

Marcell Howard

PERSONAL DETAILS

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RESEARCH INTERESTS

Gravitational Particle Production, Early Universe Cosmology, Cosmological Gravitational Wave Backgrounds, Quantum Cosmology, Primordial Black Holes, Modified General Relativity

EDUCATION

University of Pittsburgh, Pittsburgh, PA *2019 - Present*
Ph.D., Physics

Case Western Reserve University, Cleveland, OH *2015 - 2019*
B.S., Mathematics and Physics

RESEARCH EXPERIENCE

Graduate Research Assistant *2020 - Present*
University of Pittsburgh advised by Arthur Kosowsky
Doctoral Thesis: Issues of Gravitation in Cosmology

Senior Project *2018 - 2019*
Case Western Reserve University advised by Kurt Hinterbichler
Senior Project Thesis: The People vs Mimetic Gravity

Research Experience for Undergraduates *Summer 2018*
Rutgers, the State University of New Jersey advised by Andrew Baker
Probing the Evolution of Galaxies Using Stellar Mass Selected Samples

Research Experience for Undergraduates *Summer 2017*
Cornell University advised by Gordon Stacey
Using Far-Infrared Fine-Structure Lines for Characterizing Star Formation Processes in Nearby Galaxies

FELLOWSHIPS, SCHOLARSHIPS AND AWARDS

PITT PACC Fellowship *Summer 2026*
Competitive internal department fellowship for excellence in research and scholarship

Provost's Dissertation Completion Fellowship - Fall 2025 *Declined*

Competitive university-wide fellowship that acknowledges academic and scholarly accomplishments and ensure dedicated time to focus full-time on finishing the dissertation

Peter F.M. Koehler Pre-Doctoral Fellowship 2023 - 2024
Competitive internal department fellowship for excellence in teaching and research

2021 Honorable Mention, Ford Foundation Predoctoral Fellowship 2021

**Dietrich School of Arts and Sciences Summer Research
Predoctoral Fellowship** 2020
Fellowship to support the most well-prepared students and speed the transition into the research that will become thesis work and to help meet diversity goals

Kenneth P. Dietrich School of Arts & Sciences Fellowship 2019
For incoming graduate students for recognition of an outstanding undergraduate record

Case Alumni Junior/Senior Scholarship 2017 - 2019
For rising sophomores and juniors pursuing a B.S. in engineering, math, or the applied sciences based on merit, need and personal skills

PUBLICATIONS LIST

* = *Corresponding Author*

- M. Howard* and M. König, *Elastic scattering of cosmological gravitational wave backgrounds: primordial black holes and stellar objects*, *J. Cosmology Astropart. Phys.* **2024** (2024) 045 [[2309.15925](#)]
- T. Daniel, M. Howard* and M. König, *An SZ-like effect on cosmological gravitational wave backgrounds*, *J. Cosmology Astropart. Phys.* **2023** (2023) 041 [[2308.00111](#)]
- S. Alexander, T. Daniel, M. Howard* and M. König, *Exact fermionic Chern-Simons-Kodama state in quantum gravity*, *Phys. Rev. D* **106** (2022) 106012 [[2207.11856](#)]
- M. Howard*, A. Kosowsky and G. Valogiannis, *Galaxy Cluster Statistics in Modified Gravity Cosmologies*, *arXiv e-prints* (2022) [arXiv:2205.13015](#) [[2205.13015](#)]

SEMINARS AND COLLOQUIA

- University of Florida, HEP Seminar Oct 2025
- University of Illinois Urbana-Champaign, HEP Seminar Sep 2025
- University of Pittsburgh, AstroLunch Jan 2025
- Pomona College Colloquium Sep 2024

Simons-NSBP Scholars Program, Flatiron Institute	<i>July 2024</i>
Syracuse University Colloquium	<i>Nov 2023</i>
Syracuse University, Watson Cosmology Group Seminar	<i>Nov 2023</i>
MIT, String Theory Group Meeting	<i>Feb 2023</i>
Case Western Reserve University, Particle Astrophysics Seminar	<i>Sep 2022</i>
Brown University, Alexander Lab Group Meeting	<i>Mar 2022</i>

WORKSHOPS AND CONFERENCES

** = Invited Talk*

28th International Conference on Particle Physics and Cosmology	<i>Oct 2025</i>
The 2025 Phenomenology Symposium	<i>May 2025</i>
National Society of Black Physicists Conference	<i>Nov 2024</i>
Division of Particles & Fields - Phenomenology Symposium 2024	<i>May 2024</i>
National Society of Black Physicists Conference	<i>Nov 2023</i>
*International Symposium on Particles, Strings, and Cosmology	<i>June 2023</i>
*Ending Inflation and the Hot Big Bang Workshop Simons Center for Geometry and Physics	<i>June 2023</i>
American Physical Society April Meeting 2023	<i>Apr 2023</i>
Pennsylvania State University, Neighborhood Workshop	<i>Apr 2023</i>
National Society of Black Physicists Conference	<i>Nov 2022</i>
NEXUS Summer Workshop	<i>Aug 2022</i>
American Physical Society April Meeting 2022	<i>Apr 2022</i>
National Society of Black Physicists Conference	<i>Nov 2021</i>

TEACHING EXPERIENCE

Course Instructor

PHYS 0110: Introduction to Physics 1

Guest Lecturer

PHYS 3726: General Relativity 2

General Relativity as a Quantum Field Theory

Graduate Teaching Assistant

PHYS 0111: Introduction to Physics 2

PHYS 0174: Basic Physics for Science and Engineering 1

PHYS 0175: Basic Physics for Science and Engineering 2

PHYS 0212: Introduction to Laboratory Physics

PHYS 0476: Basic Physics for Science and Engineering II - Honors

- Held two-four recitation sessions per week.
- Graded quizzes and tests.

Graduate Core Course Departmental Tutor

PHYS 2565: Non-Relativistic Quantum Mechanics 1

PHYS 2566: Non-Relativistic Quantum Mechanics 2

PHYS 1373 & 2373 (Combined section): Mathematical Methods in Physics

- Held two office hours per week.
- Provided homework help as well as furthered conceptual understanding of the material.

Undergraduate Supplemental Instructor

MATH 121: Calculus for Scientists and Engineers I

MATH 122: Calculus for Scientists and Engineers II

- Held three small groups and one recitation session per week.
- Graded quizzes and tests.

Undergraduate Teaching Assistant

PHYS 121: General Physics I - Mechanics

PHYS 122: General Physics II - Electricity and Magnetism

- Graded written homework handed in every week.
- Handed out in-class assignments and provided help to various students.

OUTREACH AND SERVICE

Allegheny Observatory Public Lecture Series

July 2025

Allegheny Observatory

Invited Presenter: The First Three Minutes

Exploring the Universe with Pitt Astronomers

Aug 2024

University of Pittsburgh

Volunteer Presenter

Astronomy on Tap

Aug 2024

Two Fray's Brewery

Volunteer Presenter: When Black Holes Aren't So Black Astrophysicist for a Day <i>Allegheny Observatory</i>	<i>Mar 2024</i>
Volunteer Workshop Leader: Rediscovering Our Accelerating Universe Society of Physics Students Graduate Student Panel <i>University of Pittsburgh</i> Panelist	<i>Dec 2023</i>
Python Boot Camp 2023: Functions and Modules <i>University of Pittsburgh</i> Volunteer Presenter	<i>May 2023</i>
Astronomy on Tap NYC <i>Pete's Candy Store</i>	<i>May 2023</i>
Invited Presenter: The Wave function of the Universe International Baccalaureate Class Group Project <i>St Edward High School</i>	<i>Mar 2023</i>
Invited Speaker Seminar at High School (SAHS) and Pathway Career Speaker Series <i>Woodland Hills High School</i>	<i>Dec 2022</i>
Invited Speaker Society of Physics Students Graduate Student Panel <i>University of Pittsburgh</i> Panelist	<i>Oct 2022</i>
Astronomy on Tap <i>Two Fray's Brewery</i>	<i>Sept 2022</i>
Volunteer Presenter: The Wave function of the Universe Summer Seminar Series: So You Wanna Get Good At L^AT_EX <i>University of Pittsburgh</i> Volunteer Presenter	<i>July 2022</i>
Cornell's Focus for Teens <i>Cornell University</i> Workshop Leader	<i>Summer 2017</i>

MEDIA CONTRIBUTIONS AND APPEARANCES

Black In Cosmology <i>Nature Astronomy</i> https://doi.org/10.1038/s41550-025-02577-9	<i>June 2025</i>
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WINTER AND SUMMER SCHOOLS

39th Advanced School in Theoretical Physics on Geometry, Topology and Mechanics in Soft Condensed Matter <i>Israel Institute for Advanced Study</i> Canceled due to war	<i>Jan 2024</i>
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SKILLS

<i>Programming</i>	Python, Mathematica, Matlab
<i>Languages</i>	
<i>Software</i>	SciPy/matplotlib, AstroPy, git

PROFESSIONAL ORGANIZATIONS

Pittsburgh Particle Astrophysics and Cosmology Center	<i>2020 - Present</i>
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National Society of Black Physicists	<i>2018 - Present</i>
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REFERENCES

Arthur Kosowsky

[kosowsky\[at\]pitt.edu](mailto:kosowsky[at]pitt.edu)

University of Pittsburgh

Andrew Zentner

[zentner\[at\]pitt.edu](mailto:zentner[at]pitt.edu)

University of Pittsburgh

Stephon Alexander

[ariel.green\[at\]brown.edu](mailto:ariel.green[at]brown.edu)

Brown University