# Jorge Baeza-Ballesteros

## Personal information


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| Place and Date of Birth: | Valencia, Spain \| 15th January 1997 |
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## Education

2020-Present — PhD in Theoretical Physics, **Universitat de València**

- I research the application of lattice methods to hadron physics and early-universe cosmology under the supervision of Prof P. Hernández and Dr. D. G. Figueroa.
- Funded by a FPU Scholarship from the Spanish Ministerio de Educación y Formación Profesional.

2019-2020 — MASt in Applied Mathematics (Part III of the Mathematical Tripos), **St John's college, University of Cambridge**. Passed with Distinction (GPA: 93/100).

- Horne Scholarship and Wright Prize for ranking in upper third of Distinctions.
- Funded by "La Caixa" Scholarship for posgraduate studies in Europe from the "Fundación La Caixa" (75 scholarships given in all fields).
- Admitted as a scholar of St. John's College.

2015-2019 — Degree in Physics, **Universitat de València**. GPA: 9.91/10.00 (1st of ∼120 students).

- Extraordinary prize 2018-2019 (one awarded for each 50 students).
- Bachelor's Thesis titled "Scattering in finite volume" under the supervision of Prof. P. Hernández.

2009-2015 — Secondary Education, **Colegio San Pedro Pascual**, Valencia. GPA: 10.00/10.00

- PAU University Access Examination in 2015 with GPA 13.853/14.000

## Research Experience

2022-Present — Research project "Two- and three-particle scattering in the (1+1)-dimensional O(3) non-linear sigma model" in colaboration with Dr. M. T. Hansen.

- We have computed the two- and three-particle energy levels in the (1+1)-dimensional O(3) non-linear sigma model using lattice simulations.
- Our aim is to test the finite-volume formalism usually used in QCD by comparing against analytical predictions for the model.
- We started the project during an internship at the University of Edinburgh, funded by HPC-Europa3 (it provided a daily stipend and some computing hours for the project).

2020-Present — Research project "Gravitational radiation from large cosmic string loops" in colaboration with Dr. D. G. Figueroa, Dr. J. Lizarraga and Prof. E. Copeland.

- We are studying gravitational radiation emitted from both global and local cosmic string loops using lattice simulations. Our aim is to compare the field theory results to the predictions made in the Nambu-Goto approximation.
- We are using $\mathcal{C}$osmo$\mathcal{L}$attice, a C++ package for performing field theory simulations of the early universe. I have participated in the implementation of gravitational waves, and I am currenly developing a module to simulate the dynamics of cosmic strings.

2019-Present Research project "$\pi\pi$ scattering at Large $N_c$" in colaboration with Prof. P. Hernández and Dr. F. Romero-López.

- We are studying the large $N_c$ scaling of pion-pion scattering amplitudes for $N_f = 4$ degenerate flavors in the $SS$ and $AA$ channels using lattice simulations and in U($N_f$) chiral perturbation theory.
- We began the project as part of my Bacherlor Thesis in 2019 funded by a CSIC JAE Scholarship for Introduction to Research (200 graduate and undergraduate students selected in Spain in all fields).
- A paper with the results has been accepted for publication in JHEP. Available at `arxiv: 2202.02291 [hep-ph]`.

2019-Present Research Project: "Dynamical measurements of deviations from Newton's $1/r^2$ law" in collaboration with Dr. A. Donini.

- We have proposed and analysed an experimental setup of microscopic size for dynamically measuring deviations from Newton's law. I have focused on the study of background effects and sensitivity of the system.
- I joined the project as the External Internship at IFIC during the last year of the Degree in Physics.
- A paper with the results is published in Eur. Phys. J. C. Available at `arxiv:2106.08611 [hep-ph]`.

Jul 2016 Research Project: "$\Lambda_0$ decay channels" under the supervision of Prof. F. Martinez and Dr. A. Oyanguren at IFIC Summer Student Programme.

- I studied real and Montecarlo data of the $\Lambda_0$ decay from the LHCb experiment.

## Publications

1. J. Baeza-Ballesteros, P. Hernández, and F. Romero-López, "A lattice study of $\pi\pi$ scattering at large $N_c$". Accepted for publication in JHEP. Available at `arxiv: 2202.02291 [hep-ph]`.
2. J. Baeza-Ballesteros, P. Hernández, and F. Romero-López, "$\pi\pi$ scattering at Large $N_c$", PoS LATTICE2021 (2021) 309. Available at `arxiv:2110.15671 [hep-lat]`.
3. J. Baeza-Ballesteros, A. Donini, and S. Nadal-Gisbert, "Dynamical measurements of deviation from Newton's $1/r^2$ law", Eur. Phys. J. C 82 (2022) 2, 154. DOI: 10.1140/epjc/s10052-022-10086-6.Available at `arxiv:2106.08611 [hep-ph]`.

## Talks and seminars

Apr 2022 "$\pi\pi$ scattering at large $N_c$" seminar at the Higgs Centre for Theoretical Physics, University of Edinburgh.

Jan 2022 "$\pi\pi$ scattering at large $N_c$" talk at the 1$^{st}$ Meeting of the Spanish Network of Lattice Field Theory, University of Zaragoza.

Jul 2021 "$\pi\pi$ scattering at Large $N_c$" parallel talk at the 38$^{th}$ International Symposium of Lattice Field Theory, Massachusets Institute of Technology.

Dec 2019 "From Lorentz invariance to spin-2 fields" seminar at Part III Seminar Series (Michaelmas Term). Centre for Mathematical Sciences, University of Cambridge. I was in charge of the content and development of the talk.

## Teaching experience

2021-2022 Classical mechanics I, 2nd course of the Degree in Physics, Universitat de València. I was in charge of preparing and teaching problem classes to three groups of 20 students each. Duration: 45 hours.

2020-2021 Quantum physics laboratory, 3rd course of the Degree in Physics, Universitat de València. I was in charge of teaching, helping and evaluating a group of 16 students. Duration: 40 hours.

## Honors and Awards

2021 Academic Excelence Scholarship awarded by the Generalitat Valenciana for ranking on top of the 2015-2019 promotion of the Degree in Physics at the Universitat de València.

2021 Horne Scholarship and Wright Prize, awarded by St. John's College (Univeristy of Cambridge) for ranking in upper third of Distinctions of the Part III of the Mathematical Tripos in 2019-2020.

2021 "Capitania General de Valencia" Prize for obtaining the best final grades among all science and engineering students graduating in 2019 at the Universitat de València.

2019 Extraordinary Prize 2018-2019 in the Degree in Physics (one awarded for each 50 students)

2017 "Fundació del Carmen Izquierdo Besante Monzó" Prize for the best grades over all first year students in all scientific degrees at the Universitat de València in 2015-2016 course.

2016 First National Secondary Education Prize for the course 2014-2015.

2015 First Extraordinary Secondary Education Prize of the Valencian Community for the course 2014-2015.

2015 Bronze Medal in the National Phase of the Spanish Physics Olympiad and 1st place in the Local Phase.

2015 Silver Medal in the National Phase of the Spanish Chemistry Olympiad and 1st place in the Local Phase.

2015 4th place in the Local Phase of the Spanish Mathematics Olympiad.

2015 1st place at Level 4 of the Kangourou Olympiad in the Valencian Community. I was awarded the "Pin de plata" distinction, given to participants with the most outstanding results over the four levels (2nd at Level 1, 2nd at Level 2, 3rd at Level 3 and 1st at Level 4).

2014 "Miguel Valdivia Ureña" Prize in the Jornadas Matemáticas del Colegio Guadalaviar, for obtaining top results in all the levels since 2010.

## Other courses

Aug 2021 "EuroPLEx Summer School 2021 on lattice field theory and applications" organised by the **University of Edimbourgh**. It included courses on lattice QCD. Duration: 32 hours.

Jul 2021 "High-Energy and Nuclear Physics within Quantum Technologies" summer PhD school, organised by the **European Centre for Theoretical Studies in nuclear Physics and related areas (ECT*)** and the **University of Trento**. It included courses on lattice QCD and quantum technologies. Duration: 160 hours.

Jul 2018 "SEMF Escuela de Verano 2018" at the **Universitat de València**, organised by the **Sociedad para el Estudio de la Matemática y la Física**. It included courses in theoretical physics and mathematics. Duration: 30 hours.

Jul 2016 "Summer Student Programme for Undergraduate Students" at the **Instituto de Física Corpuscular IFIC, Universitat de València and CSIC**. It included courses in particle physics and a research project. Duration: 60 hours.

## Extracurricular activities

2017-2019 I collaborated in the organisation of the high-school competition on experiments and demonstrations in physics "Feria-Concurso Experimenta de Experimentos y Demostraciones de Fisica y Tecnología", organized by the Faculty of Physics of the Universitat de València. In 2019, I was in charge of a section of the "Contestant Help" section, and coordinated a group of 8 people and almost 100 participants.

## Languages

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| Spanish: | Native speaker |
| English: | CEFR C2 (Certificate in Advanced English with Grade A, October 2018) |
| French: | CEFR B2.1 |
| German: | CEFR C1.1 |
| Catalan: | CEFR C2 (Superior Certificate in Valencian Knowledge, June 2016) |
| Japanese: | Basic knowledge |

## Computer Skills

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| Basic knowledge: | ROOT, Bash, HDF5, Julia |
| Intermediate knowledge: | Matlab, MPI, OpenMP |
| Advanced knowledge: | Python, Mathematica, LaTeX, C, C++ |