

Marcell Howard

PERSONAL DETAILS

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RESEARCH INTERESTS

Quantum Field Theory in Curved Spacetime, Gravitational Particle Production, Early Universe Cosmology, Cosmological Gravitational Wave Backgrounds, Quantum Cosmology, Primordial Black Holes, Modifications of 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

Peter F.M. Koehler Pre-Doctoral Fellowship *2023*
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

Kenneth P. Dietrich School of Arts & Sciences Fellowship

2019

Awarded to incoming graduate students for recognition of an outstanding undergraduate record

Case Alumni Junior/Senior Scholarship

2017

Awarded to rising sophomores and juniors pursuing a BS in engineering, math, or the applied sciences based on merit, need and personal skills

PUBLICATIONS LIST

- 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]

TEACHING EXPERIENCE

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

- 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.

SEMINARS AND COLLOQUIA

Syracuse University Colloquium	<i>Nov 2023</i>
Syracuse University, Watson Cosmology Group Seminar	<i>Nov 2023</i>
Massachusetts Institute of Technology, 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

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

OUTREACH AND SERVICE

Astronomy on Tap <i>Two Fray's Brewery</i> Contributed talk	<i>Aug 2024</i>
NSBP Simon's Scholars <i>Flatiron Institute</i> Invited speaker	<i>July 2024</i>
Astrophysicist for a Day <i>Allegheny Observatory</i> Volunteer Workshop Leader: Rediscovering Our Accelerating Universe	<i>Mar 2024</i>
Society of Physics Students Graduate Student Panel <i>University of Pittsburgh</i> Panel contributor	<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> Invited talk	<i>May 2023</i>
International Baccalaureate Class Group Project <i>St Edward High School</i> Invited speaker	<i>Mar 2023</i>
Seminar at High School (SAHS) and Pathway Career Speaker Series <i>Woodland Hills High School</i> Invited speaker	<i>Dec 2022</i>
Society of Physics Students Graduate Student Panel <i>University of Pittsburgh</i> Panel contributor	<i>Oct 2022</i>
Astronomy on Tap <i>Two Fray's Brewery</i> Contributed talk	<i>Sept 2022</i>
Summer Seminar Series: So You Wanna Get Good At L^AT_EX <i>University of Pittsburgh</i> Contributed talk	<i>July 2022</i>
Cornell's Focus for Teens <i>Cornell University</i> Workshop Leader	<i>Summer 2017</i>

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

Pittsburgh Particle Astrophysics and Cosmology Center (PITT-PACC) *2020 - Present*

National Society of Black Physicists *2018 - Present*