Kate Roberts

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EDUCATION

Boston University Boston, MA | Expected 2028
Doctor of Philosophy — Astronomy

Boston University Boston, MA | November 2024
Master of Arts — Astronomy

Kalamazoo College Kalamazoo, MI | March 2022
Bachelor of Arts — Physics and Studio Art; Minor in Applied Math
Graduated *summa cum laude* with highest award of honors in physics.
Thesis: *The Surface Composition of Anomalous Asteroids as a Window into the Early Solar System*
Advisors: Prof. Katherine de Kleer (Caltech), Prof. Arthur Cole (Kalamazoo College), Received Honors

RESEARCH EXPERIENCE

Boston University | Graduate Research Fellow Boston, MA | May 2023 - Present
Mapping Temporal and Spatial Temperature Variations in Jupiter's Upper Atmosphere

- Reduced and analyzed IR spectra of Jupiter's upper atmosphere from Keck/NIRSPEC
- Derived temperatures to create maps showing temporal variations across minutes, days, weeks, and years to determine possible heat sources and transfer methods.
- Assisted in a number of observations using Keck NIRSPEC (2022, 2023, 2024) and IRTF iSHELL (2023, 2024).

Caltech | Research Support Assistant Kalamazoo, MI | March 2022 - June 2022
The Surface Composition of Anomalous Asteroids Continued

- Reduced and analyzed IR spectra of M- and L-type asteroids from Keck/NIRSPEC.
- Detected first 4.5-micron (iron) spectral feature on the surface of M-type, Psyche (unofficial).

Caltech | SURF Student Researcher Pasadena, CA | June 2021 – Aug 2021
The Surface Composition of Anomalous Asteroids as a Window into the Early Solar System

- Collaborated with Prof. Katherine de Kleer to complete a relevant research proposal for the program application.
- Reduced and analyzed IR spectra of asteroids Psyche and Eunomia from Keck/NIRSPEC.
- Determined the extent of silica compounds on the surface of the asteroid, and established significant composition variability over asteroid surfaces.
- Research completed and paper written as a Senior Individual Project (SIP, Senior Thesis) in partial fulfillment for the degree of Bachelor of Arts from Kalamazoo College.

Michigan State University | REU Student Researcher
Rochester, MI | May 2020 - Aug 2020
Machine learning for improved resolution and fast predictions in an O-PPAC

- Enrolled in two-week machine learning crash course taught by Prof. Morten Hjorth-Jensen (MSU).
- Applied gained knowledge from Prof. Michelle Kuchera (Davidson College) to create neural networks which learned on simulated data to infer the locations of rare particles.

- Detector being tested with code for faster and more accurate beam tuning within the particle accelerator at the Facility of Rare Isotope Beams (FRIB).

HONORS & AWARDS

- Recipient of the 2022 Kalamazoo College John Wesley Hornbeck Prize for Highest Achievement in Advanced Physics as a Senior Major
- Kalamazoo College Physics and 3/2 Engineering Department Student Advisor *(2021-2022)*
- President and Member of Kalamazoo College Chapter of Society of Physics Students *(2021-2022) (Vice President: 2020-2021)*
- Founder, President, and Member of Kalamazoo College Chapter of ΣΠΣ, the Physics and Astronomy Honors Society *(2021-2022)*
- Leading Senior Consultant of the Kalamazoo College Math and Physics Center *(2021-2022)*
- Society of Physics Students Notable Chapter *(2020-2021, awarded Fall 2021)*
- Recipient of the 2019 Kalamazoo College Cooper Prize for Outstanding Work in First Year Physics
- Recipient of the 2019 Kalamazoo College Brian Gougeon Prize for Outstanding Work in First Year Art

TALKS & POSTERS

Poster | American Geophysical Union Annual Meeting Dec 2024
High-Resolution Maps of Magnetically Organized Temperature and Density Structures in Jupiter's Upper Atmosphere.

Poster | Magnetospheres of the Outer Planets Conference July 2024
Jupiter's Upper Atmosphere: Observations of Temporal Variations in Temperature.

Contributed Talk | ISSI International Team 23-592, Early Career Scientist Feb 2024
Lat-Long Variations in Temperature & Density via Keck Observations in Jupiter's Upper Atmosphere.

Poster | Division for Planetary Sciences & Europlanet Science Congress Oct 2023
Mapping Temporal and Spatial Temperature Variations in Jupiter's Upper Atmosphere.

Contributed Talk | Kalamazoo College Math-Physics-CS SIP Fest April 2022
The Surface Composition of Anomalous Asteroids as a Window into the Early Solar System.

Contributed Talk | Caltech Student-Faculty Programs Summer Seminar Day Aug 2021
The Surface Composition of Anomalous Asteroids as a Window into the Early Solar System.

Poster | Division of Nuclear Physics Conference Oct 2020
Machine learning for improved resolution and fast predictions in a parallel-plate avalanche counter with optical readout.

FUNDING

Future Investigators in NASA: Earth, Space Science, and Technology 2023-2026
Boston University | Why are the Giant Planets so Hot? Determining the Dominant Heat Sources in Jupiter's Upper Atmosphere

AGU Student Travel Grant Fall 2024
Boston University | For 2024 American Geophysical Union Conference

Hartmann Student Travel Grant Fall 2023
Boston University | For 2023 joint meeting of the Division of Planetary Sciences and Europlanet Science Congress

Massachusetts Space Grant Summer 2023

Boston University | Why are the Giant Planets so Hot? Determining the Dominant Heat Sources in Jupiter's Upper Atmosphere

Massachusetts Space Grant Summer 2022

Boston University | Chasing Shadows in Jupiter's Ionosphere

OBSERVING PROGRAMS

JWST Program #5308 | Co-I Cycle 3, 2024

Hunting for the source of Saturn's atmospherically driven aurora, 11.64 hours.

Keck Program PID 130 2024A N174 | Co-I 2024A - 2025B

Joint Keck-Juno observations of Jupiter, its moons and its magnetosphere, 14.25 nights.

PUBLICATIONS & CONFERENCE ABSTRACTS

K. Roberts, L. Moore, H. Melin, T. Stallard, J. O'Donoghue, K. Knowles, C. Schmidt, P. Tiranti. **Spatiotemporal Variations of Temperature in Jupiter's Upper Atmosphere**, In Review, *Planetary Science Journal*. Paper.

K. Roberts, L. Moore, H. Melin, T. Stallard, J. O'Donoghue, K. Knowles, K. Mohamed, O. Agiwal, C. Schmidt. **High-Resolution Maps of Magnetically-Organized Temperature and Density Structures in Jupiter's Upper Atmosphere**, 2024, *AGU*. Poster Abstract.

K. Roberts, L. Moore, H. Melin, T. Stallard, J. O'Donoghue, K. Knowles, C. Schmidt. **Jupiter's Upper Atmosphere: Observations of Temporal Variations in Temperature**, 2024, *MOP A06, pg 98*. Poster Abstract.

K. Roberts, L. Moore, H. Melin, T. Stallard, J. O'Donoghue, M.N. Chowdhury, K. Mohamed, O. Agiwal, C. Schmidt, M. Vogt. **Mapping Spatiotemporal Temperature Variations in Jupiter's Upper Atmosphere From Keck Observations**, 2023, *EPSC-DPS 326.02*. Poster Abstract.

K. Roberts, M. Kuchera, R. Ramanujan, Y. Ayyad, M. Cortesi, and M. Hjorth-Jensen. **Machine learning for improved resolution and fast predictions in a parallel-plate avalanche counter with optical readout (O-PPAC)**, 2020, *APS DNP 65-12 PA*. Poster Abstract.

WORK EXPERIENCE

Boston University | Graduate Teaching Fellow Boston, MA | Sept 2022 - May 2023

- AS100 "Cosmic Controversies," *Prof Michael Mendillo, Spring 2023*
- AS101 "Solar System," *Prof Paul Withers, Fall 2022*

Kalamazoo College | Teacher's Assistant Kalamazoo, MI | Jan 2020 - Mar 2022

- PHYS150 "Introduction to Mechanics," *Winter 2020, 2021, 2022*
- PHYS152 "Introduction to Electricity and Magnetism," *Spring 2020, 2021*
- PHYS220 "Introduction to Quantum, Relativity, and Nuclear Physics," *Fall 2020, 2021*
- PHYS370 "Electronics and Electromagnetism," *Winter 2021, 2022*

Kalamazoo College | Math and Physics Center Consultant

Kalamazoo, MI | Sept 2019 - Mar 2022

- Created an environment which encourages creativity, communication, and collaboration between students, professors, and consultants.
- Promoted in the 2021-2022 school year to lead consultants and enhance work ethic, productivity, and accessibility to students of all backgrounds while maintaining a role as a tutor.

SERVICE

Boston University | Astronomy Graduate Representative

Boston, MA | July 2023 - July 2024

- Work as liason between graduate students and faculty.
- Gather and communicate ideas of the the collective graduate student body.
- Assist in planning department events including prospective student visits and faculty candidate visits during faculty searches.

MENTORING

Russell Mapaye, Undergraduate Student, Boston University — 2022 - 2024
Now a PhD Student at Aberystwyth University

Nico McMahon, Undergraduate Student, Boston University — 2022 - 2024
Now a PhD Student at Rochester Institute of Technology

Jay LoMonaco, Undergraduate Student, Boston University — 2022 - 2024

Jonah Beurkens, Undergraduate Student, Kalamazoo College — 2021 - 2022
2022 REU Student at University of Florida

Matthew Nelson, Undergraduate Student, Kalamazoo College — 2021 - 2022
Now a PhD Student at University of Illinois Urbana-Champaign

Claire Kvande, Undergraduate Student, Kalamazoo College — 2020 - 2022
Now a PhD Student at University of Washington