

OHKYUNG KWON

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ACADEMIC POSITIONS

UNIVERSITY OF CHICAGO | Associate Fellow, Kavli Institute for Cosmological Physics
April 2017 — present | Chicago, IL

FERMILAB HOLOMETER COLLABORATION | Collaboration Member • Visiting Scientist
October 2011 — present • January 2017 — present | Batavia, IL

REPUBLIC OF KOREA ARMY | Specialized Research Personnel
KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY | Institute of Natural Science
July 2015 — present | Daejeon, Republic of Korea

- Academic affiliation maintained via a restricted appointment, in fulfillment of compulsory national service duties.
- Principal Investigator of a research project on Planckian quantum space-time phenomenology, under the Basic Science Research Program of the National Research Foundation of Korea funded by the Ministry of Education.

UNIVERSITY OF CHICAGO | Research Assistant, Department of Astronomy and Astrophysics
October 2012 — June 2015 | Chicago, IL

EDUCATION

UNIVERSITY OF CHICAGO | Ph.D. in Physics, M.S. in Physics
August 2015 | Chicago, IL • GPA: 3.83 / 4.00

Dissertation: “Interferometric Probes of Planckian Quantum Geometry”

Committee: Craig J. Hogan (chair), Stephan S. Meyer (departmental sponsor), Emil J. Martinec, Dam T. Son

Robert G. Sachs Fellow — A merit fellowship typically awarded to top theoretical physics students after the candidacy exam.

HARVARD UNIVERSITY | B.A. in Physics
March 2008 | Class of 2007 | Cambridge, MA

High Honors in Field • Advisor: Howard M. Georgi

Weissman International Program (in support of research at CERN) • Harvard College Research Program

RESEARCH

HOLOMETER COLLABORATION | Fermilab • University of Chicago • KAIST
October 2011 — present | Batavia, IL • Chicago, IL • Daejeon, Republic of Korea

- Building a phenomenology of entanglement and invariant causal structure in emergent relational quantum space-time.
- Background degrees of freedom consistent with the Holographic Principle in a flat macroscopic 4-volume lead to non-local correlations measurable in an interferometer of sub-Planckian strain spectral density at superluminal frequencies.
- Theoretical research in conjunction with an ongoing experimental program probing these symmetries and covariances.

CENTER FOR AXION AND PRECISION PHYSICS RESEARCH | Institute for Basic Science
July 2016 — October 2016 | Daejeon, Republic of Korea

- Research assistance on axion phenomenology and haloscope detector theory.

ATLAS MUON SPECTROMETER | CERN (European Organization for Nuclear Research)
June 2006 — September 2006 | Meyrin, Switzerland

- Commissioning of the endcap Monitored Drift Tubes with the George W. Brandenburg group.

ANTIHYDROGEN TRAP | Harvard University
June 2005 — September 2005 | Cambridge, MA

- Assistance on Penning-Ioffe trap construction and the commissioning of a He/N₂ cryogenic exhaust control system.

PUBLICATIONS

All publications are in alphabetical co-first authorship, with the exception of [8] in sole first authorship. Corresponding authors are denoted with [*].

- [1] C. J. Hogan and O. Kwon*. **Models of Exotic Interferometer Cross-Correlations in Emergent Space-Time.** *Class. Quantum Grav.* **35** 204001 (2018) — *Focus Issue on Gravity in the Lab*
- [2] C. J. Hogan, O. Kwon*, and J. W. Richardson. **Statistical Model of Exotic Rotational Correlations in Emergent Space-Time.** *Class. Quantum Grav.* **34** 135006 (2017)
- [3] A. S. Chou, H. Glass, H. R. Gustafson, C. J. Hogan, B. L. Kamai, O. Kwon, R. Lanza, L. McCuller, S. S. Meyer*, J. W. Richardson, C. Stoughton, R. Tomlin, and R. Weiss. **Interferometric Constraints on Quantum Geometrical Shear Noise Correlations.** *Class. Quantum Grav.* **34** 165005 (2017)
- [4] C. J. Hogan and O. Kwon*. **Statistical Measures of Planck Scale Signal Correlations in Interferometers.** *Class. Quantum Grav.* **34** 075006 (2017)
- [5] A. S. Chou, H. Glass, H. R. Gustafson, C. J. Hogan, B. L. Kamai, O. Kwon, R. Lanza, L. McCuller, S. S. Meyer, J. W. Richardson*, C. Stoughton, R. Tomlin, and R. Weiss. **The Holometer: An Instrument to Probe Planckian Quantum Geometry.** *Class. Quantum Grav.* **34** 065005 (2017) — *CQG Highlights of 2017*
- [6] A. S. Chou, H. R. Gustafson, C. J. Hogan, B. L. Kamai*, O. Kwon, R. Lanza, S. L. Larson, L. McCuller, S. S. Meyer, J. W. Richardson, C. Stoughton, R. Tomlin, and R. Weiss. **MHz Gravitational Wave Constraints with Decameter Michelson Interferometers.** *Phys. Rev. D* **95** 063002 (2017)
- [7] A. S. Chou*, H. R. Gustafson, C. J. Hogan, B. L. Kamai, O. Kwon, R. Lanza, L. McCuller, S. S. Meyer, J. W. Richardson, C. Stoughton, R. Tomlin, S. Waldman, and R. Weiss. **First Measurements of High Frequency Cross-Spectra from a Pair of Large Michelson Interferometers.** *Phys. Rev. Lett.* **117** 111102 (2016)
- [8] O. Kwon* and C. J. Hogan. **Interferometric Tests of Planckian Quantum Geometry Models.** *Class. Quantum Grav.* **33** 105004 (2016)

MANUSCRIPTS IN PREPARATION

- [9] **The Holometer Collaboration.** Results from the second generation Holometer experiment designed to test the theoretical models presented in references [1, 2]. *To appear in 2019 at:* arxiv.org/a/kwon_o_1

CONFERENCE PRESENTATIONS

XXXIX International Conference on High Energy Physics

July 2018 | Seoul, Republic of Korea

American Physical Society April Meeting 2018

April 2018 | Columbus, OH

American Physical Society April Meeting 2017

January 2017 | Washington, D.C.

2nd Durham-KEK-Kavli IPMU-KIAS Joint Workshop

October 2016 | Seoul, Republic of Korea

Simplicity II Theory Workshop

September 2016 | Fermilab • Princeton University & Perimeter Institute

International Conference on General Relativity: Centennial Overviews and Future Perspectives

December 2015 | Seoul, Republic of Korea • Asia Pacific Center for Theoretical Physics

Plenary Review — *Towards a New Era of Quantum Gravity: Phenomenological and Experimental Approaches.*

12th International Symposium on Cosmology and Particle Astrophysics

October 2015 | Daejeon, Republic of Korea • Asia Pacific Organization for Cosmology and Particle Astrophysics

GRANTS AND AGREEMENTS

NATIONAL RESEARCH FOUNDATION OF KOREA | Basic Science Research Program

November 2016 | Grant No. NRF-2016R1D1A1B03934333 • Funded by the Ministry of Education

O. Kwon. *The Statistical Covariance Structure and Inertial Frames of Quantum Space-Time: A Phenomenological Study on Planckian Geometric Correlations Soon to be Experimentally Tested at a Laser Interferometer.*

KAIST | Institute of Natural Science • **FERMILAB** | Center for Particle Astrophysics

January 2017 | Collaborative Research Agreement

Led KAIST to become a Fermilab user institution under the U.S. Department of Energy's non-proprietary agreement.

Established a sub-agreement between KAIST INS and FCPA to support synergistic activities for the Holometer Collaboration.

AWARDS AND HONORS

Samsung Foundation Scholar

Autumn 2003 — Spring 2007 | Merit Scholarship • USD 200,000

Korea Science and Engineering Foundation Scholar

Autumn 2003 — Spring 2006 | Merit Scholarship

Gold Medal — 33rd International Physics Olympiad • 1st Place — Korean Physics Olympiad

July 2002 | Bali, Indonesia

TEACHING AND ADVISING

UNIVERSITY OF CHICAGO | Teaching Assistant, Department of Physics & Department of Mathematics

September 2008 — June 2014 | Chicago, IL

- **Gregor Wentzel Teaching Prize**

- Mechanics • Electricity and Magnetism • Waves, Optics, and Heat — *introductory, honors level, and intermediate*
- Mathematical Methods in Physics • Advanced Laboratory (*worked extensively with the director of instructional labs*)

UNIVERSITY OF CHICAGO | Chicago Academic Achievement Program • College Core Tutor Program

January 2010 — June 2015 | Chicago, IL

- **College Core Tutor Award**

- Served in a highly selective tutoring position working with incoming students from underserved backgrounds, often minorities from low-income communities and first-generation college students.
- Facilitated collaborative learning as an on-demand tutor for core physics courses at the main undergraduate library.

HARVARD CHICAGO SCHOOLS COMMITTEE | Alumni Interviewer and School Liaison

January 2009 — present | Chicago, IL

- Serving as a liaison providing resources to several schools on the south side of Chicago for the admissions office.
- College application guidance and counseling for talented, hardworking students.

INTERNATIONAL PHYSICS OLYMPIAD | Coach of the Korean National Team • Official Events Staff

January 2003 — July 2004 | Seoul, Republic of Korea • Pohang, Republic of Korea

- Led the design and implementation of a new training program. Commissioned instructional apparatus for the new experimental curriculum. The 2003 team placed 1st, and over five years, the median rank improved from 9th to 2nd.
- Hosted official events to foster cross-cultural community among young physicists and supervised interpreters.

SEOUL SCIENCE HIGH SCHOOL | Student Guide on Science and Research Exploratory Programs

August 2001 — December 2005 | Seoul, Republic of Korea

- Supervised student research projects, moderated talks and panels, and led recitation and laboratory sections in physics at a school for gifted students that places 10~20 medalists in the international math and science olympiads every year.
- Mentored and advised younger students as a former valedictorian of the science and research program.
- Led excursions to major U.S. universities and research institutes, administered by the Korean Ministry of Education.
- Partnered with the Seoul Education Research Institute in science outreach at its exhibitions and experimental demos.