

# Cian Roche

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|--------------|--|-----------------------------------|
| EDUCATION    | <b>Massachusetts Institute of Technology</b><br><i>PhD candidate - Physics</i><br>Thesis: “ <i>Dark Matter on Small and Large Scales</i> ”<br>Advisors: Prof. Michael McDonald, Prof. Mark Vogelsberger  | 2021 - Present                    |
|              | <b>Universität Tübingen</b><br><i>MSc Mathematical Physics</i> 1.1 GPA <sup>†</sup><br>Thesis: “ <i>Exact parallel waves in general relativity</i> ”<br>Advisor: Prof. Carla Cederbaum   | 2019 - 2021                       |
|              | <b>University College Cork</b><br><i>Bachelor of Science: Physics, 1<sup>st</sup> class honours</i>  | 2015 - 2019                       |
| AWARDS       | DAAD Graduate Program Full Scholarship ( <a href="#">link</a> )  | 2019                              |
|              | College Scholar - University College Cork  | 2019                              |
|              | Naughton Research Fellowship (one of 8 in Ireland)   | 2018                              |
|              | Naughton Foundation Scholarship (one of 29 in Ireland; <a href="#">link</a> )  | 2015                              |
|              | All-Ireland Scholarship (one of 125 in Ireland; declined; <a href="#">link</a> )   | 2015                              |
| PUBLICATIONS | First/corresponding author listed in <b>bold</b>   |                                   |
|              | 5. Rose J. C., et al.; “ <i>Introducing the DREAMS Project: DaRk mattEr and Astrophysics with Machine learning and Simulations</i> ” (2024) arXiv:2405.00766   |                                   |
|              | 4. <b>Roche, C.</b> , McDonald M., Vogelsberger, M., et al.; “ <i>Brightest Cluster Galaxy Offsets in Cold Dark Matter</i> ” (2024) arXiv:2402.00928, Accepted by OJA  |                                   |
|              | 3. <b>Roche, C.</b> , Necib, L., Lin, T., et al.; “ <i>The Escape Velocity Profile of the Milky Way from Gaia DR3</i> ” (2024) arXiv:2402.00108, Accepted by ApJ   |                                   |
|              | 2. <b>Roche, C.</b> , Aazami, A.B. & Cederbaum, C.; “ <i>Exact parallel waves in general relativity</i> ” Gen Relativ Gravit 55, 40 (2023). <a href="https://doi.org/10.1007/s10714-023-03083-x">https://doi.org/10.1007/s10714-023-03083-x</a>  |                                   |
|              | 1. <b>Roche, C.</b> & Garnavich, P.; “ <i>Testing Progenitor Models Using the Late-Time Light Curve of Supernova 1992A</i> ” Res. Notes AAS 4 207 (2020) <a href="https://doi.org/10.3847/2515-5172/abcb05">https://doi.org/10.3847/2515-5172/abcb05</a>   |                                   |
| TEACHING     | <b>Teaching Assistant - MIT 8.13</b><br>Designed and presented lectures on programming, statistics, data analysis, plotting, simulations and errors to be presented as part of the junior lab (8.13) curriculum. Also held office hours, oral exams, assisted in grading, and provided in-lab assistance ( <a href="#">link</a> ). | Fall 2022, Fall 2023, Spring 2024 |
|              | <b>Instructor - Gaia DR3 Hackathon</b> ( <a href="#">link</a> )  | 06/22                             |
|              | <b>Teaching Assistant - Introductory Physics II</b><br>Lead tutorials for 1 <sup>st</sup> year physics undergraduate students at University College Cork on the topics of electromagnetism, optics, special relativity and quantum mechanics.  | 2017 - 2018                       |
|              | <b>Leader - Peer Assisted Learning Scheme</b><br>Lead weekly mathematics/physics learning sessions for undergraduate students in scientific degrees other than math or physics for two years.  | 2016 - 2018                       |

<sup>†</sup>on a scale of 1-5, where 1 is the highest grade. Approximately equivalent to a 4.0 US grade.

## TALKS

1. “*Dark Matter Self-Interaction via Galaxy Cluster Dynamics* ” 14/02/24  
Harvard University
2. “*Galaxies Lacking Dark Matter Produced in a Cosmological Simulation*” 08/04/22  
MIT Kavli Institute for Astrophysics and Space Research
3. “*Waves in General Relativity*” 01/07/21  
Guest Lecture - Mathematical Relativity Class at the University of Tübingen ([link](#))
4. “*Exact parallel waves in general relativity*” 16/06/21  
University of Tübingen Mathematical Physics Colloquium
5. “*How to Stop a Hurricane: Complexity in Physics*” 29/10/20  
University College Cork “Blow Your Mind Week” 2020
6. “*Hermiticity of Young Operators*” 30/06/20  
Young Tableaux Seminar Series - Universität Tübingen

## COMMUNITY

**MIT Physics Graduate Admissions Committee** 2022/2023 Cycle, 2023/2024 Cycle  
Served on the admissions committee to the graduate program in physics as part of SMAC (student members of admissions committee)

**AstroWiki** 02/2023 - Present  
Created and maintain a set of living notes covering most of graduate level astrophysics, specifically designed to aid students when studying for the MIT astrophysics oral qualification exam ([link](#)).

**MIT Summer Research Program Admissions Committee** 2022/2023 Cycle  
Served on the admissions committee for the MIT Summer research program (MSRP), which aims in particular to provide high-quality research experiences to promising undergraduate students from underrepresented backgrounds ([link](#)).

**MIT GAGA Initiative | Co-Lead** 06/2022 - 09/2023  
The Graduates Advising Graduate Admissions (GAGA) program provides the graduate student perspective to the Chair of Graduate Admissions, offers information and mentorship to underrepresented groups in physics and advises on improvements to the admissions process ([link](#)).

**MIT GAGA Initiative | Organising Committee** 01/2021 - 05/2024

**MIT PhysGAAP program - Mentor and Co-Organiser** 2021-2023  
The Physics Graduate Application Assistance Program (PhysGAAP) provides guidance to prospective applicants on navigating the application process, and liaises with the physics department leadership on issues of accessibility and equity in the graduate application. I have served as a co-organizer and have mentored 5 students through the program ([link](#)).

**MIT Physics Graduate Student Council** ([link](#)) 01/2021 - 09/2023

**MKI Graduate Student Lunch | Organiser** 01/2022 - 08/2023  
Organised a weekly lunch and talk series for the physics graduate students of the MIT Kavli Institute for Astrophysics and Space Research.

**MIT Graduate Student Union | Organising Committee** 09/2021 - 05/2023

**UCC Physics and Astronomy Society | Astronomy Officer** 2017-2019