

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

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| Indiana University, Cosmology Seminar | <i>Nov 2025</i> |
| Rice University, Astronomy Undergraduate Seminar | <i>Oct 2025</i> |
| University of Florida, HEP Seminar | <i>Oct 2025</i> |
| University of Illinois Urbana-Champaign, HEP Seminar | <i>Sep 2025</i> |

University of Pittsburgh, AstroLunch	<i>Jan 2025</i>
Pomona College Colloquium	<i>Sep 2024</i>
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>

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

MEDIA CONTRIBUTIONS AND APPEARANCES

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

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

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