Jeffrey S. Hazboun

Curriculum Vitae

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ACADEMIC POSITIONS

- **NANOGrav Physics Frontiers Center Senior Postdoctoral Fellow**
  University of Washington Bothell, August 2018 - Present
- **NANOGrav Physics Frontiers Center Postdoctoral Fellow**
  University of Texas Rio Grande Valley, August 2016 - July 2018
- **Visiting Assistant Professor**
  Hendrix College, August 2015-July 2016
- **Postdoctoral Teaching Position/ Head Online Class Developer**,
  Utah State University, Logan UT September 2014 - August 2015
- **Visiting Scholar**,
  Center for Relativistic Astrophysics, Georgia Tech
  Atlanta, Georgia, June 2012 - May 2013

EDUCATION

- **PhD Physics** December 2014
  "Conformal gravity and time"
  Advisor: James T. Wheeler
  Utah State University, Logan, Utah
- **MS Physics (Mathematics Minor)** June 2008
  "The effects of negative-energy shells on Schwarzschild spacetime"
  Advisor: Tevian Dray
  Oregon State University, Corvallis, Oregon
  Physics PhD Student, September 2008 - June 2009
- **BS Biology** December 1999
  State University of New York, College of Environmental Science and Forestry, Syracuse, New York

RESEARCH INTERESTS

Gravitational wave astronomy with pulsar timing arrays and space-based detectors (LISA), pulsars and the interstellar medium, multi-messenger astronomy, cosmology, theoretical relativity and geometry

PAPERS

Refereed Papers

1. **Realistic sensitivity curves for pulsar timing arrays**
   J.S.Hazboun, J.D. Romano, T.L. Smith
   Accepted by Physical Review D, arXiv: 1907.04341
2. **Hasasia: A Python package for Pulsar Timing Array Sensitivity Curves**
   J.S.Hazboun, J.D. Romano, T.L. Smith
   Journal of Open Source Software, 4(42), 1775, DOI:10.21105/joss.01775
3. **The NANOGrav 11-Year Data Set: Evolution of Gravitational Wave Background Statistics**
   J.S.Hazboun, [and 63 others]
   In Review at Astro. Phys. Jour., arXiv: 1909.08644

4. **The International Pulsar Timing Array: Second data release**
   B.B.P. Perera, [and 74 others, including **Jeffrey S. Hazboun**]
   Accepted by MNRAS, arXiv 1909.04534
5. **The NANOGrav 11-Year Data Set:**
   Limits on Gravitational Waves from Individual Black Hole Binaries
   K. Aggarwal, [and 62 others, including **Jeffrey S. Hazboun**]
   Astrophys.J. 880 (2019) no.2, 116
6. **The Astrophysics of Nanohertz Gravitational Waves**
   S. Burke-Spolaor, S.R.Taylor, M.Charisi, T.Dolch, J.S.Hazboun, [and 10 others]
   Astron. Astrophys. Rev. 27 (2019) no.1, 5
7. **The NANOGrav 11-Year Data Set:**
   Constraints on the Stochastic Gravitational Wave Background
   Z. Arzoumanian, [and 59 others, including **Jeffrey S. Hazboun**]
   Astrophys.J. 859 (2018) no.1, 47
8. **A Second interstellar medium event from the timing of PSR J1713+0746**
   M. T. Lam, J. A. Ellis, G. Grillo, M. L. Jones, J.S. Hazboun, [and 32 others]
   Astrophys.J. 861 (2018) no.2, 132
9. **An Acoustical Analogue of a Galactic-scale Gravitational-Wave Detector**
   Michael T. Lam, Joseph D. Romano, Joey S. Key, Marc Normandin, Jeffrey S. Hazboun
   American Journal of Physics 86, 755 (2018)
10. **Constructing an Explicit AdS/CFT Correspondence with Cartan Geometry**
    Jeffrey S. Hazboun
    Nucl. Phys B 929, (2018) DOI: 10.1016/j.nuclphysb.2018.02.006
11. **Power radiated by a binary system in a de Sitter Universe**
    Béatrice P. Bonga and Jeffrey S. Hazboun
    *Phys.Rev. D*96 (2017) no.6, 064018 DOI: 10.1103/PhysRevD.96.064018
12. **C7 multi-messenger astronomy of GW sources**
    Jeffrey S. Hazboun and Shane L. Larson
    General Relativity and Gravitation Volume 46 (2014) 1771,
    DOI: 10.1007s10714-014-1771-6
13. **Time and dark matter from the conformal symmetries of Euclidean space**
    Jeffrey S. Hazboun and James T. Wheeler
    Classical & Quantum Gravity Volume 31 (2014) 215001 DOI: 10.1088/0264-9381/31/21/215001
14. **A systematic construction of curved phase space:**
    A gravitational gauge theory with symplectic form
    Jeffrey S. Hazboun and James T. Wheeler
    Journal of Physics Conference Series 360 (2012) 012013, DOI: 10.1088/1742-6596/360/1/012013
15. **The Effect of Negative-Energy Shells on the Schwarzschild Black Hole**
    Jeffrey S. Hazboun and Tevian Dray
    General Relativity and Gravitation Volume 42 (2010) 1457-1467, DOI: 10.1007/s10714-009-0916-5

White Papers and Technical Papers

16. **Physics Beyond the Standard Model With Pulsar Timing Arrays**
    X. Siemens, **Jeffrey S. Hazboun**, [and 8 others]
    *arXiv:*1907.04960
17. **The NANOGrav Program for Gravitational Waves and Fundamental Physics**
    A. Brazier, [and 13 others, including **Jeffrey S. Hazboun**]
    *arXiv:*1908.05356

18. **NANOGrav Education and Outreach: Growing a Diverse and Inclusive Collaboration for Low-Frequency Gravitational Wave Astronomy**
P.T.Baker, [and 26 others, including **Jeffrey S. Hazboun**]
*arXiv:*1907.07348
19. **Astro2020 science white paper: The gravitational wave view of massive black holes**
Monica Colpi, [and 26 others, including **Jeffrey S. Hazboun**]
*arXiv:*1903.06867
20. **The second international pulsar timing array mock data challenge**
Jeffrey S. Hazboun, Chiara M.F. Mingarelli, Kejia L
*arXiv:*1810.10527
21. **Null-stream pointing with pulsar timing arrays**
Jeffrey S. Hazboun and Shane L. Larson
*arXiv:*1607.03459
22. **Limiting alternative theories of gravity using gravitational wave observations**
Jeffrey S. Hazboun, Manuel Pichardo Marcano and Shane L. Larson
*arXiv:*1311.3153

PROFESSIONAL SOCIETIES AND COLLABORATIONS

- **North American Nanohertz Observatory for Gravitational Waves Collaboration**
- **International Pulsar Timing Array Collaboration**
- **International Gravitational Outreach Group**
- **LISA Consortium**
- **Neutron star Interior ExploreR (NICER) Timing Working Group**
- **American Physical Society**
- **American Astronomical Society**

TEACHING EXPERIENCE

- **Teaching Positions**
  - **Visiting Assistant Professor**, Hendrix College, Conway, Arkansas, Fall 2015 - Spring 2016
    Astronomy, Cosmology, Quantum Mechanics and General Physics I
    Mentored 4 undergraduate researchers.
  - **Physics Instructor**, Utah State University, Logan, Utah, Spring 2015
    General Physics II: Instructor of Record for a 165 person Physics for the Life Sciences class. Supervised nine teaching assistants.
  - **Astronomy Instructor**, Utah State University, Logan, Utah, Fall 2014
    Instructor of record for a 300+ person astronomy class. Supervised two teaching assistants.
  - **Research Advisor**, Utah State University, Logan, Utah, Fall 2013-Spring 2014
    Mentored a senior research project on multi-messenger astronomy using gravitational waves.
  - **Online Physics Course Developer & Instructor**, Utah State University, Logan, Utah, 2012-2014
    The Universe: Proposed, developed and taught an online cosmology class for non-science students. Continuously offered for the last 7 semesters. Over 400 students have taken this class.
  - **Physics Instructor**, Utah State University, Logan, Utah, Summer 2011
    General Physics I: Instructor of Record
  - **Teaching Assistant**, Utah State University, Logan, Utah, Fall 2009-Spring 2012
    General Physics I: Recitation Leader and Lab Instructor
    General Physics II: Recitation Leader and Lab Instructor

- **Teaching Assistant**, Oregon State University, Corvallis, Oregon Fall 2006-Spring 2009
  Paradigms in Physics TA: NSF funded higher division class reform project.
  Facilitated group work and took part in curriculum meetings.
  Physics for the Life Sciences: Recitation Leader and Lab Instructor
  General Physics II: Lab Instructor
- **MCAT Physics Instructor** Princeton Review, Portland, Oregon, Summer 2007
  Developed curriculum to help students review for physics portion of the MCAT exam.
  Taught students test-taking strategies to prepare for a stressful and fast-paced exam.

- **Courses Instructed,** *Textbook* (Students $\times$ Credit Hours) [cumulative]
  - **Quantum Mechanics,** *Griffiths* (39 hrs)
  - **Cosmology,** *Ryden* (27 hrs)
  - **Astronomy,** *Bennett, et al.* (1300 hrs)
  - **The Universe,** *Ratcliffe* (1200 hrs)
  - **Physics for the Life Sciences 1,** *Cutnell & Johnson* (75 hrs)
  - **Physics for the Life Sciences 2,** *Cutnell & Johnson* (450 hrs)
  - **Physics for Engineers 1,** *Halliday & Resnick* (75 hrs)

LEADERSHIP & SERVICE

- **Data Challenge Working Group Co-Chair, International Pulsar Timing Array**
- **Diversity and Equity Group Co-Chair, International Gravitational Outreach Group**
- **Local Organizing Committee, Conferences for Undergraduate Women in Physics at Seattle**
- **Local Organizing Committee Chair, NANOGrav Spring Meeting 2019**
- **LISA Data Analysis Workshop, AAS233 2019**
- **Science Organizing Committee, LISA Symposium 2018**
- **Science Organizing Committee, NANOGrav Spring Meeting 2018**
- **Science Organizing Committee, NANOGrav Spring Student Workshop 2018**
- **Student Workshop Organizer, IPTA Meeting 2017**
- **Referee for American Astronomical Society Journals**
- **Referee for Monthly Notices of the Royal Astronomical Society**
- **Referee for Classical and Quantum Gravity**
- **Referee for General Relativity and Gravitation**
- **Referee for Physical Review**
- **Referee for European Journal of Physics**

SOFTWARE DEVELOPMENT

Lead Developer

- **hasasia** Python package for calculating pulsar timing array sensitivity curves and signal-to-noise ratios.
  `https://pypi.org/project/hasasia/`
- **Pulsar Data Toolbox** Python package for accessing pulsar data files.
  `https://pypi.org/project/pdat/`
- **Pulsar Signal Simulator** Python package for simulating pulsar observation data.
  `https://github.com/PsrSigSim/PsrSigSim`
- **La Forge** Python package for making plots from Bayesian analyses of PTA data.
  `https://pypi.org/project/la-forge/`

Development Team

- **enterprise** Python package for bayesian PTA data analysis.
  `https://github.com/nanograv/enterprise`
- **enterprise_extensions** Python package for building bayesian analysis models.
  `https://github.com/stevertaylor/enterprise_extensions`
- **Tabletop PTA** Python package for an acoustical PTA demonstration.
  `https://pypi.org/project/tabletop_pta/`

ADVANCED GRADUATE SCHOOLS

- **53rd Cracow School of Theoretical Physics** Zakopane, Poland. June 2013
  Eight day school. Topics: conformal symmetry, AdS/CFT, and quantum gravity.
- **Higher Gauge Theory, Topological Quantum Field Theory and Quantum Gravity School and Workshop** Lisbon, Portugal, February 2011
  Seven day school. Topics: topology, category theory and quantum gravity.
- **PASI Quantum Gravity Summer School** Morelia, Mexico, June 2010
  Ten day school. Topics: various approaches to quantum gravity lectured.

INVITED TALKS

- **Professional**

  1. **Montana State University Physics Colloquium** Nov, 2019
     The Search for Lumbering Giants:
     Observing the Nanohertz Gravitational-Wave Sky with Pulsar Timing Arrays
  2. **GR22/Amaldi13** July, 2019
     Education and Public Outreach Efforts by Pulsar Timing Array Collaborations
  3. **Northwest APS Meeting** PTA Overview, May, 2019
     The Search for Lumbering Giants:
     Observing the Nanohertz Gravitational-Wave Sky with Pulsar Timing Arrays
  4. **Gravitational Wave Physics and Astronomy Workshop** PTA Overview, December, 2019
     Current Status of Pulsar Timing Array Gravitational Wave Astronomy
  5. **University of Washington Bothell** PSD Seminar, December, 2018
     Observing the Nanohertz Gravitational-Wave Sky with Pulsar Timing Arrays
  6. **University of Washington Seattle** AstroLunch Talk, February, 2018
     A Galactic Scale Gravitational Wave Detector: The NANOGrav 11yr Limits
  7. **University of Washington Bothell** PSD Seminar, November, 2017
     The NANOGrav Pulsar Timing Array:
     Using simulations to characterize our galactic gravitational wave detector.
  8. **University of Texas Rio Grande Valley** ARCC Meeting, February, 2017
     Simulating Pulsar Signals for Noise Characterization of PTAs
  9. **University of Arkansas** Colloquium, February, 2016
     Gravitational Wave Astronomy in the 2nd Century of GR
  10. **Western Washington University** Colloquium, May, 2015
      A New Window into the Cosmos
  11. **Brigham Young University** Theory Seminar, February, 2015
      Gravitational Gauge Theory and the Dark Cosmological Constituents

12. **Center for Relativistic Astrophysics** Departmental Colloquium, March, 2013
Biconformal Space & Testing Alternative Theories of Gravity using Multi-Messenger Astronomy
13. **Utah State University** Colloquium, February, 2013
Best Practices for the Online Classroom
14. **Utah State University** Colloquium, September 2010
Curved Phase Space from conformal symmetry
15. **Oregon State Physics Colloquium** Corvallis, Oregon, March 2009
Spherical Shells in a Schwarzschild Background

- **Public**

1. **Science Wednesday Panel Discussion** King's Live Music, Conway, Arkansas, February 2015
The Science of Time Travel
2. **Science Fiction Club Talk** Hendrix College, Conway, Arkansas, October 2015
Black Holes and Wormholes
3. **Science Unwrapped** Utah State University, Logan, Utah, February 2013
Explore to Conserve (500 person public lecture)
4. **Conservation Club Talk** Weber State Conservation Club, Ogden, Utah, February 2012
A Scientist's Role in Conservation
5. **Science Unwrapped** Swaner Ecocenter, Park City, Utah, February 2011
A Scientist's Role in Modern Exploration
6. **Science Interview for National Geographic**, November 2009
Interviewed for *Phenomena: A science salon hosted by National Geographic* about the physics in the movie "Men Who Stare at Goats".
7. **Cache Valley Stargazers Talk** Logan, Utah, November 2009
Black Holes: Ninjas of the Night Sky

RESEARCH TALKS PRESENTED

1. **GR22/Amaldi13** Valencia, Spain, July, 2019
"Realistic Pulsar Timing Array Sensitivity Curves"
Jeffrey S. Hazboun , Joseph D. Romano, Tristan L. Smith
2. **American Physical Society April Meeting** Denver, Colorado, April, 2019
"Realistic Pulsar Timing Array Sensitivity Curves"
Jeffrey S. Hazboun, Joseph D. Romano, Tristan L. Smith
3. **Spring NANOGrav Meeting** Bothell, Washington, March, 2019
"Characterizing the Sensitivity of the NANOGrav 11-year Data Set"
Jeffrey S. Hazboun
4. **American Astronomical Society Meeting** Seattle, Washington, January, 2019
"Bayesian Monitoring of Solar Electron Density Using NANOGrav Data sets"
Jeffrey S. Hazboun
5. **AstroNWxSW** Vancouver, British Columbia, November, 2018
"Bayesian Monitoring of the Solar Wind with Pulsar Timing Arrays"
Jeffrey S. Hazboun
6. **Fall NANOGrav Meeting** Green Bank, West Virginia, October, 2018
"Spurious Gravitational Wave Detections in the NANOGrav 11 Year Data Set"
Jeffrey S. Hazboun

7. **LISA Symposium** Chicago, Illinois, July, 2018
   "The International Pulsar Timing Array Mock Data Challenge"
   Jeffrey S. Hazboun on behalf of the IPTA Data Challenge Working Group
8. **IPTA 2018** Albuquerque, New Mexico, June, 2018
   "Evolution of the Detection Statistics in the NANOGrav Dataset"
   Jeffrey S. Hazboun
9. **Northwest Section APS Meeting** Tacoma, Washington, June, 2018
   "Noise Evolution in the NANOGrav 11 Year Data Set"
   Jeffrey S. Hazboun
10. **Python in Astronomy** New York, New York, May, 2018
    "Publishing a Gravitational Wave Stochastic Background Analysis"
    Jeffrey S. Hazboun
11. **American Physical Society April Meeting** Columbus, Ohio, April, 2018
    "Slicing the NANOGrav 11 Year Data Set"
    Jeffrey S. Hazboun
12. **Spring NANOGrav Meeting** Charlottesville, Virginia, March, 2018
    "Evolution of the NANOGrav 11 Year Data Set"
    Jeffrey S. Hazboun
13. **Fall NANOGrav Meeting** Easton, Pennsylvania, October, 2017
    "Slicing the NANOGrav 11 Year Data Set"
    Jeffrey S. Hazboun
14. **International Pulsar Timing Array** Sèvres, France, July, 2017
    "The NANOGrav pulsar signal simulator"
    Jeffrey S. Hazboun
15. **American Physical Society April Meeting** Washington, DC, January, 2017
    "Late-time quadrupolar gravitational wave power in de Sitter space"
    Jeffrey S. Hazboun and Béatrice Bonga
16. **American Astronomical Society 227th Meeting** Grapevine, Texas, January, 2017
    "Null Stream Approach with PTAs: Noise Characterization and Excess Power"
    Jeffrey S. Hazboun
17. **Fall NANOGrav Meeting** Urbana, Illinois, October, 2016
    "Assessing the null stream approach for source localization in PTAs"
    Jeffrey S. Hazboun
18. **Int. Soc. for General Relativity and Gravitation 21st Meeting** New York City, New York, July, 2016
    "Comparing transverse-traceless decompositions of symmetric tensors"
    Jeffrey S. Hazboun and Béatrice Bonga
19. **American Physical Society April Meeting** Salt Lake City, Utah, April, 2016
    "Null Stream Approach for finding Sky Position of Pulsar Timing Array sources"
    Jeffrey S. Hazboun and Shane L. Larson
20. **Midwest Gravity Meeting** Evanston, Illinois, October, 2015
    "A Cartan Geometry approach to the AdS/CFT "
    Jeffrey S. Hazboun
21. **American Physical Society April Meeting** Baltimore, Maryland, April 2015
    "Tracing the AdS/CFT Degrees of Freedom using Cartan Geometry"
    Jeffrey S. Hazboun
22. **American Astronomical Society 225th Meeting** Seattle, Washington, January 2015
    "Pulsar Timing Array Source Location Using the Null Signal Approach" (Poster)
    Jeffrey S. Hazboun and Shane L. Larson

23. **Midwest Gravity Meeting** Rochester, MI, November, 2014
"Conformal gravity, dark matter and time"
Jeffrey S. Hazboun and James T. Wheeler
24. **APS Four Corners Meeting** Orem, Utah, October 2014
"Conformal gravity, dark matter and time"
Jeffrey S. Hazboun and James T. Wheeler
25. **Midwest Gravity Meeting** Milwaukee, Wisconsin, October 2013
"Time from the conformal symmetries of a Euclidean space"
Jeffrey S. Hazboun and James T. Wheeler
26. **Loops 13: International Conference on Quantum Gravity** Waterloo, Canada, July 2013
"Lorentzian geometry from the conformal symmetries of a Euclidean space"
Jeffrey S. Hazboun and James T. Wheeler
27. **GR20/AMALDI 10** Warsaw, Poland, July 2013
"Testing Bimetric and Massive Gravity Theories using Multi-Messenger Astronomy"
Jeffrey S. Hazboun and Shane L. Larson
28. **53rd Cracow School of Theoretical Physics** Zakopane, Poland, June 2013
"Lorentzian spin connection from the conformal symmetries of a Euclidean space"
Jeffrey S. Hazboun and James T. Wheeler
29. **Pacific Coast Gravity Meeting** Davis, California, March 2013
"General relativity in signature changing phase space"
Jeffrey S. Hazboun and James T. Wheeler
30. **Pacific Coast Gravity Meeting** Santa Barbara, California, March 2012
"General relativity in phase space with a natural notion of time"
Jeffrey S. Hazboun and James T. Wheeler
31. **Loops 11: International Conference on Quantum Gravity** Madrid, Spain, May 2011
"A systematic construction of curved phase space: A gravitational gauge theory with symplectic form"
Jeffrey S. Hazboun and James T. Wheeler
32. **Intermountain Graduate Research Symposium** Logan, Utah, March 2010
"Quantum gravity in relativistic phase space"
Jeffrey S. Hazboun and James T. Wheeler
33. **12th Marcel Grossman Gravity Meeting** Paris, France, July 2009
"Multiple Spherical Shells in Schwarzschild Spacetime" (MS Work)
Jeffrey S. Hazboun and Tevian Dray
34. **Pacific Coast Gravity Meeting** Eugene, Oregon, March 2009
"Single Spherical Shells in Schwarzschild Spacetime" (MS Work)
Jeffrey S. Hazboun and Tevian Dray
35. **TEXAS Symposium on Relativistic Astrophysics** Vancouver, Canada, December 2008
"Multiple Spherical Shells in Schwarzschild Spacetime" (Poster, MS Work)
Jeffrey S. Hazboun and Tevian Dray

STUDENT RESEARCH PROJECTS

- **Min Young Kim** University of Washington Seattle, 2018-Present
Bayesian Pulsar Timing
- **Kyle Gersbach** University of Washington Bothell, 2018-Present
Teaching with the Pulsar Signal Simulator
- **Jacob Hesse** University of Washington Bothell, 2017-2018
Efficiently Simulating NANOGrav Pulsars
- **Amelia Henkel** REU UT Rio Grande Valley, Brownsville, Texas, Summer 2017
Dispersing Simulated Baseband Pulsar Signals

- **Cassidy Wagner** REU UT Rio Grande Valley, Brownsville, Texas, Summer 2017
  Simulating Interstellar Medium Effects with Convolution
- **Chris Griffin** Hendrix College, Conway, Arkansas, 2015-2016
  Conformal Diagrams of Crossing Spherical Shells in Schwarzschild Spacetime
- **Devon Roell** Hendrix College, Conway, Arkansas, 2015-2016
  The Quantum Exchange Force and Gravity
- **Eric Mullins**, Hendrix College, Conway, Arkansas, 2015-2016
  Localizing Gravitational Wave Sources with Noisy Null Signals
- **Connor Nelson**, Hendrix College, Conway, Arkansas, 2015-2016
  Localizing Multiple Gravitational Wave Sources with Null Signals
- **Manuel Pichardo Marcano** Utah State University, Logan, Utah, 2012-2013
  Multi-messenger Pulsar Timing Array Sources and Propagation Tests

GRANTS, HONORS and AWARDS

1. **Amazon Web Services, Research Grant 50,000 Credits,** 2019
2. **USU College of Science Graduate Teacher of the Year,** 2013
3. **Graduate Student Senate: Graduate Enhancement Award,** *$4000*, 2013
4. **Travel Grant and Support, Loops '13,** *$1000*, 2013
5. **Travel Grant and Support, 53rd Cracow School of Theoretical Physics,** *$3000*, 2013
6. **Gene Adams Endowed Scholarship,** *$400*, Spring 2011
7. **Travel Grant and Support, Higher Gauge Theory, Topological Quantum Field Theory and Quantum Gravity School and Workshop,** *$1000*, 2013
8. **Travel Grant and Support, PASI Quantum Gravity Summer School,** *$2000*, 2013
9. **National Geographic Explorer's Grant,** Kamchatka Project Summer, *$25,000*, 2010
10. **Howard L. Blood Scholarship,** *$4000*, Summer 2010
11. **Sigma Pi Sigma Physics Honor Society,** April 2010
12. **Vice-President for Research Fellowship,** *$10,000*, Fall 2009
13. **NSF Student Travel Grant,** *$2000*, Summer 2009
14. **Finalist Fulbright Scholarship,** Spring 2009
15. **Fontana Travel Award,** *$375*, December 2008
16. **Best Picture, National Paddling Film Festival, Amateur Category,** *Lemonade*, 2006

OUTREACH

See *Invited Lectures: Public* section above for more examples of outreach.

- **Tabletop PTA**, Sept 2017-Present
  A table demonstration of how a pulsar timing array works using metronomes and smart phones.
- **Kamchatka Project Science Coordinator**, January 2009-2011
  Outreach/Science coordinator for the Kamchatka Project, a National Geographic funded kayaking expedition to the Kamchatka Peninsula of far-east Russia.
- **Science Unwrapped Volunteer**, Jan 2009- 20111
  Answer questions about black holes and falling into black holes as part of
  public interactions after astrophysics themed talks.

REFERENCES

- **Dr. Joey Key** *Post Doctoral Advisor*
  Professor of Physics
  University of Washington Bothell, Bothell, WA 98011
  Phone: 425-352-5497 email:joey.key@uw.edu

- **Dr. Joseph Romano** *Post Doctoral Advisor*
  Professor of Physics
  Texas Tech University, Lubbock, TX 79409
  Phone: 806-834-6522 email:joseph.d.romano@ttu.edu

- **Dr. James T. Wheeler** *PhD Advisor, Utah State University*
  Associate Professor of Physics
  Utah State University, Logan, UT 84321
  Phone: 435-770-7601 email:jim.wheeler@usu.edu

- **Dr. Xavier Siemens** *NANOGrav PI/ Collaborator*
  Associate Professor of Physics
  Oregon State University, Corvallis, OR 97331
  Phone: 541-737-7512 *email:* xavier.siemens@oregonstate.edu