



## CALL FOR APPLICATIONS - January 2023

### Post-doctoral Positions

Donostia International Physics Center (DIPC) is currently accepting applications for Post-doctoral positions. This is a unique opportunity for junior researchers with a recent PhD degree in Physics or related fields to join one of DIPC's high-profile research teams. A description of each of the available openings, contact information and deadlines can be found on the following pages.

Although candidates are welcome to contact the project supervisors to know further details about the proposed research activity, please be aware that the application will be evaluated only if it is submitted directly to the email address listed as "application email".

Applications received by the deadline will be evaluated by a Committee designed by the DIPC board on the basis of the following criteria:

- CV of the candidate (40%)
- Adequacy of the candidate's scientific background to the project (40%)
- Reference letters (10%)
- Other: Diversity in gender, race, nationality, etc. (10%)

Evaluation results will be communicated to the candidates soon after. Positions will only be filled if qualified candidates are found.

The DIPC may revoke its decision if the candidate fails to join by the appointed time, in which case the position will be awarded to the candidate with the next highest score, provided it is above 50 (out of 100).

However, the selected candidate may keep the position if, in the opinion of the Selection Committee, the candidate duly justifies the reasons why he or she cannot join before the specified deadline, and as long as the project allows it.

**Ref. 2023/09**  
**Development of flat band theory methods for search of new materials**

**Supervisor(s):**  
*Andrei Bernevig (bernevig@gmail.com)*

**Duration\*:** 3 years

**Application Deadline:** 21/01/2023

**Application Email:** [jobs.research@dipc.org](mailto:jobs.research@dipc.org)

Project SUPERFLAT focuses on the development of a systematic approach for predicting phases of matter and materials exhibiting flat bands with high- temperature bulk and surface superconductivity, high catalytic properties and new topology. Specifically, SUPERFLAT will investigate six new intertwined directions: (1) Development of unifying principles to create flat bands whose electrons are not localised on atoms (2) Accurate prediction of materials with such electronic flat bands in the bulk and surface (3) Prediction of electron-phonon and electron-electron interactions in the flat bands of the discovered materials (4) Prediction of high- temperature superconductivity or other phases of matter in the discovered flat bands (5) Prediction of surface states, with flat bands, in all the large-gap (obstructed) insulators in nature (6) Concomitant analysis of the catalytic properties of the surface states in the obstructed insulators.

This ambitious project, started at the beginning of this year, will last 5 years. It is being funded by the European Research Council Executive Agency (Gran Agreement - 101020833) and being led by Professor A. Bernevig who has already contributed to the field with several important discoveries like the first topological insulator (HgTe), Weyl semimetal (TaAs), type 2 Weyl semimetal (WTe<sub>2</sub>), non-symmorphic insulator (KHgSb) and higher order topological states (HOTI) (Bi, WTe<sub>2</sub>). He has also a long track of contributions to the development of methodology for exploration of new states of matter, like phonon-based superconductivity, flat-band topology, many-body numerics in Moire lattices and high-throughput materials databases.

We are currently looking for a motivated candidate who will join the workgroup at DIPC headquarters in San Sebastian (Spain). The main activity will focus on developing the theory of flat bands, obtaining the general theory and then, based on the theoretical classification, preparing the material search. The candidate must hold a Degree in Physics and a PhD in a relevant subject. Any other justified previous experience who can be applied to the project will be taken into account.

**Interested candidates should submit an updated CV and a brief statement of interest to the application email listed above. Reference letters are welcome but not indispensable. The reference of the specific opening to which the candidate is applying should also be stated in the subject line.**

**\*Openings with a duration of more than one year are for a 1-year contract, renewable based on performance and availability of funding.**

*This project has received funding from the European Union's grant program "Horizon 2020-SUPERFLAT" under grant agreement 101020833.*

