



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

Hayden Scholarship 2017

Gaemsslen Grant Fund 2017

Case Alumni Junior/Senior Scholarship 2017

University Scholarship 2015

CWRU Grant 2015

PUBLICATIONS LIST

- M. Howard and M. König, *Elastic Scattering of Cosmological Gravitational Wave Backgrounds: Primordial Black Holes and Stellar Objects*, *arXiv e-prints* (2023) arXiv:2309.15925 [2309.15925]
- T. Daniel, M. Howard and M. König, *An SZ-Like Effect on Cosmological Gravitational Wave Backgrounds*, *arXiv e-prints* (2023) arXiv:2308.00111 [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.

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.

Graduate Core Course 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.

TALKS AND POSTER PRESENTATIONS

Syracuse University Colloquium

Nov 2023

Current and Future Constraints on Primordial Black Holes as Dark Matter Candidates

Invited talk

Syracuse University, Watson Cosmology Group Seminar

Nov 2023

The Gravitational Sunyaev-Zeldovich Effect as a Probe of Primordial Black Holes as Dark Matter Candidates

Invited talk

National Society of Black Physicists Conference

Nov 2023

The Gravitational Sunyaev-Zeldovich Effect as a Probe of Primordial Black Holes as Dark Matter Candidates

Contributed talk

28th International Symposium on Particles, Strings, and Cosmology

June 2023

An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds

Invited talk

Simons Center for Geometry and Physics, Ending Inflation and the Hot Big Bang Workshop

June 2023

An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds

Invited talk

American Physical Society April Meeting 2023

Apr 2023

An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds

Contributed talk

Pennsylvania State University, Neighborhood Workshop

Apr 2023

An SZ-Like Effect On Stochastic Gravitational Wave Backgrounds

Contributed talk

Massachusetts Institute of Technology, String Theory Group Meeting

Feb 2023

An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity

Invited talk

National Society of Black Physicists Conference

Nov 2022

An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity

Contributed talk

Case Western Reserve University, Particle Astrophysics Seminar

Sep 2022

An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity

Invited talk

NEXUS Summer Workshop

Aug 2022

<i>An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity</i>	
Contributed talk	
American Physical Society April Meeting 2022	<i>Apr 2022</i>
<i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i>	
Contributed talk	
Brown University, Alexander Lab Group Meeting	<i>Mar 2022</i>
<i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i>	
Invited talk	
National Society of Black Physicists Conference	<i>Nov 2021</i>
<i>Galaxy Cluster Statistics in Modified Gravity Cosmologies</i>	
Contributed talk	
American Astronomical Society Meeting (Seattle, WA)	<i>Jan 2019</i>
<i>Probing the Evolution of Galaxies Using Stellar Mass Selected Samples</i>	
Contributed poster	
Rutgers, the State University of New Jersey, REU Presentation	<i>Aug 2018</i>
<i>Probing the Evolution of Galaxies Using Stellar Mass Selected Samples</i>	
Contributed poster and talk	
Cornell University, REU Presentation	<i>Aug 2017</i>
<i>Using Far-Infrared Fine-Structure Lines for Characterizing the Star Formation Processes in Nearby Galaxies</i>	
Contributed poster and talk	

OUTREACH AND SERVICE

Python Boot Camp 2023: Functions and Modules	<i>May 2023</i>
<i>University of Pittsburgh</i>	
Volunteer Presenter	
Astronomy on Tap NYC	<i>May 2023</i>
<i>Pete's Candy Store</i>	
Invited talk	
International Baccalaureate Class Group Project	<i>Mar 2023</i>
<i>St Edward High School</i>	
Invited speaker	
Seminar at High School (SAHS) and Pathway Career Speaker Series	<i>Dec 2022</i>
<i>Woodland Hills High School</i>	
Invited speaker	
Society of Physics Students Graduate Student Panel	<i>Oct 2022</i>
<i>University of Pittsburgh</i>	
Panel contributor	
Astronomy on Tap	<i>Sept 2022</i>
<i>Two Fray's Brewery</i>	
Contributed talk	
Summer Seminar Series: So You Wanna Get Good At L^AT_EX	<i>July 2022</i>
<i>University of Pittsburgh</i>	
Contributed talk	
Cornell's Focus for Teens	<i>Summer 2017</i>
<i>Cornell University</i>	
Workshop Leader	

SCHOOLS PARTICIPATED

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

January 2024

Israel Institute for Advanced Study

SKILLS

Programming

Python, Mathematica, Matlab

Languages

Software

SciPy/matplotlib, AstroPy, git

PROFESSIONAL ORGANIZATIONS

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

National Society of Black Physicists

2018 - Present