

# Call for PhD Applicants on White Dwarf Astrophysics

## Funding

The 'Ministerio de Universidades' of the Spanish Government opens a call for grants for predoctoral contracts for the completion of doctoral theses in Spanish Universities called 'ayudas para la formación de profesorado universitario' (FPU).

Candidates are required to have a good academic record, as well as the research project being inserted within a doctoral program

## Research Group

The Astronomy and Astrophysics Group (GAA) at 'Universitat Politècnica de Catalunya' (UPC) has a long track record in the study of the last stages of stellar evolution, and in particular, in the study of white dwarfs. Its dedication over the past few decades has provided international recognition as a point of reference in both the theoretical and observational studies of white dwarfs. In this sense, a very fruitful close collaborative link has been established along the years between the UPC and the University of La Plata. As a result, two PhD projects are offered.

<https://gaa.upc.edu/en>

## PhD programme in Computational and Applied Physics

The PhD programme in Computational and Applied Physics of the Physics Department has received the Quality Award from the Spanish Ministry of Education every year since its first call in 2002. The programme provides solid grounding in the fields of computational physics and applied physics, as well as in general scientific and technical research methodologies.

<https://doctorat-fcia.postgrau.upc.edu/en>

## Requirements

- Hold a degree in astronomy, physics or related field by the application deadline (December)
- Good academic expedient

- Enthusiasm for astrophysics!

## PhD Project 1

Galactic astrophysics has entered a golden age thanks to the very detailed dynamic cartography of the Milky Way that is delivered by the *Gaia* ESA mission, with the measurement of high-precision astrometry, distances, and velocities. A few hundred thousand white dwarfs, the latest stage of evolution for low- to intermediate-mass stars, have been identified. This has led to one order of magnitude increase in magnitude limited samples and to the first statistically significant, volume-complete samples of single and multiple white dwarf systems within 100 pc away from the Sun. The GAA is co-leading the spectroscopic follow-up of such systems that will be pursued by the new generation of multi-fiber instruments both in the northern and southern hemispheres (WEAVE and 4MOST, respectively). The main scientific goals of white dwarf science are the detailed atmospheric characterization of single and binary white dwarfs, their mass and age distributions, incidence of magnetic fields, binary fractions and binary system architectures, the fate of planetary systems around Sun-like stars, thermonuclear supernova progenitors, runaway stars, and other exotic systems yet to be discovered. The student will work on selected topics, by joining the science teams of the spectroscopic surveys, developing analysis tools, and leading their research program that will make use of state-of-the-art data and modeling tools.

## PhD Project 2

*Gaia* ESA mission has provided an unprecedented wealth of information about our Galaxy, the Milky Way. In particular, the number of known white dwarfs with accurate astrometric, photometric and spectrometric measurements has dramatically grown without precedent in past decades. However, new observations bring new intriguing questions. This new data pushes our understanding of white dwarf physics to the limit. As a few examples, some white dwarfs seem to stop their ageing for billions years due to new sources of energy, others are subject to relativistic effects, while the origin of magnetic white dwarf still puzzling our understanding of their evolution. With the aid of a detailed population synthesis simulator which incorporates the most update evolutionary white dwarf cooling sequences, the student will develop their PhD thesis within a collaborative science team. The solid collaboration over the years in this field between the GAA of the UPC and the La Plata group ensure the achievement of the objectives in this promising scenario of current astrophysics.

## Contact Information

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