

Samuel E. Gralla

Assistant Professor of Physics
Core faculty, Theoretical Astrophysics Program
The University of Arizona

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RESEARCH INTERESTS

(Astro)physics of strong gravitational and electromagnetic fields.
Theory of motion and gravitational radiation in general relativity.
Extremal black holes: theoretical properties and observational signatures.
Compact object astrophysics: black holes, neutron stars, pulsars, binaries.
Plasma in strong magnetic fields, quantum electrodynamical corrections.

EDUCATION AND PROFESSIONAL EXPERIENCE

Assistant Professor of Physics, University of Arizona (2015-)
Postdoctoral Fellow, Harvard University (2014-15)
Einstein Postdoctoral Fellow, University of Maryland (2011-14)
Ph.D., Physics, University of Chicago [advisor: Robert Wald] (2011)
B.S., Mathematics & Physics, Yale University (2005)

PRIZES AND FELLOWSHIPS

NASA Einstein Fellowship (2011)
Sugarman Award for Excellence in Graduate Research, University of Chicago (2011)
Bloomenthal Fellowship (University of Chicago), awarded to the best graduate student in theoretical physics with advanced residency status (2010-2011)
Student speaking awards:
Hartle Award, 19th International Meeting on General Relativity and Gravitation (2010)
Blue Apple Award, Midwest Relativity Meeting (2009)
Blue Apple Award, Midwest Relativity Meeting (2008)
NSF Graduate Research Fellowship (2005)
Deforest Pioneers Prize (Yale University), awarded to a senior physics major for distinguished creative achievement in physics (2005)

TEACHING

Designed and taught a three-week intersession course at Johns Hopkins University (Jan 2014): calculus-based, for non-majors, on special relativity and black holes (enrollment: 26)
Undergraduate students supervised:
Theo Drivas (2010-11), leading to one publication
Daniel Brennan (2012-2014), leading to two publications

SERVICE

Referee for: *Astrophysical Journal*, Cambridge University Press, *Classical and Quantum Gravity*, *Journal of Cosmology and Astroparticle Physics*, *Foundations of Physics*, *General Relativity and Gravitation*, *Journal of High Energy Physics*, *Monthly Notices of the Royal Astronomical Society*, *Nature*, *Physical Review D*, *Physical Review Letters*, *Proceedings of the Royal Society A*
Abstract Sorter, APS April Meeting 2013
Session Chair, APS April Meetings 2012, 2014, 2015
Scientific Organizing Committee, 15th Capra Meeting on Radiation Reaction (2012)

SELECTED PUBLICATIONS

Transient Instability of Rapidly Rotating Black Holes
S. Gralla, A. Zimmerman, P. Zimmerman
Phys. Rev. D 94 084017 (2016)

Spacetime Approach to Force-Free Magnetospheres
S. Gralla and T. Jacobson
Mon. Not. R. Astron. Soc. 445, 2500-2534 (2014)

A Rigorous Derivation of Gravitational Self-force
S. Gralla and R. Wald
Class. Quantum Grav. 25, 205009 (2008)

Publications

Samuel E. Gralla

Research Journal Publications

26. "Pulsar Magnetospheres: Beyond the Flat Spacetime Dipole"
S. Gralla, A. Lupsasca, A. Philippov, *accepted to Ap. J* (arXiv:1604.04625)
25. "Force-Free Foliations"
G. Compere, S. Gralla, A. Lupsasca, *Phys. Rev. D* 94, 124012 (2016)
24. "Transient Instability of Rapidly Rotating Black Holes"
S. Gralla, A. Zimmerman and P. Zimmerman, *Phys. Rev. D* 94, 084017 (2016)
23. "Horizon Instability of Extremal Kerr Black Holes:
Nonaxisymmetric Modes and Enhanced Growth Rate"
M. Casals, S. Gralla, P. Zimmerman, *Phys. Rev. D* 94, 064003 (2016)
22. "Plasma Waves and Jets from Moving Conductors"
S. Gralla and P. Zimmerman, *Phys. Rev. D* 93, 123016 (2016)
21. "Inspiral into Gargantua"
S. Gralla, S. Hughes and N. Warburton, *Class. Quantum Grav.* 33 155002 (2016)
20. "Near-horizon Kerr Magnetosphere"
S. Gralla, A. Lupsasca and A. Strominger, *Phys. Rev. D* 93, 104041 (2016)
19. "QED Plasma and Magnetars"
M. Freytsis and S. Gralla, *J. Cosmo. Astroparticle Phys.* 05, 042 (2016)
18. "Electromagnetic Jets from Stars and Black Holes"
S. Gralla, A. Lupsasca and M. Rodriguez, *Phys. Rev. D* 93, 044038 (2016)
17. "Particle on the Innermost Stable Circular Orbit of a Rapidly Spinning Black Hole"
S. Gralla, A. Porfyriadis and N. Warburton, *Phys. Rev. D* 92, 064029 (2015)
16. "Note on Bunching of Field Lines in Black Hole Magnetospheres"
S. Gralla, A. Lupsasca and M. Rodriguez, *Phys. Rev. D* 92, 044053 (2015)
15. "Nonaxisymmetric Poynting Jets"
S. Gralla and T. Jacobson, *Phys. Rev. D* 92 043002 (2015)
14. "Spacetime Approach to Force-Free Magnetospheres"
S. Gralla and T. Jacobson, *Mon. Not. R. Astron. Soc.* 445, 2500-2534 (2014)
13. "On the Magnetosphere of an Accelerated Pulsar"
T.D. Brennan and S. Gralla, *Phys. Rev. D* 89, 103013 (2014)
12. "Hidden Momentum and Black Hole Kicks"
S. Gralla and F. Herrmann, *Class. Quantum Grav.* 30 205009 (2013)

11. "Exact Solutions to Force-Free Electrodynamics in Black Hole Backgrounds"
T.D. Brennan, S. Gralla and T. Jacobson, *Class. Quantum Grav.* 30 195012 (2013)
10. "Thermodynamics of a Black Hole with Moon"
S. Gralla and A. Le Tiec, *Phys. Rev. D* 88 044021 (2013)
9. "Mass, Charge, and Motion in Covariant Gravity Theories"
S. Gralla, *Phys. Rev. D* 87 104020 (2013)
8. "Second-Order Gravitational Self-force"
S. Gralla, *Phys. Rev. D* 85 124011 (2012)
7. "Gauge and Averaging in Gravitational Self-force"
S. Gralla, *Phys. Rev. D* 84 084050 (2011)
6. "A Note on the Coordinate Freedom in Describing the Motion of Particles in General Relativity"
S. Gralla and R. Wald, *Class. Quantum Grav.* 28, 177001 (2011)
5. "Dependence of Self-Force on Central Object"
T. Drivas and S. Gralla, *Class. Quantum Grav.* 28 145025 (2011)
4. "Bobbing and Kicks in Electromagnetism and Gravity"
S. Gralla, A. Harte, and R. Wald, *Phys. Rev. D* 81, 104012 (2010)
3. "Motion of Small Bodies in Classical Field Theory"
S. Gralla, *Phys. Rev. D* 81, 084060 (2010)
2. "A Rigorous Derivation of Electromagnetic Self-force"
S. Gralla, A. Harte, and R. Wald, *Phys. Rev. D* 80, 024031 (2009)
1. "A Rigorous Derivation of Gravitational Self-force"
S. Gralla and R. Wald, *Class. Quantum Grav.* 25, 205009 (2008)

Other Publications

2. "Book review of 'Gravitation and Spacetime' by Hans C Ohanian and Remo Ruffini"
S. Gralla, *Class. Quantum Grav.* 31 (2014) 179002
1. "Derivation of Gravitational Self-Force"
S. Gralla and R. Wald, in *Mass and Motion in General Relativity* (Springer, 2011. Print.)

Invited Research Presentations

- Solvay Workshop on Holography for Black Holes and Cosmology, May 2016
Purdue Workshop on Relativistic Plasma Astrophysics, May 2016
CIFAR Cosmology and Gravity workshop, March 2016
Caltech Theoretical Astrophysics (TAPIR) Seminar, March 2016
Harvard String Duality Seminar, March 2016
Arizona State University Comsology Seminar, February 2016
Division of Gravitational Physics Early Career Speaker Award, APS meeting, April 2015
Princeton Gravity Seminar, March 2015
Milwaukee Gravity Seminar, December 2014
Purdue Workshop on Relativistic Plasma Astrophysics, May 2014
JSI symposium, April 2014
Arizona Theoretical Astrophysics Colloquium, March 2014
UNC Physics Colloquium, February 2014
Chicago Theory Seminar, January 2014
American University Physics Colloquium, November 2013
Perimeter Institute Strong Gravity Seminar, October 2013
Cornell Astrophysics Theory Lunch, October 2013
Columbia Theory Seminar, October 2013
Maryland Astrophysics Theory Lunch, September 2013
Princeton Gravity Seminar, May 2013
Maryland Gravity Seminar, April 2013
Chicago Gravity Seminar, February 2013
Albert Einstein Institute Seminar, June 2012
Maryland Gravity Seminar, October 2011
JSI Mini-symposium, September 2011
Caltech TAPIR Seminar, November 2010
Perimeter Institute Strong Gravity Seminar, November 2010
SILMI workshop “Frontiers in Intense Laser-Matter Interaction Theory”
(Max Planck Institute of Quantum Optics, Garching, DE), March 2010
Milwaukee Relativity Seminar, December 2008
Mini-symposium in honor of Kip Thorne and Marc Davis, University of Chicago, June 2008