

Leo C. Stein

CONTACT INFORMATION	TAPIR 350-17 California Institute of Technology Pasadena, CA 91125 USA	leosteint@tapir.caltech.edu duetosymmetry.com 1-585-729-5898
EDUCATION	Ph.D., Physics , Massachusetts Institute of Technology, Cambridge, MA, USA Dissertation Advisor: Prof. Scott Hughes Dissertation Title: <i>Probes of strong-field gravity</i> May 2012 B.S., Physics , California Institute of Technology, Pasadena, CA, USA Degree conferred with honor. Senior Thesis Advisors: Dr. Patrick Sutton and Prof. Alan Weinstein June 2006	
EMPLOYMENT	Senior Postdoctoral Researcher , Caltech, Pasadena, CA USA September 2015–Present NASA Einstein Fellow , Cornell, Ithaca NY, USA September 2012–August 2015 Research and Teaching Assistant , MIT, Cambridge MA, USA September 2006–May 2012 Teaching Assistant , Caltech, Pasadena, CA, USA Fall 2004, Spring 2005 Summer Research Fellow , Caltech, Pasadena, CA, USA June–September 2003/2005	
RESEARCH INTERESTS	General relativity (GR), gravitation, and astrophysical phenomena which can elucidate gravity. Recent work is focused on gravitational-wave predictions in almost-GR effective theories of gravity. Work in progress and future work includes numerically solving for gravitational waves in extreme mass-ratio inspirals and investigating cosmological signals of gravity theories from the early universe.	
HONORS AND AWARDS	Einstein Postdoctoral Fellow , NASA 2012–2015 Henry Kendall Teaching Award , Massachusetts Institute of Technology 2011 Upperclass Merit Scholarship , California Institute of Technology 2005–2006	
TEACHING EXPERIENCE	Guest Lecturer , California Institute of Technology Ph237, Gravitational Waves Spring 2016 Guest Lecturer , Massachusetts Institute of Technology 8.901, Graduate Astrophysics I Spring 2011 Teaching Assistant , Massachusetts Institute of Technology 8.942, Cosmology Fall 2011 8.901, Graduate Astrophysics I Spring 2011 8.286, The Early Universe Fall 2009 Teaching Assistant , California Institute of Technology Ph 7, Nuclear and Quantum Physics Lab Spring 2005 Ph 5, Analog Electronics for Physicists Fall 2004	

SUBMITTED
PUBLICATIONS

2. McNeese, R., **Stein, L. C.**, Yunes, N. (2015) *Extremal Black Holes in Dynamical Chern-Simons Gravity*, [[arXiv:1512.05453](#)]
1. Galley, C. R., Tsang, D., **Stein, L. C.** (2014) *The principle of stationary nonconservative action for classical mechanics and field theories*, [[arXiv:1412.3082](#)]

REFEREED
PUBLICATIONS

17. Flanagan, É. É., Nichols, D. A., **Stein, L. C.**, Vines, J. (2016) *Prescriptions for Measuring and Transporting Local Angular Momenta in General Relativity*, *Phys. Rev. D* **93**, 104007 [[arXiv:1602.01847](#)]
16. Yagi, K., **Stein, L. C.** (2016) *Black Hole Based Tests of General Relativity*, 2016 *Class. Quantum Grav.* **33** 054001 [[arXiv:1602.02413](#)]
15. Yagi, K., **Stein, L. C.**, Yunes, N. (2016) *Challenging the Presence of Scalar Charge and Dipolar Radiation in Binary Pulsars*, *Phys. Rev. D* **93** 024010 [[arXiv:1510.02152](#)]
14. Berti, E., (5 authors), **Stein, L. C.**, (46 more authors) (2015) *Testing General Relativity with Present and Future Astrophysical Observations*, 2015 *Class. Quantum Grav.* **32** 243001 [[arXiv:1501.07274](#)]
13. Tsang, D., Galley, C. R., **Stein, L. C.**, Turner, A. (2015) “Simplicial” Integrators: Variational Integrators for General Nonconservative Systems, *ApJ* **809** L9 [[arXiv:1506.08443](#)]
12. Yagi, K., **Stein, L. C.**, Pappas, G., Yunes, N., Apostolatos, T. (2014) *Why I-Love-Q: Explaining why universality emerges in compact objects*, *Phys. Rev. D* **90** 063010 [[arXiv:1406.7587](#)]
11. **Stein, L. C.** (2014) *Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown*, *Phys. Rev. D* **90** 044061 [[arXiv:1407.2350](#)]
10. **Stein, L. C.**, Yagi, K., Yunes, N. (2014) *Three-Hair Newtonian Relations for Rotating Stars*, *ApJ* **788** 15 [[arXiv:1312.4532](#)]
9. **Stein, L. C.**, Yagi, K. (2013) *Parameterizing and constraining scalar corrections to general relativity*, *Phys. Rev. D* **89** 044026 [[arXiv:1310.6743](#)]
8. Yagi, K., **Stein, L. C.**, Yunes, N., Tanaka, T. (2013) *Isolated and Binary Neutron Stars in Dynamical Chern-Simons Gravity*, *Phys. Rev. D* **87** 084058 [[arXiv:1302.1918](#)]
7. Yagi, K., **Stein, L. C.**, Yunes, N., Tanaka, T. (2012), *Post-Newtonian, Quasi-Circular Binary Inspirals in Quadratic Modified Gravity*, *Phys. Rev. D* **85** 064022 [[arXiv:1110.5950](#)]
6. Vigeland, S., Yunes, N., **Stein, L. C.** (2011), *Bumpy black holes in alternative theories of gravity*, *Phys. Rev. D* **83** 104027 [[arXiv:1102.3706](#)]
5. Yunes, N., **Stein, L. C.** (2011), *Nonspinning black holes in alternative theories of gravity*, *Phys. Rev. D* **83** 104002 [[arXiv:1101.2921](#)]
4. **Stein, L. C.**, Yunes, N. (2011), *Effective gravitational wave stress-energy tensor in alternative theories of gravity*, *Phys. Rev. D* **83** 064038 [[arXiv:1012.3144](#)]
3. Lutomirski, A., Tegmark, M., Sanchez, N. J., **Stein, L. C.**, Urry, W. L., Zaldarriaga, M. (2011), *Solving the corner-turning problem for large interferometers*, *MNRAS* **410** 2075 [[arXiv:0910.1351](#)]
2. Sutton, P., Jones, G., Chatterji, S., Kalmus, P., Leonor, I., Poprocki, S., Rollins, J., Searle, A., **Stein, L.**, Tinto, M., Was, M. (2010), *X-Pipeline: an analysis package for autonomous gravitational-wave burst searches*, *New J. Phys.* **12** 053034 [[arXiv:0908.3665](#)]
1. Chatterji, S., Lazzarini, A., **Stein, L.**, Sutton, P., Searle, A. (2006), *Coherent network analysis technique for discriminating gravitational-wave bursts from instrumental noise*, *Phys. Rev. D* **74** 082005 [[arXiv:gr-qc/0605002](#)]

UNREFEREED
PUBLICATIONS

5. **Stein, L. C.** (2014), *Note on Legendre decomposition of the Pontryagin density in Kerr*, [[arXiv:1407.0744](https://arxiv.org/abs/1407.0744)]
4. **Stein, L. C.** (2012), *Probes of Strong-field Gravity*, Ph.D. thesis at Massachusetts Institute of Technology [[hdl:1721.1/77256](https://hdl.handle.net/1721.1/77256)]
3. Betancourt, M., **Stein, L. C.** (2011) *The Geometry of Hamiltonian Monte Carlo*, [[arXiv:1112.4118](https://arxiv.org/abs/1112.4118)]
2. **Stein, L. C.** (2009), *Binary Inspiral Gravitational Waves from a Post-Newtonian Expansion*, Contribution to the Wolfram Demonstrations Project, <http://demonstrations.wolfram.com/BinaryInspiralGravitationalWavesFromAPostNewtonianExpansion/>
1. **Stein, L. C.** (2006), *Gravitational Wave Burst Source Localization in a Coherent Network Analysis*, Senior thesis at California Institute of Technology

INVITED TALKS

10. *Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown*, Einstein fellows symposium, October 2014.
Available at ► http://youtu.be/_ErPFnrQGnE?t=1m45s.
9. *Probing (beyond) general relativity with compact binaries and gravitational waves*, Strong gravity seminar, Perimeter Institute, October 2014.
Available at ► <http://www.pirsa.org/14100003/>.
8. Friends of astronomy outreach event, Cornell, November 2013
7. *Parameterizing and constraining scalar corrections to general relativity*, Einstein fellows symposium, October 2013
6. *Corrections to general relativity, and where to look for them*, Physics colloquium, SUNY Geneseo, October 2013
5. *Parameterizing scalar corrections to general relativity*, UMD gravity seminar, University of Maryland, October 2013
4. *Corrections to general relativity, and where to look for them*, YCAA seminar, Yale University, September 2013
3. *Scalar gravitational effects*, YITP long-term workshop, Kyoto University, June 2013
2. *Conditions for Preheating*, Einstein fellows symposium, October 2012
1. *Signatures of strong gravity corrections to GR*, Cornell Relativity Lunch, November 2011

CONTRIBUTED
TALKS

10. *Hiding corrections to GR with topology*, Eastern Gravity Meeting, May 2015
9. *Why neutron stars have three hairs*, April APS Meeting 2015
8. *Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown*, NEB 16—Recent developments in gravity, September 2014
7. *Three-Hair Newtonian Relations for Rotating Stars*, April APS Meeting 2014
6. *Parameterizing and constraining scalar corrections to general relativity*, XXVII Texas symposium, December 2013
5. *Eccentric binary effects in dynamical Chern-Simons gravity*, April APS Meeting 2013
4. *Signatures of strong gravity corrections to GR*, Caltech TAPIR Seminar, December 2011
3. *Effective gravitational wave stress-energy tensor in alternative theories of gravity*, Eastern Gravity Meeting, June 2011
2. *Effective gravitational wave stress-energy tensor in alternative theories of gravity*, April APS Meeting 2011
1. *Tuning advanced gravitational-wave detectors to optimally measure neutron-star merger waves*, April APS Meeting 2010

PROFESSIONAL
ACTIVITIES,
OUTREACH, AND
SERVICE**Member, American Physical Society****2010–Present**

Division of Gravitational Physics

Executive Committee Member-at-Large

2016–2019

Division of Astrophysics

Conference and seminar organizer

Workshop on Unifying tests of GR, Caltech

July 2016

TAPIR seminar, Caltech

Fall 2015–Present

General Relativity Informal Tea-Time Series (GRITTS), MIT

Fall 2011–Spring 2012

MKI Journal Club, MIT

Fall 2007–Spring 2010**Conference session chair; Judge for best student speaker award**32nd Pacific Coast Gravity Meeting (PCGM), CSU Fullerton**April 2016**

Theoretical Astrophysics in Southern California (TASC), CSU Fullerton

November 2015**Journal referee***Journal of Cosmology and Astroparticle Physics**Monthly Notices of the Royal Astronomical Society**Physics Letters B**Physical Review D, Physical Review Letters***Outreach**Public lecture / Q&A panel on gravitational waves,
Caltech astronomy public lecture series**February 19, 2016**Invited guest host, public screening of *COSMOS* with Q&A,
Science Cabaret/Cornell**March/June 2014**Invited public talk at *Frontiers of Cornell Astronomy*,
Cornell Friends of Astronomy**November 2013**Invited video chat, *Topics in Physics* course,
Stanford Education Program for Gifted Youth**July 2013**

COMPUTER SKILLS

Languages—Expert in MATHEMATICA. Proficient in C/C++. Experience in Python, Javascript, Java, Bash, Haskell; LaTeX, HTML, CSS.**Operating systems**—Mac OS, Linux/*nix.**Software**—Most contributions can be found at <https://github.com/duetosymmetry>. Core collaborator on xACT (<http://xact.es/>) abstract tensor calculus package for MATHEMATICA. Coauthor of xTERIOR package for exterior differential geometry under xACT. Co-maintainer of community contributions at <http://contrib.xact.es/>. Developed [arXiv-keys](#) browser extension for Chrome.

REFERENCES

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