

CALL FOR AWARDING RESEARCH FELLOWSHIPS WITHIN PROJECT GRANTS AND R&D INSTITUTIONS

1 Research Fellowship(s) (BI) for a MSc student

1 Research Fellowship(s) (BI) is(are) open at the **FCiências.ID – Associação para a Investigação e Desenvolvimento de Ciências**, for the project/R&D institution “Young brown dwarfs as testbeds for star and planet formation”, PTDC/FIS-AST/28731/2017, funded by the Fundação para a Ciência e a Tecnologia, I.P./MCTES through national funds (PIDDAC) under the programme All Scientific Domains 2017, under the following conditions:

1. **Scientific Area:** Astronomy & Astrophysics
2. **Requirements for admission:** (a) A student with the bachelor degree in the area of Astronomy & Astrophysics, Physics, or a related field; (b) Fluency in spoken and written English language; (c) Motivation for pursuing research related to observation of young stars and their variability; (d) Working knowledge of some of programming languages or software used in astronomy (e.g. Python, IDL, TopCat, ds9).
3. **Additional optional skills and qualifications:** It will be positively considered, but not required: (a) Previous research experience in the field of observational astronomy, especially if related to the field of star and brown dwarf formation.
4. **Contracting requirements:** Presentation of the academic qualifications and/or diplomas. Enrolment in in the Master program in Physics, area Astrophysics & Cosmology in the year 2021/2022.
5. **Work plan:** Young star clusters, star-forming regions, and young moving groups contain objects with masses distributed over four orders of magnitude. The lower mass objects overlap in mass with giant exoplanets, with a growing body of evidence for the existence of objects with masses well below the deuterium burning limit at 12 MJup, floating freely in clusters. The exact formation mechanism of these planetary mass objects represents one of the biggest challenges in our understanding of star and planet formation. Given the overlap in effective temperatures, these planetary-mass brown dwarfs are often considered excellent analogues for studying the atmospheres of extrasolar giant planets on wide orbits. However, due to their intrinsic faintness and location in star forming regions where the extinction typically plays an important role, a detailed spectral characterization of these objects is still lacking. With the advent of the new facilities, in particular the multi-objects spectrographs at the James Webb Space Telescope, the community will be flooded with a large number of spectra in this temperature range (spectral type L0 and later), which can currently be compared only to field dwarfs or a handful of well characterized young objects. It is therefore an imperative to construct a spectral library of late-type young objects and prepare methodology for a quick and efficient analysis of the new spectra.
A large number (~60) of spectra of young members of nearby star forming regions and young moving groups with estimated spectral type later than L0 has been observed with the X-Shooter spectrograph on ESO's Very Large Telescope (VLT), with all data publicly available in the ESO Science Archive. The work plan includes the reduction and analysis of these spectra, in order to construct the largest spectral library in this mass and temperature regime, characterize their properties and develop straightforward methods for spectral type and youth analysis. The details of the work plan are as follows:
(1) Compilation of an updated list of young free-floating planetary-mass objects (spectral type L0 or later).
(2) Search the ESO Archive for the existence of X-Shooter spectra. The spectra in the archive are already sky subtracted

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and corrected for all instrumental effects, with only the telluric correction (correction for absorption by the Earth's atmosphere) missing. The student will perform this correction using the Molecfit software, which models the atmospheric absorption at the Paranal Observatory, with the help of a standard star observed at similar times to the targets.

(3) Derivation of the fundamental parameters (effective temperature, spectral type, extinction, etc.) of the spectra by comparison with spectral templates, atmospheric models, and spectral-type-sensitive indices.

(4) Investigate gravity-sensitive features that can be used to separate young objects in this spectral range from contaminants in the field. Inspect the performance of the known gravity-sensitive indices (defined for earlier spectral types), and apply machine learning techniques to separate young late-type objects from the field, as well as to search for significant spectral features that help in this comparison.

(5) Preparation of the spectra for publication, in collaboration with the supervisor.

6. **Legislation framework:** Research Fellowship Holder Statute, in accordance with Law 40/2004, of 18 August, in its current version and the FCT Regulation for Research Studentships and Fellowships, in its current version (Reg. 950/2019 published in DR on 16th December: <https://dre.pt/application/file/a/127230968>, or at the FCT website: <https://www.fct.pt/apoios/bolsas/regulamento.phtml.pt>), and FCiências.ID Fellowship Regulation, as approved on 12th May 2020 (available at [Regulamento de Bolsas de Investigação Científica da FCiências.ID](https://www.fcienciasid.pt/regulamento-de-bolsas-de-investigacao-cientifica-da-fcienciasid)).

7. **Place of work:** The work will be developed at the CENTRA – Center for Astrophysics and Gravitation, at the Faculty of Science of the University of Lisbon, under the scientific supervision of Professor Koraljka Muzic.

8. **Fellowship duration:** This position is initially opened for 6 months and will begin in February 2022. The fellowship contract may be potentially renewed for 6 months, in accordance with the provisions of Regulation of Research Fellowships from the Foundation for Science and Technology, I.P.

9. **Monthly allowance:** The fellowship amounts to € 835,98, according to [table values](#) of the fellowships awarded directly by the FCT, IP. The fellowship holder will have a personal accident insurance and can ensure the right to social security through adherence to the voluntary social insurance scheme, if not covered by any other social protection scheme, pursuant to *Código dos Regimes Contributivos do Sistema Previdencial de Segurança Social*. The fellowship will be paid monthly by bank transfer

10. **Evaluation and selection process:** Candidates will be assessed by the quality of their CV 100%. 2 best candidates according to the CV assessment will be invited for an interview. In this 2nd phase the evaluation will be 50% CV and 50% interview. Interviews will be held by video-connection (Skype, Zoom). The selection committee reserves the right not to select any of the candidates, if the evaluation is less than 70%.

11. **Selection Committee:**

President: Dr. Koraljka Muzic (CENTRA, FCUL)

Member: Prof. Dr. Antonio Amorim (CENTRA, FCUL)

Member: Prof. Dr. Andre Moitinho de Almeida (CENTRA, FCUL)

Alternate member: Dr. Joana dos Santos Brojo Ascenso (FEUP)

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12. **Publication/notification of results:** All the candidates will be notified by e-mail, sent by the call holder, with the selection meeting minutes enclosed.
13. **Deadlines:** This call for applications is open from 21/12/21 to 04/01/2022 .
14. **Application:** Applications should be sent via e-mail to kmuzic@sim.ul.pt, by attaching the following documents:
- a. Curriculum vitae - **CV may be provided in PDF or through the [CIÊNCIAVITAE](#) system;**
 - b. Certificate of completion of previous degree;
 - c. Motivation letter describing the previous study and research experience (if applicable), and motivation to pursue research under the mentioned topic.
15. **Time limits for the appeal procedure:** In case of negative decision, the candidates have 10 business days, after the date of announcement of the results of the candidates evaluation, to pronounce their disagreement in accordance with the *Código do Procedimento Administrativo*. Appeals against the final decision may be submitted to the Administration Board of FCIências.ID (fciencias.id@fciencias-id.pt) within 15 business days after the notification date

Note 1: The documents that prove the entitlement of the academic qualifications and diplomas, or the proof of registration in the academic degree or diploma requested on the call, can be dismissed during the application period and replaced by a declaration on their honour from the applicant. Their delivery is mandatory for the fellowship contractualization.

Note 2: Please note that - higher education degrees and diplomas awarded by foreign higher education institutions need to be recognized by a Portuguese higher education institution, pursuant to the [Decree-Law nr. 66/2018](#) (August 16) and the [Ministerial Order nr. 33/2019](#) (January 25). The presentation of the recognition certificate is mandatory for contract signature. More information can be obtained at: <https://www.dges.gov.pt/en/pagina/degree-and-diploma-recognition>.