Michael Ray

Curriculum Vitae

CONTACT INFORMATION

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GitHub	https://github.com/michaelray1

EDUCATION

University of Cincinnati **2017-2021**

B.S. Mathematics; B.S. Physics

I graduated *summa cum laude* (3.983/4.0 GPA) and was designated as a distinguished university honors scholar.

SUNY Stony Brook **2021-present**

degree in progress

I am currently a first year graduate student in the physics M.A. program at Stony Brook. I am also pursuing an Advanced Graduate Certificate in Data and Computational Science.

RESEARCH EXPERIENCE

Computational Astrophysics **April 2021-present**

Supervised by Dr. Rosalba Perna

Working alongside Dr. Perna and her collaborators, I am working on two projects. The first involves looking at possible mechanisms for creating hot jupiters. The second is performing a numerical computation of the radiation transfer that occurs when a gamma ray burst is emmitted in the environment of an active galactic nucleus.

Quantum Field Theory **Apr 2020-present**

Supervised by Dr. Philip Argyres

Using tools from algebraic geometry and topology, I am investigating the limiting cases of certain classes of supersymmetric quantum field theories. Understanding these limiting cases will allow physicists to have a richer understanding of these theories as a whole. This work was used as my senior capstone project in physics.

Metric Space Geometry **Aug 2020-Apr 2021**

Supervised by Dr. David Herron

Dr. Herron and I investigated the properties of the Ferrand metric in a general metric space setting. This work was used as my senior capstone project in mathematics.

CMB Data Filtering **Jan 2018-May 2020**

Supervised by Dr. Colin Bischoff

Using the programming language Python, I constructed a pipeline to filter data from the cosmic microwave background (CMB). I then used this pipeline (which is linked to below) to analyze thousands of simulated CMB maps utilizing the resources of the Ohio Supercomputer Center and the NERSC supercomputer at Lawrence Berkeley National Lab.
https://github.com/michaelray1/messenger_method/blob/master/mod_mess.py

TEACHING EXPERIENCE

ASTRO 203 Teaching Assistant **Fall 2021 - present**

I am the TA for Astro 203, an course titled "Introduction to Modern Astrophysics". I run recitations, write quizzes, and grade homeworks for this course.

PRESENTATIONS

Senior Capstone Presentation **Dec 2020**

Here I presented my senior capstone work with Dr. Argyres to faculty and undergraduates at the University of Cincinnati. The poster associated with this work can be found at the link below.
https://michaelray1.github.io/assets/Capstone_poster_physics.pdf

Summer Undergraduate Research Symposium **Aug 2020**

At this symposium I presented my summer work in quantum field theory to many faculty and undergraduates in the physics department at UC.

2020 Undergraduate Scholarly Showcase **Apr 2020**

This scholarly showcase is run annually by the University of Cincinnati to allow undergraduates to showcase their research activities. I was scheduled to present a poster but the event was cancelled due to Covid-19. However, my poster and abstract were published in the showcase proceedings. This can be found at the link below.
https://journals.uc.edu/index.php/Undergradshowcase/article/view/4117

2020 OSC Users Group Conference **Apr 2020**

This is an annual conference held at the Ohio Supercomputer Center. I was scheduled to present a poster, but the event was cancelled due to Covid-19.

University of Cincinnati Physics Poster Competition **Jan 2020**

At this competition I presented the results of the first project that I completed with Dr. Bischoff. I received second place in the Undergraduate division for my poster. A link to my poster is below.
https://journals.uc.edu/index.php/Undergradshowcase/article/view/4117/3124

DOCUMENTED RESEARCH RESULTS

- M. Ray and D. Herron "Inversion and Sphericalization Studied Through the Ferrand Metric", Senior Thesis (mathematics), April 2020
  https://michaelray1.github.io/assets/Math_Capstone_FD.pdf
- M. Ray and P. Argyres, "Exploring the SU(N) Super Yang-Mills Moduli Space of Vacua Through Isogenies Between Abelian Varieties", Senior Thesis, Dec 7 2020.
  https://michaelray1.github.io/assets/Senior_capstone_physics.pdf
- M. Ray and C. Bischoff, "Pure-B by Messenger Method", CMB-S4 internal logbook posting, Sep 16 2019.
  https://cmb-s4.uchicago.edu/wiki/index.php/PureB_by_Messenger_Method

AWARDS

Scholarships

UC Welsh University Scholarship (2020-21)
Maita Levine Scholarship (2020-21)
Jeanne Gulden Endowed Physics Prize (2020-21)
Mary Jane Toepfer Scholarship (2020-21)
Sarah Blank Greenholz Scholarship (2019-20)
Physics Alumni Endowed Scholarship (2019-20)
UC Physics Scholarship (awarded 3 separate times, from 2018-21)
**I Know I Can Founder's Scholarship (2017-21)
Cincinnatus University Scholarship (2017-21)
UC Arts and Sciences Scholarship (awarded two separate times, from 2017-19)
Columbus Dispatch Scholar Athlete Award (2017-18)
Clintonville Rotary Scholarship (2017-18)
Whetstone High School Athletic Boosters Scholarship (2017-18)

** One of 20 students selected from Columbus City Schools (21 high schools) for this award

Fellowships

SBU Fellowship ($3k per year for grad study)
Joiner Fellowship (for summer 2020 research)

Miscellaneous

UC Sophomore Achievement Award in Physics
Dean's List (every semester of undergrad)
Member of Sigma Pi Sigma physics honor society
Member of Phi Beta Kappa academic honor society
Eagle Scout

RELEVANT SKILLS

Programming Python (advanced proficiency)
Mathematica (intermediate proficiency)
Command Line/Bash (intermediate proficiency)
C++ (intermediate proficiency)

VOLUNTEER EXPERIENCE

After School Tutoring **2018-19**
Wesley Chapel Mission Center (WCMC)

During my time at WCMC, I helped tutor children in grades 3-5 through an after school program in an impoverished neighborhood of Cincinnati.

WORK EXPERIENCE

College Intern **Summer 2017**
Ohio Department of Transportation (ODOT), Full-time

During my time at ODOT, I worked with engineers to improve traffic flow after accidents occur. My work consisted primarily of data analysis using Microsoft Excel.