

Phil Arras

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education and employment

2006- Assistant Professor, University of Virginia Astronomy Department
2005-2006 Postdoctoral fellow, Kavli Institute for Theoretical Physics
2002-2005 NSF Astronomy and Astrophysics Postdoctoral Fellow
1999-2002 Postdoctoral fellow, Canadian Institute for Theoretical Astrophysics
1999 Ph.D. in Physics, Cornell University
1993 B.Sc. in Physics, B.A. in Mathematics, University of California at San Diego

PhD thesis (advisor: Ira Wasserman)

“An environmental impact study: Using globular clusters to place limits on dark matter in the galactic halo”, Cornell University (2000).

research areas

- Theoretical astrophysics.
- Extrasolar planets.
- Compact stars: neutron stars, white dwarfs and black holes.
- Stellar and planetary seismology.

current and former students

- George Trammell (graduate)
- Sarah Peacock (undergraduate)
- Christine O’Donnell (undergraduate)
- Huy-Sinh Trung (undergraduate)
- Meredith Nelson (undergraduate)
- Rolando Mendez (undergraduate)

recent collaborators (≥ 2006)

Lars Bildsten, Omer Blaes, Josh Burkart, Joleen Carlberg, Tim Cassidy, Phil Chang, Chris Fragile, Bob Johnson, Joe Lazio, Zhi-Yun Li, Steve Majewski, Bill Paxton, Eric Pfahl, Sterl Phinney, Eliot Quataert, Etienne Racine, Mike Skrutskie, Aristotle Socrates, Justin Steinfadt, Neal Turner, Dean Townsley, Nevin Weinberg,

national and international service

- Referee for Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Astronomy and Astrophysics, Physical Review D.
- NASA panel “Origins of Solar Systems” (2010).
- NASA panel “Astrophysics Theory Program” (2010).
- NSF panel “Astronomy and Astrophysics Postdoctoral Fellow” (2011, 2008).

public outreach

- Talk for Society of Physics students (2007).
- Public Night talks at McCormick Observatory (2007-)
- Public talk for the Charlottesville Astronomical Society (2008).

service to the department and university

- Undergraduate academic advisor (2007-).
- Graduate Program Policy and Review Committee (2006-). This committee has implemented changes in the graduate curriculum and teaching assistant policies.
- Colloquia committee (2006-2008). I was in charge of inviting colloquium speakers and arranging their visit.
- Graduate committee for astronomy students Jeff Oishi, Jeff Carlin, Jake Simon, Joleen Miller, Cheng-Yu Kuo, Jarron Liesenring, George Trammell, Paul Ries and Anna Bilous.
- Graduate committee for engineering students Tim Cassidy, Meredith Elrod, O.J. Tucker and Justin Deighan.
- Guest lectures in Alan Howard’s Planetary Geology course (2008-2009)
- Astronomy 174 lectures to introduce majors to research in the department (2006-).

refereed publications

“Tidal Asteroseismology: Keplers KOI-54”, J. Burkart, E. Quataert, P. Arras & N. Weinberg, submitted to MNRAS (2011).

“The Radial Velocity Signature of Tides Raised in Stars Hosting Exoplanets”, P. Arras, J. Burkart, E. Quataert & N. Weinberg, submitted to *MNRAS* letters (2011).

“Nonlinear Tides in Close Binary Systems”, N. Weinberg, P. Arras, E. Quataert & J. Burkart, submitted to *ApJ* (2011).

“Hot Jupiter Magnetospheres”, G. Trammell, P. Arras & Z.Y. Li, *ApJ*, 728, 152 (2010).

“Diffusive Nuclear Burning of Helium on Neutron Stars”, P. Chang, L. Bildsten & P. Arras, *ApJ*, 723, 719 (2010).

“Pulsations in Hydrogen Burning Low Mass Helium White Dwarfs”, J. Steinfadt, L. Bildsten, & P. Arras, *ApJ*, 718, 441 (2010).

“Thermal Tides in Fluid Extrasolar Planets”, P. Arras & A. Socrates, *ApJ*, 714, 1 (2010).

“Massive Satellites of Close-In Gas Giant Exoplanets”, T. Cassidy, R. Mendez, P. Arras, R. Johnson & M. Skrutskie, *ApJ*, 704, 1341 (2009).

“The Role of Planet Accretion in Creating the Next Generation of Red Giant Rapid Rotators”, J. Carlberg, S. Majewski, & P. Arras, *ApJ*, 700, 832, (2009).

“Ellipsoidal Oscillations Induced by Substellar Companions: A Prospect for the Kepler Mission”, E. Pfahl, P. Arras & B. Paxton, *ApJ*, 679, 783 (2009).

“Non-dissipative tidal synchronization in accreting binary white dwarf systems”, E. Racine, E.S. Phinney & P. Arras, *MNRAS*, 380, 381 (2007).

“Thermal Structure and Radius Evolution of Irradiated Gas Giant Planets,” P. Arras and L. Bildsten, *ApJ*, 650, 394 (2006).

“Oscillation Modes of Relativistic Slender Tori”, O. Blaes, P. Arras & C. Fragile, *MNRAS*, 369, 1235 (2006).

“Quasi-periodic Oscillations from Magnetorotational Turbulence”, P. Arras, O. Blaes & N. Turner, *ApJL*, 645, 65L (2006).

“Pulsational Instabilities in Accreting White Dwarfs”, P. Arras, D. Townsley & L. Bildsten, *ApJL* 643, L119 (2006).

“Radiation from Condensed Surface of Magnetic Neutron Stars,” M. van Adelsberg, D. Lai, A. Y. Potekhin & P. Arras, *ApJ*, 628, 902 (2005).

“White Dwarf Heating and Subsequent Cooling in Dwarf Nova Outbursts,” A.L. Piro, P. Arras & L. Bildsten, *ApJ*, 628, 401 (2005).

“Hydrogen Burning on Magnetar Surfaces,” P. Chang, P. Arras, & L. Bildsten, *ApJL*, 616, L147 (2004) .

“Magnetars: Time Evolution, Superfluid Properties, and Mechanism of Magnetic Field Decay,” P. Arras, A. Cumming & C. Thompson, *ApJL*, 608, 49 (2004).

“Magnetic Field Evolution in Neutron Star Crusts Due to the Hall Effect and Ohmic Decay,” A. Cumming, P. Arras & E. Zweibel, *ApJ*, 609, 999 (2004).

“Seismology of the Accreting White Dwarf in GW Librae,” D. Townsley, P. Arras, & L. Bildsten, *ApJL*, 608, 105, (2004).

“A Free, Fast, Simple and Efficient TVD MHD Code,” Ue-Li Pen, Phil Arras, & Shingkwong Wong, *ApJS*, 149, 447, (2003).

“Saturation of the r-Mode Instability,” P. Arras, E.E. Flanagan, S.M. Morsink, A.K. Schenk, S.A. Teukolsky, & I. Wasserman, *ApJ*, 591 1129A (2003).

“Nonlinear mode coupling in rotating stars and the r-mode instability in neutron stars,” A.K. Schenk, P. Arras, E.E. Flanagan, S.A. Teukolsky, & I. Wasserman, *Phys. Rev. D.*, v65, Issue 2, b4001 (2002).

“Stellar Pollution in the Solar Neighborhood,” N. Murray, B. Chaboyer, P. Arras, B. Hansen, & R.W. Noyes, *ApJ*, 555, 801 (2001).

“R-Modes in Neutron Stars with Crusts: Turbulent Saturation, Spin-down, and Crust Melting,” Y. Wu, C.D. Matzner, & P. Arras, *ApJ*, 549, 1011 (2001).

“Constraints on the mass and abundance of black holes in the Galactic halo: the high-mass limit,” C. Murali, P. Arras, & I. Wasserman, *MNRAS*, 313, 87 (2000).

“Neutrino-nucleon interactions in magnetized neutron-star matter: The effects of parity violation,” P. Arras, & D. Lai, *Phys. Rev. D.*, v60, Issue 4, d3001 (1999).

“Can Parity Violation in Neutrino Transport Lead to Pulsar Kicks?,” P. Arras, & D. Lai, *ApJ*, 519, 745 (1999).

“Canaries in a coal mine: using globular clusters to place limits on massive black holes in the Galactic halo,” P. Arras, & Wasserman, *MNRAS*, 306, 257 (1999).

unrefereed proceedings etc.

“The Fate of Exoplanets and the Red Giant Rapid Rotator Connection”, J. Carlberg, S. Majewski, P. Arras, V. Smith, K. Cunha & D. Bizyaev, in “Planetary Systems Beyond the Main Sequence: Proceedings of the International Conference. AIP Conference Proceedings, Volume 1331, pp. 33-40, (2011).

“A New Spin on Red Giant Rapid Rotators: Evidence for Chemical Exchange Between Planets and Evolved Stars”, J. Carlberg, S. Majewski, P. Arras, V. Smith, K. Cunha, R. Patterson, D. Bizyaev & R. Rood, in “Chemical Abundances in the Universe: Connecting First Stars to Planets, Proceedings of the International Astronomical Union, IAU Symposium”, Volume 265, p. 408-411, (2010)

“Response to ‘Concerning Thermal Tides on Hot Jupiters’ (Goodman 2009; arXiv:0901.3279)”, P. Arras & A. Socrates, eprint arXiv:0912.2318

“Thermal Tides in Short Period Exoplanets”, P. Arras & A. Socrates, eprint arXiv:0901.0735

“Gravitational Waves and the Maximum Spin Rate of Accreting Neutron Stars”, P. Arras, in “Binary Radio Pulsars, ASP Conference Series, Vol. 328”, Proceedings of the conference held 11-17 January, 2004, Aspen, Colorado, USA. Edited by F. A. Rasio and I. H. Stairs. San Francisco: Astronomical Society of the Pacific, 2005., p.317

honors and awards

- Alfred P. Sloan Fellow (2008).
- Fund for Excellence in Science and Technology Distinguished Young Investigator grant from UVA (2008).
- NSF Astronomy and Astrophysics Postdoctoral Fellowship (2002-2005).
- Jeffrey L. Bishop Award for research in dynamics at CITA (1999).
- Sheng Keng Ma Award at UCSD from the Physics Department (1993).

coverage of research in the press

- Nature News and Views article “Distant star moved by tides” by Ken Crosswell about our recently submitted paper “The Radial Velocity Signature of Tides Raised in Stars Hosting Exoplanets” by Arras et al.
- ABC Science News article “Big moons could orbit hot Jupiters” by Heather Catchpole about our article “Massive Satellites of Close-In Gas Giant Exoplanets” by Cassidy et al.
- Sky and Telescope article “Can Magnetism Save a Vaporizing Planet?” by Ivan Semeniuk about our paper “Hot Jupiter Magnetospheres” by Trammell et al.
- “Astrophysicist Will Use FEST Award to Model Extrasolar Planets” article in UVA Research News.
- “Sloan Fellowship Will Further U.Va. Astronomer Philip Arras’s Research on Giant Planets Beyond Our Solar System” article in UVA Today.
- “FEST Funding Supports Cutting Edge Junior Faculty Research” article in UVA Research News.

teaching experience

- Fall 2011, Astro 4810 (5010), Introduction to Astrophysics (Astrophysical Processes)
- Spring 2011, Astro 1220, Introduction to Stars, Galaxies and the Universe.
- Fall 2010, Astro 4810 (5010), Introduction to Astrophysics (Astrophysical Processes).
- Fall 2009, Astro 4810 (5010), Introduction to Astrophysics (Astrophysical Processes).
- Spring 2009, Astro 451/651, Introduction to Astrophysics.
- Spring 2009, Co-taught Astro 542, Interstellar Medium with Mr. Indebetouw.
- Fall 2008, Astro 211, General Astronomy.
- Spring 2008, Astro 520/620, Planetary Science.
- Fall 2007, Astro 836, Astronomical Topics. I initiated a journal club for the graduate students, which has continued to the present without faculty supervision.
- Spring 2007, Astro 542, Interstellar Medium.
- Fall 2006, Astro 211, General Astronomy.
- Spring 2006, “the Physics of California” through the UCSB physics department. Co-taught with Lars Bildsten.
- Spring 2005, “the Physics of California” through the UCSB physics department. Co-taught with Lars Bildsten.
- Fall 2002, “Extragalactic Astrophysics” through the UCSB physics department. Co-taught with Omer Blaes.
- Teaching Assistant in Cornell Astronomy Department, Introductory Astronomy, Introductory Planetary Science. 1998-1999.
- Grader in Cornell Astronomy Department. Graduate Class in Galactic Dynamics and Compact Stars. 1996-1998.
- Teaching Assistant in Cornell Physics Department. Engineering Physics Sequence: Classical Mechanics, Electromagnetism, Waves and Optics, Thermodynamics. Honors Physics Sequence: Electromagnetism, Waves and Optics, Special Relativity. 1993-1995, 1997-1999.
- Teaching Assistant in UCSD Physics Department. Engineering Physics Sequence: Mathematics, Electromagnetism. Mathematics Tutor for Mesa Engineering Program at UCSD. 1992-1993.

recent talks and posters

- Poster on “Magnetospheres of Hot Jupiters” at Flagstaff Strange New Worlds conference. May 2011.
- Colloquium at the Canadian Institute for Theoretical Astrophysics, July 9 2009, Magnetospheres of Hot Jupiters. Partial summary of this talk written up in Sky and Telescope magazine: “Can Magnetism Save a Vaporizing Planet” by Ivan Semeniuk

- Presented research talk Thermal Tides in Extrasolar Planets on July 20 2009 at the Carl Sagan workshop on Exoplanetary Atmospheres. Colloquium at McGill University on Oct 29 2009 on “Thermal and Gravitational Tides in Extrasolar Planets”.
- Presented research on planetary tides on May 12 2010 at the KITP workshop Theory and Observation of Exoplanets.
- “Thermal Tides in Short-Period Exoplanets” presented at Solar-Extrasolar Meeting at NASA Ames (2009).
- “The Influence of the Parent Star on Hot Jupiters” colloquium at the College of Charleston (2008).
- UNC Department of Physics and Astronomy Colloquium (2008).
- Berkeley TAC colloquium (2008).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, Cornell (2007).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, Michigan State (2006).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, University of Virginia (2006).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, Ohio University (2006).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, Princeton (2006).
- “The Physics of California”, online public talk at KITP (2006)
- “Instability Strip for Accreting White Dwarfs in CV’s”, Conference on Pulsating White Dwarfs in Cataclysmic Variables at KITP (2006).
- “Thermal Evolution and Tides in Extrasolar Gas Giant Planets”, KIPAC (2005).
- “Seismology of Accreting White Dwarfs”, and “Cooling and Tides in Extrasolar Planets”, colloquia at U. of Florida (2005).
- “Seismology of Accreting White Dwarfs”, and “Tides in Gas Giant Planets”, colloquia at Arizona State(2005).
- “Seismology of Accreting White Dwarfs”, colloquium at Chicago (2005).
- “Seismology of Accreting White Dwarfs”, colloquium at Stonybrook (2005).
- “Seismology of Accreting White Dwarfs”, colloquium at Berkeley (2005).
- “Seismology of Accreting White Dwarfs”, colloquium at U. of Michigan (2005).
- “Seismology of Accreting White Dwarfs”, The astrophysics of cataclysmic variables and related objects, ASP Conf. Ser., eds. J.M. Hameury and J.P. Lasota. (astro-ph/0410313)
- “Seismology of Accreting White Dwarfs”, colloquium at MIT (2004).
- “Tides in Gas Giant Planets”, at KITP Planet formation workshop. (2004)

- “Gravitational Waves Limiting the Spin Period of Accreting Neutron Stars,” 2004 Aspen Winter Conference on Binary Radio Pulsars, ASP Conference Proceedings, ed. F. Rasio & I. Stairs (2004).
- “Seismology of Accreting White Dwarfs”, colloquium at MIT (2004).
- “Gravitational Waves and the Spin Period of Neutron Stars,” , colloquium at Montana State (2003).
- “Magnetic Field Evolution in Neutron Stars,” at *Physics and Astrophysics of Neutron Stars* at Sante Fe (2003).
- “Gravitational Waves from Oscillation Modes in Neutron Stars,” , from *ITP Conference* on “Gravitational Interaction of Compact Objects”. (2003)
- “Nonlinear saturation of the r-mode instability” , from *ITP Conference* on “Spin and Magnetism in Young Neutron Stars” (2000)