

## David M. Goldberg

Drexel University Department of Physics  
Philadelphia, PA 19104  
215-205-4089  
*goldberg@drexel.edu*

### ACADEMIC APPOINTMENTS:

#### *Current*

July 2014 - **Associate Dean for Research and Graduate Education**  
*present* Drexel University College of Arts and Sciences  
September 2015 - **Associate Head for Undergraduate Studies** (Promotion of Title)  
*present* Drexel University Department of Physics  
September 2012 - **Professor**  
*present* Drexel University Department of Physics

#### *Prior*

2007-2015 **Director of Undergraduate Studies**  
Drexel University Department of Physics  
2008-2009 **Associate Dean for Graduate Education and Research** (Scheduled Interim Appointment)  
Drexel University College of Arts and Sciences  
2007-2012 **Associate Professor**  
Drexel University Department of Physics  
2001-2007 **Assistant Professor**  
Drexel University Department of Physics  
2000-2001 **Gibbs Lecturer in Astronomy**  
Yale University Department of Astronomy

### EDUCATION:

August 2000 **Ph.D.** Princeton University, Astrophysics  
"Using Perturbative Least Action to Run Simulations Backwards in Time"  
Dr. David N. Spergel, adviser  
June 1998 **M.A.** Princeton University, Astrophysics  
June 1996 **B.A.** Boston University, Astronomy and Physics  
Minors in Mathematics and Religion  
Summa cum Laude with Distinction

### DREXEL HONORS AND AWARDS:

- Rothwarf Award for Teaching Excellence (2005)
- 10<sup>6</sup> Club for grants totaling \$1 Million. (2003-2004)

### SPONSORED RESEARCH:

#### *Funded Grants:*

1. "Experiential Learning through the Cooperative Education Lifecycle (ExCEL)" Internal Competition: Drexel Areas of Research Excellence (DARE). (2016-2018). Co-I.
2. "Where is the Information in Cluster Lensing?" Funded by NSF Astronomy and Astrophysics. (2009-2013). Total Award: \$150,000. PI.
3. "BASIN: Beowulf Analysis Symbolic INterface." (2007-2009) Time allocation of 30,000 processing hours by the National Center for Supercomputing Applications, CyberInfrastructure Partnership. Co-I.
4. "Galaxy Flexion-Gravitational Lensing to Second Order." Funded by NASA Astrophysics Theory Program. (2005-2009). Total Award: \$274,127. PI.
5. "Urban Astronomy in Philadelphia: Hands-On Student Observing and Teacher Enrichment ." Funded by NASA Education/Public Outreach supplemental program. (2005-2008). Total Award: \$45K. PI.

6. "ITR: Beowulf Analysis Symbolic INterface." Funded by the NSF Information Technology Research program. (2003-2008). Total Award: \$1.4M. Co-I.
7. "Measuring Gravitational Flexion in ACS Clusters." Funded by the HST archival program. (2005-2008). Total award: \$68,555. PI.
8. "Measuring the Arciness in Arcs." Funded by the NSF Extragalactic program for FY 2003. Total Award: \$25K. PI.
9. "Precision Observing in an Urban Observatory." Funded by the American Astronomical Society Small Research Grant program. \$1.5K. PI.

*Senior Personnel on Funded Grants:*

1. "NRT IGE: Pedagogical Readiness Oversight for Future Educators in STEM Subjects (PROFESS). (2015-2018). Total Award: \$500,000. Funded as senior personnel (\$15,000).

**RESEARCH INTERESTS:**

Analysis of weak and strong gravitational lensing fields, with particular emphasis on higher order moments and the mass reconstruction of clusters of galaxies. The physics of the early universe. Determination of properties of galaxies in cosmological voids. Worked extensively on parameter estimation from observations, including measurement of cosmic baryon density from the galaxy power spectrum and determination of cosmological parameters from the Cosmic Microwave Background three-point correlation function.

A list of publications is attached.

**SERVICE ACTIVITIES:**

*Committee Work*

- University graduate college committee (2014-2015) - Created a new graduate college and graduate dean.
- College of Arts and Sciences Dean Review Committee (2012-2013)
- University Appeals Committee (2010-2013)
- Chair of Search Committee for History and Politics Department Head (2010-2011).
- Middlestates Student Enrollment and Support Steering Committee/Working Group (2010-2011)
- College of Arts and Sciences Graduate Curriculum Committee (Chair 2008-2009)
- University Undergraduate Research Task Force (2008-2009)
- Physics Department Undergraduate Curriculum Committee (2001-; Chair 2007-)
- Drexel University Faculty Senate (2007-2010)
- Physics Undergraduate Advising Coordinator. (2001-)
- College of Arts and Sciences Undergraduate Curriculum Committee. (2001-2002;2007-).

*Referee/Review Work*

- Invited panel to review content of Physics B (Algebra-based) AP Exam (2012)
- INCITE review panel - helped to distribute 1.3 Billion computing hours for government supercomputing facilities (October, 2009).
- Astrophysical Journal (2001-)
- Astrophysical Journal Letters (2007-)
- Monthly Notices of the Royal Astronomical Society (2008-)
- Physical Review Letters (2007-)
- Physical Review D (2002-)
- NASA Education/Public Outreach Program (2007)
- Selection Committee for Drexel University Rothwarf Award (2006-2008)
- NASA Astrophysics Theory Program (2006)
- Member of Pennsylvania Hospital Institutional Review Board (2002-2008)
- Invited Reviewer for "Astronomy Today" (Chaisson & McMillan; Prentice Hall)

- Invited Reviewer for “Matter and Interaction” (Chabay & Sherwood; Wiley)

### TEACHING AND OUTREACH ACTIVITIES:

#### *Drexel Coursework (All courses as director)*

- Physics 101 - Fundamentals of Physics I (3 times)
- Physics 111 - Physics I (2 times)
- Physics 113 - Contemporary Physics I (Initiated, taught 14 times)
- Physics 131 - Survey of the Universe (5 times)
- Physics 231 - Introductory Astrophysics (Initiated, taught 6 times)
- Physics 311 - Classical Mechanics I (1 time)
- Physics 431/531 - Galactic Dynamics (Initiated, taught 2 times)
- Physics 432/532 - Cosmology (5 times)
- Physics 511 - Graduate Electromagnetism I (5 times)
- Physics 631 - General Relativity (Initiated, taught 3 times)
- Special Topics: The Standard Model (Initiated, taught 1 time)
- tDEC 113 - Physics Foundations of Engineering II (1 time)
- tDEC 201 - Energy I (1 time)
- University 201 - Graduate School Prep (Initiated, taught 4 times)
- Honors 200 - Playing Dice with the Universe (1 time, topic set by instructor)

#### *Other Activities*

- Founding director of the Joseph R. Lynch Observatory at Drexel.
- Received NASA E/PO outreach grant to bring Philadelphia public school students to the Drexel Observatory. (2005-2008).
- Public Outreach, including Several books/articles in popular science, both as author and editor (See publications and invited talks sections).

#### *Significant Activities Prior to Drexel*

- Gibbs Lectureship in Astronomy, Yale University. Co-instructed one-year introductory level course on observational astronomy. Also, director of the student observatory. (2000-2001)
- Founding faculty adviser of Yale Undergraduate Astronomical Society, “STARRY”, (2000-2001).
- Initiated and ran monthly public observing nights at Princeton University.

### RESEARCH SUPERVISION

#### *Supervised Postdoctoral Work:*

1. Dr. Otonyo Mangete (co-supervised with Prof. Steve McMillan) (2007-2008).
2. Dr. Enrico Vesperini (co-supervised with Prof. Steve McMillan) (2004-2008)

#### *Supervised Ph.D. Research*

1. Sanghamitra Deb (2010). “Cluster Mass Reconstruction using Particle Based Lensing.”
2. Austen Groener (2015). “Dark Matter in Galaxy Clusters: Shape, Projection, and Environment.”
3. Justin Bird (2012-).

#### *Supervised Graduate Student Research*

1. Joseph Fabritius (2015-)
2. Joe Wraga (2015-)
3. Markus Rexroth (2013). Visiting student from Zurich.

4. Nicole DiGironimo (2003).
5. Tim Jones (2004).
6. Adrienne Leonard (2003-2005). Master's thesis.

#### *Supervised Undergraduate Research*

1. Jesse Unger (2016-2017). Senior thesis.
2. Joseph Tomlinson (2014). STAR (Freshman summer) scholar.
3. Andrew Pellegrino (2014). STAR scholar.
4. Daniele Schneider (2013). STAR scholar.
5. Mary Chessey (2012-2013). Senior thesis.
6. Joe Boales (2012-2013). Senior thesis.
7. Sajjan Mehta (2011-2012). Senior thesis.
8. Will Giang (2011). STAR Scholar
9. Nick Sifroudis (2011). Undergraduate Summer Researcher.
10. Wendy Harris (2009-2011). STAR Scholar and co-op.
11. Mary Chessey (2009). STAR Scholar.
12. Alyssa Wilson (2008). Co-op and research Student.
13. Max Soloff (2007-2009). Co-op student and senior thesis.
14. Vede Ramdass (2007). Co-op student.
15. Doug Jones (2006-2008). Co-op student and part time researcher.
16. Jason Haaga (2006). Co-op student.
17. Anthony Dyszel (2005-2007). Co-op, part time research, and senior thesis.
18. Kara Blaine (2004). STAR Scholar.
19. Jaclyn Marcel (2003). Senior thesis.
20. Henry Winterbottom (2003). Senior thesis.
21. Pinkesh Patel (2003-2005). Co-op and research student.
22. Ernest Mamikonyan (2002). Co-op student.
23. Greg McIvor (2002-2003). Co-op and part time research.

#### *Ph.D. Committees (non-supervising)*

1. Frank Jones (2015, planned). Title TBD.
2. Sean Lynch (2015, planned). Title TBD.
3. Erica Smith (2015, planned). Title TBD.
4. Rachael Kratzer (2014). "Mean and Extreme Radio Properties of Quasars and the Origin of Radio Emission."
5. Edward Damon (2014). "Measurement of Paraphotons in the Double Chooz Experiment Using Articulated Arm Calibration Methods."
6. Tim Jones (2012). "New Dynamical Insights on the Global Behavior of Chaotic Attractors."
7. Danny Pan (2011). "Ultraviolet Star Formation Rates of Dwarf Void Galaxies."
8. John Parejko (2010). "Hosts and Environments of Low Luminosity Active Galaxies in the Local Universe: The Care and Feeding of Weak AGN."
9. Jairzinho Ramos Medina. (2006). "Gravito Electromagnetism (GEM): A Group Theoretical Approach."
10. Jimin Gao. (2005). "A Numerical Study of an Asymmetric Breakout Model for CME Initiation."

#### **MEMBERSHIPS:**

- American Astronomical Society (1996-)
- Phi Beta Kappa (1995-)
- Sigma Xi (2007-2009)
- American Association of Physics Teachers (2012-)

**COLLEGE AND GRADUATE SCHOOL HONORS:**

- National Science Foundation Fellow, 1996
- College Awards in Astronomy and Physics, 1996
- Case Scholarship for Academic Achievement, Boston University, 1995
- Trustee Scholarship, Boston University (Full Tuition Merit-Based)

**BOOKS AND CHAPTERS**

1. **Goldberg, Dave.** *The Standard Model in a Nutshell.* Princeton University Press. (2017).
2. **Goldberg, Dave.** *The Universe in the Rearview Mirror: How Hidden Symmetries Shape Reality.* New York, Dutton (2013). Rave reviews from Discover, Nature and Publisher's Weekly, with long-form positive review, and top science books for 2013 list in New Scientist. Best Books for July list, Barnes and Noble. Staff Favorites, Powells. Short-listed for the 2014 ΦBK Science Book.
3. **Goldberg, Dave & Blomquist, Jeff.** *A User's Guide to the Universe: Surviving the Perils of Black Holes, Time Paradoxes, and Quantum Uncertainty.* Hoboken, Wiley (2010). Rated 4.3/5 stars on amazon.com, with very positive reviews by Publisher's Weekly and the Christian Science Monitor.
4. S. Hawking, *The Dreams that Stuff Is Made Of: The Most Astounding Papers of Quantum Physics-And How they Shook the World.*, edited by **D. Goldberg** & J. Kasius. 2011. Running Press. Selected all works for inclusion in this anthology.
5. S. Hawking, *A Stubbornly Persistent Illusion: The Essential Works of Albert Einstein.*, 2007. Running Press. Ghostwrote section introductions attributed to Hawking, and credited as "Editor."

**POPULAR SCIENCE AND MAGAZINE ARTICLES**

*Selected:*

1. **Dave Goldberg**, "A Brief History of Time Travel," October 12, 2016. Nature Physics. Book review/interview of James Gleick's, *Time Travel: A History.*
2. **Dave Goldberg**, "The Greatest Physics Theorem You've Never Heard Of." April 25, 2015. New Scientist. Cover Article.
3. **Dave Goldberg**, "Why the Higgs is Such a Big Deal." October 8, 2013. Slate.com.
4. **Dave Goldberg**, "Four Reasons Physics Says You Shouldn't Exist: Physics says you're an impurity in an otherwise beautiful Universe." August 29, 2013. Slate.com.
5. **Dave Goldberg** and Sean Carroll. "When Talking About Science, We Need More Tony Stark and Less Big Bang Theory." August 2, 2013. Wired.com.
6. **Dave Goldberg**, "Space, Time, and the Viability of Wormholes," May 7, 2010. LA Times op-ed (syndicated in over a dozen local dailies).
7. **Dr. Dave Goldberg**, "Ask a Physicist," a column of questions posted by readers on io9.com. 2010-2014. Typical columns have between 10,000-100,000 readers, and elicit comments in the hundreds. 50 columns total.
8. **Dr. Dave Goldberg**, "To the Writers and Director of 'Hot Tub Time Machine,' from a Physics Professor," March 29, 2013. io9.com. A humorous take on the time travel in the movies.
9. **Dave Goldberg**, "Time Traveling for Dummies: A Physicist Looks at the Time Traveler's Wife" August 13, 2009. Slate.com.

**PUBLICATIONS AND INVITED TALKS**

*Refereed Journals:*

1. Bird, J. and **Goldberg, D.M.**, 2016, Flexion in Abell 2744, submitted to MNRAS. arXiv:1611.08054
2. Groener, A.M., **Goldberg, D.M.**, and Sereno, M., 2016, The Galaxy Cluster Concentration-Mass Scaling Relation, MNRAS 455, 1:892.
3. Groener, A.M. & **Goldberg, D.M.**, 2014, Shape Profiles and Orientation Bias for Weak and Strong Lensing Cluster Halos, *Astrophys. J.* 795, 153.

4. Deb, S., Morandi, A., Pedersen, K., Riemer-Sorensen, S., **Goldberg, D.M.**, & Dahle, H, 2012, Mass Reconstruction using Particle Based Lensing II: Quantifying substructure with Strong+Weak lensing and X-rays, Submitted to *Astrophys. J.* arXiv: 1201.3636
5. Leonard, A., King, L.J. & **Goldberg, D.M.**, 2011, New Constraints on the Complex Mass Substructure in Abell 1689 from Gravitational Flexion. *MNRAS*, 413, 789-804.
6. Kratzer, R. M., Richards, G.T., **Goldberg, D.M.**, Oguri, M., Inada, N., Becker, R.H., Hodge, J.A. & Kochanek, C.S., 2011, Analyzing the Flux Anomalies of the Large-Separation Lensed Quasar SDSS J1029+2623, *Astrophys. J. Lett.*, 728, L18.
7. Deb, S., **Goldberg, D.M.**, Heymans, C. & Morandi, A., 2010, Measuring dark matter ellipticity of Abell 901/902 using Particle-Based Lensing, *Astrophys. J.*, 721, 124.
8. **Goldberg, D.M.**, Chessey, M.K., Harris, W.B., & Richards, G.T., 2010, Fold Lens Flux Anomalies: A Geometric Approach, *Astrophys. J.*, 715, 793
9. Vesperini, E., **Goldberg, D.M.**, McMillan, S., Dura, J. & Jones, D., 2008, Beowulf Analysis Symbolic INterface (BASIN): Interactive Parallel Data Analysis for Everyone, in *Computing in Science and Engineering*. vol. 11, no. 2. pp 45-51.
10. Deb, S., **Goldberg, D.M.**, 2008, Reconstruction of Cluster Masses Using Particle-Based Lensing (PBL). *Astrophys. J.*, 687, 39.
11. Massey, R. & **Goldberg, D.M.**, 2008, Weak lensing ellipticities in a strong lensing regime, *Astrophys. J. Lett.*, 673, 111.
12. Leonard, A., **Goldberg, D.M.**, Haaga, J. & Massey, R., 2007, Gravitational Shear, Flexion, and Strong Lensing in Abell 1689, *Astrophys. J.*, 666, 51
13. **Goldberg, D.M.** & Leonard, A., 2007, Measuring Flexion. *Astrophys. J.* 660, 1003
14. **Goldberg, D.M.** & Gott, J.R., 2007, Large-Scale Distortions in Map Projections, *Cartographica*, Vol. 42, N. 4, preprint at: <http://xxx.lanl.gov/abs/astro-ph/0608501>
15. Bacon, D.J., **Goldberg, D.M.**, Rowe, B.T., & Taylor, A., 2006, Weak Gravitational Flexion. *Monthly Not. Royal Astron. Soc.*, 365,414-428
16. **Goldberg, D.M.**, Jones, T.D., Hoyle, F., Rojas, R.R., Vogeley, M.S. & Blanton, M.R., 2005, The Mass Function of Void Galaxies in the Sloan Digital Sky Survey Data Release 2. *Astrophys. J.* 621, 643-650.
17. **Goldberg, D.M.** & Bacon, D.J. 2005, Galaxy-Galaxy Flexion: Weak Lensing to Second Order. *Astrophys. J.* 619, 741-748.
18. **Goldberg, D.M.** & Vogeley, M.S., 2004, Simulating Voids, *Astrophys. J.*, 605, 1-6.
19. **Goldberg, D.M.** & Natarajan, P., 2002, The Galaxy Octopole Moment as a Probe of the Weak Lensing Shear Field, *Astrophys. J.*, 564, 65-72.
20. **Goldberg, D.M.**, 2001, Using Perturbative Least Action to Reconstruct Redshift-Space Distortions, *Astrophys. J.* 552, 413-426.
21. **Goldberg, D.M.**, 2001, Using Perturbative Least Action to Simulate the Local Group, *Astrophys. J.* 550, 87-93.
22. **Goldberg, D.M.** & Spergel, D.N., 2000, Using Perturbative Least Action to Recover Cosmological Initial Conditions, *Astrophys. J.* 544, 21-29.
23. Spergel, D.N. & **Goldberg, D.M.**, 1999, The Microwave Background Bispectrum, Paper I: Basic Formalism, *Phys. Rev. D.*, 59, 103001.
24. **Goldberg, D.M.** & Spergel, D.N., 1999, The Microwave Background Bispectrum, Paper II: A Probe of the Low Redshift Universe, *Phys. Rev. D.*, 59, 103002.
25. Brainerd, T.G., Wright, C.O., **Goldberg, D.M.**, & Villumsen, J.V., 1999, A Comparison of Simple Mass Estimators for Galaxy Clusters, *Astrophys. J.* 524, 9.
26. Brainerd, T.G., **Goldberg, D.M.**, & Villumsen, J.V., 1998, High-Resolution Simulations of Cluster Formation, *Astrophys. J.*, 502, 505
27. **Goldberg, D.M.** & Wozniak, P.M., 1998, Astrometric Shifts in the OGLE-1 Microlensing Events, *Acta Astronomica*, 48, 19
28. **Goldberg, D.M.**, 1998, Using Astrometry to Deblend Microlensing Events, *Astrophys. J.*, 498, 156
29. **Goldberg, D.M.** & Strauss, M.A., 1998, Determination of the Baryon Density from Large-Scale Galaxy Redshift Surveys, *Astrophys. J.* 495, 29

30. Breuer, K., **Goldberg, D.M.**, Smith, K.E., Greenblatt, M. & McCarroll, W., 1995. Resonant Photoemission Study of the Electronic Structure of  $K_{0.3}MoO_3$ . *Solid State Comm.* 94, 601.

*Posters and Conference Proceedings:*

1. Bird, J. & **Goldberg, D.M.**, 2014, Extracting Unused Information in Cluster Lensing. Presented November 13, 2014, at the Yale Frontier Field Conference.
2. Deb, S., Nakajima, R., Mandelbaum, R., Bernstein, G. & **Goldberg, D.M.**, 2011, Quantifying substructure in Galaxy Clusters with X-ray and Gravitational Lensing Measurements., *Bull. American Astron. Soc.*, 217, #227.01.
3. Kratzer, R., Richards, G.T., **Goldberg, D.M.**, Oguri, M., Kochanek, C.S., Hodge, J.A., Becker, R.H., & Inada, N. 2011, Analyzing the Flux Anomalies of the Large-separation Lensed Quasar SDSS J1029+2623., *Bull. American Astron. Soc.*, 217, #347.04.
4. Harris, W.B., Chessey, M.K, **Goldberg, D.M.**, & Richards, G.T., 2010, Fold Lens Flux Anomalies: A Geometric Approach., *Bull. American Astron. Soc.*, 215, #406.02.
5. Deb, S., **Goldberg, D.M.** & Wilson, A, 2009, What More Can We Learn from Galaxy Cluster Lensing?, *Bull. American Astron. Soc.*, 213, #322.02.
6. Deb, S., Ramdass, V.J. & **Goldberg, D.M.**, 2007, Where is the Information in Cluster Lensing?, *Bull. American Astron. Soc.*, 211, #96.19
7. Leonard, A., Deb, S. & **Goldberg, D.M.**, 2006, Weak Gravitational Flexion, *Bull. American Astron. Soc.*
8. Vogeley, M.S., Hoyle, F., Rojas, R.R., & **Goldberg, D.M.**, 2004, The Void Spectrum and Properties of Void Galaxies in the SDSS. *Bull. American Astron. Soc.*, 205, #94.04.
9. Vogeley, M.S., Hoyle, F., Rojas, R.R., & **Goldberg, D.M.**, 2004, Mapping the cosmic web with the Sloan Digital Sky Survey. *IAU Colloquium #195*, 5-11.
10. **Goldberg, D.M.**, McMillan, S., Char, B., MacNeice, P., & Vogeley, M.S., 2003. Beowulf Analysis Symbolic INterface (BASIN). *Bull. American Astron. Soc.*, 203, #4.11.
11. **Goldberg, D.M.** & Natarajan, P., 2002. Finding the arciness in arclets - exploring the octopole moments of lensed galaxies. *The Shapes of Galaxies and Their Halos.* ed. Priya Natarajan.
12. Mamikonyan, E.N., & **Goldberg, D.M.**, 2001, Building a Supercomputer for Cheap! Cheap! Cheap!, *Bull. American Astron. Soc.*, 199, #157.01
13. **Goldberg, D.M.**, 2001, Introducing Showfits: A Web-Based Image Manipulation and Analysis Tool, *Bull. American Astron. Soc.*, 198, #15.12
14. **Goldberg, D.M.**, & Spergel, D. N. 2000, Using Perturbative Least Action to Run N Body Simulations Back in Time. *Cosmic Flows: Toward an Understanding of Large Scale Structure*, eds. Stephane Courteau, Michael Strauss, & Jeffrey Willick.
15. **Goldberg, D.M.**, Wozniak, P., & Paczynski, B. 1998, Deblending Microlensing Events Using Astrometric Shifts. *Bull. American Astron. Soc.* 191, #83.07.
16. Brainerd, T.G., **Goldberg, D.M.**, & Villumsen, J. V. 1997, High Resolution Rich Cluster Simulations. *HST and the High-Redshift Universe: Proceedings of the 37th Hersmonceux Conference*, eds. N. Tanvir, A. Aragon-Salamanca, & J. Wall.
17. **Goldberg, D.M.**, Brainerd, T. G., & Villumsen, J. V. 1995, Self-Consistent High-Resolution Simulations of Cluster Formation, *Bull. American Astron. Soc.*, 187, #52.06
18. Smith, K.E., Breuer, K., **Goldberg, D.M.**, Greenblatt, M., McCarroll, W. & Hulbert, S.L., 1995, Defects in Quasi-One Dimensional Oxide Conductors:  $K_{0.3}MoO_3$ . *Materials Research Society Proceedings*, Vol. 375, 133.

*Colloquia, Invited and Contributed Talks and Seminars:*

1. Why Symmetry Matters. Colloquium. University of the Sciences. September 17, 2013.
2. Why not use Flexion? Contributed talk in Space Telescope Workshop on Cluster Lensing. April 13, 2013.
3. Mapping Galaxy Clusters. Colloquium. Villanova University. April 7, 2011.
4. Where is the Information in Cluster Lenses? Institute for the Physics and Math of the Universe; University of Tokyo. Kashiwa, Japan. August, 2008.

5. Where is the information in Cluster Lenses? Ohio State University. Columbus, OH. Contributed talk in “Great Lakes Cosmology Workshop,” June, 2007.
6. Galaxy-Galaxy Flexion. Widener University. September 2006.
7. Weak Gravitational Flexion. Lorentz Center of Physics. Leiden, NL. Contributed talk in “Gravitational Lensing,” August, 2006.
8. Weak Gravitational Flexion. Institute for Advanced Study Seminar. Princeton, NJ. March, 2006.
9. Weak Gravitational Flexion. Aspen Center for Physics. Contributed talk in “Cosmological Probes of Baryons and Dark Matter.” Aspen, CO. January, 2006.
10. Weak Lensing and Flexion. Invited talk in, “Probing the distant universe with gravitational waves.” Johnson City, TN. November, 2005.
11. Galaxy Flexion and the ‘Banananess’ of Lensed Galaxies. Drexel University, Philadelphia, PA. June, 2005.
12. Galaxy Flexion and the ‘Banananess’ of Lensed Galaxies. Royal Observatory, Edinburgh Scotland. March 2005.
13. Galaxy Flexion: Gravitational Lensing to Second Order. The Ohio State University. Columbus, Ohio. Workshop on “Gravitational Lensing, Dark Matter, and Dark Energy.” Jan, 2005.
14. Galaxy Flexion: Gravitational Lensing to Second Order. Boston University. Boston, MA. September 2004.
15. Weak Lensing and Cosmology. Delaware Valley Amateur Astronomical Society, Philadelphia, PA, October, 2002
16. Rewinding the Universe. Drexel University, Philadelphia, PA, March, 2001
17. Weak Lensing and Cosmology. Union College, Schenectady, NY, February, 2001
18. Rewinding the Universe. University of Massachusetts, Amherst, MA, February, 2001
19. Using Perturbative Least Action to Run Simulations “Backwards in Time.” Yale University, New Haven, CT, March, 2000
20. Running Observations Back in Time Using Perturbative Least Action. Fermilab, Batavia, IL, January, 2000
21. Using Perturbative Least Action to Recover Cosmological Initial Conditions. AAS Dissertation Talk, Atlanta, GA, December, 1999
22. Running Observations Back in Time Using Perturbative Least Action. CITA, Toronto, Ontario, December, 1999
23. The Cosmic Microwave Bispectrum. Tufts/CfA/MIT Cosmology Seminar, Cambridge, MA, February, 1999

#### *Selected Popular Talks and On-air Interviews*

1. The Standard Model. Invited speaker to the ChesMont Astronomical Society. October 16, 2016.
2. Keynote Talk for College of Arts and Sciences Alumni Weekend, “Why Symmetry Matters.” May 2, 2015.
3. Interview of Freeman Dyson at the Philadelphia Free Library. April 21, 2015.
4. Keynote Talk for Philadelphia Futures National Conference, “Black Holes.” January 3, 2015.
5. What do you do? Segment on Live event for WHY?Y’s “The Pulse.” December 4, 2014.
6. Interview on WHY?Y’s “Radio Times with Marty Moss-Coane.” Broadcast January 24, 2014.
7. Popular Science at the Philadelphia Free Library (Main Branch). Event with Max Tegmark. January 14, 2014.
8. What’s the Matter with the Higgs Boson. Science on Tap (organized by the Wagner Institute). January 13, 2014.
9. Why Symmetry Matters. Talk to the Philadelphia Association for Critical Thinking (PHACT). November 16, 2013.
10. Why Symmetry Matters. Invited speaker to the Chester County Astronomical Society. November 12, 2013.
11. The Universe. “Professor Blastoff Podcast.” Broadcast October 15, 2013.
12. Why Symmetry Matters. Tredyffrin Public Library. September 24, 2013. Rebroadcast to local community access.
13. A Special Night with Author and Astrophysicist Dave Goldberg. Haverford College. September 12, 2013.
14. The Universe in the Rearview Mirror. Google Talk, at Google NY Headquarters, and rebroadcast to 100k YouTube subscribers. August 21, 2013.
15. Interview on WNYC’s “The Leonard Lopate Show.” Broadcast August 20, 2013. Focus on Emmy Noether and “The Universe in the Rearview Mirror.”
16. Interview on WHY?Y’s “NewsWorks Tonight.” Broadcast August 1, 2013. Focus on Symmetry in the Universe and “The Universe in the Rearview Mirror.”
17. Why Symmetry Matters. Philadelphia NerdNite. July 10, 2013.
18. The Physics of Time Travel. Invited speaker to Mensa-organized conference entitled, *Colloquium 2013: Between Science Fiction and Science*. Fort Worth, Texas. July 2, 2013.



19. Invited Speaker. *Library Journal Day of Dialogue*. May 29, 2013.
20. Writing Science for a Popular Audience. Workshop director. AAPT/SPS Joint Meeting. Drexel University. April 26, 2013.
21. Why Symmetry Matters. Speaker to the Stanford Charter School. Online Talk. March 15, 2013.
22. What's the Matter with the Higgs Boson? Speaker to the Delaware Valley Astronomical Society. October 19, 2012.
23. The Higgs Boson. Interview on "Day 6 with Brent Bambury," CBC 1. Broadcast July 7, 2012.
24. 'What is the Universe Expanding into?' and other perfectly reasonable questions. Speaker at Princeton Plasma Lab's "Science on Saturday" program. Approximate audience of 450. January 14, 2012.
25. 'What is the Universe Expanding into?' and other perfectly reasonable questions. Keynote speaker at "Starfest 30." Ayton, Ontario, Canada. August 27, 2011.
26. Our Uncertain Universe. Field Family Teen Author Series. Selected by the Philadelphia Free Library as one of ten speakers to talk to approximately 120 high school students about our work. April 27, 2011.
27. How (not) to build a time machine. Philly NerdNite. A talk given to approximately 100 at the Field House in Philadelphia. January 13, 2011.
28. The Dark Side of the Universe. Talk to the Rittenhouse Astronomical Society. Franklin Institute, Philadelphia. December 8, 2010.
29. Cosmology and Crackpots. Talk to Philadelphia Association for Critical Thinking (PHACT). November 11, 2010.
30. Popular Science. A talk to about 40 high school students at Philadelphia's Science Leadership Academy. May 28, 2010.
31. A User's Guide to the Universe. Talk, Q&A and book signing at Widener University. April 28, 2010.
32. A User's Guide to the Universe. Presentation at the Philadelphia Free Library Book Festival. April 17, 2010.
33. Interview on "The Space Show with David Livingston." Recorded April 2, 2010.
34. The Physics of Time Travel. Presentation at the "Meta Institute for Computational Astrophysics." March 13, 2010.
35. The Physics of Time Travel. The Franklin Institute, Philadelphia. March 11, 2010.
36. A User's Guide to the Universe. Book signing and talk at Barnes and Noble in Center City Philadelphia. March 8, 2010.
37. Time Travel and other Digressions. Drexel College of Arts and Sciences "Dean's Seminar." February 24, 2010.
38. How to build a time machine. Presentation at "Philcon: The Philadelphia sci-fi convention." November 20, 2009.
39. Time Travel. Interview on "Studio 360 with Kurt Anderson," recorded in front of a live audience, and broadcast from WNYC and nationally. Recorded November 17, 2009. Broadcast, December 31, 2009.
40. Telescopes from Galileo to the LSST. Drexel University Alumni Event. The Franklin Institute. Philadelphia, PA. August, 2009.
41. The Mysteries of Dark Matter. The Franklin Institute. Philadelphia, PA. May, 2009.