

Junhyun Lee

Curriculum Vitae

Postdoctoral Researcher
Condensed Matter Theory Center
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Education

- Harvard University** Cambridge, MA
Ph.D. in Physics, May 2016
Advisor: Professor Subir Sachdev
- Harvard University** Cambridge, MA
A.M. in Physics, May 2012
- Seoul National University** Seoul, Republic of Korea
B.S. in Physics and Mathematics, Feb. 2010

Research Interests

Theoretical Condensed Matter Physics

Strongly correlated electron systems

Quantum phase transitions in frustrated quantum magnets and cuprate superconductors

Topological phases including spin liquids, quantum Hall systems, Weyl and Dirac semimetals

Matrix product states and tensor networks

Density matrix renormalization group calculations in condensed matter systems

Publications

Hyunsoo Kim*, **Junhyun Lee***, Halyna Hodovanets, Kefeng Wang, Jay D. Sau, and Johnpierre Paglione, "Anomalous Quantum Oscillations in a Spin-3/2 Topological Semimetal," *in preparation*

Siddhartha Saha, E. J. König, **Junhyun Lee**[†], and J. H. Pixley[†], "Strongly interacting spin-orbit coupled Bose-Einstein condensates in one-dimension," arXiv:1912.06142

SangEun Han*, **Junhyun Lee***, and Eun-Gook Moon, "Lattice vibration as a knob for novel quantum criticality," arXiv:1911.01435

William S. Cole, **Junhyun Lee**, Khan W. Mahmud, Yahya Alavirad, I. B. Spielman, and Jay D. Sau, "Emergent gauge field and the Lifshitz transition of spin-orbit coupled bosons in one dimension," Scientific Reports **9**, 7471 (2019)

Junhyun Lee, J. H. Pixley, and Jay D. Sau, "Chiral anomaly without Landau levels: From the quantum to the classical regime," Physical Review B **98**, 245109 (2018)

Yahya Alavirad*, **Junhyun Lee***, Ze-Xun Lin, and Jay D. Sau, "Chiral supercurrent through a quantum Hall weak link," *Physical Review B* **98**, 214504 (2018)

Junhyun Lee, Subir Sachdev, and Steven R. White, "Electronic quasiparticles in the quantum dimer model: density matrix renormalization group results," *Physical Review B* **94**, 115112 (2016)

Junhyun Lee and Subir Sachdev, "Wess-Zumino-Witten Terms in Graphene Landau Levels," *Physical Review Letters* **114**, 226801 (2015) [Editors' Suggestion]

Junhyun Lee and Subir Sachdev, "Deconfined criticality in bilayer graphene," *Physical Review B* **90**, 195427 (2014)

Junhyun Lee, Philipp Strack, and Subir Sachdev, "Quantum criticality of reconstructing Fermi surfaces," *Physical Review B* **87**, 045104 (2013)

Myoung-Sun Heo, Yonghee Kim, Kihwan Kim, Geol Moon, **Junhyun Lee**, Heung-Ryoul Noh, M. I. Dykman, and Wonho Jhe, "Ideal mean-field transition in a modulated cold atom system," *Physical Review E* **82**, 031134 (2010)

Scholarships and Awards

Certificate of Distinction in Teaching, Harvard Derek Bok Center for Teaching and Learning (2015)

An Wang Fellowship, Harvard University (2011)

Purcell Fellowship, Harvard University (2010 - 2011)

STX Scholarship for Overseas Studies, STX Foundation (2010-2015)

Scholarship for Overseas Graduate Studies, Korea Foundation for Advanced Studies (declined) (2009)

Republic of Korea Presidential Science Scholarship, Korea Science and Engineering Foundation (2003-2010)

Invited Talks

Condensed Matter Group Seminar, Sungkyunkwan University, Suwon, Korea (May 2019)

"Chiral anomaly and anomalous quantum oscillation in topological semimetals"

CCES Seminar, IBS Center for Correlated Electron Systems, Seoul, Korea (May 2019)

"Chiral anomaly and anomalous quantum oscillation in topological semimetals"

Workshop on Quantum Many Body States 2019, Daejeon, Korea (May 2019)

"Chiral anomaly and anomalous quantum oscillation in topological semimetals"

Condensed Matter Seminar, Perimeter Institute for Theoretical Physics, Waterloo, ON (Nov. 2018)

"The Chiral anomaly without Landau levels: from the quantum to the classical regime"

Condensed Matter Physics Seminar, KAIST, Daejeon, Korea (Jul. 2017)

"Chiral anomaly in disordered Weyl semimetals"

PCS Seminar, IBS Center for Theoretical Physics of Complex Systems, Daejeon, Korea (Jul. 2017)

"Chiral anomaly in disordered Weyl semimetals"

- Condensed Matter Group Seminar, Sungkyunkwan University, Suwon, Korea (Jul. 2016)
“Electronic quasiparticles in quantum dimer model”
- Condensed Matter Physics Seminar, KAIST, Daejeon, Korea (Jul. 2016)
“Electronic quasiparticles in quantum dimer model”
- Condensed Matter Theory Center Seminar, University of Maryland, College Park, MD (Feb. 2016)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Physics Department Seminar, Université de Sherbrooke, Sherbrooke, QC, Canada (Jan. 2016)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Physics Seminar, UNIST, Ulsan, Korea (Jun. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Physics Journal Club, Seoul National University, Seoul, Korea (Jun. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Physics Seminar, KAIST, Daejeon, Korea (Jun. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Physics Journal Club, Korea Institute for Advanced Study, Seoul, Korea (Jun. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Group Seminar, Sungkyunkwan University, Suwon, Korea (Jun. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Harvard CMT Kids talk, Harvard University, Cambridge, MA (Apr. 2015)
“Wess-Zumino-Witten Terms in Graphene Landau Levels”
- Condensed Matter Physics Seminar, Seoul National University, Seoul, Korea (Aug. 2013)
“Quantum criticality of reconstructing Fermi surfaces in antiferromagnetic metals”

Conferences and Contributed Talks

- Quasiperiodicity and Fractality in Quantum Statistical Physics, New Brunswick, NJ (May 2019)
- APS March Meeting, Boston, MA (Mar. 2019)
Contributed talk : Spin-orbit Coupled Bosons in One Dimension – Entanglement Entropy and Dynamics
- APS March Meeting, Los Angeles, CA (Mar. 2018)
Contributed talk : Chiral anomaly without Landau levels
- APS March Meeting, New Orleans, LA (Mar. 2017)
Contributed talk : Chiral anomaly in disordered Weyl semimetals
- APS March Meeting, Baltimore, MD (Mar. 2016)
Contributed talk : Fractionalized Fermi liquids in a quantum dimer model
- Gordon Research Conference on Topological Correlated Matter, Hong Kong, China (Jun. 2015)

APS March Meeting, San Antonio, TX (Mar. 2015)

Contributed talk : Wess-Zumino-Witten Terms in Graphene Landau Levels

Gordon Research Conference on Correlated Electron Systems, South Hadley, MA (Jun. 2014)

APS March Meeting, Denver, CO (Mar. 2014)

Contributed talk : Possible deconfined critical transition in bilayer graphene

APS March Meeting, Baltimore, MD (Mar. 2013)

Contributed talk : Quantum criticality of reconstructing Fermi surfaces in antiferromagnetic metals

The 19th International Conference on Magnetism, Busan, Korea (Jul. 2012)

Contributed talk : Coupled Fermi-Bose renormalization group flow for a two-flavor spin-fermion model close to its antiferromagnetic quantum critical point

Gordon Research Conference on Correlated Electron Systems, South Hadley, MA (Jun. 2012)

Contributed poster: Coupled Fermi-Bose renormalization group flow for a two band model close to its antiferromagnetic quantum critical point

APS DAMOP Meeting, Charlottesville, VA (May 2009)

Contributed talk : On the microscopic theoretical approach of spontaneous symmetry breaking in parametrically driven cold atomic system

Academic Activities

Visitor at Center for Computational Quantum Physics (Flatiron Institute), New York, NY (May 2019)

Visitor at Center for Computational Quantum Physics (Flatiron Institute), New York, NY (Dec. 2018)

Visitor at Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada (Nov. 2018)

Yukawa Institute for Theoretical Physics long-term workshop: Novel Quantum States in Condensed Matter, Kyoto, Japan (Oct. 2017)

Contributed poster : Chiral anomaly in disordered Weyl semimetals

Visitor at Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada (Aug. 2016)

Fine Theoretical Physics Institute Summer School: Advances in strongly correlated electronic systems, Minneapolis, MN (Jun. 2016)

Visitor at Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada (Aug. 2015)

Summer School on Emergent Phenomena in Quantum Materials, Ithaca, NY (Aug. 2015)

Poster presentation: Wess-Zumino-Witten Terms in Graphene Landau Levels

Visitor at Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada (Aug. 2014)

Boulder School for Condensed Matter and Materials Physics: Modern Aspects of Superconductivity, Boulder, CO (Jul. 2014)

Poster presentation: Deconfined criticality in bilayer graphene

Boston University Center for Computational Science Workshop on Field Theoretic Computer Simulations for Particle Physics and Condensed Matter, Boston, MA (May 2014)

APCTP Workshop on Bad Metal Behavior and Mott Quantum Criticality, Pohang, Korea (Jul. 2013)
Theory Winter School on Unconventional Superconductivity, Tallahassee, FL (Jan. 2013)
Princeton Summer School on Condensed Matter Physics, Princeton, NJ (Jul. 2012)
CIFAR Quantum Materials Summer School, Toronto, On, Canada (May 2012)
Korean Physical Society Summer School on Condensed Matter Physics, Taejeon, Korea (Jun. 2011)
APCTP-KIAS Joint Workshop on Quantum Entanglement and Dynamics in Correlated Many-Body Systems, Pohang, Korea (May 2010)
KIAS Winter School on Quantum Information and Atomic Physics, Seoul, Korea (Feb. 2009)
APCTP Summer Institute for Theoretical Physics, Pohang, Korea (Aug. 2006)

Teaching Experience

Physics 262: Statistical Physics, Harvard University

Fall 2015, Teaching Fellow for Professor Erel Levine

Physical Sciences 3: Electromagnetism, Circuits, Waves, Optics and Imaging, Harvard University

Spring 2015, Teaching Fellow for Doctor Logan McCarty and Louis Deslauriers

Certificate of Distinction in Teaching awarded by Derek Bok Center for Teaching and Learning

Physics 253a: Quantum Field Theory 1, Harvard University

Fall 2014, Grader for Professor Matthew Schwartz

Physics 15c: Wave Phenomena, Harvard University

Spring 2014, Teaching Fellow for Professor Joao Guimaraes da Costa

Physics 253a: Quantum Field Theory 1, Harvard University

Fall 2013, Grader for Professor Matthew Reece

University Physics, Seoul National University

Fall 2009, Undergraduate tutor