James W Kennington

214.284.2773 · JamesWKennington@gmail.com · jwkennington.com

Education

2020 - Present
Phd, Physics, **The Pennsylvania State University**, University Park
Coursework includes: Classical Mechanics, Quantum Mechanics, E&M, GR, QFT
Intended Thesis Research: Numerical Methods within Loop Quantum Gravity

Summer 2019
Summer School on Quantum Gravity, **Bard College**, Red Hook
Coursework included: Covariant LQG, Quantum Cosmology, Soft Modes and Quantum Gravity, QFT in Curved Spacetime, 3D Gravity and Quantum Groups.

2013 - 2015
BS, Physics, **The University of Texas at Austin**, Austin
Departmental Honors | Major: Physics
Thesis: *Brownian Motion in a Non-Newtonian Fluid* | Advisor: Prof. Mark Raizen
GPA, IN-MAJOR GPA: 3.7/4.0

2011 - 2013
Physics Major, **United States Naval Academy**, Annapolis
Studied physics and mathematics curriculum and participated in research efforts in astrophysics and algebra.

Research Experience

2020 - Now
Institute for Gravitation and the Cosmos, Penn State, University Park PA
Graduate Fellow, Bojowald Research Group
Investigated homogeneity during bouncing cosmology using semiclassical, numerical simulations. Studied implications for loop quantum cosmology and other midisuperspace applications.

2019 - Now
Institute for Theoretical Physics, Frierich-Schiller Universität, Jena DE
Research Collaborator, Emmy Noether Junior Research Group
Studied applications of tensor networks to lattice QCD and spinfoam models of quantum gravity. Investigated high-performance algorithms for coarse graining in various bases, written primarily in Julia.

2019
Quantum Gravity Computing Lab, Bard College, Red Hook NY
Collaborator, Tensor Network Renormalization Lab
Studied tensor network formulation of the Ising model in the Julia programming language. Observed the phase transition in the Ising model by means of renormalized tensor flow. Explored applications of these techniques to LQG, and contributed Python programming language algorithms for improved computational efficiency.

2013-2015
Center for Nonlinear Dynamics, University of Texas, Austin TX
Undergraduate Researcher, Raizen Lab
Researched brownian motion under various non-Newtonian fluid model assumptions. Assisted with atomic optics experiments, focused on the optical tweezing of micrometer-scale beads to understand short-timescale behavior transition of fluids. Also conducted exploratory work in nanofluid and graphene manipulation.

2014-2015
Directed Reading Program, University of Texas, Austin TX
Undergraduate Researcher, Department of Mathematics
Researched topics in graduate mathematics with a personal (then) graduate student mentor, Dr. César Garza. Research culminated in two 15-minute, AMS format talks explaining research to undergraduate peers. Topics researched include topology, category theory, smooth manifolds, and dynamical systems.

2011-2013 Gravitational Microlensing Lab, United States Naval Academy, Annapolis MD
Undergraduate Researcher, Morgan Lab

Researched the structure of quasars and the use of gravitational microlensing as a tool for resolving physical characteristics of active galactic nuclei. Responsible for reducing data and writing scripts to manipulate data obtained from U.S. Naval Observatory. Implemented perl and IRAF solutions resulting in significant error reduction in light-curve data. Supervised by Dr. Christopher Morgan.

Fall 2012 United States Naval Observatory, Flagstaff AZ
Undergraduate Researcher, Kaj-Strand Astrometric Reflector

Operated the 1.55-m Kaj Strand astrometric reflector telescope to take infrared images of several quasar systems. Participated in colloquia. Visited Navy Precision Optical Interferometer at Lowell Observatory.

Publications & Talks

Publications

- Jeevanjee, N., Kennington, J. *Solutions Manual for "An Introduction to Tensors and Group Theory for Physicists"*. 2019, Published electronically on Overleaf.
- Manickam, V., Grinaski, I., MacLeod, C., et al. *Optical Microlensing and Accretion Disk Structure in the Lensed Quasar SDSS 1520+530*. 2015, American Astronomical Society Meeting Abstracts, 225

Talks

- *Tensorial methods in optimization*, Nov. 2019. Annual Conference, Society of Industrial and Applied Mathematics, Texas-Louisiana Section, Dallas.
- *Lyapunov stability in dynamical systems*, May. 2014. Directed Reading Program Talks, Department of Mathematics, University of Texas at Austin.
- *Topological construction in the language of categories*, Dec. 2013. Directed Reading Program Talks, Department of Mathematics, University of Texas at Austin.

Scholarships & Awards

Scholarships

- 2020 - 2025 **Mildred Dresselhaus Science Achievement Graduate Fellowship in Physics**, given by the Eberly College of Science to recognize and promote outstanding graduate students seeking a doctoral degree in physics. Awards named in honor of an outstanding woman scientist or mathematician who not only made groundbreaking discoveries, but also blazed the trail for others who have followed in their footsteps.
- 2020 - 2021 **Bert Elsbach Distinguished University Graduate Fellowship in Physics**, given by the Graduate School of the Pennsylvania State University for recognition as one of the most academically outstanding graduate students matriculating at the institution.
- 2020 - 2021 **University Graduate Fellowship**, given by the Eberly College of Science and the Graduate School of the Pennsylvania State University for academic excellence.
- 2014 **Ethel Gene Kahmer Endowed Scholarship**, usually given to graduate students in the College of Natural Sciences who have demonstrated leadership and shown interest in a career involving mathematics, physics, or chemistry.
- 2011 - 2013 **United States Naval Academy**, Department of Defense supplied full tuition and expenses as well as an undergraduate stipend.

Awards

- 2015. Honors Thesis Award, Department of Physics, University of Texas
- 2014. Honors Book Award, College of Natural Sciences, University of Texas *Chaos in Dynamical Systems*, Ott. | Awarded by Prof. Roger Bengtson

- 2013-2014 Dean's Scholar Program Membership, University of Texas
- 2012-2013. Dean's List Award, United States Naval Academy. Given for academic performance
- 2011-2012. Superintendent's List Award, United States Naval Academy, given for combined academic, physical, and military performance

Outreach & Service

Academic Service

2020 - Now Graduate Student Member, Physics Department Colloquium Committee **Pennsylvania State University**, University Park

Co-hosted a post-colloquium discussion segment between the graduate students and the colloquium speaker. Created pre-talk posters to improve engagement from graduate students and advertise the colloquium talks.

2020 - Now Co-Webmaster, Physics and Astronomy Women + **Pennsylvania State University**, University Park

Modernized, reorganized, and updated the appearance of the club website. Supported ongoing club activities by implementing publicly-visible shared event calendars.

2013 - 2015 Assistant Editor, Natural Sciences, **Texas Undergraduate Research Journal**, Austin

Interviewed various undergraduate and graduate researchers in the College of Natural Sciences. Reviewed submitted research papers from undergraduates and helped select the final papers to be accepted for publication.

Outreach Activities

2014 - 2019 Guest Speaker, **Plano Independent School District**, Plano TX

Taught several invited class sessions to advanced students in 8th grade mathematics. Various topics included symmetries of permutation groups, elementary combinatorics, non-Euclidean spaces, and probability theory.

2011 - 2013 Astro-Kids Program, **United States Naval Academy**, Annapolis MD

Planned and lead multiple events per year for local children in grades 5-10 aimed at developing their interest in astronomy and astrophysics. Gave public-oriented talks on "high-interest" topics such as black holes, general relativity, galaxy formation, etc.

Work Experience

2015 - Now Quantitative Developer, **HBK Capital Management**, Dallas TX

Designed and implemented high-performance, deferred computation libraries in Python for heterogeneous computing environments. Conducted research into systematic currency trading, statistical arbitrage equity models, and various quantitative fixed-income models. Also contributed yield and credit spread curve models and calibration techniques in Python. Proposed thermodynamics-based portfolio optimization methodology.

2016 - 2019 Co-founder and Researcher, Poincaré Research LLC, Dallas TX

Built and operated deferred calculation framework in Python, experimenting with techniques from computational topology. Applied computational geometry to various problems in physics.

Teaching Experience

Summer 2013 Science Instructor, **Guthrie Gifted Education**, Plano TX

Developed and taught physics curriculum for summer program for students in grades 5 - 10. Primarily used demonstrations in mechanics, electricity and magnetism, and optics to introduce foundational physical concepts, such as conservation laws.

2011 - 2012 Undergraduate Teaching Assistant, **United States Naval Academy**, Annapolis MD

Conducted bi-weekly recitation sections for Mechanics I course, including answering questions from peers and completing sample exercises. USNA does not have a formal TA program; however, these activities were conducted with the explicit approval of Prof. Daryl Hartley.

Skills

Programming Languages	Python (advanced), Julia, Mathemaica, C++, Bash
Scientific Python Packages	AstroPy, GWpy, LALsuite, NumPy, PyCBC, SciPy
Other Scientific Tools	LaTeX, GIT, IRAF, SAOImage DS9
Languages	English (primary), French (conversational), Russian (conversational), German (basic)

Memberships & Participation

Memberships

2017 - Now American Physical Society

2018 - Now American Mathematical Society

2016 - Now Society for Industrial and Applied Mathematics

2012 - Now The Planetary Society

Conferences Attended

Spring 2019 APS Texas Section, *Stephen F. Austin University*, Nacogdoches TX

Spring 2019 Texas Geometry and Topology Conference, *Texas Christian University*, Fort Worth TX