

Curriculum Vita for Clement Pryke

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Education:

University of Leeds , Leeds, UK

Ph.D Experimental Cosmic Ray Physics - February, 1996

Thesis: "Instrumentation development and experimental design for a next generation detector of the highest energy cosmic rays". Thesis Adviser: Prof. Alan A. Watson.

University of Leeds , Leeds, UK

BSc. (*cum laude*) Physics with Electronics and Instrumentation - July, 1992

Thesis: "Single Photon Self Interference". Thesis Adviser: Prof. A.M. Hillas.

Professional History:

10/2015 – 5/2016	Visting Scholar, Harvard/Smithsonian CfA
7/2010 – present	Associate Professor, Dept. of Physics, University of Minnesota
7/2002 – 6/2010	Assistant Professor, Dept. of Astronomy and Astrophysics, University of Chicago
1/2001 – 7/2002	Senior Research Associate, EFI, University of Chicago
4/1999 – 12/2000	Research Scientist, EFI, University of Chicago
4/1996 – 3/1999	McCormick Fellow, EFI, University of Chicago
1988 – 1989	Research Assistant, Thorn EMI Central Research Labs, UK

Awards/Honors:

2016	APS Fellow.
2005	J. and J. Neubauer Faculty Development Fellowship, College of University of Chicago.
2002	Compton Lecturer, University of Chicago.
1996 – 1999	McCormick Fellow, University of Chicago.
1992 – 1995	Henry Ellison Fellowship, University of Leeds.
1992	Widdington Prize, University of Leeds.

Research Achievements:

BICEP1/BICEP2/Keck-Array/BICEP3/BICEP-Array, March 2008 – present: The BICEP/Keck series of experiments is a bold experimental program seeking to detect gravitational wave B-modes, the "smoking gun" of Inflation, and one of the most exciting and competitive areas in all of contemporary science.

Co-PI on four collaborative awards from NSF (total funding to Pryke \$5.7M). Led cryostat design and re-engineering of the DASI mount to accept the new experiment and led on site Keck-Array deployment teams during austral summers 2010/11 to 2012/13. Led the analysis team which announced first detection of *B*-mode polarization at degree angular scales and 150 GHz in March of 2014. Also

led joint analysis team with Planck which showed that some or all of this signal is due to polarized emission from galactic dust in February 2015. Led recent analysis including 2014 data. Continuing to lead analysis efforts collaboration wide as well as recently funded proposal for the next generation of the experimental program called “BICEP Array”. Advising graduate students & postdocs and supervising winter over scientist.

QUaD experiment, June 2003 – 2009: QUaD was a bolometric CMB polarimeter sited at the South Pole which produced the high precision measurements at smaller angular scales in 2008. These results stood as the world’s best for five years until finally being surpassed by ACTpol, SPTpol and Planck.

Co-PI on three collaborative awards from NSF (Total funding to Pryke \$1.2M). Led design of interface assembly to DASI mount. Developed innovative one piece secondary support cone made from Zotefoam. Devised novel techniques to measure and align telescope mirrors. Led integration of QUaD receiver into existing DAQ system. Devised observation strategy, calibration procedures and monitoring operations. Supervised telescope operations and winter over scientist. Advised graduate student and post-doc. Led science data analysis resulting in ground breaking scientific results.

SPT/SPTpol experiment, July 2001 – present: SPT is a 10 m millimeter wave telescope now installed at the South Pole.

Co-I on successful original grant proposal. Carried out early simulations of cluster finding to determine necessary angular resolution. Designed and implemented computer network used for data acquisition and analysis. Mentor to graduate students and post-docs on team. Continuing to collaborate on data analysis and recently leading joint analysis of BICEP/Keck and SPTpol data.

SZA experiment, Aug 2000 – 2010: SZA was an interferometric array of eight 3.5 m radio telescopes optimized to study galaxy clusters through the SZ effect.

Co-I on successful initial grant proposal. Designed and implemented telescope drive system. Developed pointing model. Led design of telescope electronics modules — phaselocks, receiver bias etc. Conducted early simulations of fake data followed by reanalysis, laying the foundations for development of analysis pipeline. Mentor to graduate students on team.

DASI experiment, August 1998 – September 2004: DASI was a 13 element CMB interferometer at the South Pole which made the first detection of the polarization of the CMB.

Designed and implemented telescope drive system. Led integration of highly complex electronics and DAQ system from RF through to control computer. Deployed systems to Pole and commissioned. Developed pointing model. Automated telescope observations, data transfer and first level data reduction. Led effort to understand and remove contribution of point sources to CMB results. Led cosmological parameter analysis from first season data. Co-I on successful renewal grant proposal.

CASA-BLANCA experiment, October 1996 - June 2000: BLANCA was a system of 144 air Cerenkov detectors to investigate the cosmic ray spectrum and composition in the “Knee” region.

Designed and implemented a portable GPS driven blue LED flasher for in-situ calibration of the phototube array. Led data analysis effort — wrote “first pass” analysis code and worked closely with a graduate student on extensive refinements. Generated a large Monte Carlo air shower event library to allow extraction of physics results and assessment of their model dependence. Co-advisor to graduate student.

Auger experiment, October 1992 – July 1998: Auger is a huge detector system to study the highest energy cosmic rays.

Designed a 100 Mega Sample Per Second flash-ADC system. Developed techniques to allow low cost commercial GPS receivers to provide highly accurate relative timing, and demonstrated 7 ns accuracy over an 11 km baseline. Key contributor to Design Study Group at Fermilab in 1995. Performed detailed simulations of air showers and the detector system to produce “fake data”. Analyzed this data to predict experimental performance, and allow detector optimization. Very active role in securing the considerable funding including multiple presentations to high level committees (NSF/DoE/SAGENAP).

Industrial experience, October 1988 – June 1989: Research Assistant at the Central Laboratories of Thorn EMI — a large commercial and defense electronics corporation.

Designed multi layer circuit boards using workstation CAD system, and assisted in experiments with high frequency ballast units for discharge lamps.

Synergistic Activities:

Meeting “Cosmology with the CMB and its Polarization”, Jan 14-16 2015: Conceived and co-organized major meeting of international CMB community in Minneapolis.

See <http://www.ftpi.umn.edu/workshops/2014-2015/cmb2015>

Meeting “Astrophysics from the South Pole: Status and Future Prospects”, April 4-5 2011: Obtained funding for, and organized, a meeting in Washington DC to review status of South Pole science program and produce a white paper to feed into NRC review process. Edited final report.

See <http://find.spa.umn.edu/ pryke/southpolemeeting/>

Meeting “The Path to CMBPol - Upcoming Measurements of CMB Polarization”, July 1-3 2009:

Conceived and organized major meeting of international CMB community in Chicago.

See <http://cmbpol.uchicago.edu/workshops/path2009/>

Service (ongoing): CMB-S4 workshop scientific organizing committees, and CMB-S4 Concept Definition Task force (official DOE/NSF advisory committee).

Service (ongoing): Journal paper and research proposal reviews.

Service (ongoing): Wide range of outreach presentations and activities including appearing in full length BBC documentary about BICEP2 — see Bibliography document for a complete list.

Grants:

PI or Co-PI of the following NSF grants:

- “Collaborative Research: Imaging the Beginning of Time from the South Pole: The next Stage of the BICEP Program”, award number 1638970, 08/01/2016 to 07/31/2021. In collaboration with Harvard, Caltech and Stanford. Total funding to Pryke \$2,384,000.
- “Collaborative Research: Imaging the Beginning of Time from the South Pole: Observations with the Full SPUD Array”, award number 1145143, 08/01/2012 to 07/31/2017. In collaboration with Harvard, Caltech and Stanford. Total funding to Pryke \$1,261,068 plus supplement of \$251,788.
- “Collaborative Research: Science Observation with BICEP3 CMB Polarization Experiment”, award number 1313158, 08/15/2013 to 07/31/2016. In collaboration with Harvard, Caltech and Stanford. Total funding to Pryke \$303,448
- “Collaborative Research: BICEP2 and SPUD - A Search for Inflation with Degree-Scale Polarimetry from the South Pole”, award number 1110087, 05/15/2008 to 04/30/2012. In collaboration with Harvard and Caltech. Total funding to Pryke \$1,231,619 plus supplement of \$241,015.
- “Proposal for a Meeting: Astrophysics from the South Pole: Status and Future Prospects”, award number 1129379, 3/29/2011 to 3/31/2012. Total funds \$24,920.
- “Collaborative Research: Analysis of data from the QUaD experiment”, award number 0739413, 04/01/2007 to 03/31/2009. In collaboration with Stanford. Total funding to Pryke \$69,998.

- “Collaborative Research: Next Generation CMB Polarization Measurements with the QUaD Experiment”, award number 0638532, 04/01/2007 to 03/31/2009 (inc. 1 year extension). In collaboration with Stanford and Caltech. Total funding to Pryke \$254,807.
- “Collaborative Research: Next Generation CMB Polarization Measurements with the QUEST Experiment on DASI”, award number 0338238, 4/15/2004 to 3/31/2008 (inc. 1 year extension). In collaboration with Stanford and Caltech. Total funding to Pryke \$918,025.

Graduate Students / Postdocs:

- Postdoc Thomas Culverhouse January 2006 to September 2008. Moved on to UC Berkeley. Now working in industry.
- Graduate student Robert Friedman. Graduated August 2009 with PhD thesis “Measuring the Small Angular Scale Cosmic Microwave Background Temperature Anisotropy With the QUaD Telescope”. Now working at Adler Planetarium.
- Graduate student Chris Sheehy. Graduated August 2013 with PhD thesis “Progress Toward a Detection of Inflationary B-modes With The BICEP2 and Keck Array Polarimeters”. Moved on to KICP Fellowship at University of Chicago. Now Goldhaber Fellow at Broohaven National Lab.
- Postdoc Stefan Fliescher. November 2011 to 2015. Now working in industry.
- Graduate student Eric Bullock. Passed oral exam October 2013. Planning to graduate on Keck-Array experiment.
- Graduate student Justin Willmert. Passed oral exam August 2015. Planning to graduate on Keck-Array and BICEP3 experiments.
- Graduate student Michael Crumrine. Working on Keck-Array and BICEP3 experiments.
- Graduate student Kenny Lau. Working on Keck-Array and BICEP3 experiments.
- Other students informally advised: Joe Fowler (NIST), Matthew Sharp (State Dept).

Updated April 10, 2017