Personal Information

Howard Hui
California Institute of Technology
1200 E California Blvd., MC 367-17
Pasadena, CA 91125
Phone : (626) 395-1266
Email : hhui@caltech.edu
www.its.caltech.edu/~hhui

Positions

Research Scientist, California Institute of Technology, 2021-present
NASA Jet Propulsion Lab, 2021-present
Keck Institute for Space Studies Postdoctoral Scholar, Caltech, 2019-2021
Postdoctoral Fellow, NASA Jet Propulsion Lab, 2018-2019

Research Interests

Observational Cosmology, Cosmic Microwave Background, Galaxy Formation
Millimeter-waves Transition-Edge Sensor/ Kinetic Inductance Detector
Infrared HgCdTe (H2RG) Detector

Education

Ph.D. (Physics), California Institute of Technology (2018)
Dissertation : Measuring the Polarization of the Cosmic Microwave Background with BICEP3
Advisor : Jamie Bock
B.S. (Physics, Mathematics), Oregon State University

Fellowships/ Awards

JPL STAR Award, 2023
Keck Institute for Space Studies Affiliate, 2020
California Institute of Technology Leadership Award, 2018
Antarctic Service Medal, 2014
NSF Graduate Research Fellowship, 2011
Oregon State University Waldo-Cummings Award (Institution Highest Honor), 2009, 2010
NASA Oregon Space Grant Scholarship, 2008, 2009, 2010
NASA John Mather Nobel Scholar Award, 2008
Oregon State University Excellence in Physics Scholarship, 2008, 2009, 2010

Research

Collaborations : SPHEREx, BICEP/Keck Array, CMB Stage-4

SPHEREx : All-Sky Near-IR Spectral Survey. Calibration Scientist, 2019-

- Payload, telescope optics/detector integration and calibration.
- Instrument systematics, calibration pipeline and Galaxy Evolution simulation.
- Mission operations, in-orbit commissioning.

Far-IR bolometers and readout development, 2018-2019

- TES bolometer for a $87 - 230\mu m$ spectrometer, NEP $< 2 \times 10^{-19}$W/Hz$^{1/2}$.
- Frequency-division multiplexing readout system.

BICEP/Keck Array : Cosmic Microwave Background (CMB) polarimeters, 2011-

- BICEP3 95GHz TES bolometer, focal plane, time-division multiplexing readout.
- BK18 (science result using data from 2016-2018) analysis.
- South Pole Deployment : 2012-13, 2014-15, 2015-16, 2016-17.

Millimeter waves detector development for cosmology and earth science, 2007-2010

- 40 GHz feedhorns and TES detectors development for CMB experiments (NASA Goddard).
- Variable-delay Polarization Modulator development (NASA Goddard).
- Anti-reflection coating for Airborne Scanning Microwave Limb Sounder (JPL/A-SMLS).

Supervised Students

Abby Williams (NYU/Caltech), Research Assistant, 2022-2024
Sam Condon (Caltech), Research Assistant, 2021-2023
Cheng Zheng (Caltech), Graduate Student, Advisor : Jamie Bock, 2018- 2022
Katherine Hughes (University of Chicago), Undergraduate Summer Intern, 2018
Raj Katti (Caltech), Research Assistant, 2014-2016

Service

NASA Astrophysics Review Panel
CMB-S4 Publication Board
NSF Review Panel
NASA Academy Soffen Scholarship Board

Talks

Invited Seminars and Colloquium

NASA Jet Propulsion Laboratory Astrophysics Colloquium (2025)
Johns Hopkin University Astrophysics Seminar (2024)
Villanova University Astrophysics Colloquium (2024)
University of Pennsylvania Astrophysics Seminar (2024)
Windows on the Universe, ICISE, Vietnam (2023)
University of British Columba Physics Colloquium (2022)
Villanova University Astrophysics Colloquium (2022)
NASA Jet Propulsion Laboratory Astrophysics Seminar (2021)
Argonne National Laboratory HEP Seminar (2019)
Johns Hopkins University Astrophysics Seminar (2018)
UCLA HEAP Seminar (2018)

Conference Presentations

SPIE Astronomical Instrumentation, Yokohama, Japan (2024)
Line-Intensity Mapping, Urbana-Champaign, IL (2024)
Diffuse cosmic backgrounds and the low surface brightness universe, Aspen, CO (2024)
Present and Future of Line-Intensity Mapping, Garching, Germany (2023)
SPIE Astronomical Instrumentation, Montreal, Canada (2022)
APS April Meeting, New York, NY (2022)
18th Low Temperature Detectors, Milan, Italy (2019)
SPIE Astronomical Instrumentation, Austin, TX (2018)
CMB-S4 Collaboration Meeting, Boston, MA (2017)
17th Low Temperature Detectors Workshop, Kurume, Japan (2017)
SPIE Astronomical Instrumentation, Edinburgh, United Kingdom (2016)

Publications

Peer-Reviewed Publications

C. Nguyen et al. Improving H2RG Performance in SPHEREx Brassboard Model, ApJS 276, 43 (2025)

C. Fazar et al. "Image persistence flagging for SPHEREx", JATIS 11(1)011208 (2025)

BICEP/Keck Collaboration. "BK-XIX : Extremely Thin Composite Polymer Vacuum Windows for BICEP and Other High Throughput Millimeter Wave Telescopes", Submitted to ApJ, (2024)

BICEP/Keck Collaboration. "BK-XVIII : Measurement of BICEP3 polarization angles and consequences for constraining cosmic birefringence and inflation", Submitted to PRD,(2024)

S. Condon et al. "Cryogenic Focus Measurement System for a Wide-Field Infrared Space Telescope", Applied Optics (2024)

L. Foote et al. "High-sensitivity transition-edge-sensed bolometers : improved speed and characterization with AC and DC bias", ApJ (2023)

G. Heaton et al. "Noise Reduction Methods for Large-Scale Intensity Mapping Measurements with Infrared Detector Arrays", ApJL (2023)

BICEP/Keck Collaboration. "BK-XVII : Line of Sight Distortion Analysis : Estimates of Gravitational Lensing, Anisotropic Cosmic Birefringence, Patchy Reionization, and Systematic Errors", ApJ 949, 43 (2023)

BICEP/Keck Collaboration. "BK-XVI : Characterizing Dust Polarization Through Correlations with Neutral Hydrogen", ApJ 945, 72 (2023)

The CMB-S4 Collaboration. "CMB-S4 : Forecasting Constraints on Primordial Gravitational Waves", ApJ 926, 54 (2022)

BICEP/Keck Collaboration. "BK-XV : The BICEP3 CMB Polarimeter and the First Three Year Data Set", ApJ 927, 77 (2022)

BICEP/Keck Collaboration. "BK-XIV : Improved constraints on axion-like polarization oscillations in the cosmic microwave background", PRD 105, 022006, (2022)

BICEP/Keck and SPTPol Collaborations. "A Demonstration of Improved Constraints on Primordial Gravitational Waves with Delensing", PRD 103, 022004 (2021)

BICEP/Keck Collaboration. "BK-XIII : Improved Constraints on Primordial Gravitational Waves using Planck, WMAP, and BICEP/Keck Observations through the 2018 Observing Season", PRL 127, 151301 (2021)

BICEP/Keck Collaboration. "BK-XII : Constraints on axion-like polarization oscillations in the cosmic microwave background", PRD 103, 042002(2021)

Keck Array and BICEP2 Collaboration. "BK-XI : Beam Characterization and Temperature-to-Polarization Leakage in the BK15 Dataset", ApJ 844,114 (2019)

Keck Array and BICEP2 Collaboration. "BK-X : Constraints on Primordial Gravitational Waves Using Planck, WMAP, and New BICEP2/Keck Observations through the 2015 Season", PRL 121, 221301 (2018)

Keck Array and BICEP2 Collaboration. "BK-IX : New Bounds on Anisotropies of CMB Polarization Rotation and Implications for Axion-Like Particles and Primordial Magnetic Fields", PRD 96, 102003 (2017)

Keck Array and BICEP2 Collaboration. "BK-VIII : Measurement of Gravitational Lensing from Large-scale B-mode Polarization", ApJ 833, 228 (2016)

Keck Array and BICEP2 Collaboration. "BK-VII : Matrix Based E/B Separation Applied to BICEP2 and the Keck Array", ApJ 825, 66 (2016)

Keck Array and BICEP2 Collaboration. "BK-VI : Improved Constraints On Cosmology and Foregrounds When Adding 95 GHz Data From Keck Array", PRL 116, 031302 (2016)

Keck Array and BICEP2 Collaboration. "BK-V : Measurements of B-mode Polarization at Degree Angular Scales and 150 GHz by Keck Array", ApJ 811, 126 (2015)

BICEP/Keck and Planck Collaborations. "A Joint Analysis of BICEP2/Keck Array and Planck Data", PRL 114, 101301 (2015)

Keck Array and BICEP2 Collaboration. "BK-IV : Optical Characterization and Performance of the BICEP2 and Keck Array Experiments", ApJ 806, 206 (2015)

BICEP2, Keck Array, and SPIDER Collaborations. "Antenna-coupled TES Bolometers used in BICEP2, Keck Array, and SPIDER", ApJ 812, 176 (2015)

D. Chuss et al. "Properties of a Variable-delay Polarization Modulator", Appl. Opt. 51, 197 (2012)

M. Krejny et al. "The Hertz/VPM polarimeter : Design and first light observations", Appl. Opt. 47, 4429 (2008)

J. Danielson et al. "Intense narrow band terahertz generation via type-II difference-frequecy generation in ZnTe using chirped optical pulses", Journal of Applied Physics 104, 033111 (2008)

Conference Proceedings

S. Susca et al. "Payload system design, integration, and verification challenges for an academically centered flight instrument development", IEEE (2024)

H. Hui et al. "Spectral response of the SPHEREx telescope", Proceedings of the SPIE (2024)

P. Korngut et al. "SPHEREx Instrument optical integration and testing campaign overview", Proceedings of the SPIE (2024)

C. Nguyen et al. "How to tame your dragon's breath : edge design to minimize scattered light from sources outside of SPHEREx field of view", Proceedings of the SPIE (2024)

Y. Nakato et al. "Development of the 220/270 GHz BICEP Array CMB receiver", Proceedings of the SPIE (2024)

S. Condon et al. "SPHERExLabTools : A Python Data Acquisition System for SPHEREx Characterization and Calibration", Proceedings of the SPIE (2022)

D. Goldfinger et al. "Thermal testing for cryogenic CMB instrument design", Proceedings of the SPIE (2022)

S. Zhang et al. "BICEP ARRAY 150 GHz design development and progress", Proceedings of the SPIE (2022)

L. Moncelsi et al. "Receiver development for BICEP Array, a next-generation CMB polarimeter at the South Pole", Proceedings of the SPIE (2020)

T. St. Germaine et al. "Analysis of Temperature-to-Polarization Leakage in BICEP3 and Keck CMB Data from 2016 to 2018", Proceedings of the SPIE (2020)

J. Cornelison et al. "Polarization Calibration of the BICEP3 CMB polarimeter at the South Pole", Proceedings of the SPIE (2020)

J. H. Kang et al. "Observing low elevation sky and the CMB Cold Spot with BICEP3 at the South Pole", Proceedings of the SPIE (2020)

A. Schillaci et al. "Design and performance of the first BICEP Array receiver", JLTP (2019)

C. Zhang et al. "Characterizing the Sensitivity of 40 GHz TES Bolometers for BICEP Array", JLTP (2019)

T. St. Germaine et al. "Optical characterization of the Keck Array and BICEP3 CMB Polarimeters from 2016 to 2019", JLTP (2019)

A. Cukierman et al. "Microwave multiplexing on the Keck Array", JLTP (2019)

A. Soliman et al. "Design and Characterization of Antenna-Coupled 30/40 GHz Detectors and Modules for the BICEP Array Experiment", JLTP (2019)

J. H. Kang et al. "2017 upgrade and performance of BICEP3 : a 95GHz refracting telescope for degree-scale CMB polarization", Proceedings of the SPIE (2018)

M. Crumrine et al. "BICEP Array cryostat and mount design", Proceedings of the SPIE (2018)

H. Hui et al. "BICEP Array : a multi-frequency degree-scale CMB polarimeter", Proceedings of the SPIE (2018)

D. Barkats et al. "Ultra-Thin Large-Aperture Vacuum Windows for Millimeter Wavelengths Receivers", Proceedings of the SPIE (2018)

A. Soliman et al. "Design and performance of wide-band corrugated walls for the BICEP Array detector modules at 30/40 GHz", Proceedings of the SPIE (2018)

B. Racine et al. "Measurements of Degree-Scale B-mode Polarization with the BICEP/Keck Experiments at South Pole", Moriond (2018)

J. Grayson et al. "BICEP3 performance overview and planned Keck Array upgrade", Proceedings of the SPIE (2016)

K. Karkare et al. "Optical Characterization of the BICEP3 CMB Polarimeter at the South Pole", Proceedings of the SPIE (2016)

H. Hui et al. "BICEP3 focal plane design and detector performance", Proceedings of the SPIE (2016)

W. L. K. Wu et al. "Initial Performance of BICEP3 : A Degree Angular Scale 95 GHz Band Polarimeter", JLTP (2016)

Z. Ahmed et al. "BICEP3 : a 95GHz refracting telescope for degree-scale CMB polarization", Proceedings of the SPIE (2014)

I. Buder et al. "BICEP2 and Keck array : upgrades and improved beam characterization", Proceedings of the SPIE (2014)

K. S. Karkare et al. "Keck array and BICEP3 : spectral characterization of 5000+ detectors", Proceedings of the SPIE (2014)

R. O'Brient et al. "Antenna-coupled TES bolometers for the Keck array, Spider, and Polar-1", Proceedings of the SPIE (2012)

R. W. Ogburn et al. "BICEP2 and Keck array operational overview and status of observations", Proceedings of the SPIE (2012)

G. Voellmer et al. "A large free-standing wire grid for microwave variable-delay polarization modulation", Proceedings of the SPIE (2008)

References

Professor James Bock, jjb@astro.caltech.edu
Dr. C. Matt Bradford, charles.m.bradford@jpl.nasa.gov
Professor Steve Padin, spadin@caltech.edu
Professor John Kovac, jmkovac@cfa.harvard.edu