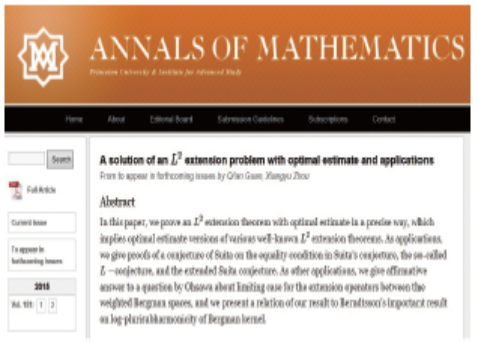
【Ruochuan Liu and his works in number theory】



An established expert in number theory and arithmetic geometry, Liu has made significant contributions in p-adic Hodge theory, p-adic Langlands program, p-adic modular forms and p-adic L-functions. In particular, Liu has proved that the eigencurves are proper.

【Qi-an Guan and his works in several complex variables】

An established expert in several complex variables and complex geometry, Guan has made substantial contributions in these fields, having published two articles in *Annals of Mathematics*.



Seminars and Colloquia

- BICMR conducts numerous academic conferences, special lecture series, summer schools, intensive training programs for graduate students, regular and special seminars.
- Over 100 seminars and colloquia took place at BICMR every year.
- Leading experts in pure mathematics are often invited to give semester-long distinguished lecture series at BICMR.

Distinguished Seminar Series (Pure Mathematics)

Cédric Villani: “Long time behavior of classical mechanical systems——from planets to stars to fluids”；

Gang Tian: “*K*-stability and Kahler-Einstein metrics”；

Yitang Zhang: “The distribution of prime numbers and Riemann –zeta function”；

Endre Szemerédi: “On subsets”

Distinguished Lecture Series (Pure Mathematics)

Spring Semester 2013:
James Carlson
delivered "Riemann Surfaces, Complex Algebraic Varieties and Hodge Theory"

Spring Semester 2014 :
John Erik Fornaess
delivered "Geometric analysis"

Distinguished Lecture Series (Pure Mathematics)

Spring Semester 2015:
Michel Broué
delivered "College Algebra II"

Spring Semester 2015 :
Jean Michel
delivered "Representation theory of finite groups of Lie type"

Scientific Exchange at BICMR

- **Visitors: Both short term and long term programs.**

  Each year BICMR welcomes over 100 visiting scholars, including some of leading mathematicians in the world:

  Fields Medalists or Wolf Prize Winners

  Wiles, Smale, Griffith, Okounkov, Zelmanov, Ngo Bao Chau……

  President, Vice President, Secretary-General of the International Math Union

  Ball, Daubechies, Griffith, Groetschel, Bismut, ……

  Directors of leading math centers or institutes in the world

  Bryant, Ballmann, Morgen, Carleson, Adem, Santosa, Camacho,……

  Members of academies of sciences around the world

International Cooperation

TRAM (Training, Research, and Motion) Network

This network was built by department of mathematics of Princeton University, BICMR and three other leading math centres around the globe. Currently the plan includes 10 partner institutions. The idea of the network is to foster exchange of students and faculty between the participating institutions. In concrete terms this means that the network provides graduate students and faculty with the opportunity to attend special lecture series, workshops or special programs at one of the participating institutions. The network facilitates and supports shorter and longer research stays at the partnering institutions as well as joint network activities.

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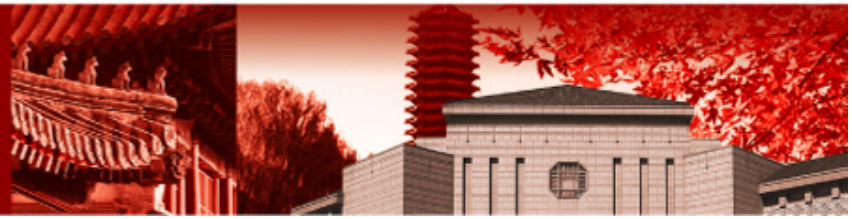

International Coorperation

Sino-French Research Program in Mathematics

•SFRPM was created in 2011 in order to improve the cooperation between Chinese and French Mathematicians. In particular it includes a regular intensive workshop program for young researchers and a research in pair program.

•Funding members of SFRPM include:

BICMR,

Chern Institute of Mathematics at Nankai University,

The Fondation Mathématique Jacques Hadamard ,

The Fondation Sciences Mathématiques Paris ,

The Institut Joseph Fourier at Grenoble University ,

The School of Math. Sciences of the Univ. of Science and Technology of China.

Contact Information

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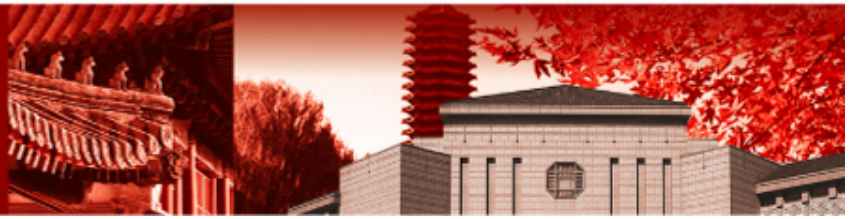

Thank You

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