

## Employment

- 2014 -present: Professor Tsinghua University.
- 2012 -2014: Assistant Professor Boston University.
- 2011 -2012: Boas Assistant Professor (Postdoctoral Fellowship) Northwestern University.
- **Visiting positions**
- 2019 -2020: Visiting fellow Institute for Advanced Study.
- 2014 -2015: Visiting fellow Perimeter Institute for Theoretical Physics.
- 2014 -2020: Affiliated Visiting Senior Scientist Kavli IPMU at University of Tokyo.
- **Service positions**
- 2020-2022, Associate Dean Qiuzhen College, Tsinghua University.
- 2019-2020, Associate Dean BIMSA, Yanqi Lake Beijing.
- 2017-2020, Associate Dean Dept. of Math. Sci., Tsinghua University.

## Education

- Ph.D. in Mathematics, 2006-2011 Harvard University.
- M.Phil. in Mathematics, 2003-2005 Univ. of Sci. & Tech. of China.
- B.Sc. in Mathematics, 1999-2003 Univ. of Sci. & Tech. of China.

## Academic Interest

- Geometry and Topology; Mathematical Physics; Quantum Field Theory and String Theory.

## Awards

- National Key Research and Development Program of China 2020YFA0713000 (PI), 2021-2025.
- NSF Beijing Key Project, Z180003 (co-PI) 2018.12-2021.12, Geometry and Category on Calabi-Yau manifolds
- NSF Grant DMS-1309118 (PI) 2013-2016, Geometric Aspects of Quantum Field Theory and Topological String.
- **Morningside Medal of Mathematics:** Gold Medal Award, 2016.

## Lecture Notes/Books

- *Classical Mechanics and Geometry*. Published by International Press of Boston. 2023.
- *Electromagnetism and Geometry*. Tsinghua University, Spring 2023.
- *Introduction to Algebraic Topology*. Tsinghua University, Spring 2020.
- *Geometry and Symmetry*. Tsinghua University, Fall 2018.

## Publications

1. *Quantum Algebra of Chern-Simons Matrix Model and Large  $N$  Limit* (with S.Hu, D. Ye, Y. Zhou), **arXiv:2308.14046 [math.QA]**
2. *Vertex algebras and quantum master equation*. **J.Diff.Geom.** 123 (2023), no 3, 461-521.
3. *Regularized Integrals on Elliptic Curves and Holomorphic Anomaly Equations (with J. Zhou)*. **Commun. Math. Phys.** 401, pages 613–645 (2023)
4. *Quadratic Duality for Chiral Algebras* (with Z. Gui, K. Zeng), **arXiv:2212.11252 [math.QA]**
5. *On the  $L^2$ -Hodge theory of Landau-Ginzburg models (with H. Wen)*. **Adv. Math.** 396 (2022) 108165
6. *Landau-Ginzburg mirror symmetry conjecture* (with W. He, Y. Shen, R. Webb). **J. Eur. Math. Soc.** Volume 24, Issue 8, (2022), pp. 2915–2978
7. *Elliptic Trace Map on Chiral Algebras* (with Z. Gui), **arXiv:2112.14572 [math.QA]**
8. *Regularized Integrals on Riemann Surfaces and Modular Forms* (with J. Zhou). **Commun. Math. Phys.** 388, pages 1403–1474 (2021)
9. *Geometry of Localized Effective Theories, Exact Semi-classical Approximation and the Algebraic Index* (with Z.Gui, K.Xu). **Commun. Math. Phys.** 382, 441–483 (2021).
10. *Anomaly cancellation in the topological string* (with K. Costello). **Adv. Theo. Math. Phys.** Vol. 24, No. 7 (2020), pp. 1723-1771.
11. *Dispersionless Integrable Hierarchy via Kodaira-Spencer Gravity* (with W.He, X.Tang, P. Yoo). **Commun. Math. Phys.** 379, 327–352 (2020).
12. *Homotopy Algebras in Higher Spin Theory* (with K. Zeng). **Adv. Theo. Math. Phys.** Vol 24, Issue 3, 757-819 (2020)
13.  *$G$ -twisted braces and orbifold Landau-Ginzburg Models* (with W. He and Y. Li), **Commun. Math. Phys.** 373, no.1, 175–217 (2020).
14. *Calabi-Yau geometry, Primitive form and Mirror symmetry*, **Adv. Stud. Pure Math.** Primitive Forms and Related Subjects, page 237-268 (2019). Mathematical Society of Japan.
15. *Categorical primitive forms and Gromov-Witten invariants of An singularities* (with A. Caldararu and J. Tu). **Int Math Res Notices**, rnz315 (2019).
16. *Seiberg-Witten differential via primitive forms* (with D. Xie and S.-T. Yau), **Commun. Math. Phys** 367, no.1, 193-214 (2019).
17. *Effective Batalin-Vilkovisky quantization and geometric applications*, Proceedings of the 7th ICCM, Vol. I, 349–372, **Adv. Lect. Math.** 43. (2019).
18. *Unfolding of Orbifold LG B-Models: A Case Study* (with W. He and Y. Li), **PAMQ** 14.3 (2018): 443-465.
19. *Some Classical/Quantum Aspects of Calabi-Yau Moduli*. **Trends in Mathematics**, Birkhäuser, Cham. B-Model Gromov-Witten Theory, page 463-497 (2018).
20. *Mirror symmetry for unimodular exceptional singularities* (with C. Li, K. Saito and Y. Shen), **J. Eur. Math. Soc.** 19 (2017), no.4, 1189-1229.
21. *Batalin-Vilkovisky quantization and the algebraic index*(with Q.Li, R. Grady), **Adv. Math.** 317 (2017), 575-639.
22. *Twisted supergravity and its quantization* (with K. Costello), **arXiv: 1606.00365 [hep-th]**
23. *On the B-twisted topological sigma model and Calabi-Yau geometry* (with Q. Li), **J.Diff.Geom.** 102 (2016) no.3, 409-484.
24. *Quantization of open-closed BCOV theory, I* (with K. Costello), **arXiv:1505.06703 [hep-th]**
25. *A mirror theorem between Landau-Ginzburg models*. **Nuclear Phys. B.**, 898 (2015).

26. *Primitive forms via polyvector fields* (with C. Li and K. Saito), **arXiv:1311.1659** [math.AG]
27. *Variation of Hodge structures, Frobenius manifolds, and gauge theory*, **arXiv:1303.2782** [math.QA]
28. *Quantum BCOV theory on Calabi-Yau manifolds and the higher genus B-model* (with K. Costello), **arXiv:1201.4501** [math.QA]
29. *Renormalization and mirror symmetry*, **SIGMA** **8** (2012), 101
30. *Feynman graph integrals and almost modular forms*, **Commun. Number theory Phys**, **6**, (2012)
31. *Picard-Fuchs Equations of Relative Periods and Abel-Jacobi Map for Calabi-Yau Hypersurfaces* (with B.H. Lian and S.T. Yau), **Amer. J. Math**, **134** (2012), no.5, 1345-1384
32. *On the spectrum of unitary finite-Euclidean graphs* (with L.A. Vinh), **Ars Combin.** **110** (2013), 275-287.
33. *BCOV theory on the elliptic curve and higher genus mirror symmetry*, **arXiv:1112.4063** [math.QA]
34. *Morphisms from Azumaya prestacks with a fundamental module to a projective variety: Topological D-strings as a master object for curves* (with C.H. Liu, R. Song and S.T. Yau), **arXiv:0809.2121** [math.AG]
35. *Hamiltonian Formalism of the de-Sitter Invariant Special Relativity* (with M.L. Yan, N.C. Xiao and W. Huang), **Commun. Theor. Phys.** **48** :27-36, (2007)
36. *Baryonium with a phenomenological skyrmion-type potential* (with M.L. Yan, B. Wu and B.Q. Ma), **Phys. Rev. D**, **72** (2005) 034027
37. *Calabi-Yau geometry and higher genus mirror symmetry*, PhD Thesis (2011), Harvard University.

## Invited Talks

1. Aug 17, 2023: QM Research Seminar, Center for Quantum Mathematics, Denmark.
2. July 31, 2023: MIST: Satellite Conference to the “International Congress of Basic Science”, CUHK, Hong Kong.
3. May 11, 2023: 2023 GADEPs focused conference II: Periods of Calabi-Yau varieties and Gromov-Witten invariants, BIMS, China.
4. Apr 27, 2023: Wu Wen-tsun Lab Lecture, USTC, China.
5. Jan 13, 2023: TSIMF 2023 Homological Algebra of the Infrared, Sanya, China.
6. Nov 2, 2022: The Greater Bay Area Geometry and Mathematical Physics Seminar
7. Aug 1, 2022: The 9th International Congress of Chinese Mathematicians, Beijing, China.
8. June 20-24, 2022: Online Workshop on Topology and QFT. University of Notre dame.
9. Mar 30, 2022: Joint Harvard-CUHK-YMSC Differential Geometry Seminar.
10. Mar 22-25, 2022: “Geometry, Representation Theory and Quantum Fields”, Osaka City University.
11. Nov 22–Dec 03 2021: String and M-Theory: The New Geometry of the 21st Century – II, NUS, Singapore.
12. Nov 22-26, 2021: Higher structures in geometry and physics, Chern Institute of Mathematics, Nankai University
13. **August 2-7, 2021: International Congress on Mathematical Physics (ICMP) 2021 (session Quantum Field Theory)**, Geneva, Switzerland.
14. **June 14-18, 2021: String-Math 2021 (Plenary talk)**, IMPA, Rio de Janeiro, Brazil.
15. May 14, 2021: TQFT Seminar, Instituto Superior Técnico, Lisbon, Portugal.
16. May 12, 2021: Hodge Seminar, Edinburgh Hodge Institute, Scotland.
17. May 3, 2021: Online Geometry and Physics Seminar, IASM at Zhejiang University, China.
18. Dec 27, 2020: ICCM Annual Meeting, USTC, China.
19. Oct 30, 2020: Wu Wen-tsün Lab Lecture, USTC, China.
20. Sep 20, 2020: “The 3rd Conference on Operad Theory and Related Topics”, Jilin University, China.

21. Apr 17, 2020: Zoom Mathematical Physics Seminar, Tsinghua University, China.
22. Dec 11, 2019: Colloquium, Columbia University, USA.
23. Dec 9, 2019: Workshop on Symplectic Geometry, NCG and Math Physics, Washington Univ. in St. Louis, USA.
24. Dec 2, 2019: Geometry, Symmetry and Physics Seminar, Yale, USA.
25. Nov 25, 2019: Geometry and Topology Seminar, UC Irvine, USA.
26. Nov 21, 2019: Geometry, Physics and Representation Theory Seminar, Northeastern, USA.
27. Nov 15, 2019: High Energy Theory Seminar Seminar, IAS, USA.
28. Nov 8, 2019: Lie Group/Quantum Mathematics Seminar, Rutgers, USA.
29. Oct 8, 2019: Colloquium, Rutgers- Newark, USA.
30. June 17-28, 2019: Lectures at summer workshop “QFT for Mathematicians”, Perimeter Institute, Canada.
31. June 14, 2019: “The mathematical foundations of conformal field theory and related topics” in honor of Yi-Zhi Huang’s 60th birthday., Nankai University, Tianjin, China.
32. **June 13, 2019: The 8th International Congress of Chinese Mathematicians (Plenary talk), Beijing, China.**
33. May 6-11, 2019: Deformation theory and homotopy algebras, Emei, China.
34. Apr 24 and Apr 26, 2019: Mathematical Physics Seminar and GAP Seminar, USTC, China.
35. Feb 17-24, 2019: BIRS Workshop on Quantum Field Theory and Factorization Algebras, Banff, Canada.
36. January 25-27, 2019: Workshop on Modular structures in Gromov-Witten theory and related topics, University of Michigan, USA.
37. Feb 14, 2019: Geometry Seminar, University of Oregon, USA.
38. **Jan 14-18, 2019: Between Topology and Quantum Field Theory in celebration of Dan Freed’s 60th birthday, University of Texas at Austin, USA.**
39. Dec 10-14, 2018: Workshop on String and M-theory: the new geometry of the 21 century, IMS at NUS, Singapore.
40. Nov 24-26, 2018: Mini-Workshop on Hochschild Cohomology and Related Topics III, East China Normal University, China.
41. Nov 16, 2018: Colloquium at IMS, ShanghaiTech University, China.
42. **July 18-22, 2018: String-Math 2018 (Plenary talk), Tohoku University, Japan.**
43. May 10, 2018: 2018 Higher Structures and Symplectic Geometry, Tsinghua University, China.
44. Feb 8, 2018: Workshop on Factorisation Homology, Factorisation Algebras and the Cobordism Hypothesis, Saint-Etienne de Tienne, France.
45. Jan 29, 2018: Higher differential geometry seminar, MPIM, Bonn, Germany.
46. Jan 10-13, 2018: Simons Collaboration Workshop on Homological Mirror Symmetry, Harvard, USA.
47. Dec 7, 2017: Geometry Seminar, CNU, Beijing.
48. Nov 16-19, 2017: Gromov-Witten invariants and integrable hierarchies, USTC, China.
49. Nov 26, 2017: Wu Wen-tsün Lab Lecture, USTC, China.
50. Oct 30-Nov 4, 2017: East Asia Symplectic Conference 2017, Chengdu, China.
51. July 31-Aug 11, 2017: Geoquant 2017, Aarhus, Danmark.
52. **July 24-29, 2017: String-Math 2017 (Parallel talk), Hamburg, Germany.**
53. July 20-22, 2017: Flat connections in physics and geometry, Heidelberg, Germany.
54. July 3-7, 2017: Symposium in Geometry and Differential Equations, Beijing, China.
55. June 8, 2017: ICTS seminar, USTC, Hefei, China.

56. May 22-26, 2017: Homological mirror symmetry and higher genus invariants, Simons Center for Geometry and Physics, USA.
57. May 8-12, 2017: Quantum fields on manifolds with boundary and the BV formalism, Perimeter Institute, Canada.
58. **Apr 28-May 1, 2017: JDG conference on geometry and topology, Harvard, USA.**
59. **Apr 25-28, 2017: Developments of mathematics at IPMU: in honor of Kyoji Saito, Kavli IPMU, Japan.**
60. Apr 17-24, 2017: Gauge Equations, Geometry and Strings, ICMAT, Madrid, Spain.
61. Mar 13-17, 2017: Workshop on homological mirror symmetry, IAS, Princeton, USA.
62. Feb 6, 2017: Geometry and Physics seminar, IBS-CGP, Korea.
63. Jan 19, 2017: Ganita seminar, University of Toronto, Canada.
64. Jan 18, 2017: Mathematical Physics seminar, Perimeter Institute for theoretical physics, Canada.
65. Oct 31-Nov 4, 2016: BICMR/IBS-CGP joint Symplectic Geometry Workshop, Jeju, Korea.
66. **Aug 6-11, 2016: The 7th International Congress of Chinese Mathematicians, Beijing, China.**
67. **Aug 1-5, 2016: Strings 2016 (Parallel talk), Beijing, China.**
68. June 20-26, 2016: Retrospective Workshop for the Thematic Program on Calabi-Yau Varieties: Arithmetic, Geometry and Physics, Herstmonceux Castle, UK
69. May 8-14, 2016: Lecture series for “Factorization Algebras and Functorial Field Theories”, MFO, Germany.
70. May 6-8, 2016: Simons Workshop on SYZ Mirror Symmetry and related topics, Harvard, USA.
71. Apr 24-30, 2016: Mini course on “BV quantization and geometric applications”, IBS-CGP, Korea.
72. Apr 5-12, 2016: MIST IV: Mathematics Inspired by String Theory, CUHK, Hong Kong.
73. Jan 1-4, 2016: Poisson Geometry and Mathematical Physics, Chern Institute of Mathematics, Tianjin.
74. **Dec 31, 2015: Strings-Math 2015 (Plenary talk), Sanya, China.**
75. Dec 27, 2015: Workshop on Mathematics Physics, Dec 27, Sanya, China.
76. Nov 24, 2015: 2015 Annual Conference of Chinese Mathematical Society, CNU, Beijing.
77. Nov 14, 2015: Geometry and Physics seminar, Shanghai Jiaotong University, Shanghai
78. July 13-July 18,, 2015: “Uniformization, Riemann-Hilbert Correspondence, Calabi-Yau manifold, and Picard-Fuchs Equation”, Mittag-Leffler Institute, Sweden
79. July 6-10, 2015: GAP XII-Derived Algebraic Geometry, IBS-CGP, Pohang, Korea
80. March 28, 2015: Tianyuan workshop in algebraic geometry, AMSS, Beijing.
81. Mar 23, 2015: Symplectic geometry and mathematical physics, BICMR, China.
82. March 7, 2015: Beijing Geometry and Physics Colloquium, Peking University
83. Feb 7-8, 2015: Lecture series-Introduction to perturbative field theory, Morningside Center, CAS, Beijing.
84. Jan 20, 2015: String/Math Seminar, Perimeter Institute, Canada
85. Aug 26, 2014: China annual complex analysis conference, USTC, Hefei.
86. Oct 20, 2014: Geometry seminar, Lehigh University, USA.
87. Oct 6, 2014: Informal mathematical physics seminar, Columbia University, USA.
88. Sep 29-Aug 3, 2014: Homological methods in quantum field theory, Simons center for geometry and physics, USA.
89. Sep 18, 2014: Seminar on mathematical physics, Morningside Center for Mathematics, CAS, Beijing.
90. **Aug 5, 2014: 60 years of Calabi conjecture-Workshop in Honor of Professor Shing-Tung Yau on the occasion of his 65th birthday, Tsinghua University**
91. June 8-15, 2014: Lecturer for Research Training Group 1670, University of Hamburg, Germany

92. May 19-23, 2014: Representation Theory, Integrable Systems, and Quantum Fields, Northwestern University, USA
93. April 1, 2014: Algebraic geometry seminar, Princeton, USA
94. Mar 3-7, 2014: Workshop on B-model aspect of Gromov-Witten theory, University of Michigan
95. Feb 10-14, 2014: Lecturer: Primitive forms and related subjects, Kavli IPMU, Japan
96. Nov 25, 2013: Geometry and Physics seminar, University of Michigan, USA
97. July 22, 2013: Invited seminar, Kavli IPMU, Japan
98. **July 16, 2013: The Sixth International Congress of Chinese Mathematicians, Taipei**
99. Apr 12-14, 2013: Mini-course for FRG Workshop on Gromov-Witten theory, Columbia University, USA
100. Mar 11, 2013: Geometry and Physics seminar, University of Michigan, USA
101. Jan 29, 2013: Differential geometry seminar, Harvard University, USA
102. Nov 30, 2012: Everytopic Seminar, Brandeis University, USA
103. Nov 27, 2012: GAP Seminar, Penn State University, USA
104. Sep 14-17, 2012: Boston-Keio Summer Workshop on Geometry, Boston University, USA
105. Aug 27, 2012: FRG Workshop: Generalized Geometry, String Theory, and Deformations, Harvard, USA
106. August 20-24, 2012: The Conference of Mirror Symmetry and Related Topics, KMUST, China
107. July 27-Aug 20, 2012: Summer course, MSC at Tsinghua University, China
108. August 10, 2012: Math Literature Seminar, MSC at Tsinghua University, China
109. July 18, 2012: Workshop on the mathematical aspects of quantum field theory, USTC, China
110. June 26, 2012: Geometry and Physics of the Landau-Ginzburg Model, IPMU, Japan
111. June 18, 2012: Quantization and Mathematics: An Undergraduate Conference, Northwestern University, USA
112. Mar 19, 2012: Geometry and Physics Seminar, University of Michigan, USA
113. Feb 18, 2012: Hong Kong Geometry Colloquium, Hong Kong
114. Feb 17,20, 2012: Geometry and Physics Seminar, HK Chinese Univ, Hong Kong
115. Feb 8,11, 2012: Geometry Seminar, HKUST, Hong Kong
116. Dec 9, 2011: Geometry Seminar, Boston University, USA
117. Nov 3, 2011: Felix Klein Seminar, University of Notre Dame, USA
118. Aug 3, 2011: Workshop on Chiral Differential Operators, Northwestern University, USA
119. July 19, 2011: Seminar on QFT, MIT, US
120. May 5, 2011: Mirror Symmetry Seminar, Simons Center for Geometry And Physics, Stonybrook
121. Mar 4, 2011: Algebraic Geometry Seminar, University of Wisconsin, USA
122. Feb 22, 2011: Differential Geometry Seminar, Harvard University, USA
123. Oct 14, 2010: Geometry/Physics Seminar, Northwestern University, USA
124. Sep 28, 2010: Differential Geometry Seminar, Harvard University, USA
125. Dec 4 2009: Differential Geometry Seminar, Harvard University, USA

## Teaching and Mentorship

### • Post-doc mentorship

- Jingyue Chen (2015-2018), work at Capital Normal University
- Weiqinag He (2015-2018), work at Sun Yat-sen University
- Hao Wen (2016-2019), work at Nankai University
- Xinxing Tang (2017-2021) work at Beijing Inst. of Math. Sci. App. (BIMSA)
- Jiawei Zhou (2019-2022) work at Beijing Inst. of Math. Sci. App. (BIMSA)
- Hongfei Shu (2021-present)
- Yong Li (2022-present)

### • Graduate (Ph.D.) mentorship

- Yifan Li (2014-2019).  
Thesis: “**Algebraic Approaches to Landau-Ginzburg Orbifolds**”.
- Zhengping Gui (2016-2021).  
Thesis: “**Chiral deformation theory of 2d conformal field theory**”
- Minghao Wang (2018-2023).  
Thesis: “**Perturbative BV-BFV formalism with homotopic renormalization**”
- Gongwang Yan (2018-2023).  
Thesis: “**Homological framework for quantum field theory on manifold with boundary: a case study**”
- Xiaoxiao Yang (2019-current)
- Peng Yang (2020-current)
- Tianqin Zhu (2020-current)

### • Undergraduate thesis mentorship

- Chenjing Bu (2021, Oxford)
- Keyou Zeng (2018, Perimeter Institute)
- Kai Xu (2018, Harvard)
- Shaoyun Bai (2017, Princeton)
- Yuxuan Yang (2017, Harvard)
- Zhengping Gui (2016, Tsinghua)
- Weifeng Sun (2016, Harvard)

### • Teaching (Tsinghua)

- Spring 2023: *Electrodynamics* (new undergraduate course for Qiuzhen College, 4 credits)
- Fall 2022: *Classical Mechanics* (new undergraduate course for Qiuzhen College, 4 credits)
- Spring 2021: *Algebraic Topology* (graduate course. 4 credits)
- Fall 2020: *Mathematical Analysis-I* (undergraduate. 5 credits)
- Spring 2020: *Algebraic Topology* (graduate course. 4 credits)
- Spring 2019: *Noncommutative geometry* (new graduate course, 4 credits)
- Spring 2019: *Mathematical Examples* (new undergraduate course for Yau Elite class, 2 credits)
- Fall 2018: *Geometry and Symmetry* (new undergraduate course for Yau Elite class, 3 credits)

- Spring 2018: *Algebraic Topology* (graduate course, evaluation top 5 % at Tsinghua, 4 credits)
- Fall 2017: *Topics in mathematical physics-supersymmetry* (**new graduate course**, 4 credits)
- Fall 2017: *Topology* (undergraduate, 3 credits)
- Fall 2015: *Linear algebra* (undergraduate, 4 credits)
- Spring 2015: *Topics in quantum field theory and geometric applications* (YMSC graduate, 4 credits)
- Summer 2014: *Introduction to deformation quantization* (YMSC graduate, 2 credits)
- Summer 2013: *Topics in quantum field theory* (YMSC graduate, 2 credits)