João F. Melo

Personal Website: joaofmelo.github.io | **iNSPIRE Profile**: inspirehep.net/authors/1762166

Professional Career

Postdoctoral Researcher, KU Leuven, Institute for Theoretical Physics **Jul 2023 — Jan 2025**
Medical Leave **Sep 2023 — Dec 2023**

Higher Education

Medical Leave **Apr 2022 — Jan 2023**

PhD in Applied Mathematics and Theoretical Physics, University of Cambridge, DAMTP **Oct 2018 — May 2023**
Thesis Title: The Many Scales of Quantum Fields and Gravity **Supervisor**: Jorge E. Santos
Topics: Quantum Field Theory in Curved Spacetime, Renormalisation, Holography, Cosmology

MASt in Applied Mathematics, University of Cambridge **Result**: Pass with Distinction **Overall Mark**: 90/100 **Oct 2017 — Jun 2018**
Exams Taken: Quantum Field Theory, Statistical Field Theory, String Theory, General Relativity, Black Holes
Essay: T-Duality and Geometry of String Theory **Advisor**: Ron Reid-Edwards

Graduate in Engineering Sciences – Engineering Physics, University of Lisbon, IST **Final Grade**: 18/20 **Sep 2014 — Jul 2017**
Core Topics: Theoretical Physics, Experimental Physics, Mathematics, Computing, Electrical Engineering
Skills Attained: Time management, teamwork, and scientific writing due to experimental and computational projects

Teaching

Summer Camp Lecturer, AstoCamp **Aug 2025**
- **Course:** Special Relativity: The Structure of Time and Space
- Lecturer in an astrophysics summer camp in Portugal for secondary school students ($\sim$ 16 years old)

Master's Thesis Supervisor, KU Leuven **Sep 2024 — Dec 2024**
- **Thesis Title:** Quantum Field Theory in Curved Spacetime
- Co-supervisor for the early stages for a Master's Thesis in the KU Leuven Master of Physics degree.

Bachelor's Project Supervisor, KU Leuven **Sep 2024 — Dec 2024**
- **Project Title:** Black Hole Thermodynamics
- Sole supervisor of 2 students for their "capstone" project in the third year of the KU Leuven Bachelor of Physics.

Teaching Assistant, KU Leuven **Nov 2024**
- **Courses:** Statistical Mechanics
- Instructor for exercise sessions for $\sim$ 20 third year students in the KU Leuven Bachelor of Physics.

Main Lecturer, KU Leuven **Feb 2024 — Jun 2024**
- **Courses:** Advanced Quantum Field Theory
- **Responsibilities:**
  - Delivering one 2-hour lecture per week for 12 weeks for $\sim$ 30 students in the KU Leuven Master of Physics
  - Drafting lecture notes
  - Writing 3 graded homework assignments
  - Conducting the final aural examination consisting of short presentations on a project written by each student chosen from a set list

Part III Examples Classes Instructor, University of Cambridge **Jan 2019 — Jan 2022**
- **Courses:** General Relativity, String Theory
- Sole instructor for $\sim$ 20 master's students in the Cambridge Part III Maths Tripos covering the Example Sheets
- Grading selected problems from the Example Sheets

Part III Preparatory Workshops Instructor, University of Cambridge **Oct 2019 — Oct 2021**
- **Courses:** General Relativity
- Interactive workshop for $\sim$ 50 master's students covering pre-requisites for the Cambridge Part III Maths Tripos.
- Notes written for those workshops are still in use.

PhD Drop-Ins, University of Cambridge **Jan 2019 — Jun 2019**
- **Courses:** General Relativity, String Theory, Statistical Field Theory
- Office hours for master's students in the Cambridge Part III Maths Tripos

Academic Service

Effective Field Theories Reading Group **Oct 2020 — Dec 2020**
Founder and Organiser
- Group for PhD students following the book "Effective Field Theories" by Andrew E. Blechman and Alexey A. Petrov

Racism Discussion Group **Jun 2020 — Dec 2020**

Co-Founder and Co-Organiser with Chandrima Ganguly, Hayley Macpherson and Miren Radia

- Group for both staff and students to discuss the issues of racial and ethnic discrimination in academia

Graduate Seminar **Oct 2019 — Jun 2020**

Co-organiser with Maeve Madigan

- Seminar for PhD students of the HEP and GR groups of DAMTP

Pre-Seminar Meetings **Oct 2019 — Jun 2020**

Founder and Co-Organiser with Filipe Miguel and Gonçalo Regado

- Meetings before the Quantum Fields & Strings and General Relativity DAMTP seminars between the speaker and PhD students

Quantum Fields and Gravity Working Group **Mar 2019 — Mar 2020**

Founder and Organiser

- Group for PhD students at the intersection of the HEP and GR groups to share and discuss their research ideas

International Physics Olympiads **Jun 2018**

Liaison Officer

- Prepared and planned the activities on each day with the organising committee
- Coordinated a team of 10 guides each with their own delegation of 5 students
- With a team of 2 other liaison officers coordinated the full logistics of Hotel Roma (housing $\sim$ 150 students) including meals, transportation, electronics storage and conflict resolution

Outreach

Demonstrating Experiments

Cambridge Hands-On Science **Oct 2018 — Mar 2020**

- Explained simple physics experiments to school children aged between 8 and 12 at schools and science festivals

NFIST - Physics Society IST **Sep 2014 — Aug 2017**

- Helped organise the Physics Week and the Physics On The Road events
- Explained simple physics experiments to pre-university students aged between 14 and 18 at schools, youth correctional centres, and science festivals
- Explained simple physics experiments to the general audience at music festivals and on the street

Popular Science Writing

1. Clarke, P., Madigan M., **Melo, J. F.** Our Place in the Universe. *BlueSci*, 47 (2020)
2. **Melo, J. F.** Interview with David Tong (in Portuguese). *Pulsar*, 40 (2019)
3. **Melo, J. F.** Physics and Technology of the Telescope (in Portuguese). *Pulsar*, 38 (2017)
4. **Melo, J. F.** Physics and Technology of the Fridge (in Portuguese). *Pulsar*, 37 (2016)
5. **Melo, J. F.** Physics and Technology of the Television (in Portuguese). *Pulsar*, 36 (2016)
6. **Melo, J. F.** Physics and Technology of the Light Bulb (in Portuguese). *Pulsar*, 35 (2015)

Publications

1. Valeixo Bento, B. & **Melo**, **J. F.** EFT & Species Scale: Friends or foes? *JHEP* **25,** 212. arXiv: 2501.08230 [hep-th] (2025).
2. **Melo**, **J. F.** *The Many Scales of Quantum Fields and Gravity* PhD thesis (Cambridge U., May 2023).
3. **Melo**, **J. F.** The propagator matrix reloaded. *SciPost Phys. Core* **6,** 019. arXiv: 2112.09119 [hep-th] (2023).
4. **Melo**, **J. F.** & Santos, J. E. Stringy corrections to the entropy of electrically charged supersymmetric black holes with $AdS_5 \times S^5$ asymptotics. *Phys. Rev. D* **103,** 066008. arXiv: 2007.06582 [hep-th] (2021).
5. **Melo**, **J. F.** & Santos, J. E. Developing local RG: quantum RG and BFSS. *JHEP* **05,** 063. arXiv: 1910.09559 [hep-th] (2020).
6. **Melo**, **J. F.** Introduction to Renormalisation. arXiv: 1909.11099 [hep-th] (Sept. 2019).

Scholarships and Awards

PhD Studentship, Fundação para a Ciência e Tecnologia **Oct 2021 — Sep 2022**
Smith-Knight and Rayleigh-Knight Prize, Faculty of Mathematics, University of Cambridge **Jan 2020**
Vice-Chancellor's Award, Cambridge Trust, University of Cambridge **Oct 2018 — Sep 2021**
Getrude Mather Jackson Prize, Girton College, University of Cambridge **Jun 2018**
M. T. Meyer Scholarship, Girton College, University of Cambridge **Jun 2018**
Merit Scholarship, IST, University of Lisbon **Sep 2016 — Jul 2017**

Short-Term Schools

TASI, Black Holes, Quantum Information and Dualities **Jun 2021**
AQFTUK/LMS, An Introduction to Quantum Field Theory in Curved Spacetime **Oct 2020**
CERN, Supergravity, Strings and Gauge Theory **Feb 2019**
LIP/CFTP, Particle and Astroparticle Physics **Feb 2017**
University of Coimbra, Projecto Quark! – Preparation for the International Physics Olympiads **Jan 2014 — Jun 2014**