



# Sergio Martin-Alvarez

*Postdoctoral researcher in Computational Astrophysics*

## Research interests:

Galaxy formation and evolution — Large Scale Structure — Synthetic observations — Numerical Methods  
Magnetohydrodynamics — Magnetic fields — Cosmic rays — Radiation & reionization

## Education

- 05/10/2015 to 21/06/2019 **Ph.D. in Astrophysics**, *University of Oxford*.  
Thesis title: Magnetic fields in and around galaxies. Supervised by: J. Devriendt & A. Slyz.
- 19/09/2014 to 27/07/2015 **MSc Advanced Physics**, *Universitat de València*, in theoretical physics and astrophysics.  
Thesis title: Cosmological shock waves. Supervised by: Vicent Quilis. 1st class degree.
- 30/09/2013 to 20/06/2014 **Erasmus course, MPhys in Physics and Astrophysics**, *University of Leeds*.  
Thesis title: Blowouts Evolution in Interstellar Bubbles. Supervised by: J. Pittard. 1st class degree.
- 13/09/2010 to 20/06/2014 **BSc in Physics**, *Universitat de València*.  
General physics. 4 academic years.

## Research experience - Astrophysics

- 2019 – Present **Research Associate**, *Institute of Astronomy & KICC, University of Cambridge*.  
With D. Sijacki and M. Haehnelt
- 2019 – Present **Churchill postdoctoral By-Fellow**, *Churchill college, University of Cambridge*.
- Apr – Jun, 2019 **Balzan Fellow**, *Balzan Centre for Cosmological Studies & Institute d'Astrophysique de Paris*.  
With Y. Dubois, working on cosmic rays, magnetic fields, and AGN
- 2015 – 2019 **Ph.D. in Astrophysics**, *University of Oxford*.  
Supervised by J. Devriendt and A. Slyz
- Jun – Sep, 2015 **Research scholar**, *Astronomy & Astrophysics - Universitat de València*.  
With V. Quilis group, studying cosmological shock waves.
- Jun – Sep, 2014 **IAC Research Scholarship**, *Instituto de Astrofísica de Canarias (IAC)*.  
Title: A Search for Abnormal Galaxies. Supervised by: I. G. De la Rosa.

## Supervised students

- 2021 – Present **Yuxuan Yuan - PhD projects**, *Lya escape from galaxies with RTCRMHD galaxy formation*, University of Cambridge, PhD thesis.
- 2021 – Present **Charlie Brooker - Master project**, *AGN and magnetic fields: galaxy formation and black hole evolution in MHD simulations with AGN*, University of Cambridge, Part III research project.
- 2020 – Present **Francisco Rodriguez-Montero - PhD projects**, *Collaborating on the supervision of his research in the role of cosmic rays in galaxy formation*, University of Oxford, PhD thesis.
- 2020 – 2021 **Rahma Alfarsy - Master student**, *Simulating the emergence of supermassive black holes during cosmic dawn with magnetic fields*, University of Cambridge, Part III research project.
- Summer 2020 **Jacob Gunn - Summer student**, *The impact of magnetic fields on the LCDM cusp-core problem*, University of Cambridge, Summer research project.
- Summer 2020 **Stefano Zazzera - Summer student**, *The impact of magnetic fields on the LCDM cusp-core problem*, University of Cambridge, Summer research project.

- 2019 – 2020 **Francisco Rodriguez-Montero - Master student**, *MHD simulations of SNe with cosmic rays*, University of Cambridge, Part III research project.  
Awarded with Institute of Astronomy Best Master Project Prize
- 2018 – 2019 **Petr Jakubcik - Undergraduate student**, *Magnetic field amplification during galaxy mergers*, University of Oxford, Supervision for undergraduate research project.
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- ## Experience
- ### Academic teaching and outreach
- 2020 – Present **Supervisor for Statistical Physics**, *University of Cambridge*.  
Supervisor for 3rd year module
- 2019 – Present **Postgraduate students mentor**, *Churchill College*, University of Cambridge.
- 2019 – Present **Supervisor for Stellar Dynamics and Structure of Galaxies**, *University of Cambridge*.  
Supervisor for 3rd year module
- 2016 – 2019 **C1 Astrophysics MPhys tutor**, *University of Oxford*.  
Tutor for the C1 Astrophysics MPhys module
- 2016 – 2019 **Astrophysics lab. junior demonstrator**, *University of Oxford*.  
Junior demonstrator in the 3rd year Physics undergrad Astrophysics laboratory
- 2015 – 2019 **Outreach grad coordinator and speaker**, *University of Oxford*.  
Stargazing event, talks, workshops with children, and telescope nights.
- 2015 **Selection committee examiner**, *Colegio Mayor San Juan de Ribera*, Valencia.  
Leading examiner for entrance exams in: Physics, English, and Critical Thinking.
- 2013 – 2014 **Spanish BSc Conversation tutor**, *University of Leeds*.  
Spanish I conversation classes, Spanish BSc.
- 2013 – Present **Outreach speaker and organiser**, *independent*.  
Organising and conducting outreach events, talks, activities, lectures, etc.
- 2008 – 2013 **Physics and maths tutor**, *for high school and BSc levels*, Castellón and Valencia.  
[Academic - community service](#)
- 2019 – Present **Reviewer**, *STFC Consolidated grants*, Astrophysics reviewer.
- 2019 – Present **Reviewer**, *MNRAS journal manuscripts referee*.  
[Physics and Astrophysics](#)
- Feb – May, 2015 **Support astronomer**, *Universitat de València*.  
Developing software, operating the telescopes (12 full nights) and attending visitors.
- Jul – Aug, 2013 **Participant**, *International Astronomers Young Camp - Observational X-ray group*.  
Analysis of the metallicity in the outskirts of SUZAKU data for the Perseus cluster using the XSPEC 12.8.0 software.
- Jun – Sep 2013 **Higgs- $\tau\bar{\tau}$  analysis intern**, *ATLAS - Instituto de Física Corpuscular*, València.  
Statistical analysis of 20.3 luminosity data simulations for channel Higgs to  $\tau\bar{\tau}$  (ROOT).  
[Organisation, communication, and management](#)
- 2020 – Present **Postdoc Committee**, *Institute of Astronomy*, University of Cambridge.
- 2020 **Postdoc welcome week organiser**, *Institute of Astronomy*, University of Cambridge.
- 2020 – Present **Postdoc mentor**, *Institute of Astronomy*, University of Cambridge.
- 2019 – 2020 **Seminar organiser**, *University of Cambridge*, Galaxies journal club.
- 2018 – 2019 **Seminar organiser**, *University of Oxford*, GES and simulators meeting.
- 2015 – 2018 **Welfare Officer** (2015 - 2016), **social secretary** (2015 - 2016), **ethics and environment officer** (2016), **food officer** (2016 - 2018), *Christ Church College - University of Oxford*.
- 2014 – 2015 **President and Founder**, *Student Association for Scientific Divulcation*, València.
- 2014 – 2015 **Physics MSc. Student representative**, *Universitat de València*.
- 2014 – 2015 **Official tutor for international incoming students**, *Universitat de València*.
- 2014 – 2015 **Physics BSc. Student representative**, *Universitat de València*.
- 2012 – 2015 **Physics Association of Student Representatives**, *Universitat de València*.

2012 – 2013 **Official tutor for freshmen students**, *Universitat de València*.

## Selected awards

### Scholarships and prizes

- 2019 – Present Churchill postdoctoral By-Fellowship - Churchill College, Cambridge.
- 2018 Balzan visitor Fellowship - Balzan Centre for Cosmological Studies, New College, Oxford.
- 2018 Contribution to access and outreach (University of Oxford - Students Union).
- 2017 Highly commended SEPnet communication awards - Stargazing team.
- 2015 – 2019 Hintze Scholarship - University of Oxford.
- 2015 Introduction to Research Scholarship - Universitat de València.
- 2014 IAC Summer Research Scholarship.
- 2013 – 2014 Erasmus Scholarship - Leeds university.
- 2010 – 2015 Fully-funded university Scholarship - CMU San Juan de Ribera.

### Computing time

**All indicated awards (in Millions of computing hours; Mh) correspond exclusively to proposals I lead or subprojects I co-lead. Full proposals may have received higher amounts (e.g. SPHINX, 68 Mhours).**

- 2021 **18 Mh.** PI: The first cosmic rays radiation-MHD galaxy formation simulations. DiRAC, UK
- 2021 **9 Mh.** Subproject PI: Influence of PMFs on the cosmic distribution of baryons. DiRAC, UK
- 2017 - 2019 **1.75 Mh.** PI: The effect of magnetic fields on the ISM of galaxies. ARC, Oxford
- 2018 **12 Mh.** Subproject co-PI: Magnetic fields in the Epoch of Reionization. PRACE, EU.  
Proposal: The first luminous objects and reionization with SPHINX (P.I.: J. Rosdahl).
- 2018 **3 Mh.** Subproject co-PI: Magnetized galaxy formation in the SKA Era. DiRAC, UK.  
Proposal: Galaxy physics from cosmological to galactic scales (P.I.: A. Slyz).
- 2015 – 2016 **0.65 Mh.** PI: Magnetic fields in galaxy formation. ARCHER, UK

## Other skills

### Coding skills

**Basic:** HTML, QBasic, MATLAB, CUDA

**Intermediate:** VisualBasic, R, OpenMP, C/C++

**Advanced:** PYTHON, Mathematica, L<sup>A</sup>T<sub>E</sub>X, FORTRAN, MPI

### Languages

Spanish 🇪🇸 **Native**

Catalan 🇪🇸 **Native**

English 🇬🇧 **Bilingual**

Mandarin 🇨🇳 **Basic**

## Scientific contributions

Find more updated information about my publications on my [webpage](#) and on [ADS](#).

### Refereed publications as lead author

- Submitted **Beyond supernova feedback: cosmological dwarf galaxy formation simulations with magnetic fields, radiative transfer and cosmic rays**,  
*Martin-Alvarez et al. submitted*, MNRAS, Draft available upon request.
- Submitted **Towards convergence of turbulent dynamo amplification in cosmological simulations**,  
*Martin-Alvarez et al. submitted*, MNRAS, Draft available upon request.
- 2021 **Unraveling the origin of magnetic fields in galaxies**, *Martin-Alvarez et al. 2021*, MNRAS.  
Featured in magazines as [Academic Times](#) and [New Scientist](#)
- 2020 **How primordial magnetic fields shrink galaxies**, *Martin-Alvarez, et al. 2020*, MNRAS.  
Featured in magazines as [New Scientist](#).
- 2018 **A three-phase amplification of the cosmic magnetic field in spiral galaxies**,  
*Martin-Alvarez et al. 2018*, MNRAS.
- 2017 **On the interplay between cosmological shock waves and their environment**,  
*Martin-Alvarez et al. 2017*, Astrophysics and Space Science.  
Journal issue cover picture

### Refereed publications as co-first author

- 2021 **Introducing SPHINX-MHD: The Impact of Primordial Magnetic Fields [...]**,  
*Co-first authored: Katz & Martin-Alvarez, et al. 2021*, MNRAS.
- 2019 **Magnetogenesis at cosmic dawn: tracing the origins of cosmic magnetic fields**,  
*Co-first authored: Katz & Martin-Alvarez, et al. 2019*, MNRAS.

### Refereed publications from my supervised students

- Submitted **Momentum deposition of Supernovae with Cosmic Rays**,  
*Rodriguez-Montero, Martin-Alvarez, et al. submitted*, MNRAS.  
Resulting from supervised master thesis. Best IoA's Master Project prize. Draft available upon request

### Other refereed publications I am part of

- 2021 **The Nature of High  $[OIII]_{88\mu m}/[CII]_{158\mu m}$  Galaxies in the Epoch of Reionization [...]**,  
*Katz et al. 2021*, MNRAS.
- 2021 **Cosmological magnetogenesis: the Biermann battery during the Epoch of reionization**,  
*Attia et al. 2021*, MNRAS.
- 2019 **Compact Star-Forming Galaxies as Old Starbursts Becoming Quiescent** ,  
*Gómez-Guijarro et al. 2019*, ApJ.
- 2019 **Modelling baryonic feedback for survey cosmology** , *Chisari et al. 2019*, OJA.

### Presentations

- 2021 **Dwarf galaxies beyond supernova feedback: magnetism, radiation, and cosmic rays**.  
RAMSES User Meeting 2021, Online
- 2021 **The galactic window to primordial magnetism**.  
RAS meeting: Galactic magnetic fields
- 2021 **Tracing the origin and fate of magnetic fields in galaxies**.  
Invited talk, University of Cambridge, UK
- 2021 **Dwarf galaxies beyond supernova feedback: magnetism, radiation, and cosmic rays**.  
Invited talk, Institute of Astronomy, University of Cambridge, UK
- 2020 **Dwarf galaxies beyond supernova feedback: magnetism, radiation, and cosmic rays**.  
Invited talk, SPHINX, RASCAS and TRIPLE meeting, Lyon, France
- 2019 **Unveiling the origin of galactic magnetic fields**.  
Invited talk, Institute d'Astrophysique de Paris, France

- 2018 **On the origin of galactic magnetic fields.**  
RAMSES User Meeting 2018, Lyon, France
- 2018 **In and around: galaxies, magnetism, and star formation.**  
Invited talk, University of Bologna, Italy
- 2018 **Magneto-thermo-turbulent star formation in cosmic spiral galaxies.**  
Magnetic fields or Turbulence conference. Hsinchu, Taiwan
- 2018 **Magnetism in and around galaxies: primordial magnetism, and star formation.**  
University of Oxford, UK
- 2017 **Mag. in galaxies: the turbulent dynamo in a cosmological context.**  
Invited talk, Surrey University, UK
- 2017 **Triphasic dynamo amplification: cosmic magnetic fields in galaxies.**  
Magnetic Fields in the Universe VI conference, Natal, Brasil
- 2017 **Triphasic dynamo amplification: cosmic magnetic fields in spiral galaxies.**  
RAMSES User Meeting 2017, Nice, France
- 2017 **Triphasic dynamo amplification: cosmic magnetic fields in spiral galaxies.**  
DiRAC Day 2017, Exeter, UK
- 2016 **On magnetic fields in galaxies: a small scale dynamo in a cosmological context.**  
RAMSES User Meeting 2016, Paris, France
- 2016 **Magnetic fields in galaxies: the small scale dynamo in a cosmological context.**  
DiRAC Day 2016, Edinburgh, UK

## References

- 1 **Debora Sijacki**, *Kavli Institute for Cosmology, Cambridge*, University of Cambridge.  
mailto: [deboras@ast.cam.ac.uk](mailto:deboras@ast.cam.ac.uk)
  - 2 **Adrienne Slyz**, *Department of Astrophysics*, University of Oxford.  
PhD Advisor. mailto: [adrienne.slyz@physics.ox.ac.uk](mailto:adrienne.slyz@physics.ox.ac.uk)
  - 3 **Martin Haehnelt**, *Kavli Institute for Cosmology, Cambridge*, University of Cambridge.  
mailto: [haehnelt@ast.cam.ac.uk](mailto:haehnelt@ast.cam.ac.uk)
- Julien Devriendt**, *Department of Astrophysics*, University of Oxford.  
PhD Advisor. mailto: [julien.devriendt@physics.ox.ac.uk](mailto:julien.devriendt@physics.ox.ac.uk)
- Yohan Dubois**, *Institute d'Astrophysique de Paris*.  
mailto: [dubois@iap.fr](mailto:dubois@iap.fr)

## Further Education

### Extracurricular Courses

- 2021 **Machine learning techniques for science**, *DiRAC*, STFC.
- 2017 **Introduction to CUDA**, *Prace*, Barcelona Supercomputing Center.
- 2016 **ARCHER Driving Test**, *EPCC*.
- 2016 **Parallel Programming: OpenMP and MPI**, *University of Oxford*.
- 2016 **Introduction to Marketing**, *Coursera*, Wharton School, University of Pennsylvania.
- 2015 **Hypersonics: from Shock Waves to Scramjets**, *edX*, Rice University, University of Queensland.
- 2015 **Astrotech: The Science and Technology behind Astronomical Discovery**, *Coursera*, University of Edinburgh.
- 2014 **An Introduction to Interactive Programming in Python**, *Coursera*, Rice University.
- 2014 **Introduction to Modified Gravity**, *University of Valencia*.
- 2014 **The Diversity of Exoplanets**, *Coursera*, University of Geneva.
- 2014 **The Science of the Solar System**, *Coursera*, Caltech.

- 2014 **Unpredictable? Randomness, Chance and Free Will**, *Coursera*, National University of Singapore.
- 2014 **Analyzing the Universe**, *Coursera*, RUTGERS University.
- 2013 **General Game Playing**, *Coursera*, Standford University.
- 2013 **Introduction to Mathematical Philosophy**, *Coursera*, LUDWIG-MAXIMILIANS-UNIVERSITAT MUNCHEN (LMU).
- 2013 **From the Big Bang to Dark Energy**, *Coursera*, University of Tokyo.
- 2013 **Competitive Strategy**, *Coursera*, LUDWIG-MAXIMILIANS-UNIVERSITAT MUNCHEN (LMU).
- 2013 **Course Programa Entreiguals**, *Formation for the guidance new students*, University of Valencia.
- 2013 **Exploring Quantum Physics**, *Coursera*, University of Maryland.
- 2013 **Energy 101**, *Coursera*, Georgia Institute of Technology.
- 2013 **Introduction to Astrobiology and the Search for Extraterrestrial Life**, *Coursera*, University of Edinburgh.
- 2013 **Introduction to Digital Sound Desing**, *Coursera*, Emory University.
- 2013 **Galaxies and Cosmology**, *Coursera*, University of California.
- 2012 **Introduction to Astronomy**, *Coursera*, Duke University.
- 2012 **How to Reason and Argue**, *Coursera*, Duke University.
- 2012 **Introduction to Sustainability**, *Coursera*, University of Illinois at Urbana-Champaign.
- 2012 **Introduction to Logic**, *Coursera*, Stanford University.

#### Other Studies

- 2020 – 2021 **Rouxbe culinary school**, *Rouxbe*.
- 2015 – 2016 **Chinese for Beginners**, *University of Oxford*, LASR Course, A1 level.
- 2014 **Certificate of Proficiency in English**, *University of Cambridge*, ESOL examinations, C2 level.
- 2007 – 2010 **Drum lessons and modern music**, *Metronom*, Castellon.
- Karate Shotokan**, *Club de Karate UV / Oxford University Karate Club / Cambridge Karate (Ken Hori)*, 1st Kyu.