

2 PhD Job Announcements - Milky Way Gaia Doctoral Network

The Gaia group (<https://gaia.ub.edu/>) of the Institut de Ciències del Cosmos de la Universitat de Barcelona (<https://icc.ub.edu/>) offers 2 PhD Positions within the Milky Way Gaia Doctoral Network “Revealing the Milky Way with Gaia” (Spain PI Carme Jordi). The Doctoral Network consists of 10 academic partners across Europe at which 12 PhD students will be researching a range of topics based on Gaia and other data.

PhD 1: Revealing weak substructures in the MW

Description: Precise astrometry of Gaia DR2/EDR3 has allowed the detection of many structures in the MW from clusters and star forming regions to moving groups and stellar streams, some of them known and many previously unnoticed. The data has also permitted to rule out some of the groups previously claimed. In parallel, the kinematic studies with Gaia DR3 carried out so far in the Large Magellanic Cloud (LMC) have revealed rich complexities and substructures in its disk.

Additional information in both data sets, namely the MW and the LMC, especially ages and chemical composition, will allow us to understand the nature of the groups and substructures and put them in the context of the MW formation and evolution. The ESR will extend existing all-sky structure-finding and clustering methodologies to the third Gaia Data Release by including its new data products (information from low and high-resolution spectra like extinction and chemical composition) and complementary measurements based on ground surveys (WEAVE, OCCASO, APOGEE, LAMOST, MIRADAS, Pan-STARRS, JPLUS/JPAS, LSST, Euclid, among others). The increase of the dimensionality of the approach and the globally improved precision of Gaia DR3 will allow it to identify tiny/weak structures unnoticed so far because of the domination of the field population. This will be applied to study the completeness of the current open clusters' catalogues and the interaction between nearby galaxies, the process of clusters disruption by the identification of their tidal tails and extended coronas, the identification of hidden subpopulations of specific types of stars like white dwarfs (to identify the very cold ones constraining the age of the populations they belong to) or RR-Lyrae (tracing substructures in distant halo streams and the Magellanic Clouds).

The UB group is deeply involved in the development of such algorithms applied to Gaia DR2/EDR3/DR3 and in some ground based spectroscopic surveys like OCCASO, WEAVE and MIRADAS. The UB group also has well established collaborations with the JPLUS/JPAS and APOGEE teams and the future 4MOST project.

The PhD candidate will develop multi-dimensional methods to identify groups of stars in areas where the stellar field population dominates. Application of these methods to analyse the full sky with Gaia EDR3, DR3 and complementary data. The advantages and limitations of the methods and data will be identified, and will constitute inputs for the WP5 roadmap. Analysis of the detected structures, both in the MW and Magellanic Clouds in the context of the MW formation and evolution. Methods and results will be disseminated through peer reviewed papers.

The candidate is expected to spend 2 secondment stays in universities in France and Sweden.

Contact: **Dr. Mercè Romero-Gómez (mromero (at) [fqa.ub.edu](mailto:mromero@fqa.ub.edu))**

PhD 2: The joint star-formation, migration, and habitability history of the Galactic disc

Description: The PhD candidate will develop a framework that allows better determination of the Galactic star-formation history and the stellar mixing rate as a function of time and position in the Galactic disc from basic observations of stellar age, metallicity, and kinematics, accounting also for non-diffusive stellar mixing.

The PhD candidate will take advantage of two things: larger samples because of Gaia and the ongoing/future spectroscopic surveys (like WEAVE and 4MOST), and novel determination of ages accounting for possible unresolved binaries (also a task for the ESR; benchmarked by asteroseismic observations from Kepler, CoRoT, K2, TESS, and eventually PLATO).

The influence of stellar migration on the Galactic Habitable Zone is a completely unexplored and exciting terrain connecting Galactic Astrophysics to exoplanet research. Using the more precise migration models obtained in the first part of the project, the PhD candidate will characterise the time evolution of the habitable-planet hosting star population around and beyond the solar vicinity. This type of study will also benefit from sophisticated comparisons to state-of-the-art cosmological Milky Way models, especially for modelling the statistical influence of cosmic radiation on potential planet host stars and for determining the occurrence rate of accreted exoplanets.

The candidate is expected to spend 2 secondment stays in universities in the Netherlands and France.

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Contact: Dr. Friedrich Anders (fanders (at) fqa.ub.edu)

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Gross salary per year: 32000-36000€ (depending on family circumstances)

Funding: H2020 / Marie Sklodowska-Curie Actions

Work location: Dept. Física Quàntica i Astrofísica, Universitat de Barcelona

Requirements: Master Degree or equivalent

Eligibility criteria: The applicant should not have resided or carried out their main activity (work, studies, etc.) in Spain for more than 12 months in the 36 months immediately before the recruitment date — unless as part of a compulsory national service or a procedure for obtaining refugee status under the Geneva Convention.

Skills: Degree on Physics, Mathematics or equivalent, experience on programming, high academic grades, good communication skills, proactive attitude, good team skills.

How to apply: Send application letter, CV and list of University courses taken and transcripts of grades obtained (i.e., original transcript and also a translated version if not in English or Spanish - no need to have it notarized) to Dr. Lola Balaguer (lbalaguer (at) fqa.ub.edu)

Application deadline: March 31st, 2023.

Additional comments: The ICCUB respects the principles of open, transparent, merit-based selection. We strongly encourage women and underrepresented minorities to apply. Priority will be given to people with disabilities (article 59 Law 5/2015 of October 30), according to the basic Statute of Public Employees.