Monica Jinwoo Kang

Contact Information

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Research Interests

High Energy Theory, Mathematical Physics, and Quantum Information

Employment

Center for Particle Cosmology, University of Pennsylvania, Philadelphia PA USA

Center for Particle Cosmology Postdoctoral Fellow, September 2023 – Present

Walter Burke Institute for Theoretical Physics, **California Institute of Technology**, Pasadena CA USA

Sherman Fairchild Postdoctoral Fellow, September 2019 – August 2023 (on leave Nov 2020 – Nov 2021 due to COVID-19)

Korea Advanced Institute of Science and Technology, Daejeon Korea

(Visiting) Postdoctoral Scholar, November 2020 – November 2021

Education

Harvard University, Cambridge, MA USA

Ph.D. in Physics, May 2019

- Dissertation: Two Views on Gravity: F-theory and Holography
- Advisor: Daniel L. Jafferis

A.M. in Physics, March 2014

University of California Berkeley, Berkeley, CA USA

A.B. in Physics (Highest Honors Degree), May 2012

- Senior Honors Thesis: Temperature Dependent Ferromagnetic Nature of the Metal-Insulator Interface State
- Advisor: Frances Hellman

A.B. in Mathematics (Honors Degree), May 2012

- Advisor: Jon Wilkening

Korea Science Academy, Busan, South Korea

- Senior Thesis: Design of Ultrasonic Welding Horn for Microelectronic Components Bonding using Finite Element Analysis
- Advisor: Young H. Kim

Awards and Honors

Burke Fellowship (Sherman Fairchild)

Strings 2018 Fellowship

Purcell Fellowship

J. D. Jackson Award (Electromagnetics Best Student Award 2011)

UC Berkeley Physics Undergraduate Research Scholarship (BPURS)

Korea Science Academy Scholarship for Undergraduate Studies Abroad

Organized Conferences and Seminars

Integrability, geometry, and QFTs: 1st MaPhyAg Workshop, Madrid, Spain, October 7-11th, 2024
Organizers: Enrique Arrondo, Angel Gonzalez, Monica Jinwoo Kang, Marina Logares, and Piergiulio Tempesta
https://eventos.ucm.es/118178/section/51101/maphyag-workshop-integrability-geometry-and-qft.html

UPenn High Energy Theory Seminar, from January 2024 – Present

Caltech High Energy Theory Seminar, January 2020 – June 2022

- Academic year 2021-2022: https://theory.sites.caltech.edu/seminars/high-energy-theory-seminars-2022-2023-1/high-energy-theory-seminars-2021-2022
- Academic year 2020-2021: https://theory.sites.caltech.edu/seminars/high-energy-theory-seminars-2022-2023-1/high-energy-theory-seminars-2020-21
- Academic year 2019-2020 and Summer 2020 : https://theory.sites.caltech.edu/seminars/high-energy-theory-seminars-2022-2023-1/high-energy-theory-seminars-2019-20

Stringy Geometry for Junior Researchers, Northeastern University, September 28th, 2018
Organizers: Mboyo Esole and Monica Jinwoo Kang
www.northeastern.edu/esole/BostonStringyGeometry.html

Invited Conference Talks, Seminars, and Colloquia

(Conference talks are in bold italics.)

131. Lehigh University, String Theory and Cosmology Seminar, November 2024
130. Korea Advanced Institute of Science and Technology (KAIST), High Energy Physics Seminar, November 2024
129. Institute for Theoretical Physics (IFT), Physics Department Seminar, October 2024
128. Universidad Complutense de Madrid, Mathematical Physics and Algebraic Geometry Seminar, October 2024
127. University of Pennsylvania, High Energy Theory Seminar, September 2024
126. ***Quantum Theory at the Extremes: Physical, Mathematical, and Philosophical Aspects***, the inaugural workshop of the Laboratory for Quantum Theory at the Extremes (LQuTE), University of Illinois Chicago, August 2024
125. Institute of Basic Science Center for Geometry and Physics (IBS-CGP), Symplectic Geometry seminar, July 2024
124. Institute of Basic Science Center for Geometry and Physics (IBS-CGP), Center for Geometry and Physics Colloquium, July 2024
123. ***Strings and Geometry 2024***, University of Hamburg and DESY, May 2024
122. Drexel University, Department of Physics, Physics Colloquium, May 2024
121. Johns Hopkins University, Particle theory seminar, April 2024
120. Rutgers, High Energy Theory Seminar, March 2024
119. ***Random Physics***, Princeton Center for Theoretical Science, March 2024
118. Northeastern University, GASC (Geometry, Algebra, Singularities, and Combinatorics) seminar, February 2024
117. University of Michigan, High Energy Theory Brown Bag Seminar, January 2024
116. Virginia Tech, Department of Mathematics, Colloquium, January 2024
115. Northeastern University, Department of Mathematics, Colloquium, December 2023
114. Southampton String theory seminar, University of Southampton, December 2023
113. Imperial College London, String theory seminar, December 2023

112. ***Bridges between holographic quantum information and quantum gravity***, Isaac Newton Institute for Mathematical Sciences, University of Cambridge, November 2023
111. University of Cambridge, Trinity College, Trinity Mathematical Society talk, November 2023
110. ***Black holes: bridges between number theory and holographic quantum information***, Isaac Newton Institute for Mathematical Sciences, University of Cambridge, November 2023
109. Texas A&M University, Mitchell Institute, MIST High-Energy Theory Seminar, October 2023
108. ***Complex Lagrangians, Mirror Symmetry, and Quantization***, Banff International Research Station, October 2023
107. University of Pennsylvania, High Energy Theory Seminar, October 2023
106. ***Symplectic Geometry, Low Dimensional Topology, and Quantum Fields***, Clay Mathematics Institute (CMI), University of Oxford, September 2023
105. Korea Advanced Institute of Science and Technology (KAIST), High Energy Physics Seminar, August 2023
104. ***Windows on the Universe, the 30th Anniversary Conference of the Rencontres du Vietnam***, August 2023
103. ***The Physical Mathematics of Quantum Field Theory Summer School***, University of Massachusetts Amherst, July 2023
102. Universidad Complutense de Madrid, Mathematical Physics Lectures, June-July 2023
101. ***The 15th edition of the International Workshop "Lie Theory and Its Applications in Physics"***, Varna, Bulgaria, June 2023
100. Ludwig Maximilian University of Munich, Fields and Strings seminar, June 2023
99. Deutsches Elektronen-Synchrotron (DESY), String theory seminar, June 2023
98. ***The Geometry, Algebra, and Physics of Higgs Bundles***, Banff International Research Station (BIRS), June 2023
97. ***Rising Stars in Physics 2023***, UC Berkeley, May 2023
96. California Institute of Technology, Observational Cosmology seminar, May 2023
95. Imperial College London, Quiver meeting seminar, May 2023
94. Institute of Basic Science Center for Geometry and Physics (IBS-CGP), Center for Geometry and Physics Colloquium, April 2023
93. Institute of Basic Science Center for Geometry and Physics (IBS-CGP), Symplectic Geometry seminar, April 2023
92. NeXus theoretical physics seminar, March 2023
91. University of Pennsylvania, High energy theory group seminar, March 2023
90. ***Strings and Geometry 2023***, University of Pennsylvania, March 2023
89. UC Berkeley, Berkeley Center for Theoretical Physics, String Seminar, February 2023
88. Pomona College, Department of Physics and Astronomy, Colloquium, January 2023
87. Princeton Center for Theoretical Science, High Energy Theory Seminar, November 2022
86. UC Santa Barbara, KITP, High Energy and Gravity Seminar, November 2022
85. UCLA, Theoretical Elementary Particle (TEP) Physics Seminar, November 2022
84. IST Lisbon, String Theory Seminar, November 2022
83. UT Austin, Geometry and String Theory Seminar, November 2022
82. UT Austin, Theory Group Seminars, November 2022
81. Stanford, SITP Monday Colloquium, October 2022

80. Kyunghee University, String Theory Group, October 2022
79. Korea Advanced Institute of Science and Technology (KAIST), KAIX seminar, October 2022
78. Pacific Institute for the Mathematical Sciences (PIMS) Geometry, Algebra, and Physics Seminar, University of Saskatchewan, August 2022
77. ***Simons Summer Workshop 2022***, Simons Center for Geometry and Physics, August 2022
76. ***Reconstructing the Gravitational Hologram with Quantum Information***, The Galileo Galilei Institute for Theoretical Physics, Florence, July 2022
75. ***Amsterdam String Workshop 2022***, Amsterdam, July 2022
74. ***Geometric Structures (re)United: Higgs bundles, geometric structures, and character varieties***, Chicago, June 2022
73. Freie Universitat Berlin, Quantum Information and Condensed Matter Seminar, June 2022
72. Quantum Security via Algebras and Representation Theory (QUASAR) seminar, Carleton University and University of Ottawa, June 2022
71. ***Canadian Operator Symposium (COSy), 50th anniversary***, June 2022
70. Massachusetts Institute of Technology, Center for Theoretical Physics, May 2022
69. UC San Diego, Particle Physics Group, May 2022
68. Kyunghee University, String Theory Group, April 2022
67. IIT-Madras, The dual mystery channel of gauge and gravity seminar, March 2022
66. ***Low Dimensional Models of Quantum Gravity***, Aspen Winter Conference, Feb 2022
65. ***Geometrization of (S)QFTs in $D \leq 6$***, Aspen Winter Conference, February 2022
64. UC Berkeley, Berkeley Center for Theoretical Physics, String-Math Seminar, January 2022
63. Freie Universitat Berlin, Quantum Information Theory Seminar, December 2021
62. Northeastern University, Geometry, Physics, and Representation Theory Seminar, Dec 2021
61. Rutgers, High Energy Theory Group, December 2021
60. UC Riverside, Differential Geometry Seminar, November 2021
59. ***Frontiers in Theoretical Physics***, Jeju, November 2021
58. ***Quantum Geometry and Duality***, GIST, October 2021
57. ***Exact results on irrelevant deformations of QFTs***, Jeju, October 2021
56. ***Geometry of (S)QFT***, Simons Center for Geometry and Physics, September 2021
55. ***2nd PIMS Summer School on Algebraic Geometry in High-Energy Physics***, Pacific Institute for the Mathematical Sciences, August 2021
54. ***Updates on Methods of Theoretical Physics 2021***, Asia Pacific Center for Theoretical Physics (APCTP), August 2021
53. University of Queensland, School of Mathematics and Physics, Physics Colloquium, July 2021
52. ***Strings, Branes and Gauge Theories 2021***, Gyeongju, July 2021
51. Korea Institute for Advanced Study, String Theory Seminar, May 2021
50. California Institute of Technology, High Energy Theory Wednesday Seminar, April 2021
49. UC Santa Barbara, KITP, High Energy and Gravity Seminar, March 2021
48. Korea Advanced Institute of Science and Technology (KAIST), Quantum Information Theory and Quantum Entanglement seminar, December 2021
47. University of Saskatchewan, Centre for Quantum Topology and Its Applications, Quantum Topology and Its Applications CRG Colloquium, November 2020
46. UC Berkeley, Berkeley Center for Theoretical Physics, String Seminar, October 2020

45. Institute for Research in Fundamental Sciences, IPM Holography Virtual Seminar, Sept 2020
44. California Institute of Technology, Institute of Quantum Information and Matter (IQIM), IQI Seminar, August 2020
43. UC Santa Barbara, KITP, High Energy and Gravity Seminar, August 2020
42. California Institute of Technology, High Energy Theory Wednesday Seminar, July 2020
41. ***Quantum Information in Quantum Gravity 6***, CERN (canceled due to COVID-19)
40. California Institute of Technology, High Energy Theory Wednesday Seminar, May 2020
39. UC Davis, Center for Quantum Mathematics and Physics (QMAP), Fields Strings Gravity Seminar, February 2020
38. Perimeter Institute, Quantum Fields and Strings Seminar, December 2019
37. ***Workshop on Qubits and Spacetime***, Institute of Advanced Studies (IAS), December 2019
36. California Institute of Technology, Institute of Quantum Information and Matter (IQIM), IQI Seminar, November 2019
35. Institute of Basic Science Center for Geometry and Physics (IBS-CGP), Center for Geometry and Physics Colloquium, November 2019
34. ***Southeastern Regional Mathematical String Theory Meeting***, Duke Univ., Nov 2019
33. California Institute of Technology, High Energy Theory Wednesday Seminar, October 2019
32. California Institute of Technology, Walter Burke Institute for Theoretical Physics, Burke Institute Luncheon, October 2019
31. Massachusetts Institute of Technology, Center for Theoretical Physics, March 2019
30. Perimeter Institute, Mathematical Physics Seminar, February 2019
29. Johns Hopkins University, December 2018
28. University of Chicago, Theory Seminar, December 2018
27. University of Milano-Bicocca, November 2018
26. Utrecht University, Institute for Theoretical Physics, November 2018
25. University of Amsterdam, Institute for Theoretical Physics Amsterdam, November 2018
24. IPhT at Saclay, Seminaire de matrices, cordes et geometries aleatoires, November 2018
23. Queen Mary University of London, Centre for Research in String Theory Seminar, Nov 2018
22. ***Current Trends on Spectral Data for Higgs Bundles***, University of Oxford, Nov 2018
21. Stanford University, November 2018
20. California Institute of Technology, High Energy Theory Seminar, November 2018
19. Simons Center for Geometry and Physics, Physics Seminar, October 2018
18. ***AMS Fall Western Sectional Meeting***, San Francisco, October 2018
17. University of Pennsylvania, Math-Physics Joint Seminar, October 2018
16. Virginia Tech, Neutrino Physics Seminar, October 2018
15. ***Physics and Mathematics of F-theory***, Harvard University, September 2018
14. New York University, Center for Cosmology and Particle Physics Seminar, September 2018
13. Columbia University, Theory Seminar, September 2018
12. ***Geometry and Physics of Gauge Theories at Infinity***, Saskatchewan, August 2018
11. ***Strings 2018*** (Gong show honorable mention, poster), Okinawa, June 2018
10. ***String-Math 2018*** (Gong show), Sendai, June 2018
9. Korea Institute for Advanced Study, String Theory Seminar, June 2018

8. CERN, String Theory Seminar, April 2018
7. University of Heidelberg, String Theory and Beyond the Standard Model Seminar, April 2018
6. Harvard Unviersity, In-House String Seminar, November 2017
5. Korea Science Academy of KAIST, Science Colloquium, August 2017
4. ***Strings 2017*** (Gong show), Tel-Aviv, June 2017
3. Kongju National University, Science Colloquium, August 2016
2. Korea Institute for Advanced Study, String Theory Seminar, July 2016
1. California Institute of Technology, High Energy Theory Seminar, December 2015

Publications

38. **Holographic tensor network in 3d spacetime**
Monica Jinwoo Kang and Shozab Qasim, To appear.
37. **Modeling the spacetime lattice: discrete to continuum**
Monica Jinwoo Kang and Shozab Qasim, To appear.
36. **Algebraic approach to spacetime bulk reconstruction**
Jason Crann and Monica Jinwoo Kang, To appear.
35. **The Higgs branch of conformal matter**
Jacques Distler, Monica Jinwoo Kang, and Craig Lawrie, To appear.
34. **Landscape of 4d $\mathcal{N} = 1$ SCFTs with $a = c$**
Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, and Jaewon Song, To appear.
33. **PIMS Lecture note on elliptic fibrations and singularities to anomalies and spectra**
Monica Jinwoo Kang, To appear.
32. **Generalized symmetry constraints on deformed 4d (S)CFTs**
Monica Jinwoo Kang, Craig Lawrie, Ki-Hong Lee, and Jaewon Song,
arXiv:2408.14532 [hep-th].
31. **Holographic duals of Higgsed $\mathcal{D}_p(ABCD)$**
Christopher Couzens, Monica Jinwoo Kang, Craig Lawrie, and Yein Lee,
arXiv:2312.12503 [hep-th].
30. **Central extensions of higher groups: Green-Schwarz mechanism and 2-connections**
Monica Jinwoo Kang and Sungkyung Kang,
arXiv:2311.14666 [hep-th].
29. **Nonperturbative gravity corrections to bulk reconstruction**
Elliott Gesteau and Monica Jinwoo Kang,
J. Phys. A: Math. Theor. **56** 385401 (2023), 10.1088/1751-8121/acef7d.
28. **Emergent $\mathcal{N} = 4$ supersymmetry from $\mathcal{N} = 1$**
Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, and Jaewon Song,
Physical Review Letters **130**, Iss. 23, 231601 (2023), 10.1103/PhysRevLett.130.231601.
27. **Isomorphisms of 4d $\mathcal{N} = 2$ SCFTs from 6d** (PRD Editors' Suggestion)
Jacques Distler, Grant Elliot, Monica Jinwoo Kang, and Craig Lawrie,
Physical Review D **107**, no.10, 106005 (2023), 10.1103/PhysRevD.107.106005.
26. **Operator spectroscopy for 4d SCFTs with $a = c$**
Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, and Jaewon Song,
Physical Review D **107**, no.6, 066018 (2023), 10.1103/PhysRevD.107.066018.
25. **Holographic Relative Entropy in Infinite-dimensional Hilbert Spaces**
Monica Jinwoo Kang and David Kolchmeyer,
Commun. Math. Phys. (2023) 1-31, 10.1007/s00220-022-04627-z.

24. **A universal formula for the density of states with continuous symmetry**
Monica Jinwoo Kang, Jaeha Lee, and Hirosi Ooguri,
Physical Review D **107**, no.2, 026021 (2023), 10.1103/PhysRevD.107.026021.

23. **Lectures on the string landscape and the Swampland**
Nathan Benjamin Agmon, Alek Bedroya, Monica Jinwoo Kang, and Cumrun Vafa,
arXiv:2212.06187 [hep-th].

22. **Higgs, Coulomb, and Hall–Littlewood**
Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, Matteo Sacchi, and Jaewon Song,
Physical Review D **106**, no.10, 106021 (2022), 10.1103/PhysRevD.106.106021.

21. **Distinguishing 6d $(1,0)$ SCFTs: an extension to the geometric construction**
Jacques Distler, Monica Jinwoo Kang, and Craig Lawrie,
Physical Review D **106**, no.6, 066011 (2022), 10.1103/PhysRevD.106.066011.

20. **Two 6d origins of 4d SCFTs: class $\mathcal{S}$ and 6d $(1,0)$ on a torus**
Florent Baume, Monica Jinwoo Kang, and Craig Lawrie,
Physical Review D **106**, no.8, 086003 (2022), 10.1103/PhysRevD.106.086003.

19. **Infinitely many 4d $\mathcal{N}=1$ SCFTs with $a=c$**
Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, and Jaewon Song,
Physical Review D **105**, no.12, 126006 (2022), 10.1103/PhysRevD.105.126006.

18. **Infinitely many 4d $\mathcal{N}=2$ SCFTs with $a=c$ and beyond**
Monica Jinwoo Kang, Craig Lawrie, and Jaewon Song,
Physical Review D **104**, no.10, 105005 (2021), 10.1103/PhysRevD.104.105005.

17. **Entanglement Wedge Reconstruction of Infinite-dimensional von Neumann algebras using Tensor Networks**
Monica Jinwoo Kang and David Kolchmeyer,
Physical Review D **103**, no.12, 126018 (2021), 10.1103/PhysRevD.103.126018.

16. **Matter representations from geometry: under the spell of Dynkin**
Mboyo Esole and Monica Jinwoo Kang,
arXiv:2012.13401 [hep-th].

15. **Holographic baby universes: an observable story**
Elliott Gesteau and Monica Jinwoo Kang,
arXiv:2006.14620 [hep-th].

14. **Thermal states are vital: State-dependent Entropies and Entanglement Wedge Reconstruction**
Elliott Gesteau and Monica Jinwoo Kang,
arXiv:2005.07189 [hep-th].

13. **The infinite-dimensional HaPPY code: entanglement wedge reconstruction and dynamics**
Elliott Gesteau and Monica Jinwoo Kang,
arXiv:2005.05971 [hep-th].

12. **Flopping and Slicing: SO(4) and Spin(4)-models**
Mboyo Esole and Monica Jinwoo Kang,
Advances in Theoretical and Mathematical Physics Volume 23 (2019) Number 4:1003-1066,
10.4310/ATMP.2019.v23.n4.a2.

11. **Euler Characteristics of Crepant Resolutions of Weierstrass Models**
Mboyo Esole, Patrick Jefferson, and Monica Jinwoo Kang,
Commun. Math. Phys. 371 (2019) 99-144, 10.1007/s00220-019-03517-1.

10. **The Geometry of the SU(2)×G_2-model**
Mboyo Esole and Monica Jinwoo Kang,
JHEP 02 (2019) 091, 10.1007/JHEP02%282019%29091.

9. **48 Crepant Paths to SU(2)×SU(3)**
   Mboyo Esole, Ravi Jagadeesan, and Monica Jinwoo Kang,
   arXiv:1905.05174 [hep-th].

8. **Characteristic numbers of elliptic fibrations with non-trivial Mordell-Weil groups**
   Mboyo Esole and Monica Jinwoo Kang,
   arXiv:1808.07054 [hep-th].

7. **Characteristic numbers of crepant resolutions of Weierstrass models**
   Mboyo Esole and Monica Jinwoo Kang,
   arXiv:1807.08755 [hep-th].

6. **Mordell-Weil Torsion, Anomalies, and Phase Transitions**
   Mboyo Esole, Monica Jinwoo Kang, and Shing-Tung Yau,
   arXiv: 1712.02337 [hep-th].

5. **The Geometry of $\mathbf{G}_2$, Spin(7), and Spin(8)-models**
   Mboyo Esole, Ravi Jagadeesan, and Monica Jinwoo Kang,
   arXiv:1709.04913 [hep-th].

4. **The Geometry of $\mathbf{F}_4$-Models**
   Mboyo Esole, Patrick Jefferson, and Monica Jinwoo Kang,
   arXiv:1704.08251 [hep-th].

3. **A New Model for Elliptic Fibrations with a Rank One Mordell-Weil Group: I. Singular Fibers and Semi-Stable Degenerations**
   Mboyo Esole, Monica Jinwoo Kang, and Shing-Tung Yau,
   arXiv:1410.0003 [hep-th].

2. **IFP Rings and Near-IFP Rings**
   Kyung-Yuen Ham, Young Cheol Jeon, Jinwoo Kang, Nam Kyun Kim, Wonjae Lee, Yang Lee, Sung Ju Ryu, and Hae-Hun Yang,
   J. Korean Math. Soc. 45 (2008), no. 3, 727–740, 10.4134/JKMS.2008.45.3.727.

1. **Design of Ultrasonic Welding Horn for Microelectronic Components Bonding using Finite Element Analysis**
   Jinwoo Kang, Young H. Kim, Jeong-Hoon Moon, Cheolho So, Kyung-soo Kim,
   Proceedings of Symposium on Ultrasonic Electronics, Vol.28, (2007), pp. 291-292 2 14-16.

Works in Progress

Multipartite entanglement
Vijay Balasubramanian, Monica Jinwoo Kang, Chitraang Murdia and Simon Ross.

Geometric construction of the bulk dual of Narain CFT
Elliott Gesteau, Monica Jinwoo Kang, and Matilde Marcolli.

Unknotting number and knot contact homology: capturing global aspect of TQFTs
Johan Asplund, Monica Jinwoo Kang, and Sungkyung Kang.

Holographic duals of 4d $\mathcal{N} = 2$ SCFTS with $a = c$
Christopher Couzens, Monica Jinwoo Kang, Craig Lawrie, Ki-hong Lee, and Jaewon Song.

Holographic spacetime tensor network: dynamics and topology changes
Monica Jinwoo Kang and Shozab Qasim.

Coulomb, Higgs, and Quivers
Monica Jinwoo Kang and Steven Rayan.

VOA and $\hat{\Gamma}(G)$ theories with $a = c$
Monica Jinwoo Kang, Craig Lawrie, and Miroslav Rapcak.

Boostrapping the 6d Higgs branch
Monica Jinwoo Kang, Craig Lawrie, Aike Liu, and Yixin Xu.

Higgsing, gauging, and dualities
Monica Jinwoo Kang, Craig Lawrie, and Jaewon Song.

Teaching Experience

Lectures

The physical mathematics of quantum field theory summer school, Lecture series, July 2023

Universidad Complutense de Madrid, Mathematical Physics Lectures, June-July 2023

Caltech, Advanced Quantum Field Theory, Spring 2022 (substituted)

Quantum Geometry and Duality, Lectures, October 2021

2nd Pacific Institute for the Mathematical Sciences (PIMS) Summer School on Algebraic Geometry in High Energy Physics, Lecture series, August 2021

Updates on methods of theoretical physics, Lecture series, August 2021

Korea Advanced Institute of Science and Technology (KAIST), Lectures in Quantum Information Theory and Quantum Entanglement, January 2021

Caltech, Quantum Field Theory II, Winter 2020 (substituted)

Harvard, Graduate Advanced Quantum Mechanics (251b), Spring 2016 (substituted)

Harvard, Algebraic Geometry II, Spring 2015 (substituted)

Harvard Teaching Fellow

Harvard Teaching Fellow, String Theory II, Spring 2019

Harvard Teaching Fellow, Graduate Advanced Quantum Mechanics (251b), Spring 2016,2017,2018

Harvard Teaching Fellow, Mechanics, Elasticity, Fluids, and Diffusion (PS2), Fall 2014

Harvard Teaching Fellow, Introduction to Electromagnetism (15b), Spring 2014

Harvard Teaching Fellow, Introduction to Theoretical Physics (151), Fall 2013

Harvard Teaching Fellow, Principles of Physics (S1ab), Summer 2013

UC Berkeley Graduate Student Instructor and Reader

UC Berkeley Graduate Student Instructor, Advanced Laboratory(111adv), Spring 2012

UC Berkeley Reader, Quantum Information (C191), Statistical and Thermal Physics (112), Introduction to General Astronomy (C10)

Referee for

Department of Energy (DOE), Office of Science Graduate Student Research (SCGSR)

Communications in Mathematical Physics

Advances in Theoretical and Mathematical Physics

Journal of High Energy Physics

Physical Review D

Nuclear Physics B

European Physical Journal C

Modern Physics Letters A

International Journal of Modern Physics A

Notices of the American Mathematical Society

International Mathematics Research Notices (IMRN)