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

Current Work

- Director, CosmoAcademy (http://cosmoquest.org/CosmoAcademy)
- Physics and math contributing editor, Double X Science (http://www.doublexscience.org/)
- Contributing writer:
  - Ars Technica (http://arstechnica.com/author/matthew-francis/)
  - BBC Future (http://www.bbc.com/future/columns/will-we-ever)
  - *Slate*, (http://www.slate.com/authors.matthew_r_francis.html)
  - *New Yorker* "Elements" (http://www.newyorker.com/online/blogs/elements/2013/04/how-to-name-a-planet.html)
  - *Nautilus* (http://nautil.us/blog/universal-remoteness-what-the-multiverse-means-about-us and http://nautil.us/blog/supernovas–other-big-bangs-where-your-body-comes-from)
- Galileo's Pendulum, personal science blog (http://GalileosPendulum.org/)
- Scientific American Guest Posts: What We Know About Black Holes (Sept. 2, 2011) and What Does the New Double-Slit Experiment Actually Show? (June 7, 2011)
- 365 Days of Astronomy Podcasts: The Biggest Things in the Universe (June 13, 2011) and Seeing Through Gravity's Lens (April 22, 2011)
- Guest series for Culture of Science: Citizen Science as a Cure for Scientific Isolation (Part 1, Part 2, Part 3)

Public Presentations and Outreach

- Weekly Space Hangouts for CosmoQuest and Universe Today
- "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" talk at The Daily Planet at the North Carolina Museum of Natural Sciences (August 17, 2012)
- "Lightning Talk" for Taste of Science at the North Carolina Museum of Natural Sciences (August 16, 2012)
- Podcast interview on the Higgs boson with Giant Fire-Breathing Robot (gaming/tech programming) (air date: July 8, 2012)
- Moderator/presenter: Science Online 2012 (January 19-21, 2012) and Science Online 2013 (January 31-February 2, 2013), North Carolina State University
- Public cosmology presentations at ThirstDC (http://thirstdc.com/speakers.php)
- Director, M.D. Anderson Planetarium (2007-2009)

- Presented twice-monthly public programs and frequent shows for school groups
- Design and management of website (http://planetarium.lambuth.edu/, no longer active)
- Organized Grand Reopening event (February 9, 2008)
- 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 April 7, 2008
    - "Water on Mars, Life on Mars", special presentation for Fall 2008
- TV interview, "Good Morning West Tennessee", WBBJ/ABC affiliate (February 7, 2008)

- Judge, West Tennessee Regional Science Fair (March 14, 2008)

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
- **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.

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)
- Nature of Science (science elective), Central College: Teaching Assistant, Spring 1998
- General Physics, Central College: Laboratory Teaching Assistant and Peer Instructor, 1995–1998

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

Seminar Talks
- Randolph-Macon Mathematics Seminar (February 26, 2010)
- Lambuth University Faculty Forum (November 20, 2008)

- Sources and Simulations Seminar, Penn State CGWP (March 16, 2006)
- Rutgers Astrophysics Seminar (March 10, 2006)

Conference Attendance
- Presenter/moderator for Science Online 2012 (January 19-21, 2012), North Carolina State University
- DC Science Writer's Association Professional Development Day (April 23, 2011), AAAS
- 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: http://twitter.com/DrMRFrancis
- Facebook: https://www.facebook.com/pages/Galileos-Pendulum/191927027511248
- LinkedIn: http://www.linkedin.com/pub/matthew-francis/32/672/179
- Google+: https://plus.google.com/u/0/107194786927451871093/posts

Computer Skills
- Word processing/typesetting: Word, OpenOffice, LaTeX
- 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