

# Marcell Howard

## PERSONAL DETAILS

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## RESEARCH INTERESTS

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

## EDUCATION

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**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

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**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

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

**dB-SERC Mentor-Mentee Evidence-Based Teaching Award** *Fall 2025*

Competitive teaching award for evidence-based teaching with a focus on transforming at least a two-week segment of a natural science course to improve student learning outcomes in a measurable way.

**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**

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\* = *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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University of Maryland, EPT Seminar

*Nov 2025*

Indiana University Bloomington, HEP 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 Pittsburgh, Mathematics Graduate Student Seminar	<i>Sep 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>

## **SELECTED WORKSHOPS AND CONFERENCES**

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*\* = Invited Talk*

28th International Conference on Particle Physics and Cosmology	<i>Oct 2025</i>
Division of Particles & Fields - Phenomenology Symposium 2024	<i>May 2024</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>
Pennsylvania State University, Neighborhood Workshop	<i>Apr 2023</i>
American Physical Society April Meeting 2022	<i>Apr 2022</i>
National Society of Black Physicists Conference	<i>Nov 2021</i>

## TEACHING EXPERIENCE

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### 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

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

## **MEDIA CONTRIBUTIONS AND APPEARANCES**

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<b>Black In Cosmology</b> <i>Nature Astronomy</i> <a href="https://doi.org/10.1038/s41550-025-02577-9">https://doi.org/10.1038/s41550-025-02577-9</a>	<i>June 2025</i>
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## **WINTER AND SUMMER SCHOOLS**

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

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

## PROFESSIONAL ORGANIZATIONS

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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

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**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