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GABRIELE MONTEFALCONE

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Institutional History

Doctor of Philosophy in Physics — Sep 2021 ▸ Now

University of Texas at Austin, Weinberg Institute for Theoretical Physics — *Austin,TX*

Advised by Katherine Freese

Bachelor of Arts in Physics — Sep 2016 ▸ Jun 2020

Princeton University, Department of Physics — *Princeton, NJ*

Senior Thesis (advised by Lyman Page): Exploring properties of galaxy clusters with the Atacama Cosmology Telescope

Junior Paper II (advised by Paul J. Steinhardt): Exploring extra dimensions with constraints on the variation of Newton's Constant

Junior Paper I (advised by Cristiano Galbiati): The DarkSide-LowMass Experiment and its Physics Potential

Papers

Journal Publications

6. **GM**, Rudnei O. Ramos, Gustavo S. Vicente, K. Freese, *Defying eternal inflation in warm inflation with a negative running*, JCAP 02 (2024) 006
5. **GM**, V. Aragam, L. Visinelli, K. Freese, *WarmSPy: a numerical study of cosmological perturbations in warm inflation*, JCAP01(2024)032
4. **GM**, V. Aragam, L. Visinelli, K. Freese, *Observational constraints on warm natural inflation*, JCAP 03 (2023) 002
3. **GM**, V. Aragam, L. Visinelli, K. Freese, *Constraints on the scalar-field potential in warm inflation*, Phys.Rev.D 107 (2023) 6, 063543
2. **GM**, M. H. Abitbol, D.Kodwani, R.D.P. Grumitt, *Inpainting CMB maps using partial convolutional neural networks*, JCAP 03 (2021) 055
1. **GM**, P.J. Steinhardt, D.H. Wesley, *Dark energy, extra dimensions, and the Swampland*, JHEP 06 (2020) 091

Preprints

2. K. Boddy, K. Freese, **GM**, B. Shams Es Haghi, *Minimal Dark Matter Freeze-in with Low Reheating Temperatures and Implications for Direct Detection*, arXiv:2405.06226 [hep-ph] (Submitted to PRL)
1. K. Freese, **GM**, B. Shams Es Haghi, *Dark Matter production during Warm Inflation via Freeze In*, arXiv:2401.17371 [hep-ph] (Accepted to PRL)

Awards & Fellowships

Graduate School Continuing Fellowship — Jun 2024 ▸ Jun 2025

Graduate School, University of Texas at Austin

Awarded by the University of Texas Graduate School, based on major accomplishments and a well-defined research program. Stipend of $36,000, tuition and insurance for full academic year included.

Steven Weinberg Summer Fellowship — May 2023 ▸ Aug 2023

Texas Center for Cosmology and Astroparticle Physics (TCCAP), University of Texas at Austin

Awarded annually to one member of the TCCAP. Stipend of $7,500 and tuition for summer term included.

A. G. Shenstone Prize Winner in Physics — Jun 2018 - Jun 2019

Department of Physics, Princeton University

Recognizes annually outstanding Physics undergraduates who have shown excellence in course work and promise in independent research. Awarded prize of $750.

Research Presentations

Invited Talks

10. Theoretical Astroparticle & COsmology Symposium in Texas — Oct 2024
Department of Physics, University of Texas at Austin — *Austin, TX*
Free-streaming neutrinos in the CMB power spectra

9. TeV Particle Astrophysics 2024 — Aug 2024
Department of Physics, University of Chicago — *Chicago, IL*
Minimal Dark Matter Freeze-in with Low Reheating Temperatures & Implications for Direct Detection

8. Workshop on Quantum Aspects of Inflationary Cosmology — Jul 2024
Munich Institute of Astro-,Particle & BioPhysics — *Munich, Germany*
WIFI A novel framework for Dark Matter production

7. International Workshop on the Identification of Dark Matter — Jul 2024
Gran Sasso Science Institute — *L'Aquila, Italy*
Minimal Dark Matter Freeze-in with Low Reheating Temperatures & Implications for Direct Detection

6. Cosmology from Home — June 2024
Online Conference — *Virtual on Zoom*
Minimal Dark Matter Freeze-in with Low Reheating Temperatures & Implications for Direct Detection

5. Neutrinos from Home — Apr 2024
Online Conference — *Virtual on Zoom*
The Imprint of cosmic neutrinos & other light-relics in the CMB

4. The Future of High Energy Physics, A New Generation, A New Vision — Mar 2024
Aspen Center for Physics — *Aspen, CO*
WIFI: A novel framework for Dark Matter Production

3. Particle Production and Thermal Effects in Inflation — Feb 2024
Physics Department, King's College London — *Virtual on Zoom*
Dark Matter Production during Warm Inflation via Freeze In

2. Cosmology-Astro Seminar — Oct 2023
Leinweber Center for Theoretical Physics, University of Michigan — *Ann Arbor, MI*
The Imprint of cosmic neutrinos & other light-relics in the CMB

1. Theoretical Cosmology Seminar — Jun 2023
CoPS division, the Oskar Klein Center, Department of Physics, Stockholm University — *Stockholm, Sweden*
Warm Inflation: Warm Natural inflation and other recent developments

At the University of Texas at Austin

5. Physics Department, Pizza Seminar — Nov 2024
Free-streaming neutrinos & the cosmic microwave background

4. Physics Concerto Seminar Series — Sep 2024
What every physicist should know about the Cosmic Microwave Background

3. Weinberg Institute, Brown Bag Seminar — Nov 2023
The Imprint of cosmic neutrinos & other light-relics in the CMB

2. Physics Concerto Seminar Series — Oct 2023
   Beyond the Big Bang: Delving into Inflationary Cosmology
1. Weinberg Institute, Brown Bag Seminar — Jan 2023
   Warm Natural Inflation

Visits

University of Michigan — Oct 15 ▸ 20 2023
Leinweber Center for Theoretical Physics, University of Michigan — *Ann Arbor, MI*
Visiting Researcher

Stockholm University — Jun 1 ▸ 30 2023
Oscar Klein Center, Department of Physics, Sotckholm University — *Stockholm, Sweden*
Visiting Researcher

Oxford University — Jun 1 ▸ Aug 10 2019
Department of Astrophysics, Oxford University — *Oxford, United Kingdom*
Research Intern

Outreach & Scientific Service

CMBverse — Jun 2024 ▸ Now
Department of Physics, University of Texas at Austin — *Austin, Tx*
CMBverse.com
I guide a team of high school and undergraduate students in creating interactive animations that let students explore the effects of cosmological parameters on the Cosmic Microwave Background. Hosted on our website, CMBverse, these tools are designed to make learning cosmology more engaging and accessible.

APS DGRAV Student Representative — Apr 2024 ▸ Now
The American Physical Society, Division of Gravitational Physics — *College Park, MD*

Physics Concerto Seminar Series — Sep 2023 ▸ Now
Department of Physics, University of Texas at Austin — *Austin, Tx*
physicsconcerto.com
Founder and organizer of the Physics Concerto, a peer-to-peer seminar series with the aim of enabling graduate students to delve into fields and roles beyond their own concentration at an advanced, yet comprehensible, level.

Physics Competition by Physics Unlimited — Nov 2019
Department of Physics, Princeton University — *Princeton,NJ*
Directed the organizing committees and designed both onsite and online exams with challenging physics problems.

Teaching

Teaching Assistant

Phy 321 - Plan II Modern physics — Spring 2023
Honors Plan II course on particle physics — *University of Texas at Austin*
Led discussion classes and supported the homework administration and grading. Taught three lectures on special relativity, principles of general relativity and the cosmic microwave background.

Phy 303k - General Physics II — Spring 2023
Introductory course in Electromagnetism for engineers — *University of Texas at Austin*
Led discussion classes and supported the homework grading.

Phy 355 - Modern Physics — Fall 2021 ▸ Spring 2022

Introductory course in Quantum Mechanics, Statistical Mechanics and Special Relativity — *University of Texas at Austin*

Led discussion classes and supported the homework administration and grading.

Phy 104 - Electromagnetism — Spring 2021

Introductory course in Electromagnetism — *Princeton University*

Led discussion classes and supported the homework grading. Contributed to the revision process of a new textbook for the course by Professor Meyers.

Phy 102 - Electromagnetism — Spring 2021

Introductory course in Electromagnetism for pre-med students — *Princeton University*

Supported the labs and homework administration and grading.

Phy 101 - Classical Mechanics — Fall 2020

Introductory course in Classical Mechanics for pre-med students — *Princeton University*

Supported the labs and homework administration and grading.

SKILLS & INTERESTS

</> Digital Competence

Data Analysis in Python, Mathematica and C++; Machine Learning with Keras; Proficient user in LaTeX.

Languages

Native Italian; Proficient English; Intermediate Spanish.

Other Interests

Running; Italian Cooking; Motorcycle Riding; Backpacking; Acoustic Guitar.