

## GREGORY S. TUCKER

Associate Professor of Physics

### EDUCATION

1991	Ph.D. in physics	Princeton University, Princeton, NJ Dissertation: An Instrument to Search for Small Scale Anisotropy in the Cosmic Microwave Background at 90 GHz
1987	M.A. in physics	Princeton University, Princeton, NJ
1985	S.B. in physics	Massachusetts Institute of Technology, Cambridge, MA

### EMPLOYMENT

2004–present	Associate Professor of Physics, Brown University
1997–2004	Assistant Professor of Physics, Brown University
2002–2003	National Academy of Sciences National Research Council Senior Fellowship at NASA/Goddard Spaceflight Center
1997–1998	Visiting Fellow, Princeton University
1996–1997	Physicist, Smithsonian Astrophysical Observatory
1994–1996	Research Associate in Physics, University of British Columbia
1992–1994	Postdoctoral Fellow in Physics, University of British Columbia
1991–1992	Research Associate in Physics, Princeton University

### REFEREED PUBLICATIONS

- “Three-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Beam Profiles, Data Processing, Radiometer Characterization and Systematic Error Limits,” N. Jarosik, C. Barnes, M. R. Greason, R. S. Hill, M. R. Nolta, N. Odegard, J. L. Weiland, R. Bean, C. L. Bennett, O. Doré, M. Halpern, G. Hinshaw, A. Kogut, E. Komatsu, M. Limon, S. S. Meyer, L. Page, D. N. Spergel, G. S. Tucker, E. Wollack & E. L. Wright, submitted to the *Astrophysical Journal* (2006)
- “Three-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Temperature Results,” G. Hinshaw, M. R. Nolta, C. L. Bennett, R. Bean, O. Doré, M. R. Greason, M. Halpern, R. S. Hill, N. Jarosik, A. Kogut, E. Komatsu, M. Limon, N. Odegard, S. S. Meyer, L. Page, H. V. Peiris, D. N. Spergel, G. S. Tucker, L. Verde, J. L. Weiland, E. Wollack & E. L. Wright, submitted to the *Astrophysical Journal* (2006)
- “Three-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Polarization Analysis,” L. Page, G. Hinshaw, E. Komatsu, M. R. Nolta, D. N. Spergel, C. L. Bennett, C. Barnes, R. Bean, O. Doré, M. Halpern, R. S. Hill, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, N. Odegard, H. V. Peiris, G. S. Tucker, L. Verde, J. L. Weiland, E. Wollack & E. L. Wright, submitted to the *Astrophysical Journal* (2006)
- “Three-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Implications for Cosmology,” D. N. Spergel, R. Bean, O. Doré, M. R. Nolta, C. L. Bennett, G. Hinshaw, N. Jarosik, E. Komatsu, L. Page, H. V. Peiris, L. Verde, C. Barnes, M. Halpern, R. S. Hill, A.

- Kogut, M. Limon, S. S. Meyer, N. Odegard, G. S. Tucker, J. L. Weiland, E. Wollack & E. L. Wright, submitted to the *Astrophysical Journal* (2006)
- “The SCUBA Half Degree Extragalactic Survey (SHADES) I - Survey Design and Data Analysis,” A. M. J. Mortier, S. Serjeant, J. S. Dunlop, S. E. Scott, P. Ade, O. Almaini, I. Aretxaga, C. Baugh, A. Benson, P. N. Best, A. Blain, J. Bock, C. Borys, A. Bressan, C. Carilli, E. L. Chapin, S. Chapman, D. Clements, K. Coppin, M. Crawford, M. Devlin, S. Dicker, L. Dunne, S. A. Eales, A. Edge, D. Farrah, M. Fox, C. Frenk, E. Gaztañaga, W. Gear, E. Gonzales-Solares, T. R. Greve, J. Grimes, J. Gundersen, M. Halpern, P. Hargrave, D. H. Hughes, R. J. Ivison, M. Jarvis, T. Jenness, R. Jimenez, E. van Kampen, A. King, C. Lacey, A. Lawrence, K. Lepage, G. L. Granato, R. G. Mann, G. Marsden, P. Mauskopf, B. Netterfield, S. Olivier, L. Olmi, M. J. Page, J. Peacock, C. P. Pearson, W. J. Percival, A. Pope, R. S. Priddey, S. Rawlings, N. Roche, M. Rowan-Robinson, D. Scott, K. Sekiguchi, M. Seigar, L. Silva, C. Simpson, I. Smail, J. A. Stevens, T. Takagi, G. Tucker, C. Vlahakis, I. Waddington, J. Wagg, M. Watson & C. Willott, *Monthly Notices of the Royal Astronomical Society*, 363, 509 (2005)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Dark Energy Induced Correlation with Radio Sources,” M. R. Nolta, E. L. Wright, L. Page, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, D. N. Spergel, G. S. Tucker & E. Wollack, *the Astrophysical Journal*, 608, 10 (2004)
- “The Balloon-borne Large Aperture Submillimeter Telescope (BLAST),” G. S. Tucker, P. A. R. Ade, J. J. Bock, M. Devlin, M. Griffin, J. Gundersen, M. Halpern, P. Hargrave, D. Hughes, J. Klein, C. B. Netterfield, L. Olmi & D. Scott, *Advances in Space Research*, 33, 1793 (2004)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: TT and TE Angular Spectrum Peaks,” L. Page, M. R. Nolta, C. Barnes, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, H. Peiris, D. N. Spergel, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 233 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Implications for Inflation,” H. V. Peiris, E. Komatsu, L. Verde, D. N. Spergel, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, L. Page, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 213 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Parameter Estimation Methodology,” L. Verde, H. V. Peiris, D. N. Spergel, M. R. Nolta, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, L. Page, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement* 148, 195 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Determination of Cosmological Parameters,” D. N. Spergel, L. Verde, H. V. Peiris, E. Komatsu, M. R. Nolta, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, L. Page, G. S. Tucker, J. L. Weiland, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 175 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: TE Polarization,” A. Kogut, D. N. Spergel, C. Barnes, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, M. Limon, L. Page, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement* 148, 161 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Angular Power Spectrum,” G. Hinshaw, D. N. Spergel, L. Verde, R. S. Hill, S. S. Meyer, C. Barnes, C. L. Bennett,

- M. Halpern, N. Jarosik, A. Kogut, M. Limon, L. Page, G. S. Tucker, J. Weiland, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 135 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Tests of Gaussianity,” E. Komatsu, A. Kogut, M. Nolta, C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, M. Limon, L. Page, D. N. Spergel, G. S. Tucker, L. Verde, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 119 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Foreground Emission,” C. L. Bennett, R. Hill, G. Hinshaw, M. Nolta, N. Odegard, L. Page, D. N. Spergel, J. Weiland, E. L. Wright, M. Halpern, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, G. S. Tucker & E. Wollack, *Astrophysical Journal Supplement*, 148, 97 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Data Processing Methods and Systematic Error Limits,” G. Hinshaw, C. Barnes, C. L. Bennett, M. Greason, M. Halpern, R. S. Hill, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, N. Odegard, L. Page, D. N. Spergel, G. S. Tucker, J. Weiland, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 63 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Galactic Signal Contamination from Sidelobe Pickup,” C. Barnes, R. S. Hill, G. Hinshaw, L. Page, C. L. Bennett, M. Halpern, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 51 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Beam Profiles and Window Functions,” L. Page, C. Barnes, G. Hinshaw, D. N. Spergel, J. L. Weiland, E. Wollack, C. L. Bennett, M. Halpern, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, G. S. Tucker & E. L. Wright, *Astrophysical Journal Supplement*, 148, 39 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: On-Orbit Radiometer Characterization,” N. Jarosik, C. L. Bennett, A. Kogut, M. Limon, S. S. Meyer, L. Page, G. S. Tucker, E. Wollack & E. L. Wright, *Astrophysical Journal Supplement*, 148, 29 (2003)
- “First Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Preliminary Maps and Basic Results,” C. L. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, L. Page, D. N. Spergel, G. S. Tucker, E. Wollack, E. L. Wright, C. Barnes, M. R. Greason, R. S. Hill, E. Komatsu, M. R. Nolta, N. Odegard, H. V. Peiris, L. Verde & J. L. Weiland, *Astrophysical Journal Supplement*, 148, 1 (2003)
- “The Optical Design and Characterization of the Microwave Anisotropy Probe,” L. Page, C. Jackson, C. Barnes, C. Bennett, M. Halpern, G. Hinshaw, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, D. N. Spergel, G. S. Tucker, D. T. Wilkinson, E. Wollack & E. L. Wright, *Astrophysical Journal*, 585, 566 (2003)
- “Design, Implementation and Testing of the MAP Radiometers,” N. Jarosik, C. L. Bennett, M. Halpern, G. Hinshaw, A. Kogut, M. Limon, S. S. Meyer, L. Page, D. N. Spergel, G. S. Tucker, D. T. Wilkinson, E. Wollack, E. L. Wright & Z. Zhang, *Astrophysical Journal Supplement*, 145, 413 (2003)
- “The Microwave Anisotropy Probe Mission,” C. L. Bennett, M. Bay, M. Halpern, G. Hinshaw, C. Jackson, N. Jarosik, A. Kogut, M. Limon, S. S. Meyer, L. Page, D. N. Spergel, G. S. Tucker, D. T. Wilkinson, E. Wollack & E. L. Wright, *the Astrophysical Journal*, 583, 1 (2003)
- “The MAP Satellite Feed Horns,” C. Barnes, M. Limon, L. Page, C. Bennett, S. Bradley, M.

Halpern, G. Hinshaw, N. Jarosik, B. Jones, A. Kogut, S. Meyer, O. Motrunich, G. Tucker, D. Wilkinson & E. Wollack, *Astrophysical Journal Supplement*, 143, 567 (2002)

“Breaking the Redshift Deadlock — I. Constraining the Star Formation History of Galaxies with Sub-millimetre Photometric Redshifts,” D. H. Hughes, I. Aretxaga, E. L. Chapin, E. Gaztañaga, J. S. Dunlop, M. J. Devlin, M. Halpern, J. Gundersen, J. Klein, C. B. Netterfield, L. Olmi & G. Tucker, *Monthly Notices Royal Astronomical Society*, 335, 871 (2002)

“NTD-Ge Based Microcalorimeter Performance,” S. Bandler, E. Silver, H. Schnopper, S. Murray, M. Barbera, N. Madden, D. Landis, J. Beeman, E. Haller & G. Tucker, *Nuclear Instruments and Methods*, A444, 273 (2000)

“Laboratory Astrophysics and Microanalysis with NTD Germanium-Based X-Ray Microcalorimeters,” E. Silver, H. Schnopper, S. Bandler, S. Murray, N. Madden, D. Landis, J. Beeman, E. Haller, M. Barbera, G. Tucker, J. Gillaspay, E. Takacs & J. Porto, *Nuclear Instruments and Methods*, A444, 156 (2000)

“Using White Dish CMB Anisotropy Data to Probe Open and Flat- $\Lambda$  CDM Cosmogonies,” B. Ratra, K. Ganga, N. Sugiyama, G. S. Tucker, G. S. Griffin, H. T. Nguyen & J. B. Peterson, *Astrophysical Journal*, 505, 8 (1998)

“Anisotropy in the Microwave Sky: Results from the First Flight of BAM,” G. S. Tucker, H. Gush, M. Halpern, I. Shinkoda & W. Towlson, *Astrophysical Journal*, 475, L73 (1997)

“A System for Grabbing Integrated Video Frames Remotely,” M. Halpern, S. Knotek & G. S. Tucker, *Review of Scientific Instruments*, 67, 4005 (1996)

“Balloon-Borne Anisotropy Measurement (BAM) Using A Cryogenic Fourier Transform Spectrometer,” M. Halpern, H. P. Gush, I. Shinkoda & G. S. Tucker, *Astrophysical Letters and Communications*, 32, 283 (1995)

“The White Dish South Pole Anisotropy Measurement,” J. B. Peterson, G. S. Griffin, M. Dragovan, H. T. Nguyen & G. S. Tucker, *Astrophysical Letters and Communications*, 32, 269 (1995)

“Cryogenic Bolometric Radiometer and Telescope,” G. S. Tucker, J. B. Peterson, C. B. Netterfield, G. S. Griffin, & E. L. Griffith, *Review of Scientific Instruments* 65, 301 (1994)

“A Search for Small Scale Anisotropy in the Cosmic Microwave Background,” G. S. Tucker, G. S. Griffin, H. T. Nguyen & J. B. Peterson, *Astrophysical Journal* 419, L45 (1993)

“BAM: Using A Fourier Transform Spectrometer to Measure Anisotropy of the Cosmic Microwave Background,” M. Halpern, H. P. Gush, I. Shinkoda & G. S. Tucker, *Annals of the New York Academy of Sciences* 688, 812 (1993)

“The Alignment of Clusters with Brightest Member Galaxies,” G. S. Tucker & J. B. Peterson, *Astronomical Journal* 95, 298 (1988)

## **SELECTED INVITED LECTURES**

“Recent Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” University of Kentucky (2004)

“Recent Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” Michigan State University (2004)

“First Year Results from the Wilkinson Microwave Anisotropy Probe (WMAP): Mission and Maps,” Recontres de Blois (2003)

“The Cosmic Microwave Background and the Wilkinson Microwave Anisotropy Probe (WMAP),” Netherlands Astronomical Conference (2003)

“First Year Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” Tufts University (2003)

“First Year Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” Indiana University (2003)

“First Year Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” Brandeis University (2003)

“First Year Results from the Wilkinson Microwave Anisotropy Probe (WMAP),” Yale University (2003)

“The Balloon-borne Large Aperture Submillimeter Telescope (BLAST),” COSPAR — The World Space Congress (2002)

“Measuring the Universe Using the Microwave Anisotropy Probe (MAP),” University of Massachusetts Dartmouth (2002)

“The Cosmic Microwave Background: The View from Space,” AAAS Annual Meeting (2002)

#### **CURRENT AND COMPLETED RESEARCH GRANTS**

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|-----------|---|
| 2006–2009 | Extragalactic and Galactic Surveys with the Balloon-borne Large Aperture Sub-millimeter Telescope - BLAST, NASA, co-I   |
| 2006–2009 | The E and B Experiment (EBEX), NASA, co-I   |
| 2004–2006 | Mission Concept Study for the Einstein Polarization Interferometer for Cosmology (EPIC), NASA, co-I   |
| 2003–2006 | Development of the Millimeter-wave Bolometric Interferometer, NASA, PI  |
| 2003–2006 | BLAST: A Balloon-borne Large Aperture Submillimeter Telescope — A Comprehensive Plan for Galactic and Extragalactic Surveys from a Long Duration Balloon Platform, NASA, Institutional PI |
| 2003–2006 | Teacher Training Through Research and Public Understanding of Cosmology, NASA, PI   |
| 2000–2003 | BLAST: A Balloon-borne Large Aperture Submillimeter Telescope — A Comprehensive Plan for Galactic and Extragalactic Surveys at Sub-millimeter Wavelengths, NASA, Institutional PI         |
| 1998–1999 | Constellation-X Mission Microcalorimeter Development, Smithsonian Institution   |

## **SERVICE**

### **To Department**

- 2005–present Colloquium Committee, Laboratory Instruction Committee, Publications/Outreach Committee Safety Committee
- 2001–2002 Graduate Advising Committee
- 2000–2002 Graduate Admissions Committee
- 2000–2001 AdHoc Committee for Brochure on Graduate Studies in Physics
- 1998–present Joint Engineering Physics Instrument Shop (JEPIS) Committee (Co-chair 2000–2002, 2003–present)
- 1998–2002 Coordinator of the Astronomy Program. (Involved training and coordinating ~15 undergraduate TAs and 2–3 graduate student TAs for three courses PH21, PH22 and PH24.
- 1998–2001 Organized Astrophysics Journal Club
- 1998–2001 Colloquium Committee
- 1998–1999 Committee on Undergraduate Concentration, Curriculum and Evaluation
- 1997–present Served on four Ph.D. Defense Committees

### **To University**

- 2005–present Freshman advisor (6 students)
- 2004–present University Library Advisory Board

### **To Community**

- 2006, 2002 Judge for Rhode Island Science Fair
- 2005 “Measuring the Dark Side of the Universe,” Brown University Staff Development Day
- 2003–present “Teacher Training Through Research and Public Understanding of Cosmology.” Provides Providence public high school science teachers experience in science research. Also gets 9th and 10th grade high school students interested in science through weekly hands-on activities. Supervision of seven graduate students and four undergraduate students.
- 2004 “Measuring the Dark Side of the Universe,” Brown University Staff Development Day
- 2001 “MAPping the Universe,” for grades 4–6 (Brown Learning Community)
- 2001, 2000 “MAPping the Universe,” for grades 7–8 (Brown Learning Community)

### **To Profession**

Referee for Review of Scientific Instruments.

Reviewer for National Science Foundation (NSF) and Department of Energy (DOE)

Asked to serve on several NASA and NSERC (Canada) peer review panels, but declined due to schedule conflicts or not permitted due to conflict of interest.

## TEACHING AT BROWN

Physics 3/5/7, Lab Manager and Physics 3 Administrator  
Fall 2003, ~ 200 students

Physics 21, “Beginning Astronomy”, 66 students  
Fall 1999, 67 students  
Fall 1998, 66 students

Physics 22, “Beginning Astronomy”  
Spring 2004, 56 students

Physics 24, “Introductory Astronomy”, 24 students  
Fall 2000, 12 students  
Spring 2000, 25 students  
Spring 1999, 35 students  
Spring 1998, 24 students

Physics 156, “Modern Physics Laboratory”  
Spring 2002, 11 students  
Spring 2001, 11 students

Physics 201, “Techniques in Experimental Physics”  
Spring 2006, 4 students  
Fall 2005, 17 student  
Fall 2001, 12 students

Group Independent Study, “Create Radio Telescope”  
Spring 2001, 6 students (Students designed and built a radio telescope.)

## ADVISING

### Postdoctoral Research Associates

2003–present      Andrei Korotkov

### Ph.D. Students

2001–present      Matthew Truch

1999–2005      Jaiseung Kim  
Ph.D. Thesis: “The Millimeter-wave Bolometric Interferometer for Observation”  
of the Cosmic Microwave Background”

1998–2001      Forest Reid, Sc.M.

1997–1999      Adam Fontecchio, Ph.D. candidate (currently assistant professor at  
Temple University)

### Undergraduate Students

2005–present      Chin Lin Wong, research

2005–present      Shawn Manchester, research

2005 (summer)      Daniel Heller, research

2003–2005      Susanna Finn, honors thesis — “Analyzing Simulations for the Balloon-borne  
Large-Aperture Sub-millimeter Telescope” (currently at Boston University)

in Astronomy Ph.D. program)

2001–2002 Amandine Cagnioncle, research (currently at Brown in Geology Ph.D. program)

2001–2002 Brian Vigorito, research

2000–2002 Jasmine Foo, honors thesis — “The Millimeter-wave Bolometric Interferometer (MBI): Theory and Simulation” (currently at Brown in Applied Math Ph.D. program)

2000–2001 Seth Mrozek, honors thesis — “Mechanical and Thermal Modeling of the BLAST Cryostat” (in business school at Carnegie Mellon University)

2000–2001 James Battat, honors thesis — “A Fast Calculation of the CMB Temperature Correlation Function with NNCorr” (currently at Harvard in Astronomy Ph.D. program)

1998–2001 Christopher Irwin, honors thesis — “Stellar Classification with a CCD Spectrometer” (currently teaching at the Hotchkiss School)

1998–2000 Marvin Seibert, research (currently at Uppsala University in Molecular Biology masters program)

1998–1999 Suvi Gezari, honors thesis — “A Study of Supersonic Turbulence Probed by Water Vapor Masers in Five Galactic Sources” (graduated from Columbia in Astronomy Ph.D. program)

1997–1999 Peter Shepard, research (currently at UC Berkeley in Physics Ph.D. program)

1997–1998 Erin Weeks, research (currently at Boston University in Astronomy Ph.D. program)

**Other**

Summer 2005 David Hurd, high school teacher, research

Summer 2004 Nina Rooks-Cast, high school teacher, research

Summer 2001 Dan Roberts, high school student, research