

Brian William O'Shea

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Appointments

- 2014 – now Associate Professor, Department of Physics and Astronomy, Department of Computational Mathematics, Science and Engineering, and National Superconducting Cyclotron Laboratory, Michigan State University
- 2008 – 2014 Assistant Professor, Lyman Briggs College and Department of Physics and Astronomy, Michigan State University
- 2005 – 2008 Director's Postdoctoral Fellow, Theoretical Astrophysics Group and Applied Physics Division, Los Alamos National Laboratory
- 2005 Graduate Research Assistant, Theoretical Astrophysics Group, Los Alamos National Laboratory
- 2002 – 2005 Graduate Research Assistant, Center for Astrophysics and Space Sciences, University of California, San Diego
- 2000 – 2002 Graduate teaching assistant and University of Illinois Graduate Fellow, Department of Physics, University of Illinois at Urbana-Champaign

Education

- 2005 University of Illinois at Urbana-Champaign, M.S. & PhD, Physics. Dissertation advisor: Michael L. Norman (UCSD/SDSC)
- 2000 University of Illinois at Urbana-Champaign, B.S., *cum laude*, Engineering Physics with concentrations in astrophysics and computational physics

Research Interests

Theoretical and computational astrophysics: numerical simulation of galaxies, galaxy clusters, and galaxy/intergalactic medium interaction. Galactic chemical evolution. High-redshift structure formation. **Computational science:** High performance computing, scientific visualization, open-source software development. Analysis and management of petascale datasets. Petascale and exascale algorithms. **Education:** Physics and computational science education, student problem-solving, curriculum reform.

Teaching

- LB 271/273, Introductory Physics, I: Fall 2008, 2009, 2010, 2011, 2012, 2013
- LB 272/274, Introductory Physics, II: Spring 2009, 2010, 2012
- LB 290, Interdisciplinary BRAID seminar, Spring 2012, Fall 2013
- LB 490A, Methods in Computational Science, Spring 2014
- LB 492, The Nuclear Age, Spring 2011, Spring 2013
- AST-410, Senior thesis research, all semesters

Publications

48 refereed publications in The Astrophysical Journal, ApJ Supplements, ApJ Letters, Monthly Notices of the Royal Astronomical Society, and Science. (3,419 citations, h-index of 27)
4 refereed education publications in The Physics Teacher, American Journal of Physics, CBE-Life Science Education, and Nature Climate Change
6 refereed computer science conference proceedings
24 conference proceedings, book chapters, and white papers
23 invited seminars and colloquia (since 2008)
50 invited and contributed talks at conferences, workshops, and summer schools (since 2008)

Awards and Honors

University of Michigan MIRA Faculty Sabbatical Fellowship, 2014-15
MSU Teacher-Scholar Award, 2015
Lilly Teaching Fellowship, 2011-12
National Science Foundation Astronomy and Astrophysics Postdoctoral Fellow, 2008
Los Alamos National Laboratory Director's Postdoctoral Fellowship, 2005-2008
University of Illinois Graduate Fellowship, 2000
James Scholar in Engineering, University of Illinois at Urbana-Champaign, 2000
Received the University of Illinois Graduate Teaching Certificate, 2002
Outstanding Teaching Assistant Award, UIUC Physics Department, Fall 1998, Spring 1999, Fall 1999, Spring 2000
On The Incomplete List of TAs Ranked "Excellent" By Their Students, Fall 1998, Spring 1999, Fall 1999, Spring 2000 (Ranked "Exceptional" Spring 1999, Fall 1999, Spring 2000)

Students mentored

PhD theses: Carolyn Peruta (MSU, PhD May 2013), Sam Skillman (CU/Boulder, with Jack Burns; PhD May 2013)

Current graduate students: Brian Crosby (MSU, 2010 – present; est. grad. May 2016), Greg Meece (MSU, 2011 – present; est. grad. May 2016), Austin Edmister (MSU, 2015 – present)

Former graduate advisees: Matthew Turk (Stanford, w/Tom Abel; 2007-9), David Ventimiglia (MSU, w/Mark Voit; 2008-10, 2013), Jennifer Jones (MSU, 2009), Marios Chatzikos (U. Virginia; visiting student, 2011-12), Chris Richardson (MSU, FAST fellowship advisor, 2011-13), Tom Finzell (MSU, FAST fellowship advisor, 2013-2014)

Undergraduate research students: Nicholas Earl (Astrophysics, 2009-11), Monica Derris (Physics, 2009-11), Chris Heuser (Computer science, 2010-11), Dan Perez (Computer Science, 2011-12), Nathan Butcher (Physics, 2012 – 2014), Hilary Egan (Physics, 2012 – 2013), Claire Kopenhafer (Physics, 2013-present), Ciara Johnson (Astrophysics, 2013-2015), Jacob Kneibel (w/Dr. Devin Silvia; 2013-present), Luc Menard (2015), Alex Kreger (2015-present)

Senior thesis or professorial assistant advisees: Emily Chouinard (2008-9), Nicole Kiriazis (2008-9), Joel Adelsberg (2009-10), Talya Krasnert (2010-11), Jessica Domine (2010-2011), Becca Robinson (w/Dr. Facundo Gomez; 2012-13), Jacob Kneibel (w/Dr. Devin Silvia; 2014-15), Madison Fitzgerald (2015-present)

Grants awarded

“Collaborative research: Multiscale physics and feedback in real and simulated circumgalactic gas over cosmic time,” MSU PI: Brian O'Shea, NSF AST program, grant #1514700, \$234,275, 9/14/2015 – 9/13/2019

“Can thermal instabilities drive galactic precipitation and explain observed circumgalactic structure?”, PI: Brian O'Shea, Hubble Theory Program, grant #AR-14315, \$60K, 12/1/2015-11/30/2016

“Petascale adaptive mesh simulations of Milky Way-type galaxies and their environments,” PI: Brian O'Shea, NSF PRAC program #1514580, \$32K and 80 million core-hours on Blue Waters, 9/1/2015 – 8/31/2017.

“Beyond the fluid approximation: Improved modeling of the intracluster plasma,” PI: Brian O'Shea. NASA ATFP program, grant #14-ATP14-0038, \$631,630, 10/1/2015 – 9/31/2018

“Unlocking the secrets of absorption line complexes in the intergalactic medium,” PI: Brian O'Shea. Hubble Theory Program, grant #AR-13261.01, \$53K, 10/1/2013-9/30/2015.

“Modeling multi-wavelength observations of galaxy clusters with adaptive mesh refinement cosmological simulations.” PI: Brian O'Shea. NASA ATFP program, grant #NNX12AC98G, \$534K, 1/1/2012-12/31/2014

“Collaborative research: Software institute for abstractions and methodologies for HPC simulation codes on Future Architectures.” PI: Anshu Dubey (I am a co-PI). NSF SI2 program. MSU component is \$9,218, 7/1/2012-6/30/2014.

“The astrophysics of galaxy clusters: the effect of nonthermal baryonic processes on cluster observables.” PI: Brian O'Shea. NASA ATFP Program, Grant #08-ATFP08-0028, \$238,989, 2/1/2009 – 1/31/2012

“Formation of the First Galaxies: predictions for the next generation of observatories.” PI: Brian O'Shea. NSF PRAC program, grant #0832662. \$40,000. 5/1/2009-4/31/2013

“Tracing the History of Galaxy Formation.” PI: Brian O'Shea. DOE/LANL IGPP collaborative grant program. \$150,000. 10/1/2009 – 9/31/2012

“Cooling and star formation in the Universe's largest galaxies.” PI: Mark Voit (I am a co-PI). NSF AST program, grant #0908819. \$267,520, 9/15/2009-8/31/2013

“CDI Type II Proposal: From models and data to knowledge and understanding.” NSF CDI program, grant #0941373. PI: Scott Pratt (I am a co-PI). \$2,360,715. 11/1/2009-10/31/2014

“Predicting the Gamma-ray signature of cosmic ray protons in galaxy clusters using numerical cosmological simulations.” PI: Eric Hallman (CU Boulder). I am a co-PI. NASA Fermi guest investigator program, Cycle 2. Grant #21077. \$79,921. 8/14/2009-8/13/2010.

“Conduction and multiphase structure in the ICM,” PI: Mark Voit (MSU). I am a co-PI. NASA Chandra Theory Program, grant #TM9-0008X. \$76,403. 1/1/2009-12/31/2009

Computing time awarded

“Petascale adaptive mesh simulations of Milky Way-type galaxies and their environments,” PI: Brian O'Shea, NSF PRAC program, 9/1/2015 – 8/31/2017, 80 million CPU-hours on Blue Waters.

“Petascale adaptive mesh simulations of Milky Way-type galaxies and their environments.” PI: Brian O'Shea. Great Lakes Consortium for Petascale Computation program (for Blue Waters), 4/1/2015 – 3/31/2016, 12.8 million CPU-hours.

“Formation of the First Galaxies: Predictions for the Next Generation of Observatories.” PI: Brian O'Shea. NSF PRAC program (for the Blue Waters supercomputer), 2013-2015. 124 million CPU-

hours.

“Probing galaxy formation at low and high redshifts.” PI: Brian O'Shea. NSF XRAC program, Grant #TG-AST090040. 6.28 million CPU-hours (2008), 3.2 million CPU-hours (2010; renewal), 4.5 million CPU-hours (2011; renewal), 4.7 million CPU-hours (2012; renewal); 1.53 million CPU-hours (2014; renewal)

“Computational studies of cosmological structure on the largest scales: galaxy clusters and filaments.” PI: Eric Hallman (I am a co-PI). NSF XRAC program, grant #TG-AST100004. 4.4 million CPU-hours (2010), 4.5 million CPU-hours (2010; renewal), 2.5 million CPU-hours (2011; renewal), 3.9 million CPU-hours (2012; renewal); 1.0 million CPU-hours (2014; renewal)

“Understanding the nature of the missing baryons and the warm-hot intergalactic medium,” PI: Britton Smith (I am a co-PI). NSF XRAC program, grant #TG-AST120009. 7.5 million CPU-hours (2012)

“Characterizing the formation history of the Milky Way,” PI: Facundo Gomez (I am a co-PI). NSF XRAC program, grant #TG-AST120022. 1.2 million CPU-hours (2012); 3.93 million CPU-hours (2014; renewal)

“Searching for the missing baryons: non-equilibrium chemistry and synthetic spectra,” PI: Devin Silvia (I am a co-PI). NSF XRAC program, grant #TG-AST140065. 1.1 million CPU-hours (2014)

“Examining the Processes of Formation and Feedback for Stars and AGN in the AMR Code Enzo,” PI: John Wise (I am a co-PI). NSF XRAC program, grant #TG-AST140081. 868,000 CPU-hours (2014)

Service

National service: Enzo project (<http://enzo-project.org>) community leader and software developer, NSF “Future of HPC in the United States” panelist, 2009-2012, Great Lakes Consortium for Petascale Computing Applications Committee (2009-present), Argonne National Laboratory CELS review panel

University committees: Computational Science Department Committee (co-chair), Learning Management Systems Futures Committee, CIRTl advisory council / FAST fellowship advisory committee, CRCSTL advisory panel, ICER Scientific Advisory Panel

College-level (LBC) and departmental (Physics) committees: LBC Educational Policy Committee (Chair, 2013-15), LBC Student Evaluation Committee, JINA advisory committee, astrophysics seminar co-chair (AY2010-11, 12-13), galaxy formation discussion group organizer, biophysics search committee (2011-12), LBC physics faculty search committee (2013-14; chair)

Referee for The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Advances in Astronomy, New Astronomy Reviews, Science, Nature, Parallel Computing, and the Journal of Computational Science Education.

Reviewer for DOE (funding and computing time; INCITE, SciDAC, ALCF), Research Corporation for Science Advancement, National Science Foundation, NASA, Netherlands Organization for Scientific Research, the Templeton Foundation

Conference Organization: First Stars III (Santa Fe, 2007; LOC chair), Chair of JINA GCE 2010 workshop organizing committee (in East Lansing, MI, April 29-May 1, 2010), 1st Annual Enzo User and Developer Workshop (San Diego, 2010; SOC and LOC), Enzo Developer Workshop (East Lansing, 2011; LOC Chair), Enzo Developer workshop (New York, 2011, SOC), YT user workshop (Chicago, 2012; SOC), Nuclear Astrophysics Town Meeting (Detroit, 2012; SOC member, GCE/BBN working group chair), University of Chicago SIMAC workshop (Chicago, 2012; SOC), Notre Dame Workshop on the Circumgalactic Medium (South Bend, IN, 2014, SOC), SC14 (Applications technical committee; 2014)

Conference proceedings: Chief editor of First Stars III conference proceedings, American (Institute of Physics Conference Proceedings Series #990, 2008)

Professional memberships: American Astronomical Society, American Physical Society, International Astronomical Union, American Association of Physics Teachers, and American Association for the Advancement of Science

Community Outreach

Judge, New Mexico Supercomputing Challenge, 2006, 2007

MSU Grandparents University, 2009-2014

Michigan Science Olympiad, 2009-2014

Lecturer, MSU Physics of Atomic Nuclei Summer School, 2009-present

MSU Research Experience for Undergraduates seminar speaker, 2009-present

Presented at Astronomical Horizons lecture series, MSU Abrams Planetarium, 2008-present

Lecturer on computational astrophysics, MSU Society of Physics Students, 2009, 2013, 2014

EarthWatch Lecturer, Los Alamos National Lab Bradbury Science Museum, 2007

Los Alamos Summer School Lecturer, 2006-2008

Impression 5 Physics & Astronomy Day, 2015 (lead organizer)

Refereed Astrophysics and Computer Science Publications

Note: the most up-to-date version of this list can be found at my [Google Scholar page](#).

53. *Tracing the evolution of high redshift galaxies using stellar abundances.* B.D. Crosby, **B.W. O'Shea**, C. Peruta, T.C. Beers, J. Tumlinson, 2015, ApJ, submitted
52. *The First Population II Stars Formed in Externally Enriched Mini-halos.* B.D. Smith, J. Wise, **B.W. O'Shea**, M. Norman, S. Khochfar, 2015, ApJ, accepted ([arXiv:1504.07639](#))
51. *Precipitation-regulated star formation in galaxies.* G.M. Voit, G.L. Bryan, **B.W. O'Shea**, M. Donahue, 2015, ApJ, accepted ([arXiv:1505.03592](#)).
50. *Cooling, AGN Feedback and Star Formation in Simulated Cool-Core Galaxy Clusters.* Y. Li, G.L. Bryan, M. Ruszkowski, G.M. Voit, **B.W. O'Shea**, M. Donahue, 2015, ApJ, accepted ([arXiv:1503.02660](#))
49. *Growth and Evolution of Thermal Instabilities in Idealized Galaxy-Cluster Cores.* G. Meece, **B.W. O'Shea**, G.M. Voit, 2015, ApJ, accepted ([arXiv:1503.02645](#))
48. *The Ultraviolet Luminosity Function of the Earliest Galaxies.* **B.W. O'Shea**, J.H. Wise, H. Xu, M.L. Norman, 2015, ApJ Letters, accepted ([arXiv:1503.01110](#))
47. *Supernova Sweeping and Black-Hole Feedback in Elliptical Galaxies.* G.M. Voit, M. Donahue, **B.W. O'Shea**, G.L. Bryan, M. Sun, N. Werner, [2015, ApJ Letters, 803, L21](#)
46. *And yet it moves: The dangers of artificially fixing the Milky Way center of mass in the presence of a massive Large Magellenic Cloud.* F.A. Gomez, G. Besla, D.D. Carpintero, A. Villalobos, **B.W. O'Shea**, E. Bell. [2015, ApJ, 802, 128](#)
45. *Visualizing likelihood density functions via optimal region projection.* H. Canary, R.M. Taylor, C. Quammen, S. Pratt, F.A. Gomez, **B.W. O'Shea**, C.G. Healey, [2014, Computers & Graphics, 41, 62-71](#)
44. *Scaling Relations for Galaxies Prior to Reionization.* P. Chen, J.H. Wise, M.L. Norman, H. Xu, **B.W. O'Shea**. [2014, ApJ, 795, 144](#)
43. *Software Abstractions and Methodologies for HPC Simulation Codes on Future Architectures,* A. Dubey, S. Brandt, R. Brower, M. Giles, P. Hovland, D.Q. Lamb, F. Loffler, B. Norris, **B.W. O'Shea**, C. Rebba, M. Snir, R. Thakur, P. Tzeferacos. [2014, Journal of Open Research Software, 2\(1\):e14](#)
42. *Heating the Intergalactic Medium by X-rays from Population III Binaries in High-redshift Galaxies.* H. Xu, K. Ahn, J.H. Wise, M.L. Norman, **B.W. O'Shea**, [2014, ApJ, 791, 110](#)
41. *A survey of High Level Frameworks in Block-Structured Adaptive Mesh Refinement Packages.* A. Dubey, A. Almgren, J. Bell, M. Berzins, S. Brandt, G. Bryan, P. Colella, D. Graves, M. Lijewski, F. Loffler, **B.W. O'Shea**, E. Schnetter, B. Van Straalen, K. Weide, [2014, Journal of Parallel and Distributed Computing, July 15.](#)
40. *Bringing simulation and observation together to better understand the IGM.* H. Egan, B.D. Smith, **B.W. O'Shea**, and J.M. Shull, [2014, ApJ, 791, 64](#)
39. *Dissecting galaxy formation models with sensitivity analysis – A new approach to constrain the Milky Way formation history.* F. Gomez, C. Coleman-Smith, **B.W. O'Shea**, J. Tumlinson, R. L. Wolpert. [2014, ApJ, 787, 20](#)
38. *Visualizing Likelihood Density Functions by Optimal Surface Projection.* H. Canary, R.M. Taylor, C. Quammen, S. Pratt, F.A. Gomez, **B.W. O'Shea**, C.G. Healey, [2014, Computers and Graphics, 41, 62-71](#)
37. *Fragmentation in dusty low-metallicity star forming halos.* G. Meece, B.D. Smith, **B.W. O'Shea**. [2014, ApJ, 783, 75](#)
36. *The AGORA High-Resolution Galaxy Simulations Comparison Project.* J.-H. Kim et al. for The AGORA Collaboration (List of 46 authors alphabetized after first author; I am #29). [2014, ApJS, 210, 14](#)

Publications, Presentations, and Media - Brian W. O'Shea

35. *Enzo: An adaptive mesh refinement code for astrophysics*. The Enzo Collaboration: G.L. Bryan, M.L. Norman, **B.W. O'Shea**, et al. (28 authors total). [2014, ApJS, 211, 19](#)
34. *Software abstractions and methodologies for HPC simulation codes on future architectures*. A. Dubey, S. Brandt, R. Brower, M. Giles, P. Hovland, D.Q. Lamb, F. Loffler, B. Norris, **B. O'Shea**, C. Rebbi, M. Snir, R. Thakur. 2014, Supercomputing 2014. (Note: position paper for the "Workshop on Sustainable Software in Science: Practice and Experiences.") ([arXiv:1309.1780](#))
33. *Cosmological simulations of isotropic conduction in galaxy clusters*. B.D. Smith, **B.W. O'Shea**, G.M. Voit, D. Ventimiglia, S. W. Skillman, [2013, ApJ, 778, 152](#).
32. *Population III star formation in large cosmological simulations, I: Halo temporal and physical environment*. B.D. Crosby, **B.W. O'Shea**, B.D. Smith, M.J. Turk, O. Hahn, [2013, ApJ, 773, 108](#)
31. *Cosmological magnetohydrodynamic simulations of galaxy cluster radio relics: insights and warnings for observations*. S. Skillman, H. Xu, E. Hallman, **B.W. O'Shea**, J. Burns, H. Li, D. Collins, and M.L. Norman. [2013, ApJ, 765, 21](#)
30. *Vertical density waves in the Milky Way disc induced by the Sagittarius dwarf galaxy*. F. Gomez, I. Minchev, **B.W. O'Shea**, T.C. Beers, J. Bullock, and C. Purcell. [2013, MNRAS, 429, 159-164](#)
29. *On the Road to More Realistic Galaxy Cluster Simulations: the Effects of Radiative Cooling and Thermal Feedback Prescriptions on the Observational Properties of Simulated Galaxy Clusters*. S. Skory, E. Hallman, J. Burns, S. Skillman, **B.W. O'Shea**, and B.D. Smith. [2013, ApJ, 763, 38](#)
28. *Characterizing the Formation History of Milky Way-like Stellar Halos with Model Emulators*. F. Gomez, C. Coleman-Smith, **B.W. O'Shea**, J. Tumlinson, and R. Wolpert. [2012, ApJ, 760, 112](#)
27. *Signatures of minor mergers in the Milky Way disc – I. The SEGUE stellar sample*. F. Gomez, I. Minchev, **B.W. O'Shea**, Y.L. Lee, T. Beers, K.An, J. Bullock, C. Purcell, and A. Villalobos. [2012, MNRAS, 423, 3727](#).
26. *A study of Physical-Science Ensemble Visualization Needs*. G. Taylor et. al. (21 authors total, I am 14th). 2012, in the Proceedings of the 2012 IEEE VisWeek Conference (peer-reviewed conference proceeding)
25. *Signatures of minor mergers in Milky Way-like disk kinematics: ringing revisited*, Gomez, F., Minchev, I., Villalobos, A., **O'Shea, B.W.**, Williams, M., [2012, MNRAS, 419, 2163](#)
24. *Galaxy cluster radio relics in adaptive mesh refinement cosmological simulations: Relic properties and scaling relationships*. Skillman, S., Hallman, E., **O'Shea, B.W.**, Burns, J., Smith, B.D. & Turk, M.J. [2011, ApJ, 735, 96](#)
23. *The Nature of the Warm-Hot Intergalactic Medium, I: Numerical Methods, Convergence, and OVI Absorption*, Smith, B.D., Hallman, E.J., Shull, J.M., and **O'Shea, B.W.** [2011, ApJ, 731, 6](#)
22. *The Properties of X-ray Cold Fronts in a Statistical Sample of Simulated Galaxy Clusters*, Hallman, E.J., Skillman, S.W., Jeltema, T., Smith, B.D., **O'Shea, B.W.**, Burns, J.O. & Norman, M.L. [2010, ApJ, 725, 1053](#)
21. *Galaxy Clusters at the Edge: Temperature, Entropy and Gas Dynamics at the Virial Radius*, Burns, J.O., Skillman, S.W., & **O'Shea, B.W.** [2010, ApJ, 721, 1105-1112](#)
20. *On the Origin of the Highest Redshift Gamma-Ray Burst, GRB 080913*, Belczynski, C., Hartmann, D.H., Fryer, C.L., Holz, D.E. & **O'Shea, B.W.** [2010, ApJ, 708, 117-126](#)
19. *The Formation of Population III Binaries from Cosmological Initial Conditions*, Turk, M., Abel, T. & **O'Shea, B.W.** [2009, Science, 325, Issue 5940, pp. 601-604](#)
18. *The Santa Fe Light Cone Simulation Project, II: The Prospects for Direct Detection of the WHIM with SZE Surveys*, Hallman, E. J., **O'Shea, B.W.**, Smith, B.D., Burns, J.O., & Norman, M.L. [2009, ApJ, 698, 1795-1802](#)
17. *Dark Matter Annihilation and Primordial Star Formation*, Natarajan, A., Tan, J.C., & **O'Shea, B.W.** [2009, ApJ, 692, 574](#)

Publications, Presentations, and Media - Brian W. O'Shea

16. *Three modes of Metal-enriched star formation at high redshift*, Smith, B., Sigurdsson, **O'Shea, B.W.**, & Norman, M.L., [2009, ApJ, 681, 441-451](#)
15. *The Biermann Battery in Cosmological MHD Simulations of Population III Star Formation*, Xu, H., **O'Shea, B.W.**, Collins, D.C., Norman, M.L., Li, H. & Li, S. [2008, ApJ, 688, L57](#)
14. *Cosmological Shocks in Adaptive Mesh Refinement Simulations and the Acceleration of Cosmic Rays*, Skillman, S.W., **O'Shea, B.W.**, Hallman, E.J., Burns, J.O., & Norman, M.L. [2008, ApJ, 689, 1063](#)
13. *The Destruction of Cosmological Halos by Primordial Supernovae*, Whalen, D., Van Veelen, R., **O'Shea, B.W.**, & Norman, M.L., [2008, ApJ, 682, 49](#)
12. *How the First Stars Regulated Local Star Formation I: Radiative Feedback*, Whalen, D., **O'Shea, B.W.**, Smidt, J. & Norman, M.L., [2008, ApJ, 679, 925](#)
11. *Population III Star Formation in a Lambda CDM Universe, II: Effects of a photodissociating background*, **O'Shea, B.W.** & Norman, M.L., [2008, ApJ, 673, 14](#)
10. *The Cosmic Code Comparison Project*, Heitmann, K., Lukic, Z., Fasel, P., Habib, S., Warren, M.S., White, M., Ahrens, J., Ankeny, L., Armstrong, R., **O'Shea, B.W.**, Ricker, P.M., Springel, V., Stadel, J., & Trac, H., [2008, Computational Science and Discovery, Volume 1, Article 015003](#)
9. *The Santa Fe Light Cone Simulation Project: I. Confusion and the WHIM in upcoming Sunyaev-Zel'Dovich Effect Surveys*, Hallman, E.J., **O'Shea, B.W.**, Burns, J.O., Norman, M.L., Harkness, R. & Wagner, R., [2007, ApJ, 671, 27-39](#)
8. *Population III Star Formation in a Lambda CDM Universe, I: Effect of Environment on Protostellar Accretion Rates*, **O'Shea, B.W.** & Norman, M.L., [2007, ApJ, 654, 66](#)
7. *Population III Star Formation in a Lambda WDM Universe*, **O'Shea, B.W.** & Norman, M.L., [2006, ApJ, 648, 31](#)
6. *CMB Polarization Due to Scattering in Clusters*, Shimon, M., Rephaeli, Y., **O'Shea, B.W.**, & Norman, M.L., [2006 MNRAS, 368, 511-517](#)
5. *Comparing AMR and SPH Cosmological Simulations, I: Dark Matter & Adiabatic Simulations*, **O'Shea, B.W.**, Nagamine, K., Springel, V., Hernquist, L. & Norman, M.L., [2005, ApJS, 160, 1](#)
4. *Forming a Primordial Star in a Relic HII Region*, **O'Shea, B.W.**, Abel, T., Whalen, D. & Norman, M.L., [2005, ApJ, 628, L5](#)
3. *A Concordance Model of the Lyman-Alpha Forest at $z = 1.95$* , Jena, T., Norman, M.L., Tytler, D., Kirkman, D., Suzuki, N., Chapman, A., Melis, C., So, G., **O'Shea, B.W.**, Lin, W., Lubin, D., Paschos, P., Reimers, D., Janknecht, E., Fechner, C., [2005, MNRAS, 361, 70](#)
2. *Did Massive Primordial Stars Preenrich the Lyman Alpha Forest?*, Norman, M.L., **O'Shea, B. W.**, & Paschos, P., [2004, ApJ, 601, L115-118](#)
1. *Baryons in the Warm-Hot Intergalactic Medium*, Dave, R., Cen, R., Ostriker, J.P., Bryan, G.L., Hernquist, L., Katz, N., Weinberg, D.H., Norman, M.L. & **O'Shea, B. W.**, [2001, ApJ, 552, 473-483](#)

Refereed Education Research Publications

4. *Promoting interdisciplinary through climate change education*. A. McCright, **B.W. O'Shea**, R. Sweeder, G. Urquhart, and A.K. Zeleke. [2013, Nature Climate Change, DOI: 10.1038/NCLIMATE1844.](#)
3. *From $F=ma$ to flying squirrels: Curricular change in an introductory physics course*. **B.W. O'Shea**, L. Terry, and W. Benenson. [2013, CBE-Life Science Education, 12, 230-238 \(ADS link\)](#)

2. *Assessing gender differences in response system questions for an introductory physics course*, Richardson, C. & **O'Shea, B.W.**, [2013, American Journal of Physics, 81, 231](#)
1. *Tutorials in Physics: The pain and the gain*, Cruz, E., **O'Shea, B.W.**, Schaffenberger, W., Wolf, S., & Kortemeyer, G., [2010, The Physics Teacher, 48, 453-457](#)

Conference Proceedings and Book Chapters

19. *The formation of the first second generation star*. B.D. Smith, J.W. Wise & B.W. O'Shea. 2012, in [Proceedings of First Stars IV – From Hayashi To The Future](#), AIP Conference Proceedings #1480, pp. 135-138
18. *Probing the formation of the Milky Way*. **B.W. O'Shea**, F. Gomez, C. Coleman-Smith, I. Minchev, J. Tumlinson, Y.S. Lee, and T. Beers. 2012, in [Galactic archaeology: Near-field cosmology and the formation of the Milky Way. Proceedings of the conference held 16-20 May 2011 in Shuzenji, Japan](#). Astronomical Society of the Pacific Conference Proceedings, Vol. 458
17. *Vertical density waves in the Milky Way induced by the Sagittarius dwarf galaxy*. F. Gomez, I. Minchev, **B.W. O'Shea**, T. Beers, J. Bullock and C. Purcell. 2012, in [Proceedings of the Argentina Astronomical Association](#), Vol. 55
16. *Characterizing the formation history of Milky Way-like stellar halos with model emulators*. F. Gomez, C. Coleman-Smith, **B.W. O'Shea**, J. Tumlinson, and R. Wolpert. 2012, in "Proceedings of the Argentina Astronomical Association, Vol. 55
15. *Protostellar Feedback Processes and the Mass of the First Stars*, Tan, J.C., Smith, B.D., & **O'Shea, B.W.**, in [Proceedings of The First Stars and Galaxies: Challenges for the Next Decade](#), Eds. D. Whalen, V. Bromm & N. Yoshida, 2010, AIP conference proceedings series.
14. *Local and Global Radiative Feedback from Population III Star Formation*, **O'Shea, B.W.** & Whalen, D. in [Proceedings of The First Stars and Galaxies: Challenges for the Next Decade](#), Eds. D. Whalen, V. Bromm & N. Yoshida, 2010, AIP conference proceedings series.
13. *Population III Binary Formation*, Turk, M., Abel, T., Norman, M.L. & **O'Shea, B.W.** in [Proceedings of The First Stars and Galaxies: Challenges for the Next Decade](#), Eds. D. Whalen, V. Bromm & N. Yoshida, 2010, AIP conference proceedings series.
12. *Towards More Realistic Simulations of Galaxy Clusters: Shocks and Radio Relics*, Skillman, S., W., O'Shea, B.W., Hallman, E.J. & Burns, J.O. [Proceedings of The Monster's Fiery Breath: Feedback in Galaxies, Groups and Clusters](#), Eds. S. Heinz & E. Wilcots, 2009, AIP conference proceedings series #1201, pp. 334-341
11. *Population III Supernovae and the Assembly of the First Galaxies*, Whalen, D.W., Van Veelen, B., **O'Shea, B.W.**, & Norman, M.L., [Proceedings of IAUS #255: Low Metallicity Star Formation: from the First Stars to the First Galaxies](#), Eds. L.K. Hunt, S. Madden, & R. Schneider, 2008 (arXiv: 0808.0524)
10. *First Stars III Conference Summary*, **O'Shea, B.W.**, McKee, C., Heger, A., & Abel, T. In [Proceedings of First Stars III](#), Eds. B. O'Shea, A. Heger & T. Abel, 2008, AIP conference proceedings series #990, pp. xiii-xxiii
9. *Toward Forming a Primordial Star in a Cosmological AMR Simulation*, Turk, M., Abel, T., & **O'Shea, B.W.** In [Proceedings of First Stars III](#), Eds. B. O'Shea, A. Heger & T. Abel, 2008, AIP conference proceedings series #990, pp. 16-20
8. *The Role of the First Metals in Forming the Second Stars*, Smith, B., Sigurdsson, S., **O'Shea, B.W.** & Norman, M.L. In [Proceedings of First Stars III](#), Eds. B. O'Shea, A. Heger & T. Abel, 2008, AIP conference proceedings series #990, pp. 73-75
7. *Photoionization of Clustered Halos by the First Stars*, Whalen, D. , **O'Shea, B.W.**, Smidt, B. & Norman, M.L. In [Proceedings of First Stars III](#), Eds. B. O'Shea, A. Heger & T. Abel, 2008, AIP conference proceedings series #990, pp. 381-385

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6. *Simulating Cosmological Evolution with Enzo*, Norman, M.L., Bryan, G., Harkness, R., Border, J., Reynolds, D., **O'Shea, B.W.**, Wagner, R. In *Petascale Computing: Algorithms and Applications*, Ed. David Bader, CRC Press, 2007
5. *AMR simulations of the Cosmological Light Cone: SZE Surveys of the Synthetic Universe*, Hallman, E.J., **O'Shea, B.W.**, Norman, M.L., Wagner, R., and Burns, J.O. In *Proceedings of Heating vs. Cooling in Galaxies and Clusters of Galaxies, MPA/ESO/MPE/USM Joint Astronomy Conference*, Eds. H. Boehringer, P. Schuecker, G.W. Pratt & A. Finoguenov, Springer-Verlag, 2007
4. *Forming a Primordial Star in a Relic HII Region*, **O'Shea, B.W.**, Abel, T., Whalen, D. & Norman, M.L. In *Proceedings of the International Astronomical Union Symposium 228 – From Lithium to Uranium: Elemental Tracers of Early Cosmic Evolution*, Eds. V. Hill, P. Francois & F. Primas, Cambridge University Press, 2005
3. *Introducing Enzo, an AMR Cosmology Application*, **O'Shea, B.W.**, Bryan, G., Bordner, J., Norman, M.L., Abel, T., Harkness, R. & Kritsuk, A. In *Adaptive Mesh Refinement – Theory and Applications*, Eds. T. Plewa, T. Linde & V.G. Weirs, Springer Lecture Notes in Computational Science and Engineering, 2004
2. *Towards Optimizing Enzo, an AMR Cosmology Application*, Bordner, J., Bryan, G., Harkness, R., Kritsuk, A., Norman, M.L. & **O'Shea, B.W.** In *Adaptive Mesh Refinement – Theory and Applications*, Eds. T. Plewa, T. Linde & V.G. Weirs, Springer Lecture Notes in Computational Science and Engineering, 2004
1. *Studying Dark Energy with Galaxy Cluster Simulations*, Mohr, J., **O'Shea, B.W.**, Evrard, A., Bialek, J. & Haiman, Z. in *Proceedings of Dark Matter 2002*

White Papers and Technical Reports

5. *Snowmass Computing Frontier: Computing for the Cosmic Frontier, Astrophysics, and Cosmology*. A. Connolly, S. Habib, A. Szalay, J. Borrill, G. Fuller, N. Gnedin, K. Heitmann, D. Jacobs, D. Lamb, T. Mezzacappa, B. Messer, S. Myers, B. Nord, P. Nugent, **B.W. O'Shea**, P. Ricker, M. Schneider. 2013. Snowmass working group report. ([arXiv:1311.2841](https://arxiv.org/abs/1311.2841))
4. *Dissecting the Epoch of Reionization with Discrete, Embedded Sources*. White Paper for the 2010 Astronomy Decadal Review. Lead author: Jason Prochaska, UC Santa Cruz. 2009 ([ADS link](#))
3. *Tracing the cosmic star formation history to its beginnings: Gamma ray bursts as tools*. White Paper for the 2010 Astronomy Decadal Review. Lead author: Dieter Hartmann, Clemson U. 2009 ([ADS link](#))
2. *Nuclei in the cosmos*. White Paper for the 2010 Astronomy Decadal Review. Lead author: Ed Brown, MSU. 2009 ([ADS link](#))
1. *First light sources at the end of the dark ages: Direct observations of Pop III stars, proto-galaxies, and supernovae during the reionization epoch*. White Paper for the 2010 Astronomy Decadal Review. Lead authors: Jeff Cooke and Asantha Cooray, UC Irvine. 2009 ([ADS link](#))

Invited Conference Talks, Seminars, and Colloquia

2015:

1. Florida State University Physics Colloquium, February 2015
2. Arizona State University cosmology seminar, February 2015
3. U. Illinois (Urbana-Champaign) Astronomy Colloquium, March 2015
4. NCSA Director's Colloquium, March 2015
5. JINA Frontiers Meeting, March 2015
6. U. Michigan Galaxy Cluster seminar, April 2015
7. APS April Meeting, D. Comp. Phys. Invited talk, April 2015
8. U. Michigan Astronomy Colloquium, April 2015
9. U. Michigan Education Research seminar, April 2015
10. NCSA Blue Waters Symposium, May 2015

2014:

1. Notre Dame Circumgalactic Medium workshop, January 2014
2. UC Irvine Near Field/Far Field Connection conference, February 2014
3. U. Wisconsin Astronomy Colloquium, March 2014
4. Blue Waters Symposium, UIUC, May 2014
5. Quenching & Quiescence Conference, Heidelberg, July 2014
6. Intracluster medium theory and simulation workshop, Copenhagen, August 2014
7. HEP/astrophysics seminar, U. Michigan, September 2014
8. Purdue University astrophysics seminar, November 2014
9. Indiana University Astronomy Colloquium, November 2014
10. Georgia Institute of Technology astrophysics seminar, December 2014

2013:

1. University of Chicago Astrophysics Colloquium, Mar. 2013
2. NCSA Private Sector Partnership meeting, May 2013
3. Aspen Center for Physics workshop on Milky Way formation, July 2013
4. MSU Physics Colloquium, September 2013
5. Lyman Briggs College faculty seminar, November 2013

2012:

1. U. Kentucky astronomy colloquium, Feb. 2012
2. U. Kentucky Center for Computational Sciences Seminar, Feb. 2012
3. Case Western Reserve University, astronomy colloquium, Feb. 2012
4. Ohio State Astronomy Colloquium, Feb. 2012
5. Ohio State physics education seminar, Feb. 2012
6. University of Colorado Astronomy colloquium, March 2012
7. University of Washington Astronomy Colloquium, April 2012
8. Numerical Cosmology 2012, Cambridge, England: **Review talk**, "Comparisons of grid and particle-based methods for cosmological hydrodynamics," July 2012
9. University of Chicago Community Code workshop, "The Enzo community code," September 2012

2011:

1. At "3rd Subaru International Conference," Shuzenji, Japan, Nov. 2011
2. MSU Institute for Cyber-Enabled Research interdisciplinary seminar, Nov. 2011
3. National Institute for Computational Science Director's colloquium, Oak Ridge National Laboratory, October 2011
4. University of Michigan galaxy formation seminar, Sep. 2011
5. MSU ArtScience symposium, June 2011
6. Harvard CfA Institute for Theory and Computation seminar, May 2011

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7. Los Alamos National Laboratory astrophysics seminar, May 2011
8. Two invited lectures on N-body simulations in cosmology, TIARA computational astrophysics summer school, Taiwan, Jan. 2011

2010:

1. Michigan State University Galaxy formation seminar, June 2010
2. "The First Stars and Galaxies: Challenges for the Next Decade," University of Texas, Austin, March 2010

2009:

1. "Extreme star formation in dwarf galaxies," University of Michigan, Ann Arbor, July 2009
2. University of Minnesota astronomy colloquium, April 2009
3. University of Minnesota stellar evolution seminar, April 2009

2008:

1. Michigan State University astronomy seminar, Nov. 2008
2. University of Michigan astronomy colloquium, October 2008
3. UC Santa Cruz astronomy colloquium, April 2008
4. Stanford University ACKS seminar, April 2008
5. Michigan State University astronomy seminar, January 2008

2007:

1. University of Chicago astrophysics seminar, Nov. 2007
2. Seminar given "Star formation through cosmic time" workshop, hosted by KITP, UC Santa Barbara, Oct. 2007
3. Fermi National Accelerator Laboratory astrophysics seminar, Sept. 2007
4. University of Notre Dame astrophysics seminar, Sept. 2007
5. Talk given at "Star formation through cosmic time" conference, hosted by KITP, UC Santa Barbara, August 2007
6. Santa Fe Cosmology Workshop, hosted by Los Alamos National Laboratory – **review talk.** July 2007
7. Keele University astrophysics seminar, June 2007
8. University of Central Lancashire astrophysics seminar, June 2007
9. University College London Computational science lecture series, June 2007
10. University College London astrophysics colloquium, June 2007
11. University of New Mexico Institute for Advanced Studies seminar, April 2007

2006 and before:

1. University of Florida astronomy seminar, Dec. 2006
2. University of New Mexico particle physics seminar, Nov. 2006
3. Columbia University astronomy seminar, Oct. 2006
4. American Museum of Natural History astrophysics seminar, Oct. 2006
5. Los Alamos National Laboratory astrophysics seminar, Sept. 2006
6. At "Physics and astrophysics of supermassive black holes," hosted by Los Alamos National Laboratory, July 2006
7. At "First Stars," a workshop hosted by the Institute for Nuclear Theory, University of Washington, July 2006
8. University of Colorado at Boulder JILA seminar, April 2006
9. UC Berkeley astrophysics lunch seminar, Nov. 2005
10. Stanford astrophysics lunch seminar, Nov. 2005
11. At "SF05 Cosmology Summer Workshop," hosted by Los Alamos National Laboratory, Santa Fe, NM, July 2005
12. At "Chemical Enrichment of the Early Universe," hosted by Los Alamos National Laboratory, Santa FE, NM, August 2004
13. At "A workshop on adaptive mesh refinement methods in cosmology," University of Durham,

England, June 2004

Contributed Conference Talks and Posters

2012:

1. At the 2012 Joint Space Science Institute workshop on "Nature's particle accelerators," Oct. 22-25, 2012, Annapolis, MD (talk)

2011:

1. At 2011 Enzo Workshop, October 2011 (talk)
2. At "TeraGrid 2011," July 2011 (talk)
3. Kavli Institute for Theoretical Astrophysics galaxy cluster formation conference, March 2011 (poster)

2010:

1. At "Teragrid 2010", Pittsburgh, PA, August 2010 (talk)
2. At "From first stars to galaxies," University of Florida, Gainesville, April 2010 (talk)

2009:

1. At "The Monster's Fiery Breath," University of Wisconsin, Madison, June 2009 (talk)

2008:

1. At "The Warm and Hot Universe," Columbia University, New York, April 2008 (talk)
2. At the American Astronomical Society 211th meeting, Austin, TX, Jan. 2008. (1 talk, 1 poster)

2007:

1. At "Radio surveys: science and techniques," Los Alamos, NM, April 2007 (talk)
2. At "A new zeal for old galaxies," Rotorua, New Zealand, March 2007 (talk)

2006 and before:

1. At the Space Telescope Science Institute May Symposium on "Massive stars, from Pop III and GRBs to the Milky Way," Baltimore, MD, May 2006 (2 posters)
2. At the Space Telescope Science Institute mini-workshop on "The End of the Dark Ages," Baltimore, MD, March 2006 (1 talk, 1 poster)
3. At "Protostars and Planets V," Hawaii, October 2006 (poster)
4. At "International Astronomical Union Symposium 228 - From Lithium to Uranium: Early Tracers of Cosmic Chemical Evolution," Paris, France, May 2005 (poster)
5. At the 205th meeting of the American Astronomical Society, Jan. 2005, San Diego, CA (talk)
6. At the "1st Arizona-Heidelberg Symposium: The High Redshift Frontier," Tucson, AZ, Nov. 2004 (talk)
7. At "A Workshop on Adaptive Mesh Refinement Methods in Cosmology," University of Durham, June 2004 (talk)
8. At the "3rd Annual Theoretical Astrophysics in Southern California (TASC) Meeting," UCLA, October 2003 (talk)
9. At the "Chicago Workshop on Adaptive Refinement Methods," University of Chicago, Sept. 2003 (talk)
10. At the "3rd Annual Theoretical Astrophysics in Southern California (TASC) Meeting," Santa Barbara, CA, October 2002 (talk)

Popular Publications, Presentations, Animations, and Press Releases

My involvement with the NSF/NCSA Blue Waters supercomputing project was featured in the journal Science: <http://www.sciencemag.org/content/334/6059/1044.full?sid=ae89a597-2047-4d05-9e1f-ba298705889a>

The visualization "Evolution of a Galaxy Cluster in Adaptive Mesh Refinement Simulations" took 3rd place at the 2010 SciDAC Visualization Night competition. Work done with Sam Skillman (CU/Boulder) and Matthew Turk (UC San Diego).

"More realistic simulations of galaxy clusters," NSF Highlights, Spring 2010. This was an NSF highlight focusing on galaxy cluster simulations that I am doing with Sam Skillman (CU/Boulder), Jack Burns (CU/Boulder), and Eric Hallman (Harvard-Smithsonian Center for Astrophysics)

"Leaving the dark days," by J. William Bell. In NCSA Access, Fall 2009. This is an article about my petascale supercomputing work with the Blue Waters project.

"MSU researcher contributes to knowledge of how early stars, galaxies formed." MSU press release, July 9, 2009. Similar press releases appeared at Stanford University and SLAC, and articles appeared in New Scientist, space.com, Science News, Symmetry Magazine, Science Daily, The Universe Today, the State News, and other sources.

"The secret lives of galaxies," popular talk at Abrams Planetarium, Feb. 19th, 2009 (as part of MSU Astronomical Horizons series). This talk was accompanied by an interview on Impact 89 FM, the MSU radio station.

"Zooming in on galaxy formation", International Science Grid This Week, July 23, 2008.

"In the beginning: SDSC and NCSA help simulate the early universe in unprecedented detail." SDSC press release, July 2008.

"Supercomputer Simulations of Universe May Help in Search for Missing Matter," In "Science Daily" for Dec. 7, 2007. An article on my large-volume light cone simulations.

"CU-Boulder Supercomputer Simulation of Universe Expected to Help in Search For Missing Matter," University of Colorado at Boulder press release, Dec. 6, 2007

"Image of the week - In the beginning." In "International Science Grid This Week," December 2007. An article on my large-volume light cone simulations.

"Looking Back in Time." In "SDSC: Envisioning The Future." An article on my large-volume light cone simulations, written for SDSC's 2007 book of research highlights.

"Monster of the Milky Way." Animations from simulations done in collaboration with Michael Norman will be shown in this PBS Nova special, which will first air on October 31, 2006.

"Black Holes: The Other Side of Infinity." Animations from simulations done in collaboration with Michael Norman are being shown in this Denver Museum of Nature and Science planetarium show, which premiered in Fall 2005 and is now being shown nationwide.

SigGraph 2005. Visualizations from a simulation done in collaboration with Michael Norman was featured at the SigGraph 2005 Computer Animation Festival in Los Angeles, CA in August 2005.

DomeFest 2005. Visualizations from a simulation done in collaboration with Michael Norman premiered at DomeFest 2005 in Albuquerque, NM. The show then toured the country and was shown on planetarium domes in many major cities.

Science Grid This Week, May 2005. Images from a simulation done in collaboration with Michael Norman, as well as an interview, are published in this online magazine.

SDSC Press Room, April 2005. A press release describing a ground-breaking simulation done in collaboration with Michael Norman was featured on the front page of the San Diego Supercomputing Center home page.

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"Origins." Animations made from simulations done in collaboration with Michael Norman are shown on this PBS Nova special, which originally aired on September 28 & 29, 2005

National Geographic, February 2003. Images from simulations in collaboration with Michael Norman are shown in the cover article, "Galaxy Hunters: The Search For Cosmic Dawn."

"Unfolding Universe." Animations made from simulations done in collaboration with Michael Norman are shown in this Discovery Channel special, which originally aired on June 3, 2002

"The Runaway Universe." Animations made from simulations done in collaboration with Michael Norman and Greg Bryan are shown in this PBS Nova special, which originally aired on November 11, 2000