

# Wyatt Brege

Astrophysics ★ Numerical Relativity ★ Python ★ C++ ★ Git

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## QUALIFICATIONS SUMMARY

- Worked with a large, collaborative driven code base
- Strong high level math and physics background
- Deep experience with Linux, version control systems and solving systems of differential equations
- Generated, tested, processed, studied, and visualized terabytes of complex datasets

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## TECHNICAL SKILLS

- **Math and Physics Specialties:** Mechanics, Hydrodynamics, Gravitation, Differential Equations, Numerical Algorithms
- **Programming Languages:** Python/Sage, C++, Fortran, PHP, Bash, Perl
- **Data Software Tools:** Pandas, Numpy, Matplotlib, Calc/Excel, D3.js, Paraview, Gnuplot, Git, TensorFlow, L<sup>A</sup>T<sub>E</sub>X<sup>1</sup>, Hugo

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## PROFESSIONAL EXPERIENCE

- Aug. 2020 - present - **Chef/Consultant**, *Restaurant Consulting*, California & Michigan.  
◦ *Adaptation:* Oversee and develop best practices for both new and existing kitchens during COVID-19
- Aug. 2019 - Aug. 2020 - **Executive Chef**, *Slanted Tree Kitchen & Taproom*, 251 Pittman Rd #E, Fairfield, CA 94534.  
◦ *Improvements:* Oversee and overhaul all aspects of an extremely fast paced kitchen
- Dec. 2017 - Jul. 2019 - **Executive Chef**, *Dawson's Bar & Grill*, 105 N 1st St, Dixon, CA 95620.  
◦ *Leadership:* cooking, recipes, scheduling, ordering, catering, specials, customer correspondence, cost analysis, administrating, accounting, menu planning, POS/tech support
- May. 2013 - Jul. 2017 - **Graduate Research Assistant**, *Physics and Astronomy, Washington State University*, PO Box 642814, Pullman, WA 99164-2814.  
◦ Implemented a high order accurate finite differencing scheme for use in high spin black hole-neutron star mergers and accretion disk simulations  
◦ Completed a nuclear theory based neutron star Equation of State survey for black hole-neutron star mergers  
◦ Technologies: C++, Spectral Einstein Code (SpEC, Python)
- Aug. 2010 - Dec. 2014 - **Graduate Teaching Assistant**, *Physics and Astronomy, Washington State University*, PO Box 642814, Pullman, WA 99164-2814.  
◦ ASTR 135 Laboratory, Astronomy, Fall 2010, Spring 2012  
◦ PHYS 101 Laboratory, General Physics I, Fall 2011, Fall 2012, Fall 2014, Summer 2017  
◦ PHYS 102 Laboratory, General Physics II, Spring 2013  
◦ PHYS 201 Laboratory, Physics for Scientists and Engineers I, Spring 2011, Summer 2012  
◦ PHYS 202 Laboratory, Physics for Scientists and Engineers II, Fall 2012
- Jun. 2005 - Jul. 2010 - **Sous Chef**, *One Trick Pony Grill and Taproom*, 136 Fulton St E, Grand Rapids, MI 49503.  
◦ cooking, menu editing, recipes, scheduling, ordering, catering, management, customer correspondence

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## EDUCATION

- 2017 **Doctor of Philosophy, Physics**, *Washington State University, Pullman, WA.*
- 2010 **Bachelor of Science, Mathematics**, *Grand Valley State University, Allendale, MI.*
- 2010 **Bachelor of Science, Physics**, *Grand Valley State University, Allendale, MI.*
- 2007 **Associate of Science**, *Grand Rapids Community College, Grand Rapids, MI.*

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## ACADEMIC ACHIEVEMENTS

- NASA Space Grant, 2015, 2016 and 2017
- Graduate Assistance in Areas of National Need (GAANN) fellowship, 2010-2011 and 2011-2012
  - taught junior-level physics majors Hamiltonian mechanics for six lectures
  - taught engine cycles and thermodynamics for several lectures to introductory (algebra-based) physics students
- Science, Mathematics, And Research for Transformation (SMART) scholarship, 2009-2010
- Outstanding Student Achievement Award, GVSU Mathematics Department, 2009

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## RESEARCH EXPERIENCE

- May. 2013 - **Black hole-neutron star mergers and accretion disk simulations**, *Washington State University, SXS collaboration.*
  - evolved black hole-neutron star systems in SpEC with adaptive mesh refinement and nuclear-theory based equations of state
  - implemented a high-order accurate finite difference scheme with boundary closures to solve the fluid equations of an accretion disk on a multipatch grid structure
  - completion of dissertation
- May. 2010 - **Generalized uncertainty principle and minimal length**, *Grand Valley State University.*
  - determined new connections between polymer quantum mechanics and minimal length
- Aug. 2009 - **Motion in two-center gravitational systems**, *Grand Valley State University.*
  - implemented Gragg extrapolation to evolve Hamilton's equations for a three-body gravitational system
  - demonstrated the chaotic behavior of particle trajectories around generic rotating binary systems
  - completion of Physics senior thesis
- Aug. 2009 - **Quasicrystals, tilings and diffraction patterns**, *Grand Valley State University.*
  - studied the atomic structure of aperiodic tiles
  - completion of Mathematics senior thesis
- May. 2009 - **Symmetry analysis of differential equations**, *University of Central Florida.*
  - determined the underlining symmetries of the Lane-Emden equation
  - participated in the UCF combined math and physics Research Experience for Undergrads

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## PUBLICATIONS

- Chakravarti, K., Gupta, A., Bose, S., Duez, M.D., Caro, J., **Brege, W.**, Foucart, F., Ghosh, S., Kyutoku, K., Lackey, B.D. and Shibata, M. *Systematic effects from black hole-neutron star waveform model uncertainties on the neutron star equation of state*, September 12, 2018 arXiv:1809.04349

- **Brege, W.**, Duez, M.D., Deaton, M.B., Foucart, F., Caro, J., Hemberger, D.A., Kidder, L.E., O'Connor, E., Pfeiffer, H.P., Scheel, M.A. *Black hole-neutron star mergers using a survey of finite-temperature equations of state*, September 12, 2018 Physical Review D, 98(6), 063009 (preprint: arXiv:1804.09823)
- Foucart, F., Desai, D., **Brege, W.**, Duez, M.D., Kasen, D., Hemberger, D.A., Kidder, L.E., Pfeiffer, H.P., Scheel, M.A., *Dynamical ejecta from precessing neutron star-black hole mergers with a hot, nuclear-theory based equation of state*, November 3, 2016 arXiv:1611.01159

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## CONTRIBUTED TALKS

- **Brege, W.**, Foucart, F., Duez, M.D., *Equation of state survey of black hole-neutron star mergers* APS April Meeting, April 16 2016, BAPS.2016.APR.C14.3
- **Brege, W.**, Duez, M.D., *A high order accurate finite difference scheme with boundary closures for astrophysical simulations* Northwest APS Meeting, May 16 2015, BAPS.2015.NWS.E6.6
- **Brege, W.**, Duez, M.D., *A stable high-order multipatch method for black hole accretion simulations* APS April Meeting, April 12 2015, BAPS.2015.APR.K13.9
- **Brege, W.**, Bolen, B., *Polymer quantum mechanics and an approach to minimal length (Poster)* 19th International Conference on General Relativity and Gravitation (GR19), 06 July 2010
- **Brege, W.**, Brennan, J., *Symmetry Analysis and the Lane-Emden Equation* 2009 Undergraduate Symposium at Argonne National Labs, Argonne, IL, 13 November 2009
- **Brege, W.**, Brennan, J., *Symmetry Analysis of the Lane-Emden Equation* MathFest 2009, Portland, OR, 07 August 2009

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## MEMBERSHIPS

- SXS Collaboration, member 2013-present
- American Physical Society, member 2009-present
- Mathematical Association of America, member 2009-present
- Omicron Delta Kappa, member 2010-present
- Society of Physics Students (SPS), member 2009-present
- Pi Mu Epsilon (Iota chapter), member 2009-2010