

# Abigail Goodhue Vieregg

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**POSITIONS HELD** Assistant Professor, Department of Physics, Enrico Fermi Institute, Kavli Institute for Cosmological Physics at the University of Chicago, 2014 –  
NSF Postdoctoral Fellow, Harvard-Smithsonian Center for Astrophysics, 2010 – 2013

**EDUCATION** University of California, Los Angeles, Ph.D., Physics, 2010  
University of California, Los Angeles, M.S., Physics, 2006  
Dartmouth College, A.B., Physics, High Honors, Magna Cum Laude, 2004

**AWARDS** NASA Nancy Grace Roman Technology Fellowship for Early Career Researchers, 2017  
Alfred P. Sloan Research Fellowship, 2017  
Shakti P. Duggal Award, For Early Career Contributions in Cosmic Ray Physics, 2017  
NSF Postdoctoral Fellowship, Office of Polar Programs, 2011 – 2013  
NASA Earth and Space Sciences Graduate Fellowship (NESSF), 2009 – 2010  
Antarctic Service Medal, 2009  
Chancellor's Prize and Physics Department Fellowship, UCLA, 2005 – 2009  
Physics and Astronomy Francis Sears Faculty Prize, Dartmouth College, 2004  
Rufus Choate Scholar, Dartmouth College, 2004  
Francis L. Town Scientific Prize in Physics, Dartmouth College, 2002

**RESEARCH** **Searches for astrophysical ultra-high energy (UHE) neutrinos using radio detection techniques**

- Co-Investigator (Co-I) on the ARA experiment at the South Pole
- Principal Investigator (PI) of an NSF award to develop a new ground-based interferometric phased array trigger, to be implemented in the ARA experiment
- Co-I and Analysis Coordinator for the ANITA experiment, a NASA long duration balloon experiment
- PI of a NASA APRA award to develop a 100-channel phased array trigger system suitable for balloon-borne applications.

**Measuring B-mode polarization in the Cosmic Microwave Background (CMB) in search of a signature of primordial inflation**

- Development of CMB-S4: Performing in-situ site characterization measurements using a scanning water vapor radiometer at potential sites around the world (South Pole and Summit Station Greenland in 2016), in collaboration with Harvard.
- Collaborator on BICEP2, the Keck Array, and BICEP3

**TEACHING** **Graduate Students Mentored**

Andrew Ludwig, PhD Student, U. Chicago, 2015 –  
Kaeli Hughes, PhD student U. Chicago, 2017 –

Kuang Wei, U. Chicago graduate student, first year (Physics 335) project 2016 – 2017  
Zoheyr Doctor, U. Chicago graduate student, first year (Physics 335) project 2014 – 2015

**Postdoctoral Fellows Mentored**

Eric Oberla, Postdoctoral Fellow, 2015 –  
Cosmin Deaconu, Postdoctoral Fellow, 2015 –  
Nicole Larsen, KICP Fellow, 2016 –  
Keith Bechtol, KICP Fellow, 2013-2015  
Chris Sheehy, KICP Fellow, 2013-2016

**Undergraduates Mentored**

10 Undergraduates at U. Chicago, 3 Senior Thesis Projects, 2014 –  
4 Undergraduates at Harvard 2010 – 2013  
1 Undergraduate at UCLA 2008 – 2010

**Courses Taught**

Introductory Mechanics (Physics 131), Autumn 2015, Autumn 2017  
Senior Thesis (Physics 291), 2015 – 2016, 2017 – 2018  
Graduate Advanced Methods of Data Analysis (Physics 386), Spring 2015, Winter 2017  
Advanced Experimental Physics (Physics 334), Spring 2017

GRANTS PI: NASA Nancy Grace Roman Fellowship (300K over 3 years), 2018 – 2021  
PI: NASA APRA, “Development of an Interferometric Phased Array Trigger for Balloon-Borne Detection of the Highest Energy Cosmic Particles” (\$427 over 3 years), 2017 – 2020  
PI: Sloan Foundation Fellowship (\$60K over 2 years), 2017 – 2019  
PI: NSF Particle Astrophysics, “Radio Detection of the Highest Energy Neutrinos with a Ground-Based Interferometric Phased Array” (\$481K over 3 years), 2016 – 2019  
Co-I: NASA APRA, PI Peter Gorham, U. Hawaii, “Ultra-high Energy Particle Astrophysics with ANITA-4” (\$371K for U. Chicago over 3 years), 2014–2017  
Co-I: NSF Physics Frontier Center, PI Michael Turner, “Kavli Institute for Cosmological Physics Pushing Cosmology to the Edge,” (\$20M over 6 years), 2014 – 2017

UNIVERSITY KICP Executive Committee, 2017 –  
SERVICE Physical Sciences Division Deanship Advisory Committee, 2017 –  
Physics Department Climate Committee, 2016 –  
Physics Department Graduate Recruitment Committee, 2016 –  
KICP Early Career and Fellows Mentorship Committee, Chair 2014 –  
KICP Colloquium Committee, 2014 – 2015, 2016 –  
KICP Women’s Lunch and Dinner Organizer, 2013 –  
KICP Fellowship Committee, 2013-2014, 2017 –  
Chicagoland Collaboration for Women in STEM Planning Committee, 2015 – 2016  
Physics Department Graduate Admissions Committee, 2015 – 2016  
KICP Physics Frontier Center, Inflation Major Area Leader, 2014 – 2017  
Physics Department Friday Lectures Committee, 2014 – 2015

SERVICE NSF Office of Polar Programs Advisory Committee, 2017 –  
ICHEP 2016 Organizing Committee, 2016  
COSMO 2014 Scientific Organizing Committee, 2016  
Various NSF Review Panels  
Referee for PRL, PRD, NIM

OUTREACH Adler Planetarium, Astronomy Conversations volunteer, Space Visualization Laboratory, 2014 –

Expanding Your Horizons (middle school girls), session instructor, built demonstrations, 2017  
Alan Alda Communicating Science Workshop Participant, 2013  
WorldWide Telescope (WWT) Ambassador, 6-week public middle school program, 2012 – 2015  
Telling Your Story, a workshop by Science on the Street and the Cambridge Science Festival, 2012  
Discover STEM Reverse Science Fair Contributor, Acton-Boxborough, MA, 2011  
Malden Public Library teen program: “Meet South Pole Scientists!” Malden, MA, 2011  
Science Club for Girls, school vacation program volunteer, Cambridge, MA, 2011  
Blogged from South Pole, McMurdo Station, Taylor Dome, and Greenland 2008 –

PUBLICATIONS h-index: 21, > 4000 citations

### **PEER-REVIEWED PUBLICATIONS**

#### **Primary Authorship:**

- J. Avva et al. “Development Toward a Ground-Based Interferometric Phased Array for Radio Detection of High Energy Neutrinos,” NIM 869:46-55 (2017).
- A. Connolly and A. Viereg. “Radio Detection of High Energy Neutrinos.” In “Neutrino Astronomy, Current Status, Future Prospects”, World Scientific. Ed. Gaisser and Karle (2016).
- A. G. Viereg, K. Bechtol, and A. Romero-Wolf. “A Technique for Detection of PeV Neutrinos Using a Phased Radio Array,” JCAP 2016:02 (2016).
- A. Romero-Wolf, S. Hoover, A. G. Viereg, et al. (The ANITA Collaboration). “An Interferometric Analysis Method for Radio Pulses from Ultra-high Energy Particle Showers,” *Astroparticle Physics* 60:72-85 (2015).
- BICEP2/Keck Array Collaborations. “BICEP2/Keck Array IV: Optical Characterization and Performance of the BICEP2 and Keck Array Experiments,” *ApJ* 806:2 (2015).
- J. Avva et al. “An In-Situ Measurement of the Radio-Frequency Attenuation in Ice at Summit Station, Greenland,” *Journal of Glaciology* 61:229 (2015).
- A. G. Viereg et al. (The ANITA Collaboration), “The First Limits on the Ultra-high Energy Neutrino Fluence from Gamma-ray Bursts,” *ApJ* 736:50 (2011).
- P. Gorham et al. (The ANITA Collaboration), “Observational Constraints on the Ultra-high Energy Cosmic Neutrino Flux from the Second Flight of the ANITA Experiment”, *PRD* 82:022004 (2010); Erratum: *PRD D* 85:049901 (2011).
- A. Connolly, A. Goodhue (Viereg), C. Miki, R. Nichol, D. Saltzberg, “Measurements of Radio Propagation in Rock Salt for the Detection of High-Energy Neutrinos”, NIM A599:184-191 (2009).

#### **Other Publications:**

- U. Abdul et al. “Measurement of the real dielectric permittivity of  $\epsilon_r$  of glacial ice,” arXiv:1712.03301 (2017).
- P. Gorham et al. “The HiCal 2 Instrument: Calibration and Antarctic Surface Reflectivity Measurement for the ANITA Experiment” arXiv:1710.11175 (2017).
- P. Allison et al. “Dynamic Tunable Notch Filters for the Antarctic Impulsive Transient Antenna (ANITA)” arXiv:1709.04536, Submitted to NIM (2017).
- M. Abitbol et al. “CMB-S4 Technology Book, First Edition” arXiv:1706.02464 (2017).
- BICEP2/Keck Array Collaboration, “BICEP2 / Keck Array IX: New Bounds on Anisotropies of CMB Polarization Rotation and Implications for Axion-Like Particles and Primordial Magnetic

- Fields,” *Phys. Rev. D* 96, 102003 (2017).
- P. Gorham et al. (The ANITA Collaboration), “Antarctic Surface Reflectivity Measurements from the ANITA-3 and HiCal-1 Experiments,” *J. Astron. Inst.* 6 (2017).
- BICEP2/Keck Array Collaboration, “BICEP2/ Keck Array VIII: Measurement of Gravitational Lensing from Large-Scale B-mode Polarization,” *ApJ* 833:2 (2016).
- BICEP2/Keck Array Collaborations. “BICEP2 / Keck Array VII: Matrix based E/B Separation applied to BICEP2 and the Keck Array,” *ApJ* 825:1 (2016).
- P. Gorham et al. (The ANITA Collaboration), “Characteristics of Four Upward-pointing Cosmic-ray-like Events Observed with ANITA,” *PRL* 117, 071101 (2016).
- BICEP2/Keck Array Collaboration. “Keck Array VI: Improved Constraints on Cosmology and Foregrounds when Adding 95 GHz Data from the Keck Array,” *PRL* 116, 031302 (2016).
- K. Belov et al. (SLAC T-510 Collaboration). “Accelerator measurements of magnetically-induced radio emission from particle cascades with applications to cosmic-ray air showers,” *PRL* 116, 141103 (2016).
- H. Schoorlemmer et al. (The ANITA Collaboration). “Energy and Flux Measurements of Ultra-High Energy Cosmic Rays Observed During the First ANITA Flight,” *Astroparticle Physics* 77, 32-43 (2016).
- BICEP2/Keck Array Collaborations. “BICEP2/Keck Array V: Measurements of B-mode Polarization at Degree Angular Scales and 150 GHz by the Keck Array,” *ApJ* 811:126 (2015).
- P. A. R. Ade, et al. “Antenna-coupled TES bolometers used in BICEP2, Keck Array, and SPIDER,” *ApJ* 802:2 (2015).
- BICEP2/Keck Array/Planck Collaborations. “Joint Analysis of BICEP2/Keck Array and Planck Data,” *PRL* 114:101301 (2015).
- BICEP2 Collaboration. “BICEP2 III: Instrumental Systematics.” *ApJ* 814:2 (2015).
- K.N. Abazajian et al., “Neutrino Physics from the Cosmic Microwave Background and Large Scale Structure,” *Astroparticle Physics* 63 (2015).
- K.N. Abazajian et al., “Inflation Physics from the Cosmic Microwave Background and Large Scale Structure,” *Astroparticle Physics* 63 (2015).
- D. Besson et al. (The ANITA Collaboration), “Antarctic Radio Frequency Albedo and Implications for Cosmic Ray Reconstruction,” *Radio Science* 50:1, 1-17 (2015).
- BICEP2 Collaboration. “BICEP2 II: Experiment and Three-Year Data Set,” *ApJ* 792:62 (2014).
- BICEP2 Collaboration. “BICEP2 I: Detection of B-mode Polarization and Degree Angular Scales,” *PRL* 112, 241101 (2014).
- P. Gorham, et al. “Implications of ultra-high energy neutrino flux constraints for Lorentz-invariance violating cosmogenic neutrinos,” *Phys. Rev. D* 86:103006 (2012).
- M. Detrixhe et al. (The ANITA Collaboration), “Ultra-Relativistic Magnetic Monopole Search with the ANITA-II Balloon-Borne Radio Interferometer,” *Phys. Rev. D* 83:023513 (2011).
- S. Hoover et al. (The ANITA Collaboration), “Observation of Ultra-high Energy Cosmic Rays with the ANITA Balloon-borne Radio Interferometer,” *Phys. Rev. Lett* 105:151101 (2010).
- P. Gorham et al. (The ANITA Collaboration), “New Limits on the Ultra-high Energy Cosmic Neutrino Flux from the ANITA Experiment”, *Phys. Rev. Lett.* 103:051103 (2009).

P. Gorham et al. (The ANITA Collaboration), “The Antarctic Impulsive Transient Antenna Ultra-high Energy Neutrino Detector Design, Performance, and Sensitivity for 2006-2007 Balloon Flight”, *Astropart. Phys.* 32:10-41 (2009).

K. Dow et al., “Magnetic Field Measurements of the BLAST Spectrometer”, *Nucl. Instrum. Meth. A* 599:146-151 (2009).

D. Besson et al. (The ANITA Collaboration), “In Situ Radiological Measurements near Taylor Dome, Antarctica and Implications for UHE Neutrino Astronomy”, *Astropart. Phys.* 29:130-157 (2008).

P. Gorham et al. (The ANITA Collaboration), “Observations of the Askaryan Effect in Ice”, *Phys. Rev. Lett.* 99:171101 (2007).

## **WHITEPAPERS**

### **Primary Authorship:**

A. G. Viereg and D. Saltzberg, “Greenland Neutrino Observatory (GNO): Radio Detection of Ultra-high Energy Neutrinos at Apex Station in Greenland,” Whitepaper for the Snowmass Process (2013).

## **CONFERENCE PUBLICATIONS AND PROCEEDINGS**

### **Primary Authorship:**

A. G. Viereg et al. “A Ground-based Interferometric Phased Array Trigger for Ultra-high Energy Neutrinos” POS, Proceedings of ICRC (2017).

A. G. Viereg. “Radio Detection of Ultra-high Energy Neutrinos.” Proceedings of Neutrino 2014 (2014).

A. G. Viereg et al. “Optical Characterization of the Keck Array Polarimeter at the South Pole,” Proceedings of the SPIE, Volume 8452: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VI (2012).

A. G. Viereg et al. (The ANITA Collaboration), “Results from the Search for Ultra High-Energy Neutrinos with the Second Flight of ANITA”, Proceedings of Neutrino 2010 (2010).

A. G. Viereg et al. (The ANITA Collaboration), “Results from the Search for Ultra High-Energy Neutrinos with the Second Flight of ANITA”, Proceedings of Recontres de Moriond (2010).

### **Other Publications:**

H. Hui et al. “BICEP3 focal plane design and detector performance,” Proceedings of the SPIE, Volume 9914: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VIII (2016).

J. Grayson et al. “BICEP3 performance overview and planned Keck Array upgrade,” Proceedings of the SPIE, Volume 9914: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VIII (2016).

K. Karkare et al. “Optical Characterization of the BICEP3 CMB Polarimeter at the South Pole,” Proceedings of the SPIE, Volume 9914: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VIII (2016).

K. Wu et al. “Initial Performance of BICEP3: A Degree Angular Scale 95 GHz Band Polarimeter,” *Journal of Low Temperature Physics* (2016).

I. Buder et al. “BICEP2 and Keck Array: Upgrades and Improved Beam Characterization,”

Proceedings of the SPIE, Volume 9153: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VII (2014).

K. Karkare et al. “Keck Array and BICEP3: Characterization of 5000+ Detectors,” Proceedings of the SPIE, Volume 9153: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VII (2014).

Z. Ahmed et al. “BICEP3: A 95 GHz Refracting Telescope for Degree-scale CMB Polarization,” Proceedings of the SPIE, Volume 9153: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VII (2014).

R. W. Ogburn IV et al. “BICEP2 and Keck Array Operational Overview and Status of Observations,” Proceedings of the SPIE, Volume 8452: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VI (2012).

S. Kernasovskiy et al. “Optimization and Sensitivity of the Keck Array,” Proceedings of the SPIE, Volume 8452: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VI (2012).

R. O’Brien et al. “Antenna Coupled TES Bolometers for the Keck Array, SPIDER, and Polar-1,” Proceedings of the SPIE, Volume 8452: Millimeter and Submillimeter Detectors and Instrumentation for Astronomy VI (2012).

Z. Staniszewski et al. “The Keck Array: A Multi Camera CMB Polarimeter at the South Pole,” Journal of Low Temperature Physics 162:827-833 (2012).

COLLOQUIA

Goddard Astrophysics Colloquium (2017)  
 MIT Kavli Institute Colloquium (2017)  
 Northwestern Physics Colloquium (2017)  
 University of Delaware Physics Colloquium (2016)  
 University of British Columbia Colloquium (2016)  
 Indiana University Physics Colloquium (2015)  
 University of Illinois Astronomy Colloquium (2015)  
 University of Toronto Astronomy Colloquium (2014)  
 Fermilab Wine and Cheese (2014)  
 Dartmouth College Colloquium (2014)  
 University of Chicago Physics Colloquium (2014)  
 Northeastern University Colloquium (2012)  
 Dartmouth College Colloquium (2011)

SEMINARS

Fermilab Neutrino Seminar (2017)  
 Argonne High Energy Physics Seminar (2016)  
 TRIUMF Seminar (2016)  
 Michigan State Astronomy/HEP Seminar (2015)  
 Harvard University Physics Seminar (2015)  
 Indiana University Physics Seminar (2015)  
 Fermilab Astrophysics Seminar (2015)  
 University of Chicago HEP Seminar (2014)  
 Gran Sasso Seminar (2014)  
 Ohio State CCAPP Seminar (2014)  
 Cornell HEP Seminar (2014)  
 Northwestern University CIERA Seminar (2014)  
 Stanford Physics Seminar (2013)  
 UCSD CASS Seminar (2013)  
 Penn State Astrophysics Seminar (2013)

University of Chicago Enrico Fermi Institute Seminar (2012)  
McGill University Joint Astrophysics Seminar (2012)  
UCLA HEP Seminar (2012)  
Ohio State CCAPP Seminar (2012)  
Harvard-Smithsonian Center for Astrophysics Seminar (2011)  
University of Maryland HEP Seminar (2010)  
University of Chicago KICP Seminar (2010)  
MIT Laboratory for Nuclear Science Seminar (2010)  
UC San Diego CASS Seminar (2010)  
UCLA HEP Seminar (2010)

INVITED  
CONFERENCE  
TALKS  
TeVPA, Invited Plenary Talk, Columbus (2017)  
CPAD Instrumentation Workshop, Invited Plenary Talk, Caltech (2016)  
American Astronomical Society 227<sup>th</sup> Meeting, Invited Talk, Kissimmee (2016)  
IceCube Particle Astrophysics Conference, Invited Review Talk, Madison (2015)  
CIFAR Annual Meeting, Invited Talk, Banff (2015)  
Neutrino 2014, Invited Review Talk, Boston (2014)  
Snowmass on the Mississippi, Invited Review Talk, Minneapolis (2013)  
SLAC Snowmass Workshop, Invited Review Talk (2013)

CONTRIBUTED  
CONFERENCE  
TALKS AND  
POSTERS  
TeVPA, Columbus (2017)  
ICRC Busan, Korea (2017)  
APS April Meeting, Savannah (2014)  
SPIE Astronomical Instrumentation, Amsterdam (2012)  
Harvard-Smithsonian Center for Astrophysics Postdoc Symposium (2011)  
Neutrino 2010, Athens (2010)  
SnowPAC Meeting, Utah (2010)  
Recontres de Moriond, La Thuile, Italy (2010)  
April American Physical Society Meeting, Washington DC (2010)  
California American Physical Society Meeting (2009)  
American Physical Society April Meeting, St. Louis (2008)