MINISTERIO
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AGENCIA ESTATAL DE INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2018

Turno de acceso general

Nombre: RIOS HUGUET, ARNAU
Referencia: RYC2018-026072-I
Área Temática: **Ciencias físicas**
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Título:

From nuclei to neutron stars with many-body theory

Resumen de la Memoria:

I am a Senior Lecturer (university permanent position) at the University of Surrey, where I supervise a team of postdocs and PhD students carrying research at the cutting edge of nuclear theory. The recent revolution in ab initio nuclear theory has provided a direct link between the basic theory of chromodynamics and nuclear structure. I work at the interface between ab initio theory and phenomenology, and my work has implications for experimental research at nuclear physics facilities worldwide (e.g. spectroscopic single-particle strength in nuclear structure), for astronomical observations (e.g. neutron-star physics) and for practical applications (e.g. fission processes in nuclear reactors).

I specialise in self-consistent Green's functions techniques, which lead the way in terms of ab initio nuclear structure. My work can be used to identify limitations in the saturation properties of nuclear hamiltonians. I also have demonstrated expertise in other techniques, like density functionals, that I have used to study nuclear ground states and dynamics. Over my career, I have obtained fellowships (Marie Curie, STFC Advanced) and research funds to carry on my research program.

I have achieved the following research highlights:

1) Ab initio predictions of the density dependence of the nuclear symmetry energy (Vidaña et al., PRC 80 045806 (2009))
2) Evolution of fragmentation in isospin imbalanced nuclear systems (Rios et al., PRC 79 064308 (2009))
3) First calculation of nuclear matter properties with 3-body forces in the Green's functions approach (A. Carbone's PhD 2014, Carbone et al., PRC 88 044302 (2013))
4) Development of a time-dependent description of nuclear fission (P. Goddard PhD 2014, Goddard et al., PRC 92 054610 (2015))
5) Solution to the isotope shift problem around the N=126 shell closure (Goddard et al., PRL 110 032503 (2013))

I have exploited collaborations with world-leading researchers on nuclear theory at an international level (Danielewicz at MSU, Dickhoff at St Louis, Polls in Barcelona) but also locally at Surrey (Barbieri and Stevenson). In the future, I plan to exploit my expertise to provide theoretical input of relevance for experimental programmes at international research facilities, while addressing directly astronomical observations in neutron stars.

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Resumen del Currículum Vitae:

I am a Senior Lecturer (university permanent position) at the University of Surrey, where I supervise a team of postdocs and PhD students carrying research at the cutting edge of nuclear theory. Research in this field provides an understanding of building blocks of nature (nuclei) and has implications for astrophysics (nucleosynthesis) and energy production (fission).

I have 15 years of research experience in this field, starting with a PhD from the University of Barcelona (2007) on theoretical nuclear physics. I was hired as a postdoctoral research fellow (2007-2009) at the National Superconducting Cyclotron Laboratory (Michigan State University, USA) to work alongside Prof Pawel Danielewicz. I moved to Surrey in 2009 with an EU Marie Curie Fellowship (acceptance rate 12%, £164k). In 2011, I was awarded a 5-year STFC Advanced Fellowship (acceptance rate 10%, £417k) on nuclear theory.

I have authored 37 refereed papers (14 as first or single author; 14 with my PhD students). I have published 2 Phys Rev Lett, 26 Phys Rev C and in other top field journals like EPL, Nucl Phys A or Phys Lett B. My work has been cited about 1000 times with a total h-index of 19 according to ISI World of Science as of January 2019. My most cited paper has +100 citations, and 3 others have 50+. My papers accrue an average of 20 citations.

I have lead developments in many-body Green s functions techniques for over a decade, in collaboration with world-leading hubs in this technique at Barcelona & St Louis. I am also engaged in work at the nuclear structure and reactions levels, using time-dependent density

functional techniques to study fission and fusion. My predicitions for neutron-star pairing gaps and equation of state have been used in astrophysical publications.

I have a track record of successful grant funding. I was the PI of 2 Fellowships that brought over £500k of individual research funding. I have been a co-PI in 2 STFC consolidated grants at Surrey, totalling over £4.3M. In both calls, I coordinated 1 of the 4 themes and was awarded funding for 2 postdoctoral positions as a result. I was the national contact point for the NewCompStar EU COST Action (2013-2017).

I have given over 70 research talks in conferences and workshops. I have recently been invited as a plenary speaker at the International Nuclear Physics Conference 2019. I have attended >20 international conferences (5 invited) and >50 specialised research workshops (12 invited) in Europe, the USA and Asia. I have organized 10 international workshops and conferences (+2 in 2019), including 3 competitive bids at the European Centre for Theoretical Studies in Nuclear Physics (Trento, ~5kEUR each) and 3 bids for Institute of Physics workshops (~1k£ each). I was the director of the 19th UK Nuclear Physics Summer School, Belfast, August-September 2017 (competitive bid under STFC, 65k£).
I have supervised 4 PhD students (+1 ongoing student). I am currently supervising 2 postdoctoral researchers.

I am actively engaged in teaching at Surrey, where I lecture at all levels, including masters. I am also year 2 coordinator, and I regularly supervise final year projects as well as students in professional and research placements. I was awarded the Graduate Certificate of Higher Education in 2016.

I participate regularly in outreach activities, delivering talks for schools and the general public (see eg TEDx talk https://youtu.be/F1Kml3zuTco)

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CONVOCATORIA 2018

Turno de acceso general

Nombre: FONT RIBERA, ANDREU
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Área Temática: **Ciencias físicas**
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Título:

Precision cosmology at high redshift with quasar spectra

Resumen de la Memoria:

The study of the large-scale structure of the Universe can answer some of the most important and challenging questions in physics: the nature of the dark energy causing the acceleration of the Universe; the inflationary origin of the density fluctuations; the physical properties of the dark matter component; and the number of neutrino species and their mass.

In order to address these questions, several international collaborations are building new instruments to map larger and larger cosmological volumes. The rapid increase of the data sets challenges stablished data analysis techniques, and the sub-percent level of precision of future surveys will require a similar level of control of systematic errors.

During the last decade, I have stablished myself as an international expert in data analysis of large spectroscopic data sets, with a leadership recognised with the role of working group chair in several international collaborations. Currently I chair the Lyman-alpha (Lya) working group of the Dark Energy Spectroscopic Instrument (DESI), an international collaboration with more than 600 scientists that will revolutionise our understanding of the Universe. My experience in data analysis, my extended leadership in large international collaborations, and my knowledge of the theoretical modelling of the large-scale structure of the Universe, put me in a unique position to lead the analysis of this exciting experiment.

During my PhD at the Universitat de Barcelona I joined in the Baryon Oscillation Spectroscopic Survey (BOSS), an international collaboration that observed over a million galaxies and two hundred thousand quasars to generate the largest map of the distribution of matter in the Universe. We were also able to study the Universe at early times using the absorption features in the spectra of high redshift quasars, a phenomenon known as the Lya forest. My main PhD project was to develop an algorithm to generate synthetic datasets that would allow us to test our analysis pipeline and possible sources of systematic errors. This new algorithm became the standard of the field and has been used in all publications from the BOSS collaboration.

Soon after starting my first postdoc at the University of Zurich (2011-2013), I was offered to chair the Lya working group of BOSS, a position that I hold until the end of the survey (2017). Using the first years of data of BOSS we published the first measurement of the expansion of the Universe at early times. While in Zurich, I also pioneered a new measurement: the cross-correlation of the absorption with other tracers of large scale structure, like quasars or galaxies.

I continued my research on cross-correlations during my postdoc at the Lawrence Berkeley National Lab (2013-2016), where I was able to measure the expansion rate 11 billion years ago with an accuracy of 2\% by combining the Lya forest measurements with their cross-correlation with the distribution of quasars.

Thanks to these impressive results, I was awarded an Ernest Rutherford Fellowship at University College London, where I am now a Lecturer in Cosmology and I have my own research group, with two master students and two PhD students. My leadership in the field was recently recognised with the offer to chair the Lya working group of DESI, and I now coordinate a group of 40 scientists to be ready for first light in late 2019.
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Resumen del Currículum Vitae:

Current Position
2018- : Lecturer in Cosmology, University College London (London, UK). Independent research group with 2 PhD students and 2 master students.
2016- : STFC Ernest Rutherford Fellow, University College London (London, UK).

Postdoctoral Positions
2013-2016: Lawrence Berkeley National Laboratory (Berkeley, USA).
2011-2013: University of Zurich (Zurich, Switzerland).

Education

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2003-2007: Physics Degree at the Universitat de Barcelona, with Extraordinary Award.
2007-2008: Master in Astrophysics at the Universitat de Barcelona. Grade of 9.3 (out of 10).
2008-2011: PhD in Physics at the Universtitat de Barcelona, with the supervision of Prof. Jordi Miralda-Escudé. Excellent Cum Laude with a PhD Extraordinary Award.

Research Experience and Leadership
2017- : Co-chair of the Lyman-alpha working group of the Dark Energy Spectroscopic Instrument (DESI).
2012-2016: Co-chair of the Lyman-alpha working group of the SDSS-III Baryon Oscillation Spectrocopic Survey (BOSS).
2013-2015: Co-chair of the Lyman-alpha working group of the SDSS-IV Extended Baryon Oscillation Spectrocopic Survey (eBOSS).
2015-2016: Member of the SDSS-IV Collaboration Council, representing Lawrence Berkeley National Lab.
2008-: Co-author of over 60 publications in high impact journals, more than 10470 citations, h index = 36.
2008-: First author of 8 publications in high impact journals, with more than 570 citations.
2008-: Astronomy and cosmology seminars given at over 40 international institutions, including Harvard, Stanford, Princeton, Berkeley, Oxford or Cambridge.
2012-: Refereed articles for Science, Physical Review Letters, Physical Review D, The Astrophysical Journal, Physics Letter B, Astronomy & Astrophysics, Astrophysical Journal Letters and Journal of Cosmology and Astroparticle Physics.
2018: Referee of an ERC starting grant proposal.
2017: Invited lecturer at the "Cosmology school in the Canary Islands" (Spain, September 2017) and at "Essential cosmology for the next generation", a.k.a. "Cosmology on the beach" (Mexico, December 2017).

Awards
2018: PI of DiRAC allocation of 460k CPU hours (PI): Modeling of neutrino masses in DESI.
2017: Co-I of the UCL Astrophysics Consolidated Grant 2018-2021 (ST/J000476/1) by the Science & Technology Facilities Council, UK. Total award: £1,308,814 over three years.
2016: Ernest Rutherford Fellowship (ST/N003853/1), by the Science & Technology Facilities Council, UK. Award: £491,529 over five years.
2015: Postdoctoral fellowship (declined), by the Max Planck Institute for Astrophysics, Munich.
2014: Kavli Fellowship (postponed), by the Institute for the Physcs and Mathematics of the Universe, Tokyo.
2014: Lagrange Fellowship (declined), by the Institut Lagrange de Paris.
2013: PhD Extraordinary Award, by the Universitat de Barcelona.
2008: JAE Predoctoral Grant, by the Spanish Research Council (CSIC).
2008: Extraordinary Award on Physics, by the Universitat de Barcelona.
2003: Best Experimental Exercise Prize and Silver Medal in the Iberoamerican Physics Olympiad, La Habana (Cuba).
2003: Gold medal in the Spanish Physics Olympiad, Cuenca (Spain).

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CONVOCATORIA 2018

Turno de acceso general

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Título:

Experimental quantum simulation of many-body physics with individual Rydberg atoms

Resumen de la Memoria:

I am an experimentalist in atomic, molecular, and optical physics. Along my career my research has mainly focused on the study of the interaction dynamics between atoms, and between atoms and surfaces, both from the fundamental point of view and with regard to technological applications. During the last 14 years I have worked in three leading laboratories in Europe: in the group of Rodolfo Miranda at Universidad Autónoma de Madrid (PhD), in the group of Tilman Pfau at Universität Stuttgart (Marie Curie IEF fellow), and in the group of Antoine Browaeys at Institut d Optique in Palaiseau, France (senior postdoc). The main achievements of my previous research are:

Validation of the Born-Oppenheimer approximation for the scattering of H2 from metallic surfaces (Science 2006).
Discovery of quantum mirrors for atoms (Advanced Materials 2008, Inside cover, European Patent).
A new method for detection of coherent phenomena involving Rydberg atoms in thermal microcells (PRL 2013).
First observation of coherent coupling between single atoms at a Förster resonance (Nature Physics 2014).
First quantum simulation of an XY Hamiltonian with individual atoms (PRL 2015).
First validation of quantum simulation of Ising Hamiltonians in large arrays of optical tweezers (Nature 2016).
Generation of defect-free 2d and 3d arrays of single atoms (Science 2016 & Nature 2018).

My research is now focused on the experimental study of quantum many-body physics with strongly interacting Rydberg atoms. In our experiments with Rydberg atoms in arrays of optical tweezers, interactions on the quantum level extend over many sites and long range quantum correlations can be precisely engineered, thereby enabling the quantum simulation of previously inaccessible Hamiltonians describing complex condensed-matter systems. At present, we achieve almost full control over more than 70 qubits in 3d geometries and are able to perform advanced quantum simulations and study the dynamics of interacting systems which cannot be calculated in classical computers. This embodies our platform as the most versatile Rydberg quantum simulator to date, and gives access to a wide range of problems in physics. I have played a major role in this development and have become an expert in the field of quantum simulation with neutral atoms. Since 2013, I have published 17 (+1 under review) articles (1 Science, 2 Nature, 1 Nature Physics, 2 PRX, 6 PRL, 3 PRA, 1 Quantum Sci. Technol .and 1 topical review in J. Phys. B) and have been invited to present my work in 8 invited talks on this topic.

In the near future I plan to continue the research in these topics with a second generation machine that overcomes some of the main limitations of current state-of-the-art experiments. In parallel, I would like to explore the feasibility to study the same physics using Rydberg atoms confined to micron-sized vapor cells, which would greatly simplify the experimental setups and facilitate technological applications.
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Resumen del Currículum Vitae:

I am author of 26 (+1 under review) peer-reviewed publications (12 as first or co-first author, 4 as corresponding author), one patent, one conference proceedings, and more than 75 communications to congresses. My publication list includes high-impact journals, among which Science (2x, one as first author), Nature (2x, one as first author, the other as co-first author), Nature Physics, Advanced Materials (as first author), Physical Review X (2x), Physical Review Letters (6x, 3 of them as first author, 1 as co-first author and Editors suggestion). I have also published in Phys. Rev. A (3x, one as Rapid Communication and 2 as Editors suggestion), New J. Phys, Appl. Phys. Lett (as first author), J. Chem. Phys. (2x, both as first author), PCCP, J. Phys. Chem., and Surf. Science (as first author). I am also co-author of a topical review paper published in J. Phys. B. Despite the technical complexity of my experiments, these publications were obtained in rather small teams, typically composed of five to seven co-authors. My research has received more than 1580 citations according to Google Scholar (h-index = 18), and has often been highlighted in several perspective articles in scientific journals (2 Perspectives in Science, 2 Nature Physics News and Views, 1 Nature Materials News and Views, 1 Nature Materials Research Highlights, 2 Nature Physics Research Highlights), and in national newspapers (e.g. El País, Le Monde).

Since 2015 I have been invited to present my work in 8 invited talks in broad spectrum conferences (EGAS-47 Riga, XIV International Conference on Quantum Optics and Quantum Information , Minsk, Congrès Optique Bordeaux 2016 , Nonlinear Spectroscopy meets Quantum Optics in Freiburg, LPHYS'17, the WE Heraeus Conference of Quantum Gases and Quantum Coherence 2018 , as well as LPHYS 19 and Dynamics and interactions in quantum gases , expected for 2019). In this period I have also presented another 2

contributed talks and several posters in a number of conferences. During my postdocs, I have been invited to report on my research in several seminars in prestigious centers including e.g. ICFO in Spain, the University of Cambridge, the University of Nottingham, or the University of Vienna. I maintain several active collaborations with re-known theoretical groups in the field, namely the groups of I. Lesanovsky in Nottingham, T. Pohl in Dresden, T. Macrì in Brazil, H. P. Büchler in Stuttgart, and A. M. Läuchli in Innsbruck.

I have participated in 19 research projects that obtained funding in public calls, including some of them funded by the EU under the FP6, FP7, and H2020 frameworks. I have co-organized some of the review meetings for those European projects in which I participated. I have participated as a local organizer of the Spring meeting of the German Physical Society DPG 2012 which hosted 2300 participants. During my PhD I had the opportunity to teach as a teaching assistant for 4th year undergraduate students in Physics at the Universidad Autónoma de Madrid. As a postdoc in Stuttgart and Palaiseau I supervised Bachelor thesis and co-supervised to completion three PhD theses, which obtained the highest grade. At present, I am co-supervising three other PhD theses.

I am presently referee for several international physics journals (PRL., PRX, PRAppl, PRA, J. Opt., J. Phys. Condens. Matter, EPL, etc.).

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CONVOCATORIA 2018

Turno de acceso general

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Título:

DEVELOPMENT OF ADVANCED TECHNIQUES IN POSITROM EMISSION TOMOGRAPHY

Resumen de la Memoria:

The research career of the applicant has been focused in the development of novel techniques for positron emission tomography (PET), a molecular imaging modality that is worldwide used in clinical and research centers for patient diagnosis, new drug development and basics science. His contributions to this field can be divided in four main aspects:

- Software tools for PET data processing and image reconstruction.
- Equipment for advanced PET imaging and integration with other imaging modalities.
- Application of PET imaging to the cardiovascular field.
- Application of PET imaging to the radiation therapy field

Therefore, the career of the applicant has grown from the technical aspects that involve hardware and software development to conform the imaging equipment to the application of this technology for diagnostic imaging and in the field of radiation oncology. In what follows, these four interrelated research lines will be explained in more detail. On each section, a brief introduction to the topic under consideration is provided followed by some of the most relevant results obtained in that field.

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Resumen del Currículum Vitae:

The applicant obtained his PhD in Nuclear Physics at the Universidad Complutense de Madrid (Madrid, Spain) in March-2009 obtaining the extraordinary doctorate award. His work was mainly focused in positron emission tomography (PET) imaging. As a result, a copyright for the reconstruction software of a small animal PET scanner was signed. This software is commercialized worldwide by international companies through license agreement and the profit is being used to support the research at UCM. In addition, the applicant developed a Monte Carlo code (PeneloPET) for the simulation of PET scanners that has been the main tool in many PhD and Master dissertations and shared with more than 40 research groups world-wide. During his PhD, he got the first award in the first competition of ideas for spin-off companies by the UCM.
After his PhD, he worked as a postdoctoral fellow in the Massachusetts General Hospital (Boston, USA) from July-2009 to January-2011 where he did research on in-vivo range verification in proton therapy using PET imaging. This work was part of a NIH funded project in collaboration with MD Anderson Cancer Center (Houston, USA). At Boston, he obtained funds from MGH to support his research (50k$).
In January-2011, he joined Ghent University (Ghent, Belgium) as a recipient of the Special Research Fund (BOF) grant to work on the development of novel techniques for the combination of PET and MRI imaging systems within a FP7-funded project led by Philips Research. He patented a novel method to calibrate monolithic crystal-based detector for PET and SPECT scanners and he developed the first small animal PET scanner based on digital technology, which led to a spin-off company (http://molecubes.com/). The Belgian government (FWO) provided him with an Individual Research Grant to support these projects (40k).
From October-2013 to March-2017 he worked at the Centro Nacional de Investigaciones Cardiovasculares (Madrid, Spain) as a recipient of the M+Vision Advanced Fellowship. He participated in medical imaging projects related to cardiovascular research with fund provided by MINECO (110 k). He patented a novel method for blood pool imaging using radiolabeled red blood cells.
Since April-2018, the applicant works at the UCM (Madrid, Spain) as a recipient of an Atracción de Talento Mod. 1 Grant with 200k funding support for research were he started his own lab and is developing novel technologist combining nuclear physics, molecular imaging and radiation therapy. He is currently supervising 2 PhD students and has supervised 12 master thesis.
The applicant s research achievements have resulted in 75 scientific publications, 7 as the main author and 2 as last author, in international peer-reviewed journals and conference proceedings that received 592 citations. He is regularly invited to review papers for most of the journals with highest impact factor in medical physics and participate as a reviewer for several research funding agencies.

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AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2018

Turno de acceso general

Nombre: ANTOJA CASTELLTORT, MARIA TERESA
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Área Temática: **Ciencias físicas**
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Título:

Galactic dynamics and Gaia

Resumen de la Memoria:

My research career has been dedicated to the structure and formation of our Galaxy and its constituents, especially on disk dynamics and satellite galaxies. During my PhD I studied the Galaxy stellar disk and its kinematics. I analysed the observed velocity distribution of the solar neighbourhood with advanced statistical techniques and showed that it presents streams of stars moving together. I also modelled the influence of the spiral arms and the bar of the Milky Way on the creation of these streams. As from my first postdoc at the University of Groningen (NL), I am part of the RAVE collaboration (researchers from over 20 institutions) in which I have led most of the publications on moving groups and the dynamics of the spiral arms and bar. In particular, I made the first discovery of kinematic groups outside of the solar neighbourhood with the RAVE catalogue, fitted models of the effects of the Outer Lindblad Resonance of the bar to the observations to give a constraint on the pattern speed of the bar, and performed other studies on chemo-dynamics of the Galaxy. During my second postdoc (ESA Research Fellowship) I worked on the preparation for the exploitation of Gaia data, developing several methods to be applied to the Gaia catalogue such as an algorithm to detect new Ultrafaint Dwarf Galaxies in the halo of the Milky Way, coordinating an international team of 11 researchers of 9 different research institutes around the world. I am currently PI of the European project MARIE SKLODOWSKA-CURIE FELLOWSHIP with full dedication to the Gaia data analysis to contribute significantly to the Gaia scientific harvest that Spain (and Europe) has planned and invested for. I have led the first article with Gaia Data Release 2 published in Nature in which we have discovered new shapes in the phase space of the nearby stars from which we have inferred that the disk of our Galaxy was perturbed few hundred million years ago, possibly by a dwarf galaxy companion. The findings challenge one of the most basic premise of galactic dynamics of dynamical equilibrium, marking a turning point in the field. I am currently one the emergent leading experts on Galactic dynamics with Gaia, with 18 papers since the first Gaia data release in 2016, including mission papers and scientific ones (open clusters, young local associations, star formation rate, initial mass function, accretion disks, Galactic warp). I am also member of the Gaia Data Processing and Analysis Consortium with my main contributions being the validation of Radial Velocities, the crucial role in two of the Gaia Performance Verification Papers on globular clusters & dwarf galaxies, and on disk kinematics, and the definition of the Gaia Archive. I am co-lead of the sub-survey Dynamics of the Galactic disks, which is part of the WEAVE Galactic Archaeology that will obtain the crucial missing radial velocities and detailed chemical abundances for the faint Gaia stars, and I have been in charge of the science case and the survey design. I have supervised 1 PhD thesis (and one ongoing), 2 Masters theses and 2 Bachelor theses on the field of Galactic dynamics. I have expertise in both observational and modelling methods, including e.g. data mining techniques, analytical modelling, orbital integrations and distributed computing.
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Resumen del Currículum Vitae:

Research positions:
1) PhD at the Universitat de Barcelona
2) Postdoc at the University of Groningen (3 yrs), Contract from European Research Council Starting Grant
3) Postdoc at the European Space Agency, ESA Research Fellowship in Space Science (3 yrs), Success rate of the Fellowship: 5/100
4) Postdoc at the Universitat de Barcelona Funded by Maria de Maeztu Excellence Unit, Success rate: 2/100
5) Current position: MARIE SKLODOWSKA-CURIE INDIVIDUAL FELLOWSHIPS (H2020) at the Universitat de Barcelona, Ranking position in Physics < 5/1000, Success rate: 14/100

Track record:
12 first author refereed publications (more than 400 citations), including 5 letters (Nature, ApJL, MNRAS, A&A)
publication in Nature journal as first author, 38 citations in 3 months, international press release
27 accepted publications as co-author in international refereed journals
total of 5037 citations
participation in more than 30 conferences, 3 invited talks, 20 accepted oral presentations, 7 seminars and invited colloquiums (+3 invited talks and 1 accepted talk in 2019)

International mobility: 2 postdocs in different institutions in the Netherlands, 3 research stays in Mexico

Supervision and mentoring: 1 finished PhD and 1 in progress, 2 Masters theses, 2 Bachelor theses, mentoring of other research projects of young students

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International Research Projects: PI of European project Marie Curie; PI of ESA Research Fellowship; Contract under ERC-StG; Researcher of 2 international (PAPIIT) and 6 national projects (MINECO, AGAUR)

Participation in missions, surveys, international collaborations: scientist of the RAVE collaboration and of the WEAVE project, member of DPAC, member of Gaia Research for European Astrometry Training, Gaia Challenge, Red Española de Gaia

Main international research collaborations: Universiad Nacional Autonoma de Mexico, Universidad Montevideo Uruguay, University of Groningen, Leiden University, ESA, GEPI Observatoire de Paris, Leibniz-Institut für Astrophysik Potsdam

Leadership Capacity: PI of projects and experience with my own research project (ESA Postdoctoral Fellowship, Postdoc position from the Maria de Maeztu Unit of Excellence, and Marie Curie Fellowship); financial management (Marie Curie Fellowship); Co-lead of the Disk Dynamics subsurvey of WEAVE

Grants: 4 fellowships (FI, Beatriu de Pinos-rejected, ESA Fellowship, Marie Curie Fellowship), 3 other research grants (NOVA postdoc-rejected, IEEC PhD grant, beca de colaboración con departamentos).
Funded by fellowships during 8 out of the 12 years of research path

Acquisition of funding: 3 travel grants (FI programme, Alpha Programme, IAU), funding for 2 visitors (ESA, Maria de Maeztu Unit of Excellence), funding for 2 organised workshops (Lorentz Center, Facultat de Física)

Public engagement activities: Outreach activities, Motivation of young careers activities and Gender balance activities

Main Teaching Activities: 1) Physics Degree, subject Observational Astronomy (4 years); 2) Lecture at the subject Galactic Astrophysics, Masters in Astrophysics, Cosmology and Particle Physics; 3) Invited to lecture at the Space Astrometry for Astrophysics in the International School of Space Science 2019

Other: Review of ESA s Fellowship Applications, Evaluation of funding allocation at ESA, organisation of 5 meetings/workshops, 8 approved observational proposals

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Turno de acceso general

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Título:

Tology in Dirac Matter

Resumen de la Memoria:

My research line is focused on the theoretical study of topologically non-trivial electronic systems and topological properties both in low dimensional systems and in three dimensions: graphene, topological insulators, Dirac/Weyl semimetals, nodal-line semimetals, etc.
I obtained my PhD from the Universidad Carlos III de Madrid in 2007 studying the electronic properties of graphene in presence of topological defects and curvature. I analyzed how topological defects and curvature alter the phase of the electronic wavefunctions in graphene and how these non trivial phases modify different observables, like the density of states and conductivities.
I spent 2 years as postdoc researcher at the Lancaster University (UK). During this period, I kept working on the topic of graphene, I started my research in the field of topological insulators, and I started the co-supervision of the Phd student Adolfo G. Grushin. With A. G. Grushin, we developed the theory of Casimir repulsion between three dimensional topological insulating systems.
Then I obtained a grant from the Universidad Autónoma de Madrid for two years and later a JAE-doc contract at the Instituto de Ciencia de Materiales de Madrid (CSIC). During this period I actively worked on the topic of the effect of interactions on the phase diagram of graphene, finding topologically non-trivial phases in graphene induced by interactions. In 2013 I started the co-supervision of Yago Ferreiros, working on two main topics: the interaction between ferromagnets and the surface states of topological insulators and the physics of Weyl semimetals. I also developed a theory on non trivial gaps induced on the surface states of three dimensional topological insulators by non ferromagnetic magnets.
In the next years I worked at the Instituto de Ciencia de Materiales de Madrid, starting my research in the field of topological Dirac and Weyl semimetals from 2014 to date. Also, during this period I started a collaboration at the ICMM to study the nontrivial topological effects in iron-based superconductors.
In 2016 I started to lead a project within the program "Proyectos Jóvenes Investigadores" (to start in 2017) devoted to the study the physics of Dirac and Weyl semimetals. Within this project I have recently developed a theory describing the so-called magneto-chiral effect, consisting of the presence of terms linear in the magnetic field in the transport and optical properties of time reversal Weyl semimetals, induced by Berry dipoles, instead of the conventional wisdom of being the Berry monopoles associated to the Weyl points the main actors behind the main topological responses in these systems.
Currently I'm working on the physics of Weyl/Dirac semimetals, nodal line semimetals, Dirac two dimensional systems and non-electronic Dirac analogs.
I am co-author of 39 peer-reviewed papers (+1 preprint) with 1361 (1821) citations and h=19 (22) in Scopus (Google Scholar Citations). I am IP of a national research project. I have been awarded with the RSEF-BBVA prize for the best outreach article in 2017.
In 2018 I obtained the ANECA certification Contratado Doctor .
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Resumen del Currículum Vitae:

Bachelor in Theoretical Physics at Universidad Complutense de Madrid, 2003. PhD in Applied Mathematics at Universidad Carlos III de Madrid, 2007. Topic of PhD Thesis: Electronic properties of graphene in presence of topological disorder.
Postdoctoral fellow at the Lancaster University (United Kingdom) in the groups of Prof. Henning Schomerus, and Prof. Vladimir Falk'o from 1/12/2008 till 31/10/2010. During this postdoc I worked in the fields of graphene and topological insulators, and started the PhD supervision of Dr Adolfo G. Grushin. Since 1/11/2010 to 15/03/2012 I started a postdoc in the Universidad Autónoma de Madrid. The main line of research in this period is the study of the physics of two dimensional and three dimensional topological insulators.
From 16/03/2012 to 15/03/2015 I enjoyed a JAE doctor fellowship at the Instituto de Ciencia de Materiales de Madrid. During this period I co-supervised the thesis of Dr Yago Ferreiros.
From 15/03/2015 to 30/10/2016 I worked as a postdoctoral researcher under the Community of Madrid project 2DMATCM (S2013/MIT-3007).
I have participated as associated researcher in 6 national/international projects.
Currently principal researcher (IP) of a national (+european funded) project about the physics of Weyl semimetals: FIS2015-73454-JIN.
In 2018 I obtained the ANECA certificate "Contratado Doctor".
In 2018 I was awarded with the RSEF-BBVA prize for the best outreach article "Quasiparticulas relativistas".

Publication Track Record:
39 published papers in international refereed journals (+1 preprints): 15 as a first author, and 13 (around 1/3) acting as senior researcher (3 single authored). h index=19 and 1361 citations according to Scopus (1821 citations and h=22 in google scholar citations).

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Mentoring and Supervision: 2 PhD Theses co-supervised: Dr Adolfo González Grushin and Dr Yago Ferreiros Bas.
Credited teaching experience: Calculus in several variables (Universidad Carlos III de Madrid, 2004), Mathematical methods II (Universidad Autónoma de Madrid, 2010/2011-2011/2012-2012/2013), Integrated analogical circuits (Universidad Autónoma de Madrid, 2010/2011), Laboratory of Physics for Biologists (Universidad Autónoma de Madrid, 2010/2011).

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Turno de acceso general

Nombre: POVEDA TORRES, JOAQUIN
Referencia: RYC2018-025791-I
Área Temática: **Ciencias físicas**
Correo Electrónico: Ximo.Poveda@cern.ch

Título:

Higgs boson and top quark physics with the ATLAS experiment at the LHC

Resumen de la Memoria:

My research career has been devoted to the study of fundamental particles and their interactions using proton-proton collision data from the LHC accelerator at CERN. I have been part of the ATLAS experiment since 2004, standing out in such a large international collaboration with several leading roles both in physics analysis and technical activities. I have extensive experience in many aspects of experimental high energy physics, being awarded in 2014 with a 5-year CERN research staff position, one of the most competitive in the field. I have led various physics analyses during the LHC Run-1 (2010-12) and Run-2 (2015-18), as coordinator of 5 ATLAS peer-reviewed journal publications and had key contributions to another 13.

I have been entrusted to represent ATLAS in two CERN LHC Seminars, where the LHC experiments present publicly their flagship results for the first time. I have also been selected to give several high-profile talks in collaboration meetings and in major international conferences such as EPS-HEP 2017, and recently invited to give prestigious seminars in Berkeley and Harvard.

I made crucial contributions to the searches for Supersymmetry (SUSY), proposing novel ideas and pioneer analyses, such as the first search for stops in decays involving Z bosons and the first search for strongly produced particles using the same-sign dilepton signature, greatly improving the limits for SUSY models. These outstanding contributions led me to present the most prominent SUSY results in a CERN LHC Seminar in 2012.

My current focus is the study of the Higgs boson production in association with a top-quark pair (ttH), since this is the most promising way to measure the Yukawa coupling of the Higgs boson and the top quark, one of the highest priorities of the LHC Run-2 physics program. I was selected to announce the ATLAS evidence of ttH production in a CERN LHC Seminar in 2017 and I am currently coordinating all ATLAS ttH analyses as Convener of the Higgs-Top group, formed by >150 physicists. Under my leadership, ATLAS published both the evidence and observation of ttH production in 2018. These results are a milestone for LHC physics being the direct proof of fermion mass generation via the Higgs mechanism and were highlighted in a CERN press release due to their utmost importance.

During Run-2 I served as Convener of the ATLAS Isolation and Fakes Forum (2016-17), coordinating all the activities related to lepton isolation as well as the estimation of the background induced by fake and non-prompt leptons. I was in charge of developing the software tools to estimate this background, currently used all across ATLAS.

Before Run-2 I was appointed as Convener of the SUSY Background Forum (2014-15), coordinating the background estimation activities for the >30 SUSY analyses, including the development of analysis tools in close collaboration with the performance, Monte Carlo and software groups.

I have accumulated a broad experience in hardware activities such as read-out electronics, data acquisition, detector commissioning and operation, including expert shift duties. I was also responsible for the offline digitization and signal reconstruction of the ATLAS Tile Calorimeter.

In addition, I have supervised 6 CERN summer students, mentored graduate students in their PhD or authorship qualification, and participated in outreach activities.
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Resumen del Currículum Vitae:

Research career
- 2014-19: CERN Research Staff
- 2012-14: Postdoc, Indiana Univ.
- 2008-12: Postdoc, Univ. of Wisconsin
- 2003-08: PhD student (FPU grant), Univ. of Valencia and IFIC

Management roles in ATLAS
- 2017-19: Convener Higgs-Top group

- 2016-17: Convener Isolation and Fakes Forum
- 2014-15: Convener SUSY Background Forum

Other positions of responsibility in ATLAS
- 2013: Coordinator of the effort to evaluate the physics impact of operating the Transition Radiation Tracker (TRT) with Ar gas, critical before LHC Run-2 due to the large Xe gas leaks developed during Run-1
- 2012-15: TRT data acquisition on-call expert
- 2006-08: Responsible for the offline energy reconstruction in the hadronic Tile Calorimeter

Selected publications (>820 publications in Web of Knowledge, >32000 citations, h-index: 79)
- Higgs-Top Convener coordinating the Observation of ttH production in ATLAS: PLB 784 (2018) 173
- Higgs-Top Convener coordinating the Evidence of ttH production in ATLAS: PRD 97 (2018) 072003
- Coordinator of the searches for SUSY with jets and two same-sign or three leptons with 13 TeV data: EPJC 76 (2016) 259, JHEP 1709 (2017) 084
- Coordinator of the search for stop production in events with a Z or Higgs boson with 13 TeV data: JHEP 1708 (2017) 006
- Coordinator of the first search at the LHC for stop production in events with a Z boson, b-jets and missing transverse momentum: EPJC 74 (2014) 2883
- Coordinator of the first search at the LHC for gluinos with two same-sign leptons and missing transverse momentum: PRL 108 (2012) 241802
- Author of the limit plot from EPJC 71 (2011) 1682 awarded with the cover of that journal volume

Analysis reviewer
- Reviewer for Physics Letters B journal
- Member of 14 ATLAS Editorial Boards

Selected talks (30 contributions to conferences)
- "Inclusive searches for squarks and gluinos in final states with leptons with the ATLAS detector", EPS-HEP 2017
- "Review of SUSY Physics" plenary talk, GRC Particle Physics 2015
- "Third generation superpartners" plenary talk, PIC 2013
- 7 high-profile talks in Physics Plenary, ATLAS Week and ATLAS Weekly collaboration meetings

Seminars
- Seminars at Berkeley and Harvard, 2019
- "Evidence for ttH production with the ATLAS detector", CERN LHC Seminar, 2017
- "Search for supersymmetry in events involving third generation squarks and sleptons with ATLAS", CERN LHC Seminar, 2012
- Seminar at Indiana Univ., 2012

Organization of R&D activities
- ATLAS HTop workshops, 2018 and 2019
- ATLAS Egamma workshops, 2016 and 2017

Supervision/Teaching
- Discussion leader at the CERN-Fermilab Hadron Collider Physics Summer School, 2017
- PhD thesis committee member, Univ. of Valencia, 2017
- Supervisor of 6 CERN summer students, 2014-17
- Co-supervisor of student PhD thesis and ATLAS qualification task
- "Nuclear Instrumentation" lab at Univ. of Valencia, 2006-07

Outreach
- ATLAS official guide, host for virtual visits
- Translator to Spanish of the ATLAS Brochure
- Author of CERN Courier article "Supersymmetry in the third generation", 2012
- Filming crew assistance for the "CERN - Refurbishing Atlas" outreach video, 2014
- Lectures for undergrad students: CERN students/teachers programme (2014), Washington & Lee Univ. (2016)
- CERN Open Days 2019 volunteer

Other merits
- First reserve in last RyC call
- Shortlisted for permanent positions at DESY and CERN in 2018

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Turno de acceso general

Nombre: HAGEDORN , CLAUDIA
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Área Temática: **Ciencias físicas**
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Título:

Flavor in Particle and Astroparticle Physics

Resumen de la Memoria:

The Standard Model of particle physics has been very successful in describing gauge interactions, however, it cannot answer the fundamental questions of the flavor sector (number of generations, fermion masses and mixing, role of neutrinos) and also not the fundamental questions in astroparticle physics (origin of matter-antimatter asymmetry of the Universe and Dark Matter).

The main goals of my research are finding the organizing principle of the flavor sector and implementing it in an extension of the Standard Model and to construct highly predictive models that point towards new directions in flavor and astroparticle physics.

I have published well-known articles on different topics ranging from studies of mixing patterns, the construction of supersymmetric models, holographic composite Higgs models and grand unified theories, to the analysis of flavor violating processes, mechanisms for generating the matter-antimatter asymmetry and Dark Matter, in particular in neutrino mass models, and long-lived particles at MATHUSLA. These articles I have published in collaboration with researchers from several European countries, the USA and Australia. In several of them I have played the leading role as senior researcher.

In particular, I have worked on: a) the relation of fermion mixing and flavor and CP symmetries, where I have proposed together with two collaborators a new approach to lepton mixing with flavor and CP symmetries that allowed for the first time to predict observable CP violation in neutrino oscillations and to constrain Majorana phases. This publication received more than 160 citations until now and has served as guideline for the study of further approaches as well as led to many models, realizing this idea; b) holographic composite Higgs models for leptons with flavor symmetries, whose study I have initiated and pursued together with M. Serone. These models were the first of their kind. Viable models for Dirac as well as Majorana neutrinos are constructed. Charged lepton flavor violating decays are well under control due to the flavor symmetry and new particles are in the reach of the LHC; c) the charting of models with different signals, e.g. I have been involved in the first study of the impact of the flavor symmetry A4 on the signal strength of charged lepton flavor violating and conserving processes, which has clearly shown that, for new physics in the TeV range, the strong experimental bounds on these processes can only be passed with the help of a flavor symmetry. This study, cited ca. 100 times by now, has triggered several further analyses of different signals and in various models; d) neutrino mass generation mechanisms: I have initiated and headed a research collaboration with researchers from Denmark, Germany, Italy, Sweden and Australia in 2015 on this topic. Aim of this collaboration was to explore theoretical and phenomenological aspects of models with neutrino mass generation at loop-level. Examples of results are the analysis of gauge coupling unification in large classes of these models and the thorough study of a one-loop neutrino mass model, that elucidates the correlations and complementarity between lepton flavor violation and Dark Matter phenomenology. In addition to receiving funding for this collaboration, I have organized a workshop with international participation on this topic.
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Resumen del Currículum Vitae:

I have obtained my diploma in general physics at the Technische Universitaet Muenchen (TUM), Germany, with overall average grade 1.0 (best grade) in 2004. I have performed my PhD in physics at the same university and at the Max-Planck-Institut fuer Kernphysik (MPI-K), Heidelberg, Germany, and have finished my PhD thesis with the title Flavored Model Building under the supervision of Prof. M. Lindner in 2008 with overall average grade 1.0 with merits (summa cum laude). I have held 3 fellowships for postdoctoral research at well-known research institutes and universities (SISSA, Trieste, INFN and University of Padua, Italy) and have been a research fellow at the Excellence Cluster (EXC) Universe , TUM. Since 2016 I am assistant professor (adjunkt) at the Center of Excellence CP3-Origins at the University of Southern Denmark (SDU).
I am co-author of over 30 published articles (only 4 with PhD supervisor). Among them are very well-known publications on predictive mechanisms that relate fermion mixing with flavor (and CP) symmetries, on supersymmetric and/or grand unified theories which have served as guideline for further model building and on different phenomenological aspects of various models, such as charged lepton flavor violation, neutrino masses and leptogenesis. Nine of them have more than 100 citations and ten 50 or more. My H-index is 28 and I have in total more than 2,400 citations (source: INSPIRE HEP). I have given talks at more than 40 international conferences and workshops, several invited plenary ones e.g. at Neutrino 2016 (ca. 600 participants). I am regularly invited for seminars in- and outside Europe. I am a referee for more than 10 journals, receiving until now 5 recognitions for excellence in reviewing. Since 2018 I am a reviewer for the French National Research Agency and the Swiss National Science Foundation. I have headed a research collaboration on neutrino mass with members from Australia, Denmark, Germany, Italy and Sweden and have (co-)organised 2 workshops and 2 international conferences in

the years 2015-2018.
I have obtained funding for fellowships, a research collaboration and the organisation of workshops/conferences. I have supervised 3 bachelor students (at SDU), co-supervised 2 master students (at Uni Padua) and currently I am the principal supervisor of 1 PhD student at SDU. I have participated in a 3-days course on PhD student supervision at SDU in 2017.
I am the teacher responsible for bachelor (incl. lab) and master level courses in physics at SDU since 2016 (5 ECTS each). I have supervised the independent study activity of a third year bachelor student in 2017/8. I have received extensive educational training (1-year Lecturer Training Program) with modules, meetings, courses, supervision sessions and a development project at SDU in 2017/8. As faculty member I am also involved in administration at SDU. I have co-organised the outreach initiative Inspire Educate Innovate in 2016-2017 and the physics film festival in 2017.
The main goals of my research are finding the organizing principle of the flavor sector and implementing it in an extension of the Standard Model of particle physics and to construct highly predictive models that point towards new directions in flavor as well as astroparticle physics, explaining the origin of the matter-antimatter asymmetry of the Universe and Dark Matter.

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CONVOCATORIA 2018

Turno de acceso general

Nombre: MARTIN NAVARRO, IGNACIO
Referencia: RYC2018-024750-I
Área Temática: **Ciencias físicas**
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Título:

Understanding galaxy evolution through stellar populations analysis

Resumen de la Memoria:

The structure of spiral galaxies
As part of my Master s thesis I focused on understanding the origin of the abrupt changes observed in the radial light distributions of these objects. Previous studies had claimed that, depending on the orientation of the galaxies, these changes in the light profile exhibited different properties. We solved this apparent contradiction by showing that spiral galaxies usually present two types of changes in their surface brightness: breaks and truncations. Thanks to the multi-wavelength approach of our study we could suggest that breaks and truncation had different physical origins.

The stellar initial mass function in massive galaxies
The stellar initial mass function (IMF) is a central concept in extra-galactic Astronomy. Traditionally assumed to be universal, it was only in 2015 during my PhD when we could measure for the first time how the IMF changes radially within massive galaxies. This initial step was then lead to the discovery of a tight relation between metallicity and IMF. Shortly later, I developed a new approach to measure IMF variations, suitable for low-resolution spectroscopic data. With this new tool in hand, we were able to measure the IMF of massive galaxies at high redshift (z=1).

Since the IMF has also a strong impact on the mass-to-light ratio of galaxies, IMF estimations can be based on dynamical measurements. We have demonstrated that both dynamics and stellar populations offer a self-consistent and complementary view of the IMF in massive galaxies.

In a single-author paper, I decided to revisit the basic ideas about the chemical enrichment of galaxies, but now taking into account the newly discovered IMF variations. The result of this study was clear: the observed properties of the IMF in massive galaxies lead to a chemistry and to star formation rates inconsistent with observations.

The effect of active galactic nuclei feedback
As a Marie Curie fellow, I started to address what I consider to be one of the most important open questions in Astronomy: how do massive galaxies get quenched?

The stellar populations, as tracers of the evolutionary processes undergone by galaxies, hold the key to understand the effect of active galactic nuclei (AGN) feedback in galaxy formation. In an exploratory paper I showed how the ages and chemical composition of galaxies depend on the amount of energy released by the AGNs. I further developed these ideas, incorporating different analysis tool, which lead to a publication in Nature where I showed that, within massive galaxies, star formation is linked to AGN activity at all redshifts. Interestingly, the effect of AGN feedback depends strongly on the mass of the galaxy, becoming almost irrelevant for low-mass systems. Moreover, our analysis naturally predicts a critical galaxy mass separating low-mass and high-mass galaxies, as found in numerical simulations. These empirical results have been recently backed up by re-analyses of numerical simulations, which further shows the strength of our approach.

Concluding remarks
From the collapse of molecular clouds shaping the observed IMF to the cosmological effects of AGN feedback, I have proved that fundamental galaxy formation processes leave a measurable imprint on the stellar population properties, leading to breakthrough results, and paving the way for upcoming discoveries.
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Resumen del Currículum Vitae:

Stellar populations bridge together the fundamental physics at atomic scales with the cosmological environment where galaxies live. My research focuses on the analysis of the absorption spectra of galaxies, and on how these spectra can be used to constrain the basic mechanisms regulating the formation and evolution of galaxies in the Universe.

Career path
I received my bachelor's degree at the Universidad de La Laguna, where I also complete my Master s project. I later became a PhD student at the Instituto de Astrofisica de Canarias. After a year as a research fellow at the University of California, Santa Cruz I was awarded with a

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Marie Curie individual fellow, which I am currently carrying out in between the Max Planck Institute for Astronomy and the University of California, Santa Cruz.

Research highlights
The stellar initial mass function is one of the most fundamental, yet poorly constrained, ingredients in Astronomy as it regulates the baryonic cycle within galaxies. For decades, it was assumed to be universal, but our results have shown that it depends on the local conditions of the gas from where stars form (e.g. Martin-Navarro et al. 2015a,b). A variable stellar initial mass function has deep consequences on a wide variety of fields, from star formation rate studies to estimations of the stellar feedback responsible for the reionization of the early Universe.

Related to this stellar feedback in self-regulating the formation of new stars, I have recently become interested in understanding the quenching process of galaxies. For massive galaxies, stars alone are not able to control star formation, and our favored Lambda-Cold Dark Mater scenario heavily relies on the energy radiated by Active Galactic Nuclei. However, up until recently, there was no observational evidence supporting this theoretical ideas, casting serious doubts about our knowledge of galaxy formation and evolution. Last year, we finally provided with the first observational proof of the effect of active galactic nuclei in regulating star formation (Martin-Navarro et al., 2018, Nature), and how it depends on galaxy mass (Martin-Navarro & Mezcua, 2018).

Fellowships and awards
In 2016, I received the thesis of the year in Astronomy award by the Sociedad Española de Astronomia. That very same year, I was awarded with the Marie Curie Fellowship.

Groups and collaborations
As a PhD student I was involved in the CALIFA collaboration in order to study the origin of the observed variations in the initial mass function. I am currently heavily involved in the Fornax3D survey as a core team member, leading the efforts to produce stellar initial mass function maps.

Referee
I have refereed papers for the Astronomy & Astrophysics journal, for the Astrophysical Journal, and for the Monthly Notices of the Royal Astronomical Society. I have also refereed a PhD thesis.

Teaching and mentoring
I have supervised a summer internship project at the Max Planck Institute for Astronomy, and I have also co-supervised a Master s thesis at the Macquarie University. At UCSC, I started and lead a series of scientific discussions within students and post-docs.

Results dissemination
In addition to numerous international conferences, I have given invited seminars in several international research centers. I also contribute regularly to outreach talks and newspapers articles.

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Turno de acceso general

Nombre: POLIN , MARCO
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Área Temática: **Ciencias físicas**
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Título:

Biophysics of microorganisms: from biology to technology

Resumen de la Memoria:

My lab at Warwick University (UK) uses experimental and theoretical tools from physics to advance our understanding of microorganisms, the most abundant and varied group of living organisms. We are particularly interested in their motility; their behaviour as active-matter; and increasingly in developing biophysical tools to investigate areas of emergent societal importance (biophysics of infection; bacterial collective motion and antimicrobial resistance; interaction with environmental microplastics). To this end we also leverage multiple collaborations, both international (5 EU; 1 US; 1 Australia) and national (3).

After my Laurea (MSc; 110/110 cum laude) in Theoretical Physics (University of Padova, Italy), I earned my PhD at the Centre for Soft Matter Research (New York University USA) with Prof. David Grier, a pioneer in optical tweezers. Trained in theoretical and experimental soft matter and optics, I contributed to technological development (US Patent 20090101807) which enabled me to investigate fundamental colloidal interactions (6 articles incl. 2 PRL; tot. 560 cit.). Meanwhile, I worked on Potts model Monte Carlo simulations with Prof. Alan Sokal (1 PRL; 1 J. Stat Phys.). My PhD was co-financed by a Dean s Dissertation Fellowship.

In 2007 I joined Prof. Raymond Goldstein s group at the Department of Applied Mathematics (U. of Cambridge), first as a Marie-Curie Fellow and then as EPSRC Fellow. At DAMTP I became interested in the role of physics in microbiology, and the insights offered in this area by mathematical models. I trained in microbial wetlab techniques, cell biology, microhydrodynamics, dynamical systems.

My research in Cambridge (tot. 981 cit.) focussed on cell motility and eukaryotic flagella, whip-like active organelles common to most eukaryotic species (incl. humans). I spearheaded a new line of research into flagellar coordination, leading to important discoveries on flagellar dynamics, their intrinsic biochemical noise, and the resulting cell motility (1 Science; 3 PRLs). I discovered the simplest known organism displaying large-scale ciliary coordination (as in humans), characterised its dynamics and developed a model for it (1 PRL, 1 Roy Soc. Interface). I performed the first measurement of microbial flow fields (1 PRL), and helped discover how flagella modify interactions between microbes and surfaces (1 PNAS).

In 2013 I moved to the Physics Dept. of Warwick University, where I am Associate Professor (jointly appointed (30%) at the Medical School). Since 2017 I am Group Leader in the Centre for Mechanochemistry. My group (5 PhDs; Completed: 1 PDRA, 1 PhD, 1 MSc-Research; plus further 8 MSc and 4 BSc) produced publications in top journals (Nat. Com.; PRL; eLife; Sci. Rep.; Roy. Soc. Interface; Phys. Rev. Fluids; tot. 203 cit.; 4 in prep). Current research expanded greatly beyond flagella, from physics of active suspensions to motility under confinement, to motility and cell metabolism. Exciting new directions include: biophysics of infection; biophysics of emergence of antimicrobial resistance; dynamics of colonisation of environmental microplastics.

I have received 12 awards (grants/fellowships): 10 as PI with >£1m of total value (>£600k ongoing); 2 as Co-I, joint value >£1.1m. I am also part of the research team on 3 grants from the Ministerio de Educacion y Ciencia, held at IMEDEA (UIB-CSIC).

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Resumen del Currículum Vitae:

Publications:
- 23 publications; Tot cit. 1743 (Google Scholar; 1167 cit. WoS); >75 cit/paper avg.
- 95% in Q1, 67% >95th percentile (Incl. Science, Nat Comm; PNAS, 9 PRL);
- 1st/2nd author of 5; last/joint last of 8; 5 are published in alphabetical order.
- h = 18 (Google Scholar; 16 SCOPUS); i10 = 21; AccIF = 169.5;
- U.S. patent 20090101807

Funding: 15 awards (grants/fellowships); 10 as PI with >£1m of total value (PI only), incl. (as PI):
- Marie-Curie Intra-European Fellowship
- Engineering and Physical Sciences (EPSRC) Fellowship
- Research Grant from The Royal Society, UK
- Two Research Grant from The Leverhulme Trust, UK
-Albert Shimmins International Fellowship, University of Melbourne, Australia
-Visiting Professor Fellowship, University of Melbourne, Australia
-Pump-priming funds from INNOVATE, EPSRC-funded Antimicrobial Initiative at Warwick

International Experience:
-ITA: Master in Physics in Italy (Full marks);

-USA: PhD at the Centre for Soft Matter Research in New York University, USA (3.944/4);
-UK: Postdoc at the University of Cambridge (DAMTP), UK;
-UK: Associate Professor at the University of Warwick, UK.
-ESP: Two Visiting Fellowships at IMEDEA UIB/CSIC, Spain (2);
-AUS: Two Visiting Fellowships at the University of Melbourne, Australia (2).
- 31 invited lectures/seminars (27 since 2013): 12 at international meetings; 8 at international institutions across 8 countries; 11 national.
> 40 conferences/workshops as contributor.

Active International Collaborations:
-AUS: Dr. Douglas Brumley, University of Melbourne, Australia
-NLD: Dr. Luca Giomi, University of Leiden, The Netherlands
-DEN: Dr. Anders Andersen, Technical University of Denmark, Denmark
-FRA: Dr. Fernando Peruani, University of Nice, France.
-ESP & FRA: Dr. Idan Tuval, IMEDEA, Spain.
-USA: Dr. Kela Lushi, New Jersey Institute of Technology, NJ USA.

Professional Services:
- Referee for >10 journals (~7 per year; incl. Nat. Com., eLife, PNAS, PRX, PRL);
- PhD examiner: 8 times;
- 2011-2013: Member of Governing Body and Fellowship Committee of Clare Hall (U. Cambridge College);
- 2017-present: Member of the Management Committee for IBR Doctoral Training Partnership

Research Leadership and Supervision:
- Current group: 5 PhDs (Main sup); (1 PDRA and 1 PhD student to join in 2019)
- Completed supervisee: 1 Postdoc and 13 students (1PhD Main sup. + 1PhD Co-sup., 7 MSc, 4 BSc);
- Academic Mentor for 1 Assistant Professor (U. Warwick);
- PhD advisory panel member for 6 students;
- Mini-projects supervision: 5 PhD-level (>2 months); 12 undergraduate (10 weeks)

Outreach: 20 events including public lectures, Open Days, hosting students (pre-University)

Teaching:
- Taught Modules: 15 undergraduate, 8 graduate;
- Weekly tutorials for 1st and 2nd year Physics students (tot. 25 undergraduates overall);
- Course Supervision (pre-Warwick): 7 undergraduate, 2 graduate;
- PCAPP (2-y part-time course in higher-education teaching, UK Higher Education Academy Accredited)

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CONVOCATORIA 2018

Turno de acceso general

Nombre: ZANIN ZANIN, ROBERTA
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Área Temática: **Ciencias físicas**
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Título:

Very-high-energy gamma rays: a tool to study the physics of compact objects and the origin of cosmic rays

Resumen de la Memoria:

My scientific production is mostly related to the non-thermal emission from Galactic astrophysical sources, in particular those powered by compact objects (either neutron stars or black holes), i.e. microquasars, pulsars, and pulsar environments (PWN), supernova remnants (SNR). I have also investigated the origin of Galactic cosmic rays by using gamma-ray observations. My main contributions to the astroparticle community come from my works on the Crab pulsar and pulsar wind nebula, and those on microquasars in gamma rays.

I discovered Cygnus X-1 for the first time above 60 MeV with a power-low energy spectrum reaching few tens of GeV and no sign of cutoff by analyzing 8 yr of PASS8 LAT data. I also worked in comparing the high-energy emission from the two microquasars so far detected in the Fermi-LAT energy range. It is likely to be of jet origin and produced via inverse Compton scattering off seed photons, but it is independent from the nature of the jet. As PI of all the microquasar observations in MAGIC for almost ten years, I tried to catch (sub-)TeV emission from this class of sources, but so far without success.

I conducted physic driven studies on the Crab nebula obtaining high-precision measurements of the spectral properties of the inverse Compton emission component above 50 GeV. This is one of the MAGIC most important publications as it defines the reference inverse Compton spectrum from the Crab nebula. I also led two important publications on the Crab pulsar emission that will constitute one of the main legacy by MAGIC for future experiments: the detection of the bridge emission above 50 GeV, and the detection of pulsed emission up to TeV energies with no sign of cutoff. I am currently involved in the detection of a new spectral component for the Vela pulsar within the H.E.S.S. collaboration. This results signs the beginning of a new era for the pulsar phsyics. I am currently involved also in the study of evolved PWNe and SNRs with Fermi-LAT.

After 7 years of independent international post-doctoral experience mainly on research fellowships, I now aim to build my own research group (preferably in Spain), and the support of a long term Ramón y Cajal fellowship would be crucial to keep my career progressing. This would allow to fully develop my lines of research focused on the exploitation of the sensitivity frontier of CTA, especially of the LSTs above 20 GeV with their huge potential for the transient science cases. In particular, I would like to focus my research lines on the search for extreme transients like gamma-ray bursts, gravitational wave counter-parts, as well as on pulsars and their winds also in the context of the positron excess.

I would add to the Spanish community a recognized expertise in the physics of Galactic compact objects at high energies (gamma rays), coupled to strong technical experience in the commissioning, running, and analyzing data from IACTs that is invaluable at the advent of the CTA era, and, in particular, with the exploitation of its large-sized telescopes (LSTs). They are optimal instrument for all the science cases to transient extreme phenomena, on which I have a deep expertise.

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Resumen del Currículum Vitae:

I obtained my PhD in Spain in 2011 at the Institut de Fisica d Altes Energies, Universitat Autonoma de Barcelona, and then I spent almost four years (including two maternity leaves) at the Universitat de Barcelona with a Juan de la Cierva fellowship under the tutorship of Prof. J. M. Paredes.
In 2015 I moved to the Max Planck Institut für Kernphysik in Heidelberg (Germany), with a von Humboldt postdoctoral fellowship to work on pulsars, and pulsar winds in the gamma-ray energy band.
These 7 years of postdoctoral research experience allowed me to develop an independent line of investigation, as well as a diffuse network of collaborators spread over more than 30 countries. I also had a number of experiences in mentoring master and PhD thesis.

Over the last 11 years I have been an active member of two of the three existing imaging atmospheric Cherenkov telescopes MAGIC (2006-2015), and H.E.S.S. (2015-Present). Since 2012 I am a member of the CTA consortium.

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My publication record (151 papers in refereed journals, H-index=42, out of which 12 papers as corresponding authors and 9 as convener) shows the impact of my research on the astroparticle community. My works on the Crab pulsar and nebula within the MAGIC collaboration show my most influential contribution to the community.

The 15 invited talks given in international conferences, 9 contributed talks, 5 invited seminars, the organization of one international conference: Gamma2016, the leadership of physics working group of international collaborations such as MAGIC, CTA, and XIPE and of the European COST Action CA16214, all prove the recognition of my work by the international high-energy astroparticle community. Since 2016 I am a reviewer of the Astrophysical Journal, Astronomy & Astrophyics and Monthly Notices of the Royal Astronomical Society. I was invited to write a review chapter on the observational status of the Crab nebula for the book Modeling pulsar wind nebulae edited by D. Torres, Springer, 2018. I am currently co-editing with Prof. Mukherjee the book Advances in very high energy astrophysics .
I have gained a substantial knowledge of the IACT technique thanks to the several technical and operational tasks I have been in charge of. Between 2007 and 2009, I actively participated to the commissioning of the second MAGIC telescope for which I took the responsibility of developing the central control software for the array of the two telescopes. As a key person of the telescope operations I was later also appointed as deputy scheduler, and a member of the safety committee of the MAGIC collaboration for 2 years. I strongly contributed to the software development for the analysis of the stereoscopic MAGIC data: I was a member of the software board for 2.5 years. For CTA, I am currently involved in the development of the gammapy open-source Python package data of which I have been appointed as project manager. This is one of the two prototypes proposed to become the official CTA science tool. This technical expertise gave me a unique perspective in the definition of my physics research activities.

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Turno de acceso general

Nombre: COLOMA ESCRIBANO, MARIA DEL PILAR
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Área Temática: **Ciencias físicas**
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Título:

Neutrino phenomenology

Resumen de la Memoria:

Mi línea principal de investigación consiste en el estudio de la fenomenología de neutrinos, donde me he especializado en el estudio de experimentos de medida de oscilaciones a larga distancia. Hasta ahora, mi trabajo se ha centrado principalmente en entender cómo se pueden optimizar la presente y futura generación de experimentos de neutrinos para medir los parámetros de mezcla del sector leptónico de manera más precisa, así como en tratar de buscar nuevas formas de acotar teorías más allá del modelo estándar a baja energía (usando experimentos de oscilaciones) o incluso a alta energía (estudiando posibles señales de nueva física en el LHC).
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Resumen del Currículum Vitae:

Después de terminar mi doctorado en octubre de 2011 hice una estancia postdoctoral en Virginia Tech (tres años), y empecé un segundo contrato postdoctoral en Fermilab. Antes de terminar mi segundo contrato postdoctoral, concursé y obtuve una plaza de tipo "Tenure Track" en Fermilab, tan sólo 5 años después de conseguir mi título de doctora.

A fecha de hoy tengo 59 publicaciones científicas (entre artículos, proceedings y reportes de projectos), que acumulan un total de más de 2700 citas de acuerdo a la base de datos inspire. Entre ellas destacan cuatro artículos en Physical Review Letters, un artículo como autora única con más de 60 citas en 3 años y varios artículos con más de 50 y más de 100 citas. Cabe destacar la independencia de mi director de tesis y el desarrollo de una amplia red de colaboradores a lo largo de los años, demostrando así mi fuerte independiencia investigadora. Además, soy revisora para revistas internacionales con alto factor de impacto como Journal of High Energy Physics, Physical Review Letters y Physical Review D, he sido invitada a dar varias conferencias plenarias en congresos internacionales y he dado varias clases en escuelas de verano para estudiantes de doctorado. Asimismo he participado en colaboraciones experimentales y en proyectos de investigación europeos, así como en la organización de varias conferencias. También he sido miembro de comités de evaluación de becas postdoctorales de prestigio (Lederman fellowship committee), coordinadora en la escritura de "white papers" y miembro de la "Neutrino Theory Platform" en el CERN.

Por último, cabe mencionar la supervisión de varios estudiantes de doctorado durante sus estancias de investigación en Fermilab. Entre ellos destaca particularmente la estancia de Ivan Martinez-Soler, que pasó 6 meses en Fermilab durante el año 2016. Durante su visita trabajamos en dos artículos que fueron publicados en revistas internacionales de alto impacto (incluyendo un Physical Review Letters), sin participación por parte de su director de tesis. No sólo le propuse varios proyectos que pudiera desarrollar en ese periodo de tiempo y supervisé su trabajo directamente, sino que también le ayudé a ganar visibilidad en EEUU, a preparar sus solicitudes para plazas postdoctorales y a preparar charlas para conferencias durante el verano. Esto demuestra mi capacidad para supervisar estudiantes de doctorado a varios niveles.

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Turno de acceso general

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Título:

Stellar core collapse: connecting the inner engine to observables and nucleosynthesis

Resumen de la Memoria:

Numerical simulations of the complex flows in astrophysical explosions and hydromagnetic instabilities are at the centre of my research. Since these systems combine a wide range of physics and demand a high accuracy, they require the development of specialised numerical methods. Therefore, I used my own codes to run large-scale in grants obtained on simulations on Tier-0 and Tier-1 supercomputers. The code includes modern schemes for the equations of magnetohydrodynamics (MHD) and neutrino transport in a versatile parallel framework. The numerical properties of the underlying methods for MHD (analysis of numerical errors) and transport (accuracy of the scheme and applicability of approximations used in other codes) form an important part of my work.

My main line of research focuses on the collapse of stellar cores in which rotation and magnetic fields are important dynamical factors besides neutrino radiation and hydrodynamics. These cases are observationally connected the some of most energetic supernovae and gamma-ray bursts and represent particularly interesting events in terms of their multi-messenger (gravitational waves, neutrinos, electromagnetic radiation) signal and their nucleosynthetic yields. Using axisymmetric as well as three-dimensional models that include all relevant microphysics, I investigate the conditions for an explosion of any of these types and for the formation of a neutron star or a black hole as a function of the pre-collapse state and processes such as the amplification of magnetic fields by instabilities and turbulence. For suitable progenitors resulting from stellar-evolution modelling, I demonstrated the viability of rapid, collimated outflows powered by the rotation of the core and driven by magnetic fields and the feasibility of generating a gamma-ray burst. The gravitational-wave signal contains the imprints of the oscillations of the core and the outflows. Ongoing analysis shows that some of these cores are possible sites of r-process nucleosynthesis. For many cores, however, the magnetic field is too weak initially. I assessed the possibility of processes amplifying the field to dynamically relevant strengths in cases with and without rapid rotation, in particular the magnetorotational instability (MRI). Besides fully self-consistent neutrino-MHD simulations, the effort relied on semi-global simulations of small parts of the unstable regions in boxes covered by a very find grid. The results of several large parameter studies indicate that secondary instabilities of Kelvin-Helmholtz of tearing-mode type grow on top of the MRI modes at a growth rate increasing with the amplitude of the MRI. Eventually, they will grow faster than the MRI and quench its growth at relatively limited final field strengths. I performed a similar investigation of the field growth due to the Kelvin-Helmholtz instability in neutron-star mergers, alos suggesting that secondary instabilities disrupt the thin flux tubes generated during early phases before fields become extremely strong.

Furthermore, I performed 3d simulations of the evolution of a supernova remnant and compared the resulting light curves, spectra and particle distribution to observations of the Vela Jr. remnant, which is embedded in a clumpy medium. From my models, constraints on the mass and energy of the explosion, otherwise very uncertain, can be derived.
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Resumen del Currículum Vitae:

During my studies of physics at the Technical University of Munich, I specialised in stellar astrophysics, before finishing it in 2004 with a Diploma thesis on "Numerical Simulations of the Gravitational Collapse of Rotating Magnetised Stellar Cores" performed in the hydrodynamics group of the Max Planck Institute for Astrophysics (MPA), Garching, directed by E. Müller and co-supervised by M.Á. Aloy. Continuing to work as a Ph.D. student at MPA, I extended my work on the development of numerical schemes for magnetohydrodynamics (MHD) and core-collapse supernovae to methods for radiative transfer and to the study of MHD instabilities (the magneto-rotational instability, MRI, and the Kelvin-Helmholtz instability). These projects were summarised in my Ph.D. thesis "Astrophysical magnetohydrodynamics and radiative transfer: numerical methods and applications", again supervised by E. Müller and M.Á. Aloy, accepted by the Technical University of Munich in 2008 (which makes this the last time I can apply for a Ramón y Cajal fellowship).

I continued to work on the same fields of research as a postdoc in E. Müller's group at MPA. During this time, I started to collaborate with R. Moll and H. Spruit on jet acceleration and began to contribute to the supervision of Ph.D. students: O. Just, working on neutrino transport and accretion tori in neutron-star mergers (Ph.D. thesis in 2012), and T. Rembiasz, working on the non-linear evolution of the magnetorotational instability in core-collapse supernovae (Ph.D. thesis in 2013).

I left MPA to start to work as a Golda Meir Postdoctoral Fellow in the High-Energy Astrophysics Group of the Racah Insititute for Physics, Hebrew University of Jerusalem, led by T. Piran, in November 2010. While retaining the connection to MPA and my old lines of research, I added gamma-ray bursts to my fields of research and started to perform simulations of jet propagation in the collapsar model for long

gamma-ray bursts. To this end, I implemented a module for special-relativistic MHD in my code.

In October 2011, I moved to the Departament d'Astronomia i Astrofísica of the Universitat de València to join the group of M.Á. Aloy, funded by the European Research Council under the Starting Independent Researcher Grant: 'CAMAP: Computer Aided Modeling of Astrophysical Plasma'. Within the lines established in previous years, I focused more closely on large-scale, state-of-the-art numerical models of extreme cases of stellar core collapse. As a member of the Valencia node of the Virgo collaboration, I am working on the emission of gravitational waves in stellar core collapse. I was involved in teaching (courses on stellar astrophysics) and the supervision of master (J.Ma. Chimeno in Valencia; A. Endrizzi in Trento) and graduate students (C. Cuesta in a project on the electromagnetic signature of jets in gamma-ray bursts).

In August 2018, I took up a postdoctoral position in the Theoretical Astrophysics group led by A. Arcones (ERC Starting grant "The origin of heavy elements: a nuclear physics and astrophysics challenge (EUROPIUM)") at the Institute for Nuclear Physics of the Technical University of Darmstadt in order to strengthen the connection of my work to aspects such as nucleosynthesis or reactions between matter and neutrinos.

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Turno de acceso general

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Título:

Physics beyond the Standard Model

Resumen de la Memoria:

The Standard Model of particle physics successfully describes phenomena in a vast range of energies. It also provides a coherent theoretical understanding to the world of fundamental particles based on the profound principle of gauge invariance. However, there are several experimental observations and theoretical indications that have led to the global consensus that it cannot be the final theory. Among the experimental reasons, the existence of non-zero neutrino masses is arguably the strongest one, while the dark matter and baryon asymmetry of the universe constitute other phenomenological indications to go beyond the Standard Model. Similarly, there are also theoretical arguments in favor of the existence of new physics. The most widely discussed of them is the hierarchy problem, which would make the Standard Model Higgs boson mass unnatural if this couples to new physics at energy scales clearly above the Fermi scale. The flavor puzzle, the unknown origin of the pattern of fermion masses and mixings, also suggests the existence of a new physics explanation.

In my scientific career I have investigated several subjects covering a wide range of theoretical and phenomenological aspects in the field of physics beyond the Standard Model. The main focus of my research has been on the lepton sector, where one finds most of the open questions. I have contributed substantially to the development of new neutrino mass models and their phenomenological study at colliders and low-energy experiments.

In the first stages of my career I worked on the phenomenology of supersymmetric neutrino mass models. This includes models with explicit and spontaneous violation of R-parity as well as high-scale seesaw models.

I have made a notable contribution to the recent research activity in the field of lepton flavor violation, one of the standard features in models with extended lepton sectors. This field is expected to live a golden era in the near future given the numerous planned experiments about to start their operation. These include MEG-II, Mu3e, Mu2e and COMET, to mention a few. One can also test low-scale neutrino masses through their impact on universality violating observables. I have explored this idea in the context of the inverse seesaw, showing that the NA62 experiment is sensitive to the existence of light sterile neutrinos. I have also investigated the possible connection between neutrino masses and other areas of particle particle physics, such as dark matter and the Higgs boson mass.

I have contributed to the development of two popular computer tools: FlavorKit, for the calculation of flavor observables, and DsixTools, for the matching and renormalization group evolution of effective field theories.

Several experiments in flavor physics have recently published results on B-meson decays in conflict with the Standard Model predictions. The LHCb collaboration has found anomalous results in observables associated to b -> s transitions (partially confirmed by Belle), whereas LHCb, Belle and BaBar also find deviations in b -> c observables constructed to test lepton flavor universality. This is one of my current lines of research: to assess the robustness of the Standard Model predictions, to understand the implications of these anomalies using effective field theory techniques and to build models of new physics able to explain them.

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Resumen del Currículum Vitae:

During my scientific career I have developed a research line with high impact and international projection within the high energy physics community. I have worked on a wide variety of subjects associated to the search of a new paradigm beyond the Standard Model.

I did my PhD at Instituto de Física Corpuscular (IFIC), in Valencia (Spain), under the supervision of José W. F. Valle and Martin Hirsch. In this period I spent 3 months as a Marie Curie ESR fellow at CERN. I had two other scientific stays during my PhD period: at Institute for the Physics and Mathematics of the Universe in Kashiwa, Japan, where I worked under the supervision of Hitoshi Murayama, and at Instituto Superior Técnico in Lisbon, Portugal, where I was supervised by Jorge Romao.

After my PhD I joined the University of Würzburg (Germany) for a short postdoctoral stay. Then, also in 2011, I joined the Laboratoire de Physique Théorique d'Orsay (France), where I collaborated with Asmaa Abada and Adam Falkowski. In July 2013 I joined the University of Liège (Belgium), where I spent two years with a certain independence that allowed me to start several research lines. I am part of IFIC in Valencia since July 2015. After a short postdoctoral contract I became Juan de la Cierva Incorporación researcher in January 2016 and later postdoctoral researcher at the University of Valencia. I am currently Principal Investigator of the project Búsqueda de Nueva Física a través del Sabor , funded by Generalitat Valenciana via the SEJI program for excellent junior researchers. Leading this 3-years project with 14 researchers from Europe, North and South America and Australia constitutes a crucial step forward in my career.

I have published 43 research articles in prestigious peer-reviewed journals, including three invited review papers. I have given 44 talks in international conferences (15 of them as invited speaker, including 5 review talks) and appeared in 9 conference proceedings. I have also given 22 invited seminars. According to the inSPIRE database, my publications have received 2024 citations (as of January 29th, 2019), with an h factor of 26. I have also published the codes FlavorKit, currently used by many researchers for their own projects in flavor physics, and

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DsixTools, a package for the handling of the Standard Model Effective Field Theory.
I am currently supervising the PhD thesis of Paulina Rocha Morán. Her PhD deals with lepton flavor violation in low-scale neutrino mass models and is expected to be finished in 2019.
I have been invited as lecturer to several doctoral schools: the ISAPP 2016 International School of Astroparticle Physics, Milano (Italy), the 17th International Baikal Summer School on HEP and Astrophysics, in 2017 in Bol'shie Koty (Russia), and the post-FPCP school, in 2018 in Hyderabad (India). I have been invited to teach the PhD course "Computer tools in particle physics" at CINVESTAV (Mexico DF, Mexico, 2015), IFIC (Valencia, Spain, 2016 and 2017) and Universidad de Antioquia (Medellín, Colombia, 2016). I have also given a hands-on session on SARAH and FlavorKit at "Neutrinos from GUTs down to low energies", in Garching (Germany) in 2015.
Finally, I am also actively involved in the organization of several scientific and outreach activities. I am one of the cofounders of the IFIC outreach blog and lead the science outreach association "Sapiencia".

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Turno de acceso general

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Título:

Unraveling new physics through lepton flavour universality tests

Resumen de la Memoria:

I am an experimental physicist with well-balanced experience in data analysis of flavour physics and low-energy QCD experiments, and detectors. Since 2012 I am a member of the LHCb collaboration, after joining the Instituto Galego de Física de Altas Enerxías (IGFAE) at the University of Santiago de Compostela (USC).

In 2013, I was awarded one of the 50 Xunta de Galicia young postdoctoral fellowships that allowed me to work on the study of charmless B->VV decays at LHCb for 3 years. During this period, I was the main author of 3 publications. In 2016, I obtained one of the 20 senior fellowships offered by the Xunta that included funding to open my own research line: the study of Lepton Flavour Universality (LFU) in semitauonic B decays using 3-prong hadronic tau decays at LHCb. This funding allowed me to coordinate a group formed by 3 PhD students and 3 seniors. Thanks to this grant, I extended the LHCb physics program by performing a new measurement of the observable R(D*) using tau->3pinu decays. My work fructified in 2017 with 2 publications about the R(D*) measurement. As a recognition of my work, I became convener of the LHCb semitauonic decays sub-working group.

I have been a CERN Project Associate for 9 months in the period 2017-2018. This allowed me to develop a new dedicated trigger line which was operating during the 2018 data taking. In the summer of 2018 I was awarded a María de Maeztu/Global Talent fellowship at the IGFAE, which will allow me to extend my studies on LFU for the next 3 years.

I completed my PhD thesis in 2008 working in the DIRAC experiment at the IGFAE. During my earlier career, I have been a main contributor to the data analyses resulting in the main publications of the DIRAC (CERN) and SIDDHARTA (LNF-Frascati) collaborations, and I was on-call expert of the MSGC/GEM detector for a total of 6 months in 2002-03.

In 2007, I was awarded one of the 28 INFN fellowships for non-Italian citizens and I joined the Nuclear Physics group at LNF-Frascati to work in SIDDHARTA. I was a main contributor to the data analysis and to the development and testing of the Silicon Drift Detectors, later installed in SIDDHARTA, and a TPC and Scintillating fibres coupled to Silicon Photo-multipliers, a trigger prototype for the AMADEUS experiment.

I have participated in outreach activities by teaching high-school students to introduce them in the world of trigger systems for HEP experiments; I supervised 1 PhD thesis, 2 Master Degree theses and 1 Diploma thesis; and mentored many students. Nowadays, I supervise 2 PhD theses focused on semitauonic B decays. I presented my work in many international conferences and I was PI of a project funded by Xunta de Galicia.

During my whole career, I have demonstrated my ability to lead international collaborating groups in different experiments, and to open new research lines. One of these lines, the study of semitauonic B decays, is one of the high-priority lines of the LHCb and Belle-II experiments. The next years will be crucial to elucidate if the B anomalies are originated in physics beyond the SM or are an experimental artefact.
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Resumen del Currículum Vitae:

Research career:
08/2018-07/2021: María de Maeztu/Global Talent fellow at the Instituto Galego de Física de Altas Enerxías (IGFAE) of the University of Santiago de Compostela (USC)
09/2018-12/2018: CERN Project Associate (PJAS)
09/2017-02/2018: CERN PJAS
07/2016-07/2018: Postdoctoral Research Fellow at IGFAE, funded by Xunta de Galicia (I2C modality B)
04/2016-07/2016: Research Associate at IGFAE
04/2013-04/2016: Postdoctoral Research Fellow at IGFAE, funded by Xunta de Galicia (modality A)
01/2012-04/2013: Research Associate at IGFAE
11/2009-12/2011: Research Associate at the Laboratori Nazionali di Frascati (LNF-INFN)
10/2007-10/2009: Postdoctoral Research Fellow at LNF-IFNF

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2008: PhD thesis Precision determination of the S-wave pipi Isospin Scattering Length difference |a0-a2| in the DIRAC experiment , USC
2003: Advanced studies degree at the USC Development of a tracking system for the DIRAC experiment , USC

Stays at R&D centres:
07/2018-12/2018: CERN
09/2017-02/2018: CERN
10/2007-12/2011: LNF-INFN
2002-2003: 2 stays at CERN of 4 months each for data-taking of the DIRAC experiment and detector operation (on call expert MSGC/GEM, detector)

Grants:
08/2018-07/2021: María de Maeztu/Global Talent fellow at the IGFAE
07/2016-07/2018: Postdoctoral fellowship I2C modality B . Xunta de Galicia
04/2013-07/2016, Postdoctoral fellowship I2C modality A . Xunta de Galicia
10/2007-10/2009, INFN Postdoctoral fellowship for non-Italian citizens , LNF-INFN

Responsibilities at LHCb:
01/2017-today: Convener of the LHCb semitauonic sub-working group
Member of the LHCb internal review panel
Member of the LHCb editorial board for 10 publications

Responsibilities at DIRAC:
Member of the editorial board of the DIRAC experiment (2008-2011)

Organization of R&D activities:
Member of the organizing committee Second LHCb open semitauonic workshop . 11/2017. Orsay, Paris
2016: Convener of the stream Semileptonic and rare decays of Beauty, Charm and Strange at the Implications of LHCb measurements and future prospects workshop (CERN, 10/2016)
2016: Member of the organizing committee of the 81st LHCb Collaboration Week . 09/2016. Santiago de Compostela

R&D management:
PI of a project funded by the Xunta de Galicia (20,000 euros)
Participation as Research Associate in the European FP7 project HadronPhysics2.
Participation in 12 national/regional projects

Talks:
CERN LHC Seminar Lepton Flavour Universality tests using semitauonic decays at LHCb . 06/06/2017
More than 20 talks given at international/national conferences/workshops

Scientific production:
My total number of publications is 532 with a total of 22,179 citations and 41.7 citations per paper (from INSPIRE). My h-index is 75. I have 3 renowned papers (more than 500 citations), 11 famous papers (250-499 citations), 30 very well-known papers (100-249 citations) and 82 well-known papers (50-99 citations).

Supervision of students:
I have supervised 1 PhD thesis, 2 master theses and one diploma thesis at USC. Nowadays, I supervise two PhD theses

Teaching:
2016-2018: 144 hours of lectures at USC

Outreach:
02/2009-05/2009: Lecturer at Stages for high school students. Silicon Drift Detectors and Silicon Photomultipliers: different applications of Silicon detectors for the construction of an experiment

Other merits:
Reserve list in Proyectos de I+D+i para jóvenes investigadores sin vinculación o con vinculación temporal 2015

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Turno de acceso general

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Título:

Micofluidics for Biological Physics

Resumen de la Memoria:

My research has focused on the physical properties of soft systems such as vesicles, particles, capsules, drops and bubbles, as these are the properties that control fundamental aspects of the behavior of such systems and their utility in many industrial applications. To fabricate these systems in a very controlled fashion, I use the microfluidic technology that I developed as a postdoctoral researcher at Harvard University. This technology will provide the research group that I am starting to nucleate at Universidad Politecnica of Madrid with very controlled model systems to study the physical principles that govern biological membrane-based systems. I have a solid academic education on Physics (Licenciada en Fisica, UCM. 2010) and on Physical Chemistry (Licenciada en Quimica, UCM, 2004) and a Ph.D. on the Physics of biological membranes (European Ph.D, 2010). I did my Ph.D. studies in the group of Prof. Monroy (Complutense University of Madrid, UCM) on the mechanics of model biomembranes. During that period I did many research stays including the Fresnel Institut (Marseille, Prof. Mangoteau), the Center for biomembrane physics (University of Southern Denmark, Prof. Bagatolli), the Technical University of Berlin (Prof. Hellweg), and perform neutron and synchrotron measurements at several European facilities. This research was productive (9 papers including 1 PRL, 2 Biophys. J., 2 PRE, etc; 5 papers as first author). After my Ph.D. (2010, cum laude), I joined the group of Prof. Langevin (Laboratoire de Physique des Solides, Universite Paris sud), where I contributed to the understanding of the glass transition at reduced dimensions and was introduced to the physics of foams. That was extremely productive (10 papers including 1 PRL, 5 of them as first author and the last one as corresponding author). After that, I was awarded with the Burgen Scholar Award from Academia Europaea that recognizes emerging talents and potential leaders in their fields. I then joined the group of Prof. Weitz (Department of Physics and School of Engineering and Applied Sciences, Harvard University) for a second postdoc (4 years), where I received training on microfluidic technologies and contributed to the development of novel microfluidic methods for materials production, specially in the field of lipid membranes, publishing 9 papers (including 1 PNAS, 1 Small, 6 Lab Chip, etc), 5 of them as first author. Using the returning phase of the prestigiuos Marie Curie International Outgoing Fellowship I came back to Europe, where I continued my research on Sot Matter Physics funded later by Juan de la Cierva Incorporation program. Very recently, I joined Universidad Politecnica of Madrid as an Assistant Professor and started to nucleate a research group that will focus on Microfluidics for Biological Physics in the short-term, including three parallel axes: experimental physics, membrane-based biology, and microfluidic technologies.
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Resumen del Currículum Vitae:

During my research career, I have published 33 papers in peer-reviewed journals (including 1 PNAS, 2PRL, 1 Small, 6 Lab Chip, etc.), 17 as first and/or corresponding author, and a book chapter. My papers have received more than 850 citations. I have an h-index of 20 (Google Scholar). I am the inventor of a system and method for producing double emulsions with relatively thin shells, an invention patented and later sold and transferred to the President and Fellows of Harvard College. I have contributed to more tan 20 national or international conferences. I am transferring microfluidic technologies from USA to Europe, in particular to Spain. An important feature of my research career is that I have been self-funded during most of it. I was first awarded with a predoctoral fellowship from UCM, and later with a predoctoral fellowship from Comunidad de Madrid, which gave me the opportunity to fund my research in two different foreign laboratories for three months each. As a postdoc, I was awarded with the Fellowship for Recent Doctors from Real Colegio Complutense at Harvard, the Marie Curie Outgoing Fellowship from the European Council and the Juan de la Cierva Incorporation Fellowship from MINECO. In addition, I was funded by Humboldt Universitat zu Berlin for two different predoctoral stays in the lab of Prof. Hellweg, appointed at Universite Paris Sud funded by a project from the European Space Agency awarded to Prof. Langevin and appointed at Harvard University funded by a project from the National Science Fundation awarded to Prof. Weitz, during the predoctoral stays and postdoctoral periods that were not covered by the mentioned Fellowships. Another important feature of my career is its international character. I spent more than 8 months in foreign laboratories during my predoctoral period, 16 months as a first postdoc in France, in the Laboratoire de Physique des Solides (Universite Paris Sud, Orsay) and 4 years as a second postdoc at Harvard University (Massachusetts, USA). This international career has provided me with an extensive network of collaborators that extends over the world. I have participated as an invited speaker in several occasions. In addition, I serve as a Referee for several journals including Proc. Natl. Acad. Sci., Soft Matter, Langmuir, Chemistry and Physics of Lipids, Adv. Colloid Interface Sci., RSC Advances, Microfluidics and Nanofluidics, Physical Chemistry Chemical Physics and Nanoscale. Furthermore, I have been the Editor of a Special Issue to tribute Prof. Langevin at the occasion of her 70th Birthday, together with Prof. Monroy and Prof. Hellweg. I am also a member of the organizing comitee of 12th EBSA 2019, a conference that will be held in Madrid together with the 10th ICBP-IUPAP Congress this year. I have taught 123.5 hours of both theoretical and practical courses at different levels, Bachelor and Master, and for students of different backgrounds, including Physics, Biochemistry, Chemistry, Industrial and Chemical Engineering, and Education. I have supervised several Bachelor and Master thesis and I am the co-

director of two ongoing Ph.D thesis. Currently, I am an Assistant Profesor at Universidad Politecnica of Madrid starting to nucleate a research group that will focus on "Microfluidics for Biological Physics".

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AGENCIA ESTATAL DE INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2018

Turno de acceso general

Nombre: DE MARCO , BARBARA
Referencia: RYC2018-025950-I
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Título:

A X-ray spectral-timing view of the accreted and ejected gas in active galactic nuclei and X-ray binaries

Resumen de la Memoria:

My research interests revolve around the physics of accreting black holes (BH). My main analysis approach focuses on combining the X-ray spectral and timing information to single out radiation produced at different distances from the BH, down to the event horizon. This innovative approach allowed me to achieve several important and widely recognized results, and to become a leader in the field. My most influential works are in the field of X-ray reverberation, the study of the time-delayed response of the accretion disc after illumination of the variable primary X-ray source. I searched for the X-ray reverberation signal in both extragalactic (active galactic nuclei, AGN, ultraluminous X-ray sources, ULX) and galactic (BH X-ray binaries, BHXRB) sources, to constrain the geometry of the accreted gas.

I reported new detections in all of those objects, demonstrating that X-ray reverberation techniques can be applied to different kinds of systems, thus significantly contributing to popularize this analysis approach within different communities. Notably, X-ray reverberation is now among the main focuses of the major future X-ray missions (eXTP, ATHENA, STROBE-X), in most of which Spain is greatly involved.

Through these studies I demonstrated, in a model-independent way, that the X-ray source is compact and the disc extends close to the BH last stable orbit in radio-quiet AGN. In the field of X-ray reverberation this publication has, after the discovery paper, the highest citation rate.
I was the first to use X-ray reverberation to map the evolution of disc geometry in transient BHXRB, and detected the first FeK line reverberation lag in one of them. These achievements earned me recognition within the two, quite disconnected, AGN and BHXRB communities, and allowed me to significantly contribute in the sharing of knowledge between these two communities.

During my career I also carried out several studies aimed at probing the dynamics of the accreted and ejected gas in BH-accreting systems by using X-ray variability as a diagnostic. These include: probing orbital motions of the accreted gas in AGN; investigating the X-ray flaring activity from the supermassive BH in the Galactic Center; constraining the accretion state of binary systems hosting a neutron star (NS) or a BH; inferring the mass of the compact object in one ULX; investigating the structure and distance of the ejected outflowing gas in AGN during transient obscuration events.

I am part of numerous international collaborations, which tackle outstanding issues related to both accretion and ejection phenomena in AGN and galactic X-ray binaries.

The focuses of my current and future research are to use X-ray spectral-timing methods to:
study the geometry of the inflowing matter in different classes of accreting BH systems; map the evolution of accretion flow geometry in BHXRB throughout an entire outburst (by exploiting the wealth of new X-ray data collected by NICER and ASTROSAT); study the coupling between the variability properties of the accretion flow and the jet in BH-accreting systems; develop theoretical spectral-timing models to explain the data; investigate how these behaviours extend to different classes of AGN and NS systems in different accretion states; study winds in AGN and X-ray binaries, to characterize their properties as a function of the state of the source.
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Resumen del Currículum Vitae:

I obtained my Ph.D. in Astrophysics in October 2009 at the International School for Advanced Studies SISSA-ISAS (Trieste, Italy).

I spent 7 years as a post-doctoral fellow in European institutions: Universita' degli studi di Bologna and INAF-IASF Bologna in Italy (Dec 2009-Nov 2011), Centro de Astrobiología INTA-CSIC in Madrid (Feb 2012-Dec 2012), Max Planck Institute for Extraterrestrial Physics in Garching bei München, Germany (March 2013-January 2017).

Since February 2017 I cover a non-permanent position of assistant professor at N. Copernicus Astronomical Center of the Polish Academy of Sciences (CAMK). I obtained fundings of the Marie Skłodowska-Curie COFUND grant Polonez which supported my research activity during the past 2 years. Last year I obtained a Marie Skłodowska-Curie Individual Fellowship, which will start in February 2019.

My publication record comprises a total of 64 scientific contributions, which include 57 refereed papers (+2 under review) in international

high impact factor journals (Science, Nature, MNRAS, A&A, A&ARv, ApJ, AN), 4 published papers in support of X-ray missions (2 for ATHENA, 1 for eXTP, and 1 for LOFT) and 1 paper in support of ATHENA and STROBE-X submitted to Astro 2020 Decadal Survey. I am lead-author of 10 refereed papers (which include 1 invited review paper currently in press), and author of the chapter "Variability-selected AGN" included in the refereed review paper "Active Galactic Nuclei: what's in a name? (Padovani et al. 2017).
My papers have collected a total of 1185 citations (h-index=17), of which 348 to papers as first author and as author of chapters of review papers (source: SAO/NASA ADS as of 2019 Jan 28). The interest of the scientific community in my research is highly reflected in the large number of invitations as a speaker (mostly as a review speaker) at international conferences and institutions (a total of 45 invitations). My most cited paper currently scores, in the field of X-ray reverberation, the highest rate (21.2) of citations per year after the discovery paper (with 33 citations/year).

In the past years my line of research allowed me to obtain three Marie Skłodowska-Curie COFUND fellowships in different countries (Polonez in Poland and AtroFIt2 1st and 2nd calls in Italy) and one Marie Skłodowska-Curie Individual Fellowship in Poland. In 2017 I received the Marie Skłodowska-Curie Actions Seal of Excellence for high quality project proposals in a highly competitive evaluation process.

I built a wide network of international collaborations (including several in Spain) which earned me participation in several intriguing discoveries, some published in Science and Nature. In the past two years at CAMK I have been able to build a small group which includes 3 Ph.D. students and 2 post docs.

I am part of the consortia supporting ATHENA, eXTP, and THESEUS missions, participating in a total of 3 working groups. In particular, for the ATHENA working group "The close environments of supermassive black holes" (chairs prof. G. Matt, dr. G. Miniutti and dr. M. Dovciak) I provide scientific support to the Study Team on the science objective AGN reverberation mapping .

Since 2013 I am reviewer for the journals ApJ, MNRAS, and A&A. In 2017 I have been an independent reviewer for the British Royal Society University Research Fellowship (URF) Renewal Scheme .