

Department of Physics  
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# Jeffrey Satoshi Oishi

## Education

- 2007 **Ph.D.**, *University of Virginia*, Astronomy.
- 2000 **B.S.**, *Columbia University*, Applied Physics.

## Experience

- 2016–present **Assistant Professor of Physics**, *Bates College*, Lewiston, ME.
- 2014–2016 **Assistant Professor of Physics**, *Farmingdale State College*, Farmingdale, NY.
- 2014–present **Research Associate**, *American Museum of Natural History*, New York, NY.
- 2012–2014 **Research Scientist**, *American Museum of Natural History*, New York, NY.
- 2010–2012 **Postdoctoral Fellow**, *Kavli Institute for Particle Astrophysics and Cosmology*, *Stanford University*, Stanford, CA.
- 2008–2010 **Postdoctoral Fellow**, *University of California, Berkeley*, Berkeley, CA.

## Grants Awarded

- 2017-2018 **Research Corporation Scialog Grant**, \$50,000, PI.  
“The Stellar MRI”
- 2017-2018 **Maine Space Grant Consortium**, \$22,495, Co-I.  
“Integration of Research into Undergraduate STEM Curriculum”
- 2016-2019 **NASA LWS Program**, \$960,131 (*Bates portion: \$114,483*), Bates PI.  
“Stellar Insights into Solar Magnetism: Exploring Fundamental Dynamo Physics Across the Lower Main Sequence”  
Grant number NNX16AC92G.

## Computer Time Awarded

- 2016 **NASA Pleiades**, 22 Million CPU Hours.
- 2015 **NASA Pleiades**, 8 Million CPU Hours.
- 2014 **CU Janus**, 4 Million CPU Hours.
- 2012 **NSF XSEDE**, 1.6 Million CPU hours.

## Awards

- 2016 **Scialog Fellow**, Research Corporation.
- 2007 **Graduate Student Paper Prize**, Astronomical Society of New York.
- 2006 **Anette Kade Graduate Fellowship**, American Museum of Natural History.
- 2003 **Graduate Teaching Award**, University of Virginia, Department of Astronomy.

## Students Mentored

### Graduate

- 2013–2017 **Susan Clark**, Columbia University, Astronomy.  
working on weakly nonlinear magnetorotational instability (now at Institute for Advanced Study)

### Undergraduate

- 2017– **Michael Bancroft**, Bates College, Physics.  
Developing MHD  $\beta$ -plane simulations
- 2016–2017 **William Sheehan**, Bates College, Physics.  
Constructed a comprehensive test suite for Dedalus
- 2016–2017 **Charles Colony**, Bates College, Physics.  
Performed periodic  $\beta$ -plane test simulations
- 2016–2017 **Matthew Parrino**, Bates College, Physics.  
Developed sparse eigenvalues for Dedalus
- 2016 **Jaskarun Pabla**, Farmingdale State College, Applied Math.  
worked on Taylor-Couette magnetorotational stability
- 2016 **Jose Nicasio**, Farmingdale State College, Mechanical Engineering Technology.  
worked on Taylor-Couette magnetorotational stability

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- 2015–2016 **Rayhan Morales Castro**, *Farmingdale State College*, Electrical Engineering Technology.  
worked on magnetic reconnection
- 2014–2015 **Chris Hunter**, *Farmingdale State College*, (transferred to MIT).  
worked on Dedalus Project test suite
- 2013 **Moeko Tamura**, *Barnard College*, Physics.  
developed magnetic reconnection data analysis pipeline
- 2012 **Devan Conroy**, *Fairfield University*, Math.  
implemented wavelet-based turbulence analysis method
- 2011–2012 **Keaton Burns**, *UC Berkeley*, Applied Math/Physics/Astronomy.  
contributor to the Dedalus Project; now lead developer
- 2011 **Greg Peairs**, *Stanford University*, Physics.  
worked on initial conditions for cosmological simulations

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## Invited Talks

- 2017 Physics Colloquium, University of Maine, Orono
- 2017 Black Hole Initiative Colloquium, Harvard University
- 2016 Physics Colloquium, CUNY LaGuardia Community College
- 2015 Physics Colloquium, Bates College
- 2015 School of Arts and Sciences Colloquium, Farmingdale State College
- 2015 New York Area Computational Astrophysics Group Meeting
- 2015 Astronomy Colloquium, Adler Planetarium
- 2015 Scientific Python Group, Leeds University
- 2014 KITP Program: Wave-Flow Interaction in Geophysics, Climate, Astrophysics, and Plasmas, Santa Barbara, CA
- 2013 Pencil Code Meeting, Lund, Sweden
- 2013 Astronomy Colloquium, Niels Bohr International Academy
- 2013 Wednesday Lunch Talk, Princeton University
- 2012 Astronomy Colloquium, University of Michigan
- 2012 Astronomy Colloquium, Michigan State University
- 2012 Instabilities and Structures in Protoplanetary Disks, Marseille, France
- 2012 Instructor, yt Workshop, FLASH Center, University of Chicago
- 2011 Astronomy Seminar, NASA Ames
- 2011 Compressible Turbulence at the Intersection of Astrophysics and Engineering, Santa Fe, NM
- 2011 Partially Ionized Plasmas Throughout the Cosmos, Nashville, TN
- 2011 Colloquium, Canadian Institute for Theoretical Astrophysics
- 2009 Tea Talk, Kavli Institute for Particle Astrophysics and Cosmology

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2006 ISM seminar, Princeton University

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## Service

- 2016-present Referee, Journal of Fluid Mechanics
- 2015-2016 Organizer, New York Area Computational Astrophysics Group
- 2015-present Panelist, NSF Division of Advanced Cyberinfrastructure
- 2013-present Panelist, NSF Division of Astronomical Science
- 2013-present Panelist, NASA Heliophysics and Astrophysics Theory Program
- 2013-present Referee, Monthly Notices of the Royal Astronomical Society
- 2012-present Referee, Astrophysical Journal Letters
- 2009-present Referee, Astrophysical Journal
- 2008-present Member, yt development team, an open-source, multi-platform data analysis and visualization toolkit (<http://yt-project.org>)

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## Courses Taught

### At Bates

- PHYS107 Classical Physics
- PHYSs10 Basic Computational Science Lab Skills
- PHYS412 Advanced Classical Mechanics
- PHYS216 Computational Physics

### At Farmingdale

- PHY117 Solar system astronomy
- PHY121 Classical physics for non majors
- PHY123 Particle physics & cosmology for non-majors
- PHY125/126 Physics lab for non-majors
- PHY135 Introductory algebra-based mechanics (lecture & lab)
- PHY323 Advanced electrodynamics
- PHY333 Modern physics

### Elsewhere

- "Constructing the Laws of Nature", Eugene Lang College
- "Watching Flows: Visualization in Astrophysics", School of the Art Institute of Chicago
- ASTR122 Introduction to the Stars, Galaxies, and the Universe, University of Virginia

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## References

### Mordecai Mark-Mac Low

Curator and Professor  
Department of Astrophysics  
American Museum of Natural History  
212-496-3443  
mordecai@amnh.org

### Tom Abel

Director  
Kavli Institute for Particle Astrophysics  
and Cosmology  
Stanford University  
650-926-2421  
tabel@slac.stanford.edu

### Ben Brown

Assistant Professor  
Department of Astrophysical & Planetary  
Sciences  
University of Colorado, Boulder  
303-492-8647  
Benjamin.P.Brown@colorado.edu

### Matthew Turk

Assistant Professor and DXL Group  
Leader  
Department of Astronomy and School of  
Information Sciences  
University of Illinois  
matthewturk@gmail.com

## Publications

22 refereed; 1605 citations; h-index 14 (via NASA ADS)

### Refereed

- 2017 A. L. Rosen, M. R. Krumholz, **J. S. Oishi**, A. T. Lee, and R. I. Klein. Hybrid Adaptive Ray-Moment Method (HARM<sup>2</sup>): A highly parallel method for radiation hydrodynamics on adaptive grids. *Journal of Computational Physics*, 330:924–942, February 2017.
- S. E. Clark and **J. S. Oishi**. The Weakly Nonlinear Magnetorotational Instability in a Local Geometry. *ApJ*, 841:1, May 2017.
- S. E. Clark and **J. S. Oishi**. The Weakly Nonlinear Magnetorotational Instability in a Global, Cylindrical Taylor-Couette Flow. *ApJ*, 841:2, May 2017.
- 2016 G. M. Vasil, K. J. Burns, D. Lecoanet, S. Olver, B. P. Brown, and **J. S. Oishi**. Tensor calculus in polar coordinates using Jacobi polynomials. *J. Comput. Phys.*, 325:53–73, November 2016.
- D. Lecoanet, J. Schwab, E. Quataert, L. Bildsten, F. X. Timmes, K. J. Burns, G. M. Vasil, **J. S. Oishi**, and B. P. Brown. Turbulent Chemical Diffusion in Convectively Bounded Carbon Flames. *ApJ*, 832(1):71, November 2016.
- D. Lecoanet, M. McCourt, E. Quataert, K. J. Burns, G. M. Vasil, **J. S. Oishi**, B. P. Brown, J. M. Stone, and R. M. O’Leary. A validated non-linear Kelvin-Helmholtz benchmark for numerical hydrodynamics. *MNRAS*, 455:4274–4288, February 2016.
- 2015 **J. S. Oishi**, M.-M. Mac Low, D. C. Collins, and M. Tamura. Self-generated Turbulence in Magnetic Reconnection. *ApJ*, 806:L12, June 2015.
- D. Lecoanet, M. Le Bars, K. J. Burns, G. M. Vasil, B. P. Brown, E. Quataert, and **J. S. Oishi**. Numerical simulations of internal wave generation by convection in water. *Phys. Rev. E*, 91(6):063016, June 2015.
- 2014 D. Lecoanet, B. P. Brown, E. G. Zweibel, K. J. Burns, **J. S. Oishi**, and G. M. Vasil. Conduction in Low Mach Number Flows. I. Linear and Weakly Nonlinear Regimes. *ApJ*, 797:94, December 2014.
- G. L. Bryan, M. L. Norman, B. W. O’Shea, T. Abel, J. H. Wise, M. J. Turk, D. R. Reynolds, D. C. Collins, P. Wang, S. W. Skillman, B. Smith, R. P. Harkness, J. Bordner, J.-h. Kim, M. Kuhlen, H. Xu, N. Goldbaum, C. Hummels, A. G. Kritsuk, E. Tasker, S. Skory, C. M. Simpson, O. Hahn, **J. S. Oishi**, G. C. So, F. Zhao, R. Cen, Y. Li, and Enzo Collaboration. ENZO: An Adaptive Mesh Refinement Code for Astrophysics. *ApJS*, 211:19, April 2014.
- 2012 M. J. Turk, **J. S. Oishi**, T. Abel, and G. L. Bryan. Magnetic Fields in Population III Star Formation. *ApJ*, 745:154, February 2012.
- J.-C. Passy, O. De Marco, C. L. Fryer, F. Herwig, S. Diehl, **J. S. Oishi**, M.-M. Mac Low, G. L. Bryan, and G. Rockefeller. Simulating the Common Envelope Phase of a Red Giant Using Smoothed-particle Hydrodynamics and Uniform-grid Codes. *ApJ*, 744:52, January 2012.

- 2011 M. J. Turk, B. D. Smith, **J. S. Oishi**, S. Skory, S. W. Skillman, T. Abel, and M. L. Norman. yt: A Multi-code Analysis Toolkit for Astrophysical Simulation Data. *ApJS*, 192:9, January 2011.
- J. S. Oishi** and M.-M. Mac Low. Magnetorotational Turbulence Transports Angular Momentum in Stratified Disks with Low Magnetic Prandtl Number but Magnetic Reynolds Number above a Critical Value. *ApJ*, 740:18, October 2011.
- 2010 P. Chang and **J. S. Oishi**. On the Stability of Dust-laden Protoplanetary Vortices. *ApJ*, 721:1593–1602, October 2010.
- 2009 **J. S. Oishi** and M.-M. Mac Low. On Hydrodynamic Motions in Dead Zones. *ApJ*, 704:1239–1250, October 2009.
- 2008 J. L. Maron, M.-M. Mac Low, and **J. S. Oishi**. A Constrained-Transport Magnetohydrodynamics Algorithm with Near-Spectral Resolution. *ApJ*, 677:520–529, April 2008.
- 2007 **J. S. Oishi**, M.-M. Mac Low, and K. Menou. Turbulent Torques on Protoplanets in a Dead Zone. *ApJ*, 670:805–819, November 2007.
- M.-M. Mac Low, J. Toraskar, **J. S. Oishi**, and T. Abel. Dynamical Expansion of H II Regions from Ultracompact to Compact Sizes in Turbulent, Self-gravitating Molecular Clouds. *ApJ*, 668:980–992, October 2007.
- A. Johansen, **J. S. Oishi**, M.-M. Mac Low, H. Klahr, T. Henning, and A. Youdin. Rapid planetesimal formation in turbulent circumstellar disks. *Nature*, 448:1022–1025, August 2007.
- 2006 **J. S. Oishi** and M.-M. Mac Low. The Inability of Ambipolar Diffusion to Set a Characteristic Mass Scale in Molecular Clouds. *ApJ*, 638:281–285, February 2006.
- 2003 R. A. Chevalier and **J. Oishi**. Cassiopeia A and Its Clumpy Presupernova Wind. *ApJ*, 593:L23–L26, August 2003.
- Unrefereed**
- 2016 K. Burns, B. Brown, D. Lecoanet, **J. Oishi**, and G. Vasil. Dedalus: Flexible framework for spectrally solving differential equations. Astrophysics Source Code Library, March 2016.
- B. Brown, D. Lecoanet, **J. S. Oishi**, K. Burns, and G. M. Vasil. Tachocline dynamics: convective overshoot at stiff interfaces. In *AAS/Solar Physics Division Meeting*, volume 47 of *AAS/Solar Physics Division Meeting*, page 7.13, May 2016.
- 2015 **J. S. Oishi** and K. Menou. Magnetorotational instability in the presence of composition gradients. In *American Astronomical Society Meeting Abstracts*, volume 225 of *American Astronomical Society Meeting Abstracts*, page #133.04, January 2015.
- J. Oishi**, K. Burns, B. Brown, D. Lecoanet, and G. Vasil. The Non-linear Saturation of the Goldreich-Schubert-Fricke Instability. In *APS Meeting Abstracts*, November 2015.

- D. Lecoanet, M. Le Bars, K. J. Burns, G. M. Vasil, E. Quataert, B. P. Brown, and **J. Oishi**. Internal Wave Generation by Turbulent Convection. *AGU Fall Meeting Abstracts*, December 2015.
- D. Lecoanet, M. Le Bars, K. Burns, G. Vasil, E. Quataert, B. Brown, and **J. Oishi**. Convective Excitation of Internal Waves. In *APS Meeting Abstracts*, November 2015.
- B. Brown, K. Burns, D. Lecoanet, **J. Oishi**, and G. Vasil. Stratified Convection in Stellar Interiors. In *American Astronomical Society Meeting Abstracts*, volume 225 of *American Astronomical Society Meeting Abstracts*, page 138.15, January 2015.
- 2014 **J. S. Oishi**, M. Mac Low, and D. C. Collins. Self-generated Three Dimensional Turbulence in Magnetic Reconnection Layers Sharply Increases Reconnection Rates. In *American Astronomical Society Meeting Abstracts #223*, volume 223 of *American Astronomical Society Meeting Abstracts*, page #118.05, January 2014.
- D. Lecoanet, E. Quataert, G. M. Vasil, B. P. Brown, and **J. Oishi**. Simulations of Convective Excitation of Internal Waves in Water. *AGU Fall Meeting Abstracts*, page A3790, December 2014.
- 2013 **J. S. Oishi** and P. Chang. Methods for Simulating the Heavy Core Instability. In *European Physical Journal Web of Conferences*, volume 46 of *European Physical Journal Web of Conferences*, page 6001, April 2013.
- 2012 M. J. Turk, **J. S. Oishi**, T. Abel, and G. L. Bryan. Magnetic fields and angular momentum in population III star formation. In M. Umemura and K. Omukai, editors, *American Institute of Physics Conference Series*, volume 1480 of *American Institute of Physics Conference Series*, pages 77–80, September 2012.
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- D. S. Ebel, A. Hubbard, C. McNally, M.-M. Mac Low, **J. Oishi**, and J. Maron. Chondrule Formation, Complementarity, and Pervasive, Highly Local Heating by Current Sheets. *Meteoritics and Planetary Science Supplement*, 75:5387, September 2012.
- O. De Marco, J.-C. Passy, F. Herwig, C. L. Fryer, M.-M. Mac Low, and **J. S. Oishi**. How Common Envelope Interactions Change the Lives of Stars and Planets. In M. T. Richards and I. Hubeny, editors, *IAU Symposium*, volume 282 of *IAU Symposium*, pages 517–520, April 2012.
- 2011 J.-C. Passy, C. L. Fryer, S. Diehl, O. De Marco, M. Mac Low, F. Herwig, and **J. S. Oishi**. Comparisons Between SPH and Grid-Based Simulations of the Common Envelope Phase. In *American Astronomical Society Meeting Abstracts #217*, volume 43 of *Bulletin of the American Astronomical Society*, page #144.18, January 2011.



- J.-C. Passy, O. De Marco, C. L. Fryer, F. Herwig, S. Diehl, **J. S. Oishi**, M.-M. Mac Low, G. L. Bryan, and G. Rockefeller. Simulations of the Common Envelope Interaction Between a Red Giant Branch Star and Low-Mass Companions. In L. Schmidtbreick, M. R. Schreiber, and C. Tappert, editors, *Evolution of Compact Binaries*, volume 447 of *Astronomical Society of the Pacific Conference Series*, page 107, September 2011.
- J. S. Oishi** and M.-M. Mac Low. Magnetic Helicity and Astrophysical Disk Dynamos. In V. Florinski, J. Heerikhuisen, G. P. Zank, and D. L. Gallagher, editors, *American Institute of Physics Conference Series*, volume 1366 of *American Institute of Physics Conference Series*, pages 122–128, September 2011.
- T. Abel, M. Turk, J. Wise, **J. Oishi**, J. Kim, P. Wang, and M. Alvarez. The first stars and black holes. In *Galaxy Formation*, page 89, July 2011.
- 2010 M. J. Turk, B. D. Smith, **J. S. Oishi**, S. Skory, S. W. Skillman, T. Abel, and M. L. Norman. yt: A Multi-Code Analysis Toolkit for Astrophysical Simulation Data. Astrophysics Source Code Library, November 2010.
- J. S. Oishi**, C. McKee, and R. Klein. Numerical Methods for Radiative Feedback from the First Stars: Ionization in Adaptive Mesh Refinement Simulations. In D. J. Whalen, V. Bromm, and N. Yoshida, editors, *American Institute of Physics Conference Series*, volume 1294 of *American Institute of Physics Conference Series*, pages 270–271, November 2010.
- 2009 R. Chornock, J. S. Bloom, S. B. Cenko, J. M. Silverman, A. V. Filippenko, M. D. Hicks, K. J. Lawrence, P. Chang, J. M. Comerford, M. R. George, M. Modjaz, **J. S. Oishi**, E. Quataert, and L. E. Strubbe. SDSS J1536+0441: An Extreme "Double-peaked Emitter," Not a Binary Black Hole. *The Astronomer's Telegram*, 1955:1, March 2009.
- 2006 **J. S. Oishi**, M. Mac Low, and K. Menou. Turbulent Torques on Protoplanets in a Dead Zone. In *American Astronomical Society Meeting Abstracts*, volume 38 of *Bulletin of the American Astronomical Society*, page #179.03, December 2006.
- 2005 **J. S. Oishi**, M.-M. Mac Low, and K. Menou. Protoplanetary Migration in Layered, Magnetized Disks: First Results. In *Protostars and Planets V Posters*, page 8439, 2005.
- 2004 **J. S. Oishi** and M.-M. Mac Low. The Inability of Ambipolar Diffusion to Set the Inner Scale of Density and Energy in Molecular Clouds. In *American Astronomical Society Meeting Abstracts*, volume 36 of *Bulletin of the American Astronomical Society*, page 1439, December 2004.
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