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EDUCATION Massachusetts Institute of Technology (Ph.D., 1993)
Thesis in physics, advisor: Roman Jackiw

California Polytechnic State University (B.S., 1988)
Degrees in physics and mathematics

EXPERIENCE Associate Professor (2005 – present)
Columbia University, Department of Physics

Visiting scientist (Fall 2003)
Rutgers University, Department of Physics

Assistant Professor (1999 – 2005)
Columbia University, Department of Physics

Post-doctoral fellow (1997 – 1999)
Institute for Advanced Study

Post-doctoral fellow (1996 – 1997)
New York University, Department of Physics

Post-doctoral fellow (1993 – 1996)
Rutgers University, high energy theory group

Summer research assistant (1987)
University of California Irvine, neutrino physics group
Measured the effect of impurities on drifting electrons
in a prototype liquid argon time projection chamber.

PUBLICATIONS

1. “Pseudo-redundant vacuum energy” (with P. Batra, K. Hinterbichler and L. Hui), arXiv:0801.4526.
2. “Local bulk operators in AdS/CFT and the fate of the BTZ singularity” (with A. Hamilton, G. Lifschytz and D. Lowe), arXiv:0710.4334. To appear in the proceedings of the 2007 Sowers workshop.
3. “Local bulk operators in AdS/CFT: a holographic description of the black hole interior” (with A. Hamilton, G. Lifschytz and D. Lowe), *Phys. Rev.* **D75** (2007) 106001, arXiv:hep-th/0612053.
4. “Holographic representation of local bulk operators” (with A. Hamilton, G. Lifschytz and D. Lowe), *Phys. Rev.* **D74** (2006) 066009, arXiv:hep-th/0606141.
5. “A note on the Coulomb branch of susy Yang-Mills” (with G. Lifschytz), *Phys. Lett.* **B633** (2006) 641, arXiv:hep-th/0511226.
6. “Local bulk operators in AdS/CFT: a boundary view of horizons and locality” (with A. Hamilton, G. Lifschytz and D. Lowe), *Phys. Rev.* **D73** (2006) 086003, arXiv:hep-th/0506118.
7. “String windings in the early universe” (with R. Easther, B. R. Greene and M. G. Jackson), *JCAP* **0502** (2005) 009, arXiv:hep-th/0409121.
8. “A first-quantized formalism for cosmological particle production” (with A. Hamilton and M. Parikh), *JHEP* **0407** (2004) 024, arXiv:hep-th/0311180.
9. “Brane gases in the early universe: thermodynamics and cosmology” (with R. Easther, B. R. Greene and M. G. Jackson), *JCAP* **0401** (2004) 006, arXiv:hep-th/0307233.
10. “Stretched horizons, quasiparticles and quasinormal modes” (with N. Iizuka, G. Lifschytz and D. Lowe), *Phys. Rev.* **D68** (2003) 084021, arXiv:hep-th/0306209.

11. “Quasiparticle picture of black holes and the entropy–area relation” (with N. Iizuka, G. Lifschytz and D. Lowe), *Phys. Rev.* **D67** (2003) 124001, arXiv:hep-th/0212246.
12. “Brane gas cosmology in M-theory: late time behavior” (with R. Easther, B. R. Greene and M. G. Jackson), *Phys. Rev.* **D67** (2003) 123501, arXiv:hep-th/0211124.
13. “QCD vacuum structure in strong magnetic fields” (with K. Lee and E. Weinberg), *Phys. Rev.* **D66** (2002) 014004, arXiv:hep-ph/0204120.
14. “de Sitter entropy from conformal field theory” (with G. Lifschytz), *JHEP* **0204** (2002) 019, arXiv:hep-th/0203083.
15. “Probing black holes in non-perturbative gauge theory” (with N. Iizuka, G. Lifschytz and D. Lowe), *Phys. Rev.* **D65** (2002) 024012, arXiv:hep-th/0108006.
16. “Black hole entropy from non-perturbative gauge theory” (with G. Lifschytz and D. Lowe), *Phys. Rev.* **D64** (2001) 124015, arXiv:hep-th/0105171.
17. “Testing cosmological supersymmetry breaking” (with A. Rajaraman), *Phys. Lett.* **B516** (2001) 383, arXiv:hep-ph/0102309.
18. “Black hole thermodynamics from calculations in strongly-coupled gauge theory” (with G. Lifschytz and D. Lowe), *Phys. Rev. Lett.* **86** (2001) 1426, arXiv:hep-th/0007051. Also appeared in Strings 2000 proceedings, *Int. J. Mod. Phys.* **A16** (2001) 856 and in *Mirror symmetry 4: proceedings of the 2000 CRM workshop on strings, duality and geometry*, D. Phong, ed. (American Mathematical Society, 2002).
19. “Approximations for strongly-coupled supersymmetric quantum mechanics” (with G. Lifschytz), *Nucl. Phys.* **B571** (2000) 419, arXiv:hep-th/9910001.
20. “Gauge theory origins of supergravity causal structure” (with G. Lifschytz), *JHEP* **9905** (1999) 005, arXiv:hep-th/9902073.
21. “Tachyons and black hole horizons in gauge theory” (with G. Lifschytz), *JHEP* **9812** (1998) 002, arXiv:hep-th/9806214.

22. “Linearized supergravity from matrix theory” (with W. Taylor), *Phys. Lett.* **B426**, 297 (1998), arXiv:hep-th/9712185.
23. “Spherical membranes in matrix theory” (with W. Taylor), *Adv. Theor. Math. Phys.* **2**, 181 (1998), arXiv:hep-th/9711078. Reprinted in *Physics in non-commutative world*, M. Li and Y.-S. Wu eds. (Rinton Press, 2002).
24. “Wilson lines and T-duality in heterotic M(atr)ix theory” (with S.-J. Rey), *Nucl. Phys.* **B508**, 535 (1997), arXiv:hep-th/9707099.
25. “D-branes and short distances in string theory” (with M. R. Douglas, P. Pouliot and S. H. Shenker), *Nucl. Phys.* **B485**, 85 (1997), arXiv:hep-th/9608024.
26. “A comment on zero-brane quantum mechanics” (with P. Pouliot), *Phys. Rev. Lett.* **77**, 1004 (1996), arXiv:hep-th/9603127.
27. “Black hole entropy in the $O(N)$ model” (with S. H. Shenker and M. J. Strassler), *Phys. Rev.* **D52**, 7027 (1995), arXiv:hep-th/9506182.
28. “Black hole entropy and entropy of entanglement,” *Nucl. Phys.* **B453**, 281 (1995), arXiv:hep-th/9503016.
29. “A comment on entropy and area” (with M. J. Strassler), *Phys. Lett.* **B329**, 46 (1994), arXiv:hep-th/9401125.
30. “Canonical quantization and braid invariance of (2+1)-dimensional gravity coupled to point particles” (with M. E. Ortiz), *Phys. Rev.* **D49**, 1684 (1994), arXiv:hep-th/9305155.
31. “Validity of the eikonal approximation,” *Comments Nucl. Part. Phys.* **20**, 325 (1992), arXiv:hep-th/9204103.
32. “Eikonal quantum gravity and Planckian scattering” (with M. Ortiz), *Nucl. Phys.* **B388**, 570 (1992), arXiv:hep-th/9203082.
33. “Electromagnetic fields of a massless particle and the eikonal” (with R. Jackiw and M. Ortiz), *Phys. Lett.* **B277**, 148 (1992), arXiv:hep-th/9112020.

34. “Conditions for the existence of closed time-like curves in 2+1 gravity,” *Phys. Rev.* **D46**, 2720 (1992).
35. “Canonical quantization of abelian Chern–Simons solitons,” *Phys. Lett.* **B281**, 265 (1992).
36. “Effects of oxygen and nitrogen on drifting electrons in a liquid argon TPC” (with S. D. Biller, R. C. Allen, G. Bühler and P. J. Doe), *Nucl. Instrum. Methods* **A276**, 144 (1989).

TEACHING

COURSES AT COLUMBIA

- Spring '00: G8040 General relativity
- Fall '00: G6037 Quantum mechanics I
- Spring '01: G6038 Quantum mechanics II
- Fall '01: G6037 Quantum mechanics I
- Spring '02: G6038 Quantum mechanics II
- Fall '02: G6037 Quantum mechanics I
- Spring '03: G6038 Quantum mechanics II
- Spring '04: G8069 Particle physics I
- Fall '04: G8069 Particle physics I
- Spring '05: G8070 Particle physics II (supersymmetry)
- Fall '05: G8069 Particle physics I
- Spring '06: G8070 Particle physics II (phenomenology)
- Fall '06: G8069 Particle physics I
- Spring '07: G8070 Particle physics II (supersymmetry)
- Fall '07: V3500 String theory I
- Spring '08: V3500 / G8099 String theory II

OTHER TEACHING AND OUTREACH

- Spring '00: taught an informal course on bosonic string theory.
- Spring '02: ran a supervised reading course in general relativity.
- Summer '02: supervised a group of students in a research project on supersymmetric quantum mechanics: see J. Conley, B. Geller, M. G. Jackson, L. Pomerance and S. Shrivastava, *A quantum mechanical model of spherical supermembranes*, JHEP **0301**, 070 (2003), arXiv:hep-th/0210049. Also helped supervise a high school student (Amos Marguiles) in a project on gravitational lensing and holography.
- Summer '04: supervised two Columbia undergraduates (William Pontius and Dhruv Bansal) studying path integrals for target spaces with boundaries.
- Fall '04 – Spring '05: supervised an undergraduate thesis by Nada Petrovic on the ergodic dynamics of Einstein gravity compactified on a torus. Also supervised two high school students (Kenneth Liew and Ganesh Nair) who studied the twin paradox in a gravitational field.
- Fall '05 – Spring '06: gave a two semester reading course on string theory for undergraduates.
- Fall '06 – Spring '07: supervised a high school student (Carol Hsin) studying gravitational lensing of the cosmic microwave background by a moving cosmic string. Ran a reading course on advanced topics in general relativity in the fall and a reading course on string theory for undergraduates in the spring.

ACTIVITIES AND AWARDS

GRADUATE ADVISING

- Norihiro Iizuka (Ph.D., July 2003)
- Alex Hamilton (Ph.D., July 2007)
- Kurt Hinterbichler (Ph.D. expected summer '09)

FUNDING HISTORY

- U.S. Department of Energy, grant DE-FG02-92ER40699.
- Principal investigator, Columbia University Initiatives in Science and Engineering (award amount: \$68500, award dates: 7/06 – 6/08).
- Principal investigator, US-Israel Binational Science Foundation grant #2000359 (award amount: \$35952, award dates: 10/01 – 9/05).

Finalist for the Columbia University 2008 Presidential Teaching Award

Referee for *Physical Review*, *Physical Review Letters*, *Reviews of Modern Physics*, *Physics Letters*, *Nuclear Physics*, *JHEP*, *JCAP*, *International Journal of Modern Physics*, *Il Nuovo Cimento*, *Journal of Physics* and *Foundations of Physics*. Reviewer for *Mathematical Reviews*.