LaCaixa 2020 PhD Position @BCAM

**Project title / Job position title:**

**Mathematical Physics**

**Research Project / Research Group Description.** max. 2.000 characters

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**PhD position in Mathematical Physics.**

- **Objective:** At the interface between Mathematics and Physics is the so-called Mathematical Physics that at BCAM is represented by the research lines in Quantum Mechanics, Statistical Physics and Singularity Theory & Algebraic Geometry.

- **Applications:** Our methods could apply to, future applications of quantum technologies or forecast of wildland fire propagation to preserve natural heritage, criptography and string theory.

Specific research PhD project thesis

- **Singularities in Algebraic Geometry and/or symplectic topology.** Advisor: J. Fernandez de Bobadilla. The team focuses in Singularities and Algebraic Geometry from a inter-disciplinar perspective (algebraic, topological, symplectic or Hodge Theoretical methods). He will focus on a topic in the field according with his thematic preference and abilities. Possibilities include Lipschitz Geometry of Singularities, Floer Homology of Milnor fibrations, Geometric Representation Theory, Sheaf and Hodge Theoretic aspects of singularities.

- **Mathematical properties of Quantum Many-Particle Systems and Flow Equations.** Advisor: Jean-Bernard Bru. Description: The aim of the thesis is to study the mathematical properties of large quantum systems via, for instance, (Brocket-Wegner) flow equations. The project mainly belongs to Functional Analysis (semigroup theory, spectral theorem, etc.), in relation with quantum statistical mechanics in Physics (superconductivity, Bose-Einstein condensation, etc.).

- **Hydrodynamic interactions and anomalous diffusion: Smoothed Dissipative Particle Dynamics method.** Advisors: M. Ellero and G. Pagnini. In many complex systems, anomalous dynamics is observed and this calls for new stochastic processes for its understanding. SDPD is a novel particle method based on pairwise interactions and it is suitable to simulate fluctuating hydrodynamic regimes in a thermodynamically-consistent way.
BCAM is a world-class research center in the field of Applied Mathematics located in Bilbao (Spain). It obtained the Severo Ochoa Center of Excellence award in 2013 and 2018 given by the Spanish Ministry of Science, Innovation and Universities. BCAM is part of the ERCOM European Research Centers on Mathematics http://www.ercom.org networks. BCAM has endorsed the Charter & Code in 2008 and has been awarded the HR Excellence in research Logo in 2016.

The candidate will be part of the Mathematical Physics research area at BCAM.

The candidate must have solid knowledge and experience.

The research environment is international and open to national and international collaborations, the candidate must have willingness to team working and traveling.

Requirements:
- Master degree (preferable in Mathematics, Physics, Engineering or Computer Science).
- Applicants must have an excellent academic record.

Skills:
- Good communication and interpersonal skills.
- Ability to effectively communicate and present research ideas to researchers with different background (e.g., mathematicians and engineers as well as employ of forest service).
- Ability to clearly present and publish research outcomes in spoken (talks) and written (papers) form.
- Good command of spoken and written English.

Additionally, in terms of transferable & complementary skills, BCAM is carrying out the Action Plan within Human Resources Strategy for Researchers (HRS4R) BCAM action plan available here https://bit.ly/2MH1R9S; so, the fellow will benefit of this training program composed by: Leadership, Ethic and Research, Effective Communication/Teamwork, Gender Balance, Research Integrity, Citizenship Science, etc. The fellow will receive all the needed support from BCAM to be fully integrated in the group and in the center.
INPhINIT Offer, eligibility requirements, evaluation and selection process

Incoming: https://obrasociallacaixa.org/en/investigacion-y-becas/programa-de-becas-de-posgrado/inphinit/incoming

Retaining: https://obrasociallacaixa.org/en/investigacion-y-becas/programa-de-becas-de-posgrado/inphinit/retaining

How to Apply

1. Click in https://hosts.lacaixafellowships.org/finder, click in RESEARCH CENTRE and choose “Basque Center for Applied Mathematics - BCAM”

2. Click in “SEARCH” and the displayable will list the positions offered
3. Click in the selected PhD Offer and click in “START THE APPLICATION”

4. The system will open a new window with the application website [https://www.lacaixafellowships.org/index.aspx](https://www.lacaixafellowships.org/index.aspx). Click in “Please register” for new applicants.
5. After the registration, the system will send to you the confirmation email and the link to access into the system. Now you are in the position to access into the application system. Please choose INPhINIT: Doctorate in Spanish Research Centre of Excellence
6. Now you are in the position to fill the application form, upload the required documents and choose the project thesis. To choose the project thesis, click in “Studies to be Pursued”, choose the centre and the position.