

# Dr. Matthew R. Francis

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## Education

- Rutgers University, Piscataway, New Jersey: Ph.D. in Physics and Astronomy, May 2005  
Thesis Title: “From Structure Evolution to Gauge Theories: Topics in Gravitational and Cosmological Physics” (Thesis Advisor: Arthur Kosowsky)
- Johns Hopkins University, Baltimore, Maryland: 1998–1999
- Central College, Pella, Iowa: B.A. *Summa Cum Laude* in Physics, May 1998

## Selected Recent Work

- Contributing writer (complete portfolio at [bowlerhatscience.org/writing-portfolio/](http://bowlerhatscience.org/writing-portfolio/))
  - *Mosaic Science* (Oct. 2015), [What is Life?](#)
  - *The Daily Beast* (2014–present) ([www.thedailybeast.com/contributors/matthew-francis.html](http://www.thedailybeast.com/contributors/matthew-francis.html))
  - *Forbes* ([www.forbes.com/sites/matthewfrancis/](http://www.forbes.com/sites/matthewfrancis/))
  - *Ars Technica* (2012–present, [arstechnica.com/author/matthew-francis/](http://arstechnica.com/author/matthew-francis/))
  - *NOVA* (2014–present, [www.pbs.org/wgbh/nova/blogs/physics/author/matthew-francis/](http://www.pbs.org/wgbh/nova/blogs/physics/author/matthew-francis/))
  - *Symmetry Magazine* (<http://www.symmetrymagazine.org/author/matthew-r-francis>)
  - *Smithsonian Air & Space* (July 2015), [The Universe is Ringing](#)
  - *Scientific American* (Jan. 2015), [Weird X-rays spur speculation about dark matter](#)
  - *Slate* ([www.slate.com/authors/matthew\\_r\\_francis.html](http://www.slate.com/authors/matthew_r_francis.html))
  - *Aeon* ([bowlerhatscience.org/writing-portfolio/writing-portfolio-aeon-magazine/](http://bowlerhatscience.org/writing-portfolio/writing-portfolio-aeon-magazine/))
  - *Physics World* ([bowlerhatscience.org/writing-portfolio/writing-portfolio-physics-world/](http://bowlerhatscience.org/writing-portfolio/writing-portfolio-physics-world/))
- Director, CosmoAcademy (2013–present, [cosmoquest.org/x/cosmoacademy/about-cosmoacademy/](http://cosmoquest.org/x/cosmoacademy/about-cosmoacademy/))
- Galileo’s Pendulum, personal science blog (2010–present, [GalileosPendulum.org/](http://GalileosPendulum.org/))

## Prior Academic Positions

- Visiting Assistant Professor of Physics, Randolph-Macon College (2009-2011)
- Assistant Professor of Physics and Planetarium Director, Lambuth University (2007-2009)
- Special Lecturer, New Jersey Institute of Technology (NJIT) (September 2006–June 2007)
- Adjunct Faculty Member, Rutgers University (September 2005–June 2006)
- Visiting Scientist, Center for Gravitational Wave Physics, Pennsylvania State University (October 2005)
- Postdoctoral Researcher, Atacama Cosmology Telescope Project, Rutgers University (July–August, 2005)

## Refereed Papers

- **M. R. Francis** and E. J. Fertig (2012) Quantifying the Dynamics of Coupled Networks of Switches and Oscillators. *PLoS ONE* 7(1): e29497. DOI: [10.1371/journal.pone.0029497](https://doi.org/10.1371/journal.pone.0029497)
- **M. R. Francis**, R. Bean, and A. Kosowsky, Impact of Systematic Errors on Sunyaev-Zel’dovich Effect Surveys, *JCAP* **0512** (2005), 001. [astro-ph/0511161](#)

- **M. R. Francis** and A. Kosowsky, The Construction of Spinors in Geometric Algebra, *Ann. Phys.* **317** (2005), 383–409. [math-ph/0403040](#)
- **M. R. Francis** and A. Kosowsky, Geometric Algebra Techniques for General Relativity, *Ann. Phys.* **311** (2004), 459–502. [gr-qc/0311007](#)
- **M. R. Francis** and A. Kosowsky, Geodesics in the Generalized Schwarzschild Solution, *Am. J. Phys.* **72** (2004), 1204–1209. [gr-qc/0311038](#)
- J. Javanainen, J. Ruostekoski, B. Vestergaard, and **M. R. Francis**, One-Dimensional Modeling of Light Propagation in Dense and Degenerate Samples, *Phys. Rev. A* **59** (1999), 649–666. DOI: [10.1103/PhysRevA.59.649](#)

#### Teaching: Randolph-Macon College

- Introduction to Astronomy (Astronomy 101): Lecture and Lab (two sections), Summer 2011
- Modern Physics (Physics 205): Lecture and Lab, Spring 2011
- Electricity and Magnetism (Physics 340): Lecture, Spring 2011
- Quantum Mechanics (Physics 430): Lecture, Spring 2011
- Introduction to Physics I and II (Physics 151–152): Lecture and Lab, Fall 2009–Fall 2010
- Modeling Data in Physics (Physics 382): Lecture, Fall 2010
- Science Vs. Pseudoscience (Honors 280): Seminar, Fall 2010
- Hitchhiker’s Physics (Physics 105): Lecture and Lab, Fall 2009
- Mathematical Physics (Physics 250): Lecture, January 2010
- Thermal Physics (Physics 440), Randolph-Macon: Lecture, Spring 2010

#### Teaching: Previous Instructor Positions

- Nonlinear Dynamics (Math 4703/Physics 4703), Lambuth: Lecture, Spring 2009
- Physics for Science and Engineering (Physics 2314–2324), Lambuth: Lecture and Lab, Fall 2008–Spring 2009
- College Physics (Physics 2214–2224), Lambuth: Lecture and Lab, Fall 2007–Spring 2008
- Astronomy and Cosmology (Physics 1214), Lambuth: Lecture and Lab, Fall 2008–Spring 2009
- Planetary Astronomy (Physics 1314), Lambuth: Lecture and Lab, Fall 2007
- Stellar Astronomy (Physics 1324), Lambuth: Lecture and Lab, Spring 2008
- Astronomy and Astrophysics I and II (Physics 320–321), NJIT: Lecturer, Fall 2006–Spring 2007
- Introductory Astronomy and Cosmology (Physics 202, two sections), NJIT: Lecturer, Fall 2006–Spring 2007
- Mechanics (Physics 105), NJIT: Lecturer, Fall 2006
- Mechanics (Physics 111), NJIT: Workshop Instructor, Spring 2007
- Electricity and Magnetism (Physics 121), NJIT: Recitation Instructor, Spring 2007
- Analytical Physics II (Physics 227–228), Rutgers University: Instructor and Course Administrator, Fall 2005–Spring 2006
- Introduction to Radio Astronomy (Physics 343), Rutgers University: Laboratory Instructor, Fall 2003, 2004, and 2005

#### Teaching: Previous Assistantships

- Honors Physics (Physics 271–272), Rutgers University: Recitation Instructor, 2002–2003
- Extended Analytical Physics (Physics 203–204), Rutgers University: Teaching Assistant, 2001–2002
- Extended General Physics (Physics 201–202), Rutgers University: Teaching Assistant, 2000–2001
- General Physics, Johns Hopkins University: Teaching Assistant (1998–1999)

## Selected Public Presentations and Outreach

- “Gravity: a Love Story” (Nov. 21, 2014): astronomy colloquium at New Mexico State University ([available on YouTube](#))
- ”DIY Science Zone” workshop, GeekGirlCon [geekgirlcon.com](#) (2013 and 2014)
- “Lessons in the communication of science from the BICEP2 story” (Oct. 20, 2014): panel moderator at the National Association of Science Writers/Council for the Advancement of Science Writing (NASW/CASW) meeting
- “Gravity: a Love Story” (Nov. 14, 2013): presentation to University of Central Arkansas Society of Physics Students ([www.youtube.com/watch?v=waqHDqv8LME](#))
- “Ugly Telescope, Beautiful Science” (July 9, 2013) at Richmond Astronomical Society (Science Museum of Virginia in Richmond, Virginia)
- “Mining for Dark Matter” (June 4, 2013) and “Black Holes Don’t Suck” (Sept. 4, 2012) at [Science Pub RVA](#) in Richmond, VA
- “Science Saturday” presentation at [Richmond \(Virginia\) Public Library](#) (Nov. 10, 2012)
- “Science Drop-in” and “Lightning” talks at the [North Carolina Museum of Natural Sciences](#) (Aug. 16 and 17, 2012)
- Moderator/presenter: [Science Online 2012](#), [Science Online 2013](#), and [Science Online 2014](#), North Carolina State University
- Director, M.D. Anderson Planetarium (2007-2009)
  - Presented twice-monthly public programs and frequent shows for school groups
  - Original Programming:
    - “See How Far the Light Came”; written/produced for the Grand Reopening
    - “Could There Be Life in the Solar System?”, show for K-3 schoolchildren (collaboration with the Lambuth Education Department)
    - “Saturn: News from the Ringed Planet”, special presentation on Apr. 7, 2008
    - “Water on Mars, Life on Mars”, special presentation for Fall 2008
  - TV interview, “Good Morning West Tennessee”, [WBBJ/ABC](#) affiliate (Feb. 7, 2008)
- See [bowlerhatscience.org/public-speaking/](#) for a complete list

## Other Teaching Activities

- Faculty advisor, Lambuth Pre-Engineering Program: 2007-2009
- Facilitator of Astronomy Salon, NJIT: Spring 2007
- Unofficial advisor of Society of Physics Students, NJIT: Spring 2007

## Students Supervised

- Zach Radeka (Class of 2014), Freshman Research Student, Randolph-Macon: Spring 2011
- Michael Hudson (Class of 2011), Research Student, Randolph-Macon: 2010-2011
- James Olson (Class of 2010), Research Student, Randolph-Macon: Fall 2009
- Peter Bonanno (Class of 2007), Research Student, NJIT: Spring 2007
- Jeremiah Rogers (Class of 2012), Planetarium Assistant, Lambuth: 2008-2009
- Tad McElroy (Class of 2009), Planetarium Assistant, Lambuth: 2007-2008
- Margaret Day (Class of 2011), Planetarium and Physics Laboratory Assistant, Lambuth: 2007-2008

## Conference Attendance

- [DC Science Writer’s Association Professional Development Day](#) (2011, 2012, 2014)

- [Chesapeake Section of the AAPT Fall Meeting](#) (October 29–30, 2010), Randolph-Macon College (contributed talk)
- [Great Lakes Cosmology Workshop](#) (June 8–11, 2008), Carnegie Mellon University
- Atacama Cosmology Telescope general meeting (May 5–6, 2005), Princeton University (contributed talk)
- 3rd Oxford-Princeton Workshop on Astrophysics and Cosmology (February 28–March 2, 2005), Princeton University (contributed talk)
- [205th Meeting of the American Astronomical Society](#) (January 9–13, 2005), San Diego (contributed talk)
- [Fundamental Physics from Clusters of Galaxies](#) (December 9–11, 2004), Fermilab (contributed talk)
- American Physical Society April Meeting (April 5–8, 2003), Philadelphia (contributed talk)

### **Society Memberships**

- National Association of Science Writers (NASW)
- DC Science Writers Association (DCSWA)

### **Social Networking**

- Twitter: [@DrMRFrancis](#)
- Facebook: [facebook.com/GalileosPendulum](#)
- Google+: [plus.google.com/+MatthewFrancis/](#)

### **Computer Skills**

- Word processing/typesetting: Word, OpenOffice, L<sup>A</sup>T<sub>E</sub>X
- Web development: HTML/XHTML, CSS, Wordpress
- Multimedia: Audacity (audio recording/mixing), The GIMP (graphics manipulation), Xfig (vector graphics)
- Programming languages: Python, C/C++, Matlab, Fortran 90/95, Perl, R
- Operating systems: Linux, Mac OS X, various Windows platforms
- Computer algebra systems: Mathematica, Maple, Maxima
- Educational software: Moodle, WebAssign, MasteringPhysics/MasteringAstronomy

### **Other Professional Experience**

- Independent contractor (Python programming), Right Force Orthodontics (June–July 2006)
- Senior Cyber Net, Baltimore, Maryland: Systems Administrator (Linux/Windows), 1999–2000