

# Fernando Hidalgo Pineda

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## EDUCATION

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### University of Glasgow

MSci Physics with Astrophysics, Predicted First-Class Honours (Current GPA: 20.380/22)

Glasgow, UK

Expected June 2024

*Relevant coursework:* Cosmology, Galaxies, High Energy Astrophysics, General Relativity and Gravitation, Plasma Theory and Diagnosis, Stellar structure and Evolution, Numerical Methods, Mathematical Methods and Modelling, Relativistic Quantum Fields, Statistical Mechanics.

**External Master's Project:** "Bridging scales for galactic winds in cosmological simulations"

Supervisors: Prof. Romeel Davé, Dr. Britton Smith

IfA, Edinburgh

## RESEARCH EXPERIENCE

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### Institute of Astronomy, University of Cambridge

Advisors: Prof. Debora Sijacki, Dr. Martin Bourne

Cambridge, UK

June 2023 - Present

- Modelled a bipolar kinetic energy injection region for an AGN feedback simulation using an aggressive mesh refinement scheme in the parallel-gravity and MHD Arepo code, running simulations for a novel bipolar injection description of galactic winds.
- Piloted and set up initial conditions for isolated galaxy simulations, effectively extracting trends in behaviour for large parameter spaces.
- Analysed and optimised the study of essential evolutionary features, contrasting properties with traditional spherical AGN-driven wind models and cross-checking with observables.
- Modified source code, producing a new kernel weighting for the injected momentum kick region perpendicular to the galactic plane.
- Delivered a presentation of the results at the IoA and composed a manuscript to be submitted to MNRAS in 2024.

### Max Planck Institute for Astrophysics

Advisors: Dr. Max Grönke, Dr. Ryan Farber

Garching, Germany

June 2022 - April 2023

- Performed parallel 3-dimensional astrophysical MHD simulations of cold clouds in hot galactic winds utilising high-performance computing facilities.
- Reviewed the classical problem of cold cloud survival in hot plasmas implementing wind-driven magnetised molecular clumps with Athena simulations in C, explaining rapidly outflowing cold gas from galactic winds.
- Developed and optimised Python scripts to analyse the simulation results.
- Presented findings at the 241st AAS Sep 2023 meeting and programmed talk at Edinburgh IfA on Mar 2023.
- Composed a first-author manuscript in Latex, published in MNRAS on the 9th of October 2023.

### Institute of Astrophysics of Andalusia, IAA-CSIC

Advisor: Prof. Concepción Del Olmo

Granada, Spain

Sep 2017 - Mar 2018

- Analysed structural and temporal feature evolution of galaxies, proving correlations of measurements with Secular theory of evolution.
- Programmed astronomy software algorithms, characterising 20,000 elliptical, lenticular and spiral systems and successfully extracted cosmological indicators for quenched star formation.
- Processed SDSS datasets and star catalogues with Topcat, identifying star systems by their number of stellar companions and finding relationships in their timeline evolution and set-off point from the Main Sequence.
- Presented results at the CSIC May 2018 Project Conference and the 'PIIISA' Jun 2018 Conference.

### UAL School of Physics and Chemistry, Calar Alto Observatory

Advisor: Dr. María José García Salinas

Almería, Spain

Jun 2017 - Sep 2017

- Processed light phenomenology and observations from CARMENES in the seek of extrasolar planets, successfully resolving primary sources and companions besides identifying essential planetary features.
- Performed physics laboratory techniques for the observation of exoplanets in distant galaxies which included direct observation, planetary transit and Doppler Shift.

- Built and designed prototypes of optical instrumentation subject to diffraction and light collimators.

Faculty of Physics, University of Granada  
 Advisor: Prof. Alonso Salinas Extremera

Granada, Spain  
 Sep 2016 - Mar 2017

- Examined Schumann Resonances and extremely low-frequency electromagnetic signals produced within the magnetic cavity of the Earth via large-database analysis in Python and stochastic simulations.
- Handled and gathered data from the Schumann Resonances Metering Station in Sierra Nevada, demonstrating the existence and tracking the location of three main resonance source loci.
- Presented results at the 'PIISA' Jun 2017 Conference.

## PUBLICATIONS

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**Hidalgo-Pineda, F., Sijacki D., Bourne M.,** *Impact of a Bipolar AGN-driven Wind Model upon Galactic Evolutionary Features*, In prep., submission in 2024 to MNRAS.  
**Hidalgo-Pineda, F., Farber R. J., Gronke M.,** *Better Together: The Complex Interplay Between Radiative Cooling and Magnetic Draping*, 2023, MNRAS, 527, 135, doi: [10.1093/mnras/stad3069](https://doi.org/10.1093/mnras/stad3069).

## CONFERENCES & PRESENTATIONS

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**F. Hidalgo Pineda** (July 2023). *"Can AGN-driven winds change our galactic evolution models?"*, IoA Summer Seminar Series (Cambridge, UK).  
**F. Hidalgo Pineda** (February 2023) *"Entrainment of cold gas by hot plasmas"*, Guest Talk (Edinburgh, UK)  
**F. Hidalgo Pineda**, R. Farber, M. Gronke (January 2023) *"The interplay between magnetic draping and radiative cooling"*, 241<sup>st</sup> AAS Meeting (Seattle, US).  
**F. Hidalgo Pineda** (March 2021). *"Optimising logistic alternatives from short-scale variations in multi-variable stochastic physical systems."*, European Cassini Competition (Brussels, Belgium).  
**I. Angulo Santos, F. Hidalgo Pineda, I. Lopez-Atienza Martin** (May 2018). *"How do galaxies evolve? A study of galactic sequences"*, CSIC Project Conference (Granada, Spain)

## AWARDS & GRANTS

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IoA Undergraduate Intership Funding Programme	2023
Academic Excellence Award	2023
Cassini Hackathon National Prize, EU	2021
IV Concurso de Buenas Practicas, Spanish Ministry of Sciences	2020
Full Advanced Studies Scholarship, UK	2019
Academic Honours Award, Ministry of Education	2019
'Hands on Particle Physics' Grant	2018

## COMPLEMENTARY ACADEMIC FORMATION

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<b>MPCDF AI for Science</b>	May 2023
CNN Primer and Keras 101	Munich, Germany (Virtual)
<b>Data Science with Python</b>	February 2023
An Introduction to Statistical Learning	Harvard, US (Virtual)
<b>Introduction to Astronomy ('Intro2Astro')</b>	June – August 2022
Foundations for astrophysical research	Caltech, US (Virtual)
<b>Deep learning and ANN</b>	June 2022
Initiation on multi-layer machine processing	Zeta Alumni, Coimbatore (Virtual)
<b>ATLAS Masterclass Hands on Particle Physics</b>	March 2019
Analysis of the Standard Model from ATLAS and LHC detections	Granada, Spain

## TECHNICAL BACKGROUND

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Experience with computer clusters:

- **Freya**, local cluster at the Max Planck Institute of Astrophysics, Germany.

- **Peta4**, machine of the UK CSD3 National Network in Cambridge, UK.
- **SuperMUC**, supercomputer of the Leibniz Supercomputing Centre, Germany.
- **Cuillin**, unit of the CSD3 Network in Edinburgh, UK.

Experience with programming languages/software:

**Highly-proficient:** Python, Numpy, SciPy, YT, C, C++, UNIX  
**Proficient:** MPI, Matlab, TopCat, VO tools, Bash  
**Competent:** HTML, PHP

Experience with Athena/ Athena ++, Arepo and development of SWIFT scientific code for astrophysical runs:

- Experienced with initial parameters for galactic and cosmological simulations, monitoring runs and analysing output with YT.
- Successfully ran and visualized results for cloud survival in ISM and CGM.
- Produced SPH projection plots and temperature, metallicity, velocity and density cuts for galaxy simulations.
- Developed code in massively parallel, cosmological and astrophysical numerical solvers.

Experience with scientific equipment such as CCD imaging, radio telemetry and digital spectrometers. Mentor of students at the Institute of Astronomy.

## PROJECTS & TEACHING

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**Cambridge Interns' Mentor** June 2023 - August 2023  
 Institute of Astronomy *Cambridge, UK*

- Mentored and guided upcoming undergrad interns undertaking their research programmes at the Institute of Astronomy, Cambridge.

**GUSEDS Co-secretary and Head of Events** October 2020 - October 2022  
 University of Glasgow *Glasgow, UK*

- Collaborated in discussion panels with researchers from NASA, ESA, Airbus and ISU.
- Trained 30 members in pursuing jobs in space fields, resulting in the construction of a technical team constructing rovers, 2 analogue astronauts and the confirmed publication of review papers by 2023.
- Installed interdisciplinarity of student-based space development driving to completion sustainability, law and economy colloquia.

**La Zubia Voluntaria - Mentor** September 2020 - June 2021  
 Government of La Zubia *Granada, Spain*

- Worked on a bi-weekly basis with children at risk of social exclusion (9-18 years old).
- Tutored students, majorly in mathematics and physics, achieving a 20% increase in participation rate in higher education.
- Devised dynamics and campaigns against misinformation outsets supported by the Government.
- Restructured programme for special economic-sanitary circumstances, reaching out to 10 extra solicitors.

**Private Tutoring** February 2020 - June 2020  
*Granada, Spain*

- Instructed physics students in advanced notions of Electromagnetic Theory, Nuclear Particles, Newtonian Dynamics and Oscillating Systems
- Provided academic guidance to individuals aiming to access University studies, with an overall candidate acceptance rate of 80%.

## CO-CURRICULAR ACTIVITIES

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- Sports:** Player of the Glasgow Lions Basketball team competing in the Scottish National League, Welfare Convenor of the Men's Basketball University Club.
- Music:** Violinist with Certified Professional Music Studies at the Angel Barrios Conservatory (Spain), supplementary studies in Piano and Ukulele.
- Academic:** Vice-president of Glasgow University for Sustainable Development Goals, Partner Liaison of Spanish Society, elected Class Representative.
- Languages:** Spanish (Native), English (Fluent), French (Proficient), Italian (Competent).
- Volunteering:** Volunteer of Amnesty International.