



Marcell Howard

Curriculum Vitae

PERSONAL DETAILS

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RESEARCH INTERESTS

Cosmological Gravitational Wave Backgrounds, Quantum Field Theory in Curved Spacetime, Early Universe Cosmology, Quantum Cosmology, Gravitational Particle Production, 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
Honor's 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*

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

Case Alumni Junior/Senior Scholarship

2017

PUBLICATIONS LIST

- M. Howard and M. König, *Elastic scattering of cosmological gravitational wave backgrounds: primordial black holes and stellar objects*, *Journal of Cosmology and Astroparticle Physics* **2024** (2024) 045
- 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

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.

TALKS AND POSTER PRESENTATIONS

Syracuse University Colloquium <i>Current and Future Constraints on Primordial Black Holes as Dark Matter Candidates</i> Invited talk	Nov 2023
Syracuse University, Watson Cosmology Group Seminar <i>Formalism of the Gravitational Sunyaev-Zeldovich Effect</i> Invited talk	Nov 2023
National Society of Black Physicists Conference <i>The Gravitational Sunyaev-Zeldovich Effect as a Probe of Primordial Black Holes as Dark Matter Candidates</i> Contributed talk	Nov 2023
28th International Symposium on Particles, Strings, and Cosmology <i>An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds</i> Invited talk	June 2023
Simons Center for Geometry and Physics, Ending Inflation and the Hot Big Bang Workshop <i>An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds</i> Invited talk	June 2023
American Physical Society April Meeting 2023 <i>An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds</i> Contributed talk	Apr 2023
Pennsylvania State University, Neighborhood Workshop <i>An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds</i> Contributed talk	Apr 2023
Massachusetts Institute of Technology, String Theory Group Meeting <i>An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity</i> Invited talk	Feb 2023
National Society of Black Physicists Conference <i>An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity</i> Contributed talk	Nov 2022
Case Western Reserve University, Particle Astrophysics Seminar <i>An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity</i> Invited talk	Sep 2022
NEXUS Summer Workshop <i>An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity</i> Contributed talk	Aug 2022
American Physical Society April Meeting 2022 <i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i> Contributed talk	Apr 2022
Brown University, Alexander Lab Group Meeting <i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i> Invited talk	Mar 2022
National Society of Black Physicists Conference <i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i> Contributed talk	Nov 2021
American Astronomical Society Meeting (Seattle, WA)	Jan 2019

Probing the Evolution of Galaxies Using Stellar Mass Selected Samples

Contributed poster

Rutgers, the State University of New Jersey, REU Presentation

Aug 2018

Probing the Evolution of Galaxies Using Stellar Mass Selected Samples

Contributed poster and talk

Cornell University, REU Presentation

Aug 2017

Using Far-Infrared Fine-Structure Lines for Characterizing

the Star Formation Processes in Nearby Galaxies

Contributed poster and talk

OUTREACH AND SERVICE

Society of Physics Students Graduate Student Panel

Dec 2023

University of Pittsburgh

Panel contributor

Python Boot Camp 2023: Functions and Modules

May 2023

University of Pittsburgh

Volunteer Presenter

Astronomy on Tap NYC

May 2023

Pete's Candy Store

Invited talk

International Baccalaureate Class Group Project

Mar 2023

St Edward High School

Invited speaker

Seminar at High School (SAHS) and Pathway Career Speaker Series

Dec 2022

Woodland Hills High School

Invited speaker

Society of Physics Students Graduate Student Panel

Oct 2022

University of Pittsburgh

Panel contributor

Astronomy on Tap

Sept 2022

Two Fray's Brewery

Contributed talk

Summer Seminar Series: So You Wanna Get Good At L^AT_EX

July 2022

University of Pittsburgh

Contributed talk

Cornell's Focus for Teens

Summer 2017

Cornell University

Workshop Leader

SCHOOLS PARTICIPATED

39th Advanced School in Theoretical Physics on Geometry, Topology and Mechanics in Soft Condensed Matter

Jan 2024

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 (PITT PACC) *2020 - Present*

National Society of Black Physicists *2018 - Present*