

Francisco Rodriguez

DPhil candidate in ASTROPHYSICS



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<https://bit.ly/2FvJuCV>



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PROFILE



I am a theoretical astrophysicist focused on the study of the most massive galaxies in the early Universe with large numerical simulations. At the present moment, I am a DPhil student at the University of Oxford under the supervision of Adrienne Slyz and Julien Devriendt.

I have experience in astronomical data analysis, theoretical physics and computational astrophysics. My work and academic experience has involved me in scientific collaborations across many countries in which I have actively lead research teams. I am also an active organiser of outreach events and I have extensive experience in teaching.

EDUCATION



2014 - 2016

INT. BACCALAUREATE (39/45)

Martinez Montañes, Seville (Spain)

2016 - 2019

BSc ASTROPHYSICS (1st Class)

University of Edinburgh, Edinburgh (UK)

2019 - 2020

MASt ASTROPHYSICS (IoA Prize)

University of Cambridge, Cambridge (UK)

2020 - now

DPhil ASTROPHYSICS

University of Oxford, Oxford (UK)

AWARDS



2016

BACCALAUREATE AWARD

Ministry of Education (Spain)

2017

PRE-HONOURS MERIT CERTIFICATE

University of Edinburgh (UK)

2018

EPSRC SUMMER SCHOLARSHIP

Engineering and Physical Sciences Council (UK)

Continue in next page...

RESEARCH EXPERIENCE



2015
-
2016

DEVELOPMENT OF AN AUTOMATIC TRACE DETECTION OF GEOSTATIONARY OBJECTS | REAL OBSERVATORIO DE LA ARMADA, SAN FERNANDO (SPAIN)

On the basis of the positions detected in astronomical images, using a Python algorithm of my own, the results were compared with the catalogue developed in the Real Observatorio de la Armada. This research was meant as the Extended Essay at the end of my studies in the International Baccalaureate.

2018

RESEARCH INTERNSHIP AT SOPA (UNIVERSITY OF EDINBURGH)

Summer research funded by EPSRC Summer Scholarship focused in the chaotic properties of turbulent isotropic fluids and their connection with weather phenomena. Supervised by Prof. Arjun Berera and Richard Ho.

EXOPLANET GROUP RESEARCH AT IFA (UNIVERSITY OF EDINBURGH)

Using the student telescope at the Royal Observatory to study the astronomical properties of the exoplanet TrES-2b.

SENIOR HONOURS RESEARCH (UNIVERSITY OF EDINBURGH)

I carried research into how mergers influenced galaxy evolution and the processes that quenched star formation, thanks to state-of-the-art cosmological simulations. The results of this work lead to a publication.

DARK MATTER SIMULATION PROJECT (EUYSRA)

I lead this team that is currently simulating dwarf galaxies dark matter halos that include an additional "dark-electromagnetism" as a cooling system. This is a project supported financially by the Edinburgh Young Scientific Research Association (EUYSRA).

RESEARCH ASSISTANT SOPA (UNIVERSITY OF ST. ANDREWS)

Summer research supervised by Vivienne Wild and in collaboration with Romeel Davé, in which I studied the relation between mergers, quenching and galaxy colours in cosmological simulations.

2019

RESEARCHER INSTITUTE OF ASTRONOMY (UNIVERSITY OF CAMBRIDGE)

In a collaboration with Debora Sijacki and Sergio Martin-Alvarez, I am developing the first magnetohydrodynamical simulation of supernovae including cosmic rays acceleration. The goal of this project is to parametrise, using the results of state-of-the-art simulations, the importance of cosmic rays in galactic evolution.

2020

DPHIL CANDIDATE (UNIVERSITY OF OXFORD)

PhD program funded by the Wolfson-Harrison UK Physics Scholarship on the interplay between extreme star formation and super-massive black hole feedback. Supervised by Prof Adrienne Slyz and Prof Julien Devriendt, I am developing the physical framework to perform state-of-the-art simulations of the most massive galaxies in the early Universe.

2022

INVITED RESEARCHER (INSTITUT ASTROPHYSIQUE DE PARIS)

Under the supervision of Dr Yohan Dubois, I am developing a novel dust evolution model for cosmological galaxy simulations. This model accounts on-the-fly for the most relevant processes of dust in galaxies and their interaction with thermo-chemistry, radiation and cosmic rays.

AWARDS (continued)

2019
EUROPEAN SCHOLARSHIP
Cambridge Trust (UK)

2019
RAMSAY MEMORIAL PRIZE
University of Edinburgh (UK)

2020
IoA PROJECT PRIZE
Institute of Astronomy, Cambridge (UK)

2020
WOLFSON-HARRISON SCHOLARSHIP
Wolfson College, University of Oxford (UK)

2021
STFC LONG ATTACHMENT GRANT
University of Oxford (UK)

EXPERTISE

- Adobe Illustrator and InDesign
- Adobe Photoshop and Premiere Pro
- Matlab, Python, C++ and Fortran90
- Parallel programming and HPC
- Numerical methods for physics


LANGUAGE

- SPANISH (native language)
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- ENGLISH (academic level)
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- FRENCH(intermediate level)
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- MODERN GREEK(basic speaking)
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INTERESTS



Galaxy Formation



Numerical Methods

TEACHING EXPERIENCE

2017 -
2018 - ● **PRIVATE TUTOR (SEVILLE)**
Fort two consecutive summers I prepared high school students for their university exams in the subjects of Math, Physics, Chemistry and Biology.

2018 -
2019 - ● **MENTOR AT THE PHYSICS AND MENTORING SCHEME (UNIVERSITY OF EDINBURGH)**
This is a student run peer support scheme for pre-honours (year 1 and 2) students, in which I provided one-on-one meetings on a regular basis to help them with coursework.

2021 -
2022 - ● **C1 ASTROPHYSICS TUTOR (UNIVERSITY OF OXFORD)**
I was a tutor for the masters C1 Astrophysics course at the University of Oxford during the 2021/2022 academic year. My duties as a tutor consisted in preparing and imparting tutorials for my group of students and marking their problem sheets.

CONFERENCES AND TALKS

- 2020 - SIMBA User Meeting, CCA, Flatiron Institute (New York, USA)
- 2021 - National Astronomical Meeting, University of Bath (Bath, UK)
- 2021 - RAMSES User Meeting, Observatoire de Lyon (Lyon, France)
- 2022 - YMCA, Institut Astrophysique de Paris (Paris, France)
- 2022 - National Astronomical Meeting, University of Warwick (Coventry, UK)
- 2023 - RAMSES User Meeting, University of Oxford (Oxford, UK)
- 2023 - National Astronomical Meeting (S. Org.), University of Cardiff (Cardiff, UK)

PUBLICATIONS

- Francisco Rodríguez Montero, R. Davé, V. Wild, D. Anglés-Alcázar & D. Narayanan, **Mergers, Starbursts, and Quenching in the Simba Simulation**, Monthly Notices of the Royal Astronomical Society, <https://doi.org/10.1093/mnras/stz2580>
- Francisco Rodríguez Montero, S. Martín-Álvarez, D. Sijacki, A. Slyz, J. Devriendt & Y. Dubois, **Momentum deposition in supernovae with cosmic rays**, Monthly Notices of the Royal Astronomical Society, <https://doi.org/10.1093/mnras/stab3716>
- Y. Zheng, R. Davé, V. Wild, Francisco Rodríguez Montero, **Rapidly quenched galaxies in the Simba cosmological simulation and observations**, Monthly Notices of the Royal Astronomical Society, <https://doi.org/10.1093/mnras/stac905>
- H. Katz, S. Liu, T. Kimm, M. P. Rey, E. P. Andersson, A. J. Cameron, Francisco Rodríguez Montero, O. Agertz, J. Devriendt, A. Slyz, **PRISM: A Non-Equilibrium & Multiphase Interstellar Medium Model for Radiation Hydrodynamics Simulations of Galaxies**, arXiv pre-print, <https://arxiv.org/abs/2211.04626>