NATHAN P. LOURIE

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EDUCATION

University of Pennsylvania — Philadelphia, PA 19104
Ph.D. – Physics & Astronomy — 2018
M.S. – Physics & Astronomy — 2013

Kenyon College — Gambier, OH 43022
Bachelor of Arts, Physics with High Honors, magna cum laude — 2010

PROFESSIONAL APPOINTMENTS

University of Pennsylvania — Philadelphia, PA 19104
Postdoctoral Researcher — Devlin Experimental Astrophysics Lab — July 2013 - Present

- Assembling, integrating, testing, and deploying The Next Generation Balloon-borne Large Aperture Submillimeter Telescope (BLAST-TNG).
- Leading the cryogenic receiver and telescope optics integration, metrology and alignment and analysis during preflight integration of the payload at the NASA Columbia Scientific Ballooning Facility in Palestine, TX and final integration and launch from McMurdo Station, Antarctica in December, 2018.

University of Pennsylvania — Philadelphia, PA 19104
Research Assistant — Devlin Experimental Astrophysics Lab — May 2012 – June 2018

- Thesis Advisor: Dr. Mark Devlin
- Key member of the design, integration, and flight operation team for the BLAST-TNG telescope. Played a role in the design, production, integration, and testing of nearly every hardware system on the experiment.
- Designed the telescope mount, payload gondola, and balloon suspension system. Prepared mechanical certification document to NASA. Developed thermal model of the entire payload in Thermal Desktop and designed and built the Sun shields. Developed and analyzed finite element models of gondola.
- Developed optomechanical requirement document for the aerospace company that built the telescope, took laser tracker measurements of secondary mirror surface, analyzed metrology data, modeled telescope point-spread function.
- Led the cryogenic receiver development, and the integration of the Microwave Kinetic Inductance Detector (MKID) arrays in the liquid helium cryostat. Designed, tested, and built the 1 K cryogenic system and integrated with sorption fridges. Rebuilt and rewired a test cryostat based on a pulse-tube cooler. Designed laser-cut multilayer insulation blankets. Built cryogenic harness for reading out the detector arrays. Measured MKID response using a vector network analyzer, conducted optical characterization tests to measure detector responsivity and polarization efficiency.
- Simulated observations of the diffuse interstellar medium to select targets for characterization of polarized foregrounds.
- Trained younger graduate students from Penn and collaborating institutions and mentored nine undergraduate interns.

Physics Tutor — 2015 – Present

- One-on-one tutoring of five students in introductory mechanics, electricity & magnetism courses, for both physics majors, engineers, pre-med students, and non-traditional post-baccalaureate and professional students.

Teaching Assistant, Department of Physics and Astronomy — 2012 – Present

- Taught and graded introductory mechanics, electricity & magnetism labs. Graded for introductory astronomy.

Teaching Assistant Training Leader, UPenn Center for Teaching and Learning — Summer 2013

- Led the 3-day intensive teaching assistant (TA) training required of all new TAs at the University of Pennsylvania.

ADNET Systems Inc. / Contractor at NASA – Goddard Space Flight Center (Code 665) — Greenbelt, MD 20771
Associate Detector Test Engineer, Observational Cosmology Laboratory — 2010 – 2012

- Developed, tested, and evaluated superconducting microwave transition-edge sensor (TES) bolometers operating at 40 GHz for the Cosmology Large Angular Scale Surveyor (CLASS), a ground-based cosmic microwave background polarimeter. Measured and modeled detector thermal response, created automated measurement routines in MATLAB and LabVIEW. Characterized microwave circuitry, wire bonded detectors, rebuilt test cryostat based on an adiabatic demagnetization refrigerator (ADR) operating below 100 mK. These detectors have been observing on the CLASS telescope since 2016. Mentored seven undergraduate interns. Contributed to four peer-reviewed publications, and several conference proceedings.

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UNDERGRADUATE RESEARCH

Kenyon College Gambier, OH 43022

- Completed department's first experimental honors project in five years. Developed novel non-destructive technique for imaging and characterizing rough surfaces. Analyzed surface data in IDL. Analysis was used to select appropriate surface treatment for a far-infrared reflectometer for laboratory astrophysics.

NASA – Goddard Space Flight Center (Code 665) Greenbelt, MD 20771

- Completed three summer internships in infrared and submillimeter instrumentation labs. Designed and built a far-infrared integrating sphere reflectometer to measure simulated astronomical dust at far-infrared wavelengths for a laboratory astrophysics group. Data taken with this instrument has been published in at least two peer-reviewed journal articles.

SCIENCE EDUCATION AND PUBLIC OUTREACH

Penn Education Public Outreach in Physics & Astronomy (PEPOPA) Group Philadelphia, PA 19104
Volunteer with UPenn Physics Dept 2013 – Present

- Conduct public physics and astronomy demonstrations at various events around the Philadelphia area, including demonstrations on light and optics, black holes, gravitational lensing and spacetime.
- Designed and built a public demonstration using LEDs to transmit audio signals
- Participated in Philadelphia Science Festival, and events at the Franklin Institute (Philadelphia Science Museum) geared towards children as well as 21+ young professionals

iPraxis Youth Science Outreach Philadelphia, PA 19104
Volunteer in Philadelphia Public Schools 2013 – 2015

- Volunteered with at-risk students at two Philadelphia public schools
- Developed a new afterschool "Reverse Engineering" program for elementary students, which met once a week over a full semester to disassemble toys and electronic equipment to understand their inner workings, develop skills with tools, and encourage scientific curiosity.
- Met weekly with small groups of 6th and 7th grade elementary school students during their science class over the course of the semester to help them develop entries for the city-wide science fair, from conception of the project to the data analysis and presentation.
- Awarded Mentor of the Year in 2015 by the organization

Pop-Up Astronomy Various Locations

- Have set up simple refracting telescopes in public places around Philadelphia during clear nights and/or astronomically interesting events. Set up telescope with solar filter in Nashville, TN during the 2017 total solar eclipse

Public Lectures

- Franklin Institute, "*What has NASA done for me lately? NASA technology in everyday life.*" (Invited Talk) Phildelphia, PA (July 9, 2015).

FIRST-AUTHOR PUBLICATIONS (MOST RECENT FIRST)

[1] **Lourie, N. P.**, Ade, P., Angil`e, F. E., Ashton, P., Austermann, J., Billings, T., Che, G., Cho, H.-M., Davis, K., Devlin, M., Dicker, S., Dober, B. J., Fissel, L. M., Fukui, Y., Gao, J., Gordon, S., Groppi, C. E., Hillbrand, S., Hilton, G. C., Hubmayr, J., Irwin, K. D., Klein, J., Li, D., Li, Z.-Y, Lowe, I., Mani, H., Martin, P. G., Mauskopf, P., McKenney, C., Nati, F., Novak, G., Pascale, E., Pisano, G., Santos, F. P., Scott, D., Sinclair, A., Soler, J. D., Tucker, C., Underhill, M., Vissers, M., and Williams, P., "Design and characterization of a balloon-borne diffraction-limited submillimeter telescope platform for BLAST-TNG," in [*Ground-based and Airborne Telescopes VII*], *Proceedings of the SPIE* Vol. 10700 (2018).

[2] **Lourie, N. P.,** Ade, P., Angil`e, F. E., Ashton, P., Austermann, J., Devlin, M., Dober, B. J., Fissel, L. M., Gao, J., Gordon, S., Groppi, C. E., Hilton, G. C., Hubmayr, J., Klein, J., Li, D., Lowe, I., Mani, H., Mauskopf, P., McKenney, C., Nati, F., Novak, G., Pascale, E., Pisano, G., Sinclair, A., Soler, J. D., Tucker, C., Vissers, M., and Williams, P., "Preflight characterization of the BLAST-TNG receiver and detector arrays," in [*Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX*], *Proceedings of the SPIE* Vol. 10708 (2018).

[3] **Lourie, N.P.,** Chuss D.T., Henry R.M., Wollack E.J., "Investigation of Truncated Waveguides," *Microwave and Optical Tech. Letters*, Vol 55, Issue 6, pages 1281 -1285, (2012).

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CONTRIBUTING-AUTHOR PUBLICATIONS (MOST RECENT FIRST)

N.B. in this field of research, all authors are typically listed alphabetically except for the first author regardless of seniority or degree of contribution to the presented work.

[1] Galitzki, N., Ade, P., Angil`e, F. E., Ashton, P., Austermann, J., Billings, T., Che, G., Cho, H.-M., Davis, K., Devlin, M., Dicker, S., Dober, B. J., Fissel, L. M., Fukui, Y., Gao, J., Gordon, S., Groppi, C. E., Hillbrand, S., Hilton, G. C., Hubmayr, J., Irwin, K. D., Klein, J., Li, D., Li, Z.-Y., **Lourie, N. P.**, Lowe, I., Mani, H., Martin, P. G., Mauskopf, P., McKenney, C., Nati, F., Novak, G., Pascale, E., Pisano, G., Santos, F. P., Scott, D., Sinclair, A., Soler, J. D., Tucker, C., Underhill, M., Vissers, M., and Williams, P., "Instrumental performance and results from testing of the BLAST-TNG receiver, submillimeter optics, and MKID detector arrays," in [*Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VIII*], *Proceedings of the SPIE*, Vol. 9914, (July 2016).

[2] Dober, B., Austermann, J. A., Beall, J. A., Becker, D., Che, G., Cho, H. M., Devlin, M., Duff, S. M., Galitzki, N., Gao, J., Groppi, C., Hilton, G. C., Hubmayr, J., Irwin, K. D., McKenney, C. M., Li, D., **Lourie, N. P.**, Mauskopf, P., Vissers, M. R., and Wang, Y., "Optical Demonstration of THz, Dual-Polarization Sensitive Microwave Kinetic Inductance Detectors," *Journal of Low Temperature Physics* 184, 173–179 (July 2016).

[3] Gordon, S., Dober, B., Sinclair, A., Rowe, S., Bryan, S., Mauskopf, P., Austermann, J., Devlin, M., Dicker, S., Gao, J., Hilton, G. C., Hubmayr, J., Jones, G., Klein, J., **Lourie, N. P.**, McKenney, C., Nati, F., Soler, J. D., Strader, M., and Vissers, M., "An Open Source, FPGA-Based LeKID Readout for BLAST-TNG: Pre-Flight Results," Journal of Astronomical Instrumentation 5, 1641003 (March 2016).

[4] Galitzki, N., Ade, P. A. R., Angil`e, F. E., Ashton, P., Beall, J. A., Becker, D., Bradford, K. J., Che, G., Cho, H.-M., Devlin, M. J., Dober, B. J., Fissel, L. M., Fukui, Y., Gao, J., Groppi, C. E., Hillbrand, S., Hilton, G. C., Hubmayr, J., Irwin, K. D., Klein, J., van Lanen, J., Li, D., Li, Z.-Y., **Lourie, N. P.**, Mani, H., Martin, P. G., Mauskopf, P., Nakamura, F., Novak, G., Pappas, D. P., Pascale, E., Pisano, G., Santos, F. P., Savini, G., Scott, D., Stanchfield, S., Tucker, C., Ullom, J. N., Underhill, M., Vissers, M. R., and Ward- Thompson, D., "The Next Generation BLAST Experiment," *Journal of Astronomical Instrumentation* 3, 1440001 (2014).

[5] Dober, B. J., Ade, P. A. R., Ashton, P., Angil`e, F. E., Beall, J. A., Becker, D., Bradford, K. J., Che, G., Cho, H.-M., Devlin, M. J., Fissel, L. M., Fukui, Y., Galitzki, N., Gao, J., Groppi, C. E., Hillbrand, S., Hilton, G. C., Hubmayr, J., Irwin, K. D., Klein, J., Van Lanen, J., Li, D., Li, Z.-Y., **Lourie, N. P.**, Mani, H., Martin, P. G., Mauskopf, P., Nakamura, F., Novak, G., Pappas, D. P., Pascale, E., Santos, F. P., Savini, G., Scott, D., Stanchfield, S., Ullom, J. N., Underhill, M., Vissers, M. R., and Ward-Thompson, D., "The next-generation BLASTPol experiment," in [*Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII*], *Proceedings of the SPIE* 9153, 91530H (July 2014).

[6] Rostem K, Chuss, D. T., Colazo, F. A., Crowe, E. J., Denis, K. L., **Lourie, N. P.**, Moseley, S. H., Stevenson, T. R., Wollack, E. J., "Precision Control of Thermal Transport in Cryogenic Single-Crystal Silicon Devices," *Journal of Applied Physics*, 115, 124508 (2014).

[7] Rostem K., Chuss D.T., **Lourie N. P.**, Voellmer G. M., Wollack E. J. , "A Waveguide-Coupled Thermally-Isolated Radiometric Source," *Rev. Sci. Inst.* (2013).

[8] Chuss D. T., **Lourie N. P.**, et al, "Electromagnetic Design of Feedhorn-Coupled Transition-Edge Sensors for Cosmic Microwave Background Polarimetry," *Journal of Low Temperature Physics*, Vol. 167, 5/6, page 923, (2012).

CONFERENCE TALKS

[1] "Design and characterization of a balloon-borne diffraction-limited submillimeter telescope platform for BLAST-TNG," in [*Ground-based and Airborne Telescopes VII*], *SPIE Astronomical Telescopes and Instrumentation* 10700-69. Austin, TX (June 15, 2018).

[2] "Preflight characterization of the BLAST-TNG receiver and detector arrays," in [*Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX*], *SPIE Astronomical Telescopes and Instrumentation* 10708-19. Austin, TX (June 11, 2018).

[3] "The BLAST-TNG Telescope: Optical, Mechanical, and Thermal Design," *Scientific Ballooning Technical Workshop*. Minneapolis, MN (May 17, 2018).

[4] "The BLAST-TNG Telescope for High-Resolution Balloon-borne Submillimeter Polarimetry," *SPIE Mirror Tech Days Workshop*. Annapolis, MD (November 10, 2015).

[5] "BLAST-TNG Telescope Overview and Status," *4th Workshop of the Scientific Committee for Antarctic Research – Antarctic Astronomy and Astrophysics*. Hawaii, HI (Augus 8, 2015).

CONFERENCE POSTER PRESENTATIONS

[1] "A Truncated Waveguide Phase Shifter," *22nd International Symposium on Space Terahertz Technology (ISSTT 22)*, Tuscan, AZ (2011).

[2] "An Integrating Sphere for Far-Infrared Reflectometry," *NASA Scientific Internship in Science and Engineering (SESI) Workshop*. Greenbelt, MD (2009).

[3] "A Novel Technique for Non-Destructive Characterization of Roughened Surfaces," *Society of Physics Students Conference*. Pittsburgh, PA. 2009.