Marcell Howard

Curriculum Vitae

PERSONAL DETAILS

Address	3941 O'Hara Street, Pittsburgh, PA 15260 USA
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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*
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.

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*
Formalism of the Gravitational Sunyaev-Zeldovich Effect
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*
An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity
Contributed talk

American Physical Society April Meeting 2022 *Apr 2022*
Galaxy Cluster Statistics in Modified Gravity Cosmologies
Contributed talk

Brown University, Alexander Lab Group Meeting *Mar 2022*
Galaxy Cluster Statistics in Modified Gravity Cosmologies
Invited talk

National Society of Black Physicists Conference *Nov 2021*
Galaxy Cluster Statistics in Modified Gravity Cosmologies
Contributed talk

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 LaTeX *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

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

PROFESSIONAL ORGANIZATIONS

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

National Society of Black Physicists *2018 - Present*