

Brian Charles Thomas

Assistant Professor
Department of Physics and Astronomy
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Education

- Ph.D., physics, University of Kansas, Lawrence, KS, August, 2005
 - Thesis advisor: Adrian L. Melott
 - Thesis title: “Ozone Depletion Due to a Milky Way Gamma-Ray Burst”
- M.S., physics, University of Kansas, 2002
- B.S. with Honors, physics, University of the Pacific, Stockton, CA, 1999

Teaching

Interests

- Courses: astronomy/astrophysics (introductory and upper level), computational physics, classical mechanics, quantum mechanics, electromagnetism.
- Physics education reform: Have implemented elements of Peer Instruction and Lecture Tutorials in introductory astronomy courses and physical science course. Assisted with physics education project in an introductory (calculus-based) physics course (spring 2004).

Experience and Appointments

- Courses taught: Introductory Physics, Introductory Astronomy (both Solar System and Stars & Galaxies); Physical Science for Elementary Educators (responsible for coordination of team of instructors and teaching physics and astronomy portions); Upper Level Electromagnetism, Thermodynamics, Optics, Mathematical Methods (Theoretical Physics), Classical Mechanics.
- Fall 2005 to present: Assistant Professor, Department of Physics and Astronomy, Washburn University, Topeka, KS
- Teaching Assistant for introductory astronomy laboratory and introductory physics laboratory.
- Assisted with physics education project in an introductory (calculus-based) physics course (spring 2004).
- Spring 2004: Graduate Teaching Assistant, University of Kansas (intro astronomy lab)
- Fall 2003: Adjunct Professor, Baker University, Baldwin City, KS (intro physics)
- Fall 2003: Graduate Teaching Assistant, University of Kansas (intro physics lab)
- Fall 2002: Adjunct Professor, Baker University (advanced electromagnetism)
- Summer 2000, 2001, 2002, 2003: Physics Instructor for Health Careers Pathways Program, University of Kansas (intro physics)
- 1997-2002: Private tutor for various levels of physics.
- 1996-1998: Laboratory Teaching Assistant, University of the Pacific (intro physics)

Research

Interests

- Astrobiology, particularly how astrophysical events and environments affect the development and sustainability of life on Earth.
- Active participant with Astrobiophysics Research Group at the University of Kansas. Involved in projects ranging from astrophysical ionizing radiation events to investigating 62 million year biodiversity cycles. See “Search and Discovery” article in Physics Today, October 2007, pp. 18-20

(Available online: http://ptonline.aip.org/journals/doc/PHTOAD-ft/vol_60/iss_10/18_1.shtml)

- Continuing work on theoretical and computational modeling of terrestrial atmospheric, biological and geochemical effects of astrophysical events, including gamma-ray bursts, supernovae and extreme solar flares.
- Initial research training in cosmology with emphasis on large-scale structure. Worked on “Bull's Eye effect” as probe of the mass density of the universe.

Experience

- Fall 2005 to present: Assistant Professor, Department of Physics and Astronomy, Washburn University, Topeka, KS
- Summer 2004 – Spring 2005: Graduate Research Assistant, University of Kansas, funded by Adrian Melott (NASA grant).
- Spring 2004: Graduate Research Assistant, University of Kansas, funded by Niel Gehrels at NASA Goddard Space Flight Center.
- Spring 2003: Graduate Research Assistant, University of Kansas, funded by Adrian Melott (NSF grant).
- Summer 1998: Research Experience for Undergraduates participant, University of California at Santa Cruz
- Summer 1996, 1997: Research Assistant, University of the Pacific

Academic Awards and Grants

Recent Proposals Submitted (as PI or local PI)

- “Supernova Intrusion into the Solar System: Damage and Detection” (September 2009) Submitted to NASA (Lead institution: University of Kansas), \$57,485 (local PI amount). Requested duration: 3 years (04/01/2010-03/31/2013). External collaborators: Brian Fields (University of Illinois) and Adrian Melott (University of Kansas)

Proposals Awarded

- National Center for Supercomputing Applications, “High Energy Cosmic Ray Effects on Terrestrial Atmospheric Chemistry,” 60,000 hours on Intel 64 cluster (Abe), 9/09 to 9/10. PI, Co-I Dimitra Atri (University of Kansas)
- National Center for Supercomputing Applications, “A Lookup Table to Compute High Energy Cosmic Ray Effects on Terrestrial Atmospheric Chemistry,” 50,000 hours, 8/09 to 8/10. Co-PI; PI: Adrian Melott (University of Kansas).
- “Astrophysical Ionizing Photon Events and Primary Productivity of Earth's Oceans” (September 2008), Submitted to NASA, \$530,703 (total amount), 7/1/2009-6/30/2012. Co-Investigators: Adrian Melott (University of Kansas), Patrick Neale (Smithsonian Environmental Research Center)
- Washburn University International Travel Grant to attend 42nd annual ESLAB symposium on “Cosmic Cataclysms and Life” as an invited speaker (November 2008).
- Washburn University Small Research Grant, “Atmospheric Effects of a Nearby Supernova,” \$1000, 7/1/2007 – 6/30/2008.
- Dissertation Fellowship (\$10,000 award), University of Kansas, Spring, 2005
- National Center for Supercomputing Applications, “Modeling the Effects of a Nearby Gamma-Ray Burst on the Earth's Atmosphere,” 10,000 hours of IBM P690 time, 8/04 to 8/05 (Co-PI, not PI due only to NSF regulations).
- NASA, “Do Gamma-Ray Bursts Damage Planetary Biospheres?”, \$417,552, 5/04 to 4/07

- Wrote portions of grant proposal, not a Co-I due to university regulations.
- Preparing Future Faculty Fellow (\$600 award), University of Kansas, 2003-2004
- Madison and Lila Self Graduate Fellowship (approximately \$100,000 award), University of Kansas 1999-2003

Publications

Refereed Articles (* indicates undergraduate student)

- “A Lookup Table to Compute High Energy Cosmic Ray Effects on Terrestrial Atmospheric Chemistry,” A. L. Melott, D. Atri, **B. C. Thomas**, A. J. Krejci*, *J. Cosmology and Astroparticle Phys.*, submitted March 2009, pre-print: <http://arxiv.org/abs/0804.3207>
- “Cometary airbursts and atmospheric chemistry: Tunguska and a candidate Younger Dryas event,” A.L. Melott, **B.C. Thomas**, G. Dreschhoff, Carey K. Johnson, *Geology*, in press, pre-print: <http://arxiv.org/abs/0907.1067>
- “Gamma-Ray Bursts as a Threat to Life on Earth,” **B.C. Thomas**, *International Journal of Astrobiology*, **8**, 183, doi:10.1017/S1473550409004509, 2009.
- “Late Ordovician geographic patterns of extinction compared with simulations of astrophysical ionizing radiation damage,” A.L. Melott and **B.C. Thomas**, *Paleobiology*, **35**, 311, 2009.
- “An In-Class Discussion Activity on the Nature of Science and Intelligent Design,” **B. C. Thomas**, *The Physics Teacher*, **47**, 106, doi: 10.1119/1.3072458, 2009.
- “Amphibian nitrate stress as an additional terrestrial threat from astrophysical ionizing radiation events?” **B.C. Thomas**, M.D. Honeyman*, *Astrobiology*, **8**, 731, doi:10.1089/ast.2007.0262, 2008.
- “Atmospheric Consequences of Cosmic Ray Variability in the Extragalactic Shock Model,” A. L. Melott, A. J. Krejci*, **B. C. Thomas**, M. V. Medvedev, G. W. Wilson, M. J. Murray, *Journal of Geophysical Research*, **113**, E10007, doi:10.1029/2008JE00320, 2008.
- “Superluminous supernovae: No threat from Eta Carinae,” **B. C. Thomas**, A. L. Melott, B. D. Fields, B. J. Anthony-Twarog, *Astrobiology*, **8**, 9, doi:10.1089/ast.2007.0181, 2008.
- “Modeling atmospheric effects of the September 1859 Solar Flare,” **B. C. Thomas**, C. H. Jackman, A. L. Melott, *Geophysical Research Letters*, **34**, L06810, doi:10.1029/2006GL029174, 2007.
- “Terrestrial Consequences of Spectral and Temporal Variability in Ionizing Photon Events,” L. M. Ejzak*, A. L. Melott, M. V. Medvedev, **B. C. Thomas**, *Astrophysical Journal*, **654**, 373, 2007.
- “Gamma-ray bursts and terrestrial planetary atmospheres,” **B. C. Thomas**, A. L. Melott, *New Journal of Physics*, **8**, 120, 2006.
- “Gamma-Ray Bursts and the Earth: Exploration of Atmospheric, Biological, Climatic and Biogeochemical Effects,” **B. C. Thomas**, A. L. Melott, C. H. Jackman, C. M. Laird, M. V. Medvedev, R. S. Stolarski, N. Gehrels, J. K. Cannizzo, D. P. Hogan*, L. M. Ejzak*, *Astrophysical Journal*, **634**, 509, 2005.
- “Climatic and biogeochemical effects of a galactic gamma ray burst,” A. L. Melott, **B. C. Thomas**, D. P. Hogan*, L. M. Ejzak*, C. H. Jackman, *Geophysical Research Letters*, **32**, L14808, 2005.
- “Terrestrial Ozone Depletion Due to a Milky Way Gamma-Ray Burst,” **B. C. Thomas**, C. H.

Jackman, A. L. Melott, C. M. Laird, R. S. Stolarski, N. Gehrels, J. K. Cannizzo, D. P. Hogan*,
Astrophysical Journal Letters, **622**, L153, 2005.

- “Did a gamma-ray burst initiate the late Ordovician mass extinction?” A. Melott, B. Lieberman, C. Laird, L. Martin, M. Medvedev, **B. Thomas**, J. Cannizzo, N. Gehrels, C. Jackman, *International Journal of Astrobiology*, **3**, 55, 2004.
- “Quantifying the Bull's Eye Effect,” **B. C. Thomas**, A. L. Melott, H. A. Feldman, S. F. Shandarin, *Astrophysical Journal*, **601**, 28, 2004.

Conference Proceedings

- “Development of Radiation-Hard Materials for Microstrip Detectors,” T. Dubbs, W. Kroeger, T. Pulliam, D. Roberts, W.A. Rowe, H.F-W. Sadrozinski, A. Seiden, **B. Thomas**, A. Webster, Presented at IEEE Nuclear Science Symposium, Toronto, Canada, November 8-14, 1998.

Other Publications

- Contributor to “The Astrobiology Primer: An Outline of General Knowledge—Version 1, 2006,” published in *Astrobiology*, Oct 2006, Vol. 6, No. 5, 735-813.
- Numerous articles about my research work have appeared in print and online publications such as *Astronomy* magazine, New Scientist online, Discovery Channel online, etc. A NASA press release was issued to announce results of my dissertation topic in 2005, and a documentary on that work was aired in September 2007 on the show “Mega Disasters” on the History Channel.

Presentations and Conferences Attended

National and International

- “Late Ordovician geographic patterns of extinction compared with simulations of astrophysical ionizing radiation damage,” B.C. Thomas, A.L. Melott, Presented at Geological Society of America Annual Meeting, Portland, OR, October 20, 2009.
- Invited speaker to 42nd annual ESLAB symposium on “Cosmic Cataclysms and Life,” Frascati, Italy, November 10-14, 2008. Spoke on the topic of “Gamma-Ray Bursts and the Earth.”
- “Superluminous supernovae: No threat from Eta Carinae,” B.C. Thomas, Presented at American Astronomical Society 212th Meeting, St. Louis, MO, June 1, 2008.
- “Modeling Atmospheric Effects of the September 1859 Solar Flare,” B.C. Thomas, C.H. Jackman, A. Melott, Presented at American Astronomical Society 209th Meeting, Seattle, WA, January 7, 2007.
- Attended “New Physics and Astronomy Faculty Workshop,” held by the American Association of Physics Teachers, in conjunction with the American Astronomical Society and the American Physical Society, at the American Center for Physics in College Park, MD, October 26-29, 2006.
- “Terrestrial Effects of a 30 pc Supernova,” B.C. Thomas, A. Melott, D. Hogan, Presented at American Astronomical Society 207th Meeting, Washington, DC, January 9, 2006. Also attended CAPER-led workshop on teaching introductory astronomy.
- “Ozone Depletion Due to a Milky Way Gamma-Ray Burst,” B. C. Thomas, C. Jackman, A. Melott, C. Laird, R. Stolarski, Presented at American Astronomical Society 205th Meeting, San Diego, CA, January 10, 2005.
- “Did a gamma-ray burst initiate the late Ordovician mass extinction?” B. Thomas, A. Melott, B.

Lieberman, C. Laird, L. Martin, M. Medvedev, J. Cannizzo, N. Gehrels, C. Jackman, Presented at American Physical Society April Meeting, Denver, CO, May 1-4, 2004.

- “Did a gamma-ray burst initiate the late Ordovician mass extinction?” B. Thomas, A. Melott, B. Lieberman, C. Laird, L. Martin, M. Medvedev, J. Cannizzo, N. Gehrels, C. Jackman, Presented at Astrobiology Graduate Conference, Tucson, AZ, January 7-11, 2004.
- “Nothing new under the Sun: An analysis of Steinhardt and Turk's Cyclic Universe Model,” B. C. Thomas, Presented at American Scientific Affiliation annual meeting, Denver, CO, July 26, 2003.
- “Presenting Cosmology to a Local Church,” B. C. Thomas, Presented at American Scientific Affiliation annual meeting, Denver, CO, July 26, 2003.
- “Using the Bull's Eye Effect to Probe Ω_m ” B. C. Thomas, A. L. Melott, H. A. Feldman, Presented at American Astronomical Society 199th Meeting, Washington, D.C., January 9, 2002.
- International Summer School on the Historical Development of Modern Cosmology, Valencia, Spain, September 18-22, 2000.

Regional and Local

- “Comparing simulations of astrophysical ionizing radiation damage with Late Ordovician geographic patterns of extinction,” B.C. Thomas, A.L. Melott, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 4, 2009.
- “Late Ordovician geographic patterns of extinction compared with simulations of astrophysical ionizing radiation damage,” B.C. Thomas, A.L. Melott, Presented at the 141st Annual Meeting of the Kansas Academy of Science, Topeka, KS, March 28, 2009.
- “How science works: Teaching *about* science, not just teaching science,” B. C. Thomas, talk for Washburn University Natural Sciences Division Meeting, October 17, 2008.
- “Superluminous supernovae: No threat from Eta Carinae,” B.C. Thomas, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 12, 2008.
- “Modeling Atmospheric Effects of the September 1859 Solar Flare,” B. C. Thomas, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 14, 2007.
- “Atmospheric Effects of the September 1859 Solar Superflare,” B. C. Thomas, Presented at Astrobiology Seminar, University of Kansas, September 19, 2006.
- “Terrestrial Effects of a 30 pc Supernova,” B. C. Thomas, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 8, 2006.
- “Death from Above: Astrophysical Impacts on Life on Earth,” B. C. Thomas, talk for Washburn University Natural Sciences Division Meeting, March 10, 2006.
- “Gamma-Ray Bursts and Terrestrial Ozone Depletion: Exploration of Event Latitude and Season Effects,” B. C. Thomas, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 16, 2005.
- “Did a gamma-ray burst initiate the late Ordovician mass extinction?” B. C. Thomas, Presented at the 137th Annual Meeting of the Kansas Academy of Science, Overland Park, KS, March 19, 2005.
- “Did a gamma-ray burst initiate the late Ordovician mass extinction?” B. Thomas, A. Melott, B. Lieberman, C. Laird, L. Martin, M. Medvedev, J. Cannizzo, N. Gehrels, C. Jackman, Presented at the Oklahoma Supercomputing Symposium, Oct. 6-7, 2004.

- “Atmospheric Effects of a Gamma-Ray Burst Impact: Preliminary Results,” B. C. Thomas, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 16, 2004.
- “Quantifying the Bull's Eye Effect,” B. C. Thomas, A. L. Melott, H. A. Feldman, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, April 11, 2003.
- “Using the Bull's Eye Effect to Investigate Ω ,” B. C. Thomas, A. L. Melott, H. A. Feldman, Presented at Mid-America Regional Astrophysics Conference, Kansas City, MO, October 13, 2000.
- Numerous presentations at weekly Astrophysics Seminar, University of Kansas, Fall 1999 - Fall 2004.

Service Activities

- Served on MS oral exam committee for Dimitra Atri at University of Kansas, Department of Physics and Astronomy, March 2009.
- Spoke to Preparing Future Faculty class at University of Kansas, regarding the academic job search process, March 2009. Spoke to graduate student group at the University of Kansas Department of Physics and Astronomy on succeeding in graduate school, the job search process, etc., April 2009.
- Served on organizing committee for 2009 meeting of the Kansas Academy of Sciences, held at Washburn University, March 27-28.
- Chair of search committee for lecturer/public outreach position, Fall 2008.
- Served as referee for articles submitted to journal *Annales Geophysicae*, October 2007, 2008.
- Served as referee for article submitted to journal *Astrobiology*, October 2009.
- Appointed by College of Arts and Sciences Dean for three year term on Bachelor of Integrated Studies Committee
- Participated in “Pizza, Pop, and Profs” for Fall 2006 and 2007 new student orientation (WU)
- Department Representative to College Faculty Council, Fall 2006 – present.
- Served on College Resource Committee, Spring 2007 – present.
- Department Representative to Natural Sciences Division General Education Committee, 2006
- Department Representative to University Library Committee, Fall 2005 – present
- Assisted with Washburn student move-in day, August 2005, 2006, 2007, 2008
- Student representative on Graduate Education Committee, Dept. of Physics and Astronomy, University of Kansas (1999-2000)
- Student representative on faculty search committees: Dept. of Physics and Astronomy, University of Kansas (2002); Dept. of Physics, University of the Pacific (1998, 1999)

Public Outreach

- Organized and ran neighborhood star party, in conjunction with College Hill Neighborhood Association, October 2009.
- Taught basic astronomy content for Washburn University Merit Badge Conference, February 2009.
- Presented talk on Astrobiology for Lakin High School (Lakin, Kansas) physics class, via

videoconference, February 2009.

- Planned and conducted planetarium and observatory visits for numerous school and community groups, 2007-present.
- “The History of the Universe: What we Know and How we Know It” presented May 11, 2008 for Atheist Community of Topeka.
- Planned and conducted planetarium visit and “You Are Here” astronomy discussion for Lawrence Book Club, October 2007.
- Assisted with preschool units on physics and astronomy at East Heights Early Childhood Center, Lawrence, KS; March and May, 2007
- “Aliens: Are They Out There?” presented (twice, Fall 2005) as part of Washburn University’s “FUNatic Fridays” recruiting event, administered through WU admissions office.
- “Cosmology: The Study of the Universe,” presented at:
 - Rockhurst University, Kansas City, MO, December 2003, for undergraduate physics majors.
 - St. Charles High School, St. Charles, IL, March 2002, 2003, for honors physics classes.
- “The Heavens Declare,” presented at:
 - Lawrence Wesleyan Church, Lawrence, KS, October 2002.
- “Introducing Astronomy,” presented at:
 - Centennial Elementary School, Lawrence, KS, May 2001, for 6th grade class.

Professional Affiliations

- Sigma Pi Sigma Physics Honor Society (initiated 2000)
- Phi Kappa Phi Honor Society (initiated 1998)
- American Astronomical Society
- American Physical Society
- American Association of Physics Teachers
- American Geophysical Union

Other Activities and Interests

- Interested in questions in science & religion, religion & society and social justice issues. I have been involved with science and religion issues in a variety of venues.
- Member of Unitarian Universalist Fellowship of Topeka.