

Brian Farris

Theoretical Astrophysicist

Contact

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About

I am interested in high energy theoretical astrophysics, numerical relativity, general relativistic magnetohydrodynamics, radiative transfer, binary black hole mergers in gaseous environments.

Research Experience

Columbia University / NYU 2012 - Present**Postdoctoral Researcher. Advised by Andrew MacFadyen and Zoltan Haiman**

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Performed 2D Newtonian simulations of black hole mergers in disk-like gaseous environments using DISCO, a finite-volume, moving-mesh code for viscous hydrodynamics. Studied characteristic time variability signatures in accretion rate and luminosity, dependence on binary mass-ratio, spectral signatures, and decoupling dynamics prior to merger.

University of Illinois at Urbana-Champaign 2012 – 2014**Graduate Student. Advised by Stuart Shapiro**

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Performed fully general relativistic simulations of black hole mergers in disk-like gaseous environments. Calculated luminosity of electromagnetic radiation emitted, investigating possible mechanism for simultaneous detection of gravitational and electromagnetic signatures from merging supermassive black holes.

University of Illinois at Urbana-Champaign 2008 – 2010

Graduate Student. Advised by Stuart Shapiro

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Performed fully general-relativistic hydrodynamic simulations of merging black hole binaries embedded in spherical Bondi-like accretion environments.

University of Illinois at Urbana-Champaign 2005 – 2007**Graduate Student. Advised by Stuart Shapiro**

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Wrote and tested a fully general relativistic code which evolves Magnetohydrodynamic fluids and radiation in dynamical spacetimes. The code solves the Einstein-Maxwell-MHD-Radiation system of coupled equations in axisymmetry and in full $3 + 1$ dimensions.

Supernova Cosmology Project, LBNL 2004 – 2005**Advised by Saul Perlmutter**

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Worked as full time researcher with the Supernova Cosmology Project to generate lightcurves for the '99 Nearby Supernova Campaign.

Nearby Supernova Factory, UC Berkeley 2003 – 2004**Advised by Gerson Goldhaber**

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Completed senior thesis entitled "Lightcurves of Nearby Supernovae"

Nearby Supernova Factory, UC Berkeley 2002 – 2004**Advised by Gerson Goldhaber**

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Participated in Berkeley Undergraduate Research Scholars Program, conducting research in collaboration with Professor G. Goldhaber and S. Perlmutter with the Supernova Cosmology Project. Work included scanning for new nearby supernovae, simulating illumination of telescope domes in order to assess dome flat procedure, simulating asteroid orbits in order to predict and eliminate asteroids as false supernova candidates, and generating supernova lightcurves.

Conference Talks

International LISA Symposium, Gainesville 2014

Simulations of Disk Accretion onto Black Hole Binaries.

Astro-GR meeting, Atlanta 2013

Simulations of Disk Accretion onto Black Hole Binaries.

APS April meeting, Atlanta 2012

Simulations of Binary Black Hole Mergers in Magnetized Gaseous Disks.

21st Midwest Relativity Meeting, University of Illinois 2011

Simulations of Binary Black Hole Mergers in Gaseous Disks.

APS April meeting, Anaheim 2011

Simulations of Binary Black Hole Mergers in Gaseous Disks.

20th Midwest Relativity Meeting, University of Guelph 2010

General Relativistic Simulations of Binary Black Hole Mergers in Gaseous Environments.

APS April meeting, Washington DC 2010

General Relativistic Simulations of Binary Black Hole Mergers in Gaseous Environments.

19th Midwest Relativity Meeting, University of Michigan 2009

Simulations of Binary Black Hole Mergers in Gaseous Environments

18th Midwest Relativity Meeting, University of Notre Dame 2008

Relativistic Radiation Magnetohydrodynamics in Dynamical Spacetimes.

APS April meeting, St. Louis 2008

Relativistic Radiation Magnetohydrodynamics in Dynamical Spacetimes.

Education

University of Illinois at Urbana-Champaign 2005 – 2012

Physics

Ph.D.

University of California, Berkeley 2000 – 2004

Physics

B.S.

Awards

Earth and Space Science Fellowship

by **NASA**

Awarded 2009-09-01

Travel Grant

by **Topical Group in Gravitation**

Awarded 2008-09-01

Carver Fellowship

by **UIUC Engineering Dept.**

Awarded 2005-09-01

For Outstanding Incoming Doctoral Student

Pomerantz Scholarship

by **U.C. Berkeley**

Awarded 2003-09-01

For Outstanding Physics Student

Undergraduate Research Scholarship

by U.C. Berkeley

Awarded 2004-09-01

Alumni Scholarship

by U.C. Berkeley

Awarded 2000-09-01

Chancellor's Scholarship

by U.C. Berkeley

Awarded 2000-09-01

Drake Scholarship

by U.C. Berkeley

Awarded 2000-09-01

Publications

B. D. Farris, P. Duffell, Andrew I. MacFadyen, Z. Haiman, 'Characteristic Signatures in the Thermal Emission from Accreting Binary BlackHoles'.arXiv:1406.0007 (2014)

P. C. Duffell, Z. Haiman, A. I. MacFadyen, D. J. D’Orazio, B. D. Farris, 'Type II Migration is not Locked to Viscous Disk Evolution'. arXiv:1405.3711 (2014)

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B. D. Farris, P. Duell, A. I. MacFadyen, and Z. Haiman, 'Binary Black Hole Accretion From a Circumbinary Disk: Gas Dynamics Inside the Central Cavity'. ApJ, 783, 134 (2014)

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B.D. Farris, R.G. Gold,V. Paschalidis and S.L. Shapiro, 'Binary black hole mergers in magnetized disks: simulations in full general relativity'. Phys. Rev. Lett., 109, 221102 (2012)

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A.N.Staley,T.W.Baumgarte,J.D.Brown, B.D.Farris, and S.L.Shapiro, 'Oppenheimer-Snyder Collapse in Moving-Puncture Coordinates'. Classical and Quantum Gravity, 29, 015003 (2012)

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B.D. Farris, Y.T. Liu, and S.L. Shapiro, 'Binary black hole mergers in gaseous environments: “Binary Bondi” and “binary Bondi-Hoyle-Lyttleton” accretion'. Phys. Rev. D., 81, 084008 (2010)

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B.D. Farris, T.K. Li, Y.T. Liu, and S.L. Shapiro, 'Relativistic Radiation Magnetohydrodynamics in Dynamical Spacetimes: Numerical Method and Tests'. Phys. Rev. D., 78, 024023 (2008)

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Skills

Computing

- C
- C++
- Fortran
- Python
- R
- Mathematica
- HTML
- CSS
- Javascript
- Linux
- Unix
- MacOS
- High Performance Parallel Computing

Scientific

- Numerical Relativity
- Magnetohydrodynamics
- Computational Fluid Dynamics
- Accretion Disk Theory
- Black Holes

References

- Andrew MacFadyen Ph.D., Professor. New York University.
Email: macfadyen@nyu.edu
- Zoltan Haiman Ph.D., Professor. Columbia University.
Email: zoltan@astro.columbia.edu