Suzanne Therese Staggs

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Professional Preparation

1993	Princeton University	Ph.D. (Physics)
1989	Princeton University	M.A. (Physics)
1987	Rice University	B.A. (Physics)

Appointments

2005 –	Professor of Physics	Princeton University
2001–2005	Associate Professor of Physics	Princeton University
1996–2001	Assistant Professor of Physics	Princeton University
1994–96	Hubble Fellow	University of Chicago
1994	Fermi Fellow	University of Chicago
1993–94	Research Associate	Princeton University

Relevant Experience

Management: Staggs has been fielding successful CMB experiments since 1989, including the balloon payload XPER in 1995. She has been managing multi-institution CMB projects for the last fifteen years, as PI of CAPMAP and PIQUE, institutional PI for QUIET and leader of the detector effort for ACT and ACTPol. For ACT and ACTPol, she works closely with the PI (Lyman Page) and co-I Mark Devlin on all aspects of the project management. The ACT detector effort involved managing a large team at Princeton, GSFC, UBC, Penn and NIST; for ACTPol, Michigan and Cornell have joined the team as well. She was PI for NASA and JPL DRDF technology grants that led to the ABS detector development and enabled aspects of the QUIET polarimetry development. She is the current PI of the ABS project, though she and Page share responsibilities.

Cameras: Staggs has long-standing experience with cryogenics: her detector group at Princeton has two rapid-turnaround and one large-volume 300 mK test cryostats and one 100 mK dilution fridge test system. She has substantial experience with transition edge sensor (TES) detectors; the ACT prototype camera built at Princeton, CCAM, was one of the first to make astrophysical observations using TES detectors; her group at Princeton has played a key role in verification of the NIST polarimeters, and will be the first to field them, in the ABS experiment in Chile this spring. ACT fielded three 1000-element TES bolometer arrays, using linear arrays of detectors with the pop-up architecture from GSFC. The devices were screened in extensive 300 mK testing of 1x32 arrays at Princeton, and then assembled into arrays there.

Service and Awards: Staggs served on the Dark Energy Task Force (DETF), more than a dozen NSF review panels, a half-dozen NASA review panels, and was a member of the NASA Capabilities Roadmapping Team in 2005 (for Scientific Instruments & Sensors) Her work has been recognized with a CAREER award, the Maria Goeppert-Mayer Award and a Sloan Fellowship.

Selected Related Publications

- D. Samtleben, S. T. Staggs, & B. Winstein, "The Cosmic Microwave Background for Pedestrians, 2007, Ann. Rev. Nuc Sci., 57, 245.

- **XPER**: The measurement reported below for this balloon-borne project had the smallest error of any at wavelengths longward of the COBE FIRAS until the recent spectacular results from ARCADE were published.

  - S. T. Staggs, N. C. Jarosik, S. S. Meyer & D. T. Wilkinson, "An Absolute Measurement of the Cosmic Background Radiation Temperature at 10.7 GHz," 1996, ApJ 473, L1.

- **PIQUE**: Staggs was the PI of PIQUE, the first of a new cohort of experiments designed specifically to begin searching for the CMB polarization in the 1990s.

  - M. M. Hedman, D. Barkats, J.O. Gundersen, S. T. Staggs & B. Winstein, "New Limits on the Polarized Anisotropy of the Cosmic Microwave Background at Subdegree Angular Scales," APJL 573, L73, 2002:
  - M. M. Hedman, D. Barkats, J.O. Gundersen, J. J. McMahon, S. T. Staggs & B. Winstein, "A Limit on the Polarized Anisotropy of the Cosmic Microwave Background at Subdegree Angular Scales," ApJL 548, L111,2001.

- **CAPMAP**: Staggs was the PI of CAPMAP, which used coherent amplifiers in correlation polarimeters coupled to the 7m Lucent Technologies off-axis Cassegrain telescope to make the first (albeit low signal to noise) measurements of the EE polarization at small angular scales, and which later published some of the first detailed measurements of EE at high ℓ, with complementary data at both 40 GHz and 90 GHz.

  - Barkats, et al., "First Measurements of the Polarization of the Cosmic Microwave Background Radiation at Small Angular Scales from CAPMAP," 2005, ApJL, 619, L127.
  - Bischoff, et al, "New Measurements of Fine-Scale CMB Polarization Power Spectra from CAPMAP at Both 40 and 90 GHz", 2008, ApJ 684, 771.
  - Barkats et al, "CMB Polarimetry using Correlation Receivers with PIQUE and CAPMAP Experiments," 2005, ApJS, 159, 1.

- **ACT/ACTPol**: ACT is a 6m special-purpose telescope in Chile. Highlights in the subset below include the first direct detection of gravitational lensing of the CMB, the first evidence for dark energy using the CMB alone, detection of the kinematic SZ effect from clusters via the ACT map skewness, accurate measurements of the CMB power spectrum over a factor of 30 in ℓ, cosmological parameters therefrom, blind SZ cluster detections, novel techniques of calibration, and novel cross-correlations. ACTPol is a new funded camera under construction which features three arrays of NIST polarimeters with NIST feedhorn arrays. The first array is in the field now.

  - Das et al, "Detection of the Power Spectrum of Cosmic Microwave Background Lensing by the Atacama Cosmology Telescope," 2011, PRL 107, 2, 021301.
  - Sherwin et al, "Evidence for Dark Energy from the Cosmic Microwave Background Alone Using the Atacama Cosmology Telescope Lensing Measurements," 2011, PRL 107, 021302.

- Dunkley et al, "The Atacama Cosmology Telescope: likelihood for small-scale CMB data," 2013, JCAP, 7, 25.
- Hand et al., "Evidence of Galaxy Cluster Motions with the Kinematic Sunyaev-Zel'dovich Effect," 2012, PRL, 109d1101.
- Calabrese et al, "Cosmological parameters from pre-planck cosmic microwave background measurements, " 2013, PRD, 87, 103012.
- Hasselfield et al, "The Atacama Cosmology Telescope: Sunyaev-Zel'dovich selected galaxy clusters at 148 GHz from three seasons of data," 2013, JCAP 7, 8.
- Hajian et al, "The Atacama Cosmology Telescope: Calibration with WMAP Using Cross-Correlations," 2011, ApJ 740, 86.
- Wilson, et al, "Atacama Cosmology Telescope: A measurement of the thermal Sunyaev-Zel'dovich effect using the skewness of the CMB temperature distribution," 2012, PRD, 122005.
- Niemack et al, "ACTPol: a polarization-sensitive receiver for the Atacama Cosmology Telescope," 2010, (SPIE) Conference Series 7741, 77411S; arXiv 1006.5049

- **TRUCE**: TRUCE is the collaboration among NIST, Princeton, Michigan, Chicago and UCB to develop the NIST polarimeters proposed for use in deLITE; below is a subsample of our publications.
  - Yoon et al., "Feedhorn-Coupled TES Polarimeters for Next-Generation CMB Instruments", 2009, LTD-13, AIP Conference Proceedings.
  - Appel et al, "Characterizing and Modeling the Noise and Complex Impedance in Feedhorn-Coupled TES Polarimeters", 2009, LTD-13, AIP Conference Proceedings.
  - Henning et al, "Optical efficiency of feedhorn-coupled TES polarimeters for next-generation CMB instruments," 2010, (SPIE) Conference Series 7741, 774122.
  - Bleem et al, "Optical properties of Feedhorn-coupled TES polarimeters for CMB polarimetry", 2009, LTD-13, AIP Conference Proceedings.

- **QUIET**: Staggs is a founding member of QUIET and served as its spokesperson during the drafting and publication of the two 2012-3 papers. The data-taking is complete, but some final analyses continue. QUIET uses similar techniques to CAPMAP, but with many more (and much more compact) receivers, at a much better site, with more optimized but smaller optics. The QUIET polarimeters were developed at JPL by T. Gaier.
  - The QUIET Collaboration et al, "First Season QUIET Observations: Measurements of CMB Polarization Power Spectra at 43 GHz in the Multipole Range $25 \leq \ell \leq 475$," 2011, ApJ, 741, 111.
  - The QUIET Collaboration et al., "Second Season QUIET Observations: Meausrements of the Cosmic Microwave Background Polarization Power Spectrum at 95 GHz," 2012, ApJ 760, 145.
  - The QUIET Collaboration et al., 11The Q/U Imaging ExperimenT Instrument," 2013, 768, 9.

- **ABS**: ABS, a compact B-mode project featuring cryogenic mirrors and a warm HWP, using 240 NIST polarimeters at 140 GHz. ABS is taking data in the Atacama now and analysis of its data is underway.

– Essinger-Hileman et al, "The Atacama B-Mode Search: CMB Polarimetry with Transition-Edge-Sensor Bolometers," 2010, Proceedings of the Thirteenth International Conference on Low-Temperature Detectors, arXiv 1008.3915