MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **VAZQUEZ ACOSTA, MONICA**
Referencia: RYC-2013-14660
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: monicava@mail.cern.ch

Título:

Estudio del Boson de Higgs en el LHC

Resumen de la Memoria:

Un gran número de resultados experimentales en el campo de la Física de altas energías han confirmado la validez del modelo teórico de las interacciones fundamentales, el Modelo Estándar. Estos resultados incluyen las medidas que realicé durante mi tesis en el experimento ZEUS (HERA) sobre las propiedades de chorros hadrónicos ("jets") en colisiones profundamente inelásticas y la extracción de la constante de las interacciones nucleares fuertes, que es uno de los parámetros fundamentales del Modelo Estándar.

A pesar de este increíble éxito del Modelo Estándar, algunas incógnitas permanecían sin resolverse como el origen de la masa de las partículas fundamentales, que es uno de las principales líneas de investigación en el Gran Colisionador de Hadrones (LHC). En el Modelo Estándar hay una partícula, el bosón de Higgs, que es responsable de dar masa a todas las partículas con masa. En los últimos 8 años de mi carrera, he coordinado con éxito los equipos que prepararon el descubrimiento del bosón de Higgs en el Experimento CMS en el LHC. He dirigido el grupo estudiando la desintegración del Higgs a leptones de tipo tau, que es uno de los 5 canales principales de desintegración. He encontrado evidencia de que el bosón de Higgs se desintegra en leptones tau y que es consistente con los resultados en otros canales. También he buscado bosones de Higgs en el contexto de otras teorías alternativas, como las extensiones supersimétricas del Modelo Estándar.

La búsqueda de nuevos fenómenos físicos más allá del Modelo Estándar en el LHC y la medida de las propiedades del bosón de Higgs son los grandes retos a los que se enfrenta el campo experimental de altas energías en los próximos años.

Resumen del Currículum Vitae:

Soy doctora en Física Teórica y Doctora Europea por la Universidad Autónoma de Madrid con calificación Sobresaliente Cum Laude (por unanimidad).

Soy autora de 566 artículos en revistas ciéntificas en el campo de la Física de altas energías.

Destaca el artículo publicado con los resultados de mi tesis sobre el estudio de chorros hadrónicos en colisiones profundamente inelásticas en el Experimento ZEUS (HERA): "Jet production in charged current deep inelastic e+p scattering", Eur. Phys. J. 31 " 149 (2003). También es de gran importancia para el campo de la Física mi reciente descubrimiento del Bosón de Higgs desintegrándose en leptones de tipo tau y que han sido incluidos en el artículo "Evidence for the 125 GeV Higgs boson decaying to tau leptons" CERN-PH-EP-2014-001 (submitted to JHEP).

Otras publicaciones de gran relevancia en mi carrera ciéntifica han sido incluídas en mi Currículum Vitae.

He dado 12 charlas en conferencias internaciones líderes en el campo de altas energías. Destacan los dos seminarios plenarios sobre los resultado del Bosón de Higgs en congresos internacionales en Liverpool y Chicago en representación de los dos principales experimentos del LHC: ATLAS y CMS. También he dado el seminario en el CERN donde se presentó por primera vez la evidencia de la desintegración del bosón de Higgs a leptones de tipo tau.

Durante mi trayectoria profesional he trabajado para instituciones de renombre internacional: NIKHEF (Instituto Nacional de Física Subatómica de Holanda) y el CERN (Centro Europeo de Investigación Nuclear, Ginebra). Mi trabajo para el CERN fue financiado con una de las prestigiosas becas: "CERN Research Fellow". Actualmente trabajo para la Universidad Imperial College London que es una institución líder en campo de la investigacíon a nivel mundial. Mi trabajo en el CERN es financiado por la Agencia Estatal "Science and Technology Facilities Council" del Reino Unido. A parte de mis investigaciones ciéntificas en el campo del bosón de Higgs, también doy cursos de doctorado en la Universidad y superviso a estudiantes de doctorado en su tesis.

En el experimento CMS he desarrollado diversos cargos de gran importancia. Destaca mi trabajo como coordinadora del grupo de Física con leptones de tipo tau, que ha sido uno de los grandes artífices del reciente descubrimiento del bosón de Higgs en el canal de taus. He organizado grupos de trabajo en el campo del trigger o la física de chorros hadrónicos (jets) entre otros, con reconocido éxito. También he

sido "Reviewer" de la revista ciéntifica Physics Letters B.

Tengo una capacidad demostrada para liderar grandes grupos de investigación en un contexto global y multinacional, gracias a mis capacidades ciéntificas y de comunicación. Este contrato de investigación me permitirá desarrollar un plan de investigación con un impacto a nivel internacional en el campo de la Física.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **TORTOLA BAIXAULI, MARIA AMPARO**
Referencia: RYC-2013-12438
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: mariam@ific.uv.es

Título:

Massive neutrinos: flavor oscillations and other phenomenological implications

Resumen de la Memoria:

Neutrino physics has experienced a revolution in the last decade. Experiments observing neutrinos produced inside the Sun, in the Earth atmosphere, in nuclear power plants, and in particle accelerators have finally established the existence of neutrino oscillations, a quantum effect that occurs when neutrinos have a mass. In the Standard Model of elementary particles neutrinos are massless. Hence, the discovery of neutrino oscillations has far-reaching consequences, since it is the first evidence for physics beyond the Standard Model and requires an extension of the model, leaving several open questions: What is the origin of neutrino mass? Why it is so small? Is lepton number conserved? Can we understand from first principles the observed pattern of neutrino mixings, so different from the one that characterizes quarks? Furthermore, neutrino oscillations have important astrophysical and cosmological implications since neutrinos provide an important probe of the interior of stars and the early Universe.

During my scientific career I have worked on several research lines that cover different theoretical and phenomenological aspects of neutrino physics. My main activity has been focused on the simulation of the neutrino signal in underground detectors and the statistical analysis of the experimental data from solar, atmospheric, accelerator and reactor neutrino experiments. My work on global analyses of neutrino oscillation data is documented by a significant number of well-recognized papers, which made a notable contribution to the recent research activity in neutrino physics. Apart from the standard global analyses of neutrino oscillations I have also studied the phenomenology of neutrino experiments in non-standard scenarios with the presence of light sterile neutrinos, non-standard interactions or neutrino magnetic moments, among others. Furthermore, I have also worked on more theoretical aspects of neutrino physics, analyzing the properties of several neutrino mass models in the context of Grand Unified Theories, supersymmetry or discrete flavour symmetries as well as their cosmological implications for leptogenesis and dark matter. In the more general context of Astroparticle Physics I have also experience in the study of the origin and propagation of ultra-high energy cosmic rays.

Resumen del Currículum Vitae:

EDUCATION My Physics degree in Valencia (Valencia University Special Award, 2000) came just after the historic discovery of neutrino oscillations in 1998. Since then a revolution started in the field to which I have contributed significantly. So far the neutrino sector provides the clearest indication for new physics, and hence constitutes a most vibrant particle physics research branch. My PhD work was performed at IFIC-CSIC/UV with a FPU fellowship under the supervision of Prof. JWF Valle. My PhD Thesis won the UV's Special Award in 2007, as well as the accreditation of European Doctorate. From 2/2006 to 8/2008 I worked at IST (Lisbon), with a Marie Curie postdoctoral contract. Next I joined Hamburg University, with a German-funded contract till 12/2009, when I returned to IFIC, within the JAE-Doc CSIC Program.

RESEARCH: My main activity has been on phenomenological aspects of neutrino physics, where I produced oscillation data analyses which have had a major impact world-wide. In addition to standard oscillation analyses, I have also investigated non-standard interactions and neutrino magnetic moments within various particle physics models, such as high & low-scale seesaw and supersymmetry. I have investigated the important issue of robustness of the neutrino oscillation parameter determination with respect to solar physics uncertainties such as from possible density fluctuations deep inside the Sun. I considered the most relevant experimental setups, and for this reason I have taken active part for example in collective studies such as the ISS report. My skills have been applied to treat a wide variety of data from all the leading experiments, with a special care in combining complementary data sets. Thanks to this we now have a clear picture of the neutrino world, except for the CP violation and the nature of the spectrum. My work is well recognized the particle physics community and won the RSEF/BBVA prize for Young Researchers in 2009. Elucidating the above open issues constitutes a major challenge for the next generation of oscillation and (double) beta decay studies. I have also worked on neutrino theory topics such as models for neutrino masses and their cosmological implications in leptogenesis & dark matter. I have also papers on the origin and propagation of ultra-high energy cosmic rays and neutrino geotomography.

PROJECTS: I have by now participated in many national & international projects, such as Marie Curie Training Networks or Bilateral Agreements and currently I have active collaborations with several EU institutes.

PUBLICATIONS: In addition to my 29 articles in high-impact peer-reviewed journals, including 3 invited reviews, I have 15 Conference Proceedings reports. Altogether my papers obtained more than 3500 citations in the INSPIRE database used in the particle physics community (2218 in WOS) and two of them with 853 and 576 citations constitute standard references in the neutrino community.

CONFERENCES: I presented results in 24 of the ~35 international meetings I have attended. I have co-organized 2 international conferences and given talks at several universities & research institutes. At present I belong to the Editorial Board of ISRN High Energy Physics Journal and act as regular referee for the top journals in my field: Phys. Rev. D, Phys. Lett. B, JCAP and Reports on Progress in Physics, among others. I co-supervise the PhD theses of D.V. Forero & F.J. Escrihuela.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **AGUDO RODRIGUEZ, JUAN IVAN**
Referencia: RYC-2013-14511
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: agudo@jive.nl

Título:

High Energy Astrophysics of Relativistic Jets in the Environment of Supermassive Black Holes

Resumen de la Memoria:

The most luminous long-lived sources of radiation in the cosmos – active galactic nuclei (AGN) - are powered by gas falling from an accretion disk into a super-massive black hole (SMBH, ~10^8 M_Sun) at their center. Among the most exotic AGN are blazars, a class defined by wild variability of flux of non-thermal radiation from radio to gamma-ray frequencies produced in their highly relativistic (superluminal), and extremely variable jets. I have accumulated vast experience on the study of some of the most relevant problems in this field, on which I have contributed with a good number of publications that had a relevant impact (as demonstrated by the large number of citations and other medibles). My six more-cited first-author papers on the field accumulate 332 cites; the first three with 94, 90 (in 3 years) and 52 (in 2.5 years) cites, respectively.

I have accumulated vast expertise on both theoretical and observational methods to interpret the behavior of AGN jets. However, my main specialty lies on (polarimetric and total flux) radio and millimeter observations, both single dish and interferometric. I have demonstrated skills to compete as PI for observing time on ambitious astrophysical projects in first line astronomical facilities, and to manage small groups of collaborations on them (e.g. at Calar Alto, IRAM-30m-Telescope, Very Long Baseline Array, Global Millimeter VLBI Array, Swift, ALMA, and European VLBI Network, where I accumulate several hundreds of observing hours; in most of them). Some of these research projects are the main subject of the two PhD projects and Master Thesis that I currently supervise (or have already superived) at the IAA-CSIC since 2010 and 2011, which points out my ability to coordinate a group of young researchers.

During the development of my career I have also acquired experience on the management of R&D funding projects for both the organization of international scientific meetings and visit exchanges, and for actual research projects. This allowed me to gain experience both, on the preparation of successful proposals, and on the economic and scientific management of funded projects. In particular, I am principal investigator and coordinator of a NASA-Fermi Guest Investigator research project and of other 5 funding projects for conferences and visit exchange programs, 3 of the latter with funding from outside Spain, which provides an idea about my independence as researcher. Moreover, I have also been reviewer of the NASA Postdoctoral Program, the Shota Rustaveli National Science Foundation, and I have been member of two PhD. committees, and referee for ApJ, ApJS, MNRAS, A&A, and IJMP. All this, together with my membership on 4 LOCs of international conferences (SOC in two of them), are signs of the international relevance and prestige of my research. An additional assessment of my international recognition as independent researcher comes from my appointment as member of the Square Kilometer Array (SKA) Cosmic-Magnetism Science-Working-Group that aids the SKA International Organization on the assessment of the SKA Baseline Design, as well as from the large number of citations of some of my most relevant publications, the 5 invited talks that I have given in international conferences, and the 8 seminars (5 of them by invitation) that I gave in different international research institutes.

Resumen del Currículum Vitae:

PhD. in Physics (Astrophysics) in December 2002 by the University of Granada.

About 10 years of experience as postdoctoral and senior researcher. Senior Support Scientist at the Joint Institute for VLBI in Europe (JIVE) for 6 months now. Representative of JIVE as member of the Square Kilometer Array (SKA) Cosmic-Magnetism Science-Working-Group (that aids the SKA Organization on the assessment of the specifications for the SKA Baseline Design) and on the European-VLBI-Network Calibration Technical-Operation-Group. Senior Postdoctoral Researcher (JA Excellence Fellow) at the IAA-CSIC for 2.5 years (2010-2012.5, plus other earlier postdoctoral stay from 2007 to 2010), where I supervise two PhDs. and I have supervised 3 Master Thesis. Research Associate during 2010 at the Institute for Astrophysical Research (IAR) of the Boston University, where I still hold a Visiting Researcher appointment, in the Group of Blazar Research led by Prof. Marscher (current Director of the IAR). During another postdoctoral stay in Germany (3 years and 7 months at the Max-Planck-Institut für Radioastronomie, MPIfR, 2003-2007), in the VLBI Group of the MPIfR led by Prof. Zensus, I held a Max Planck Fellowship and a Marie Curie Fellowship by the European Commission through a FP6 Training Network, of which I was member for >3 years.

Currently, I lead several large observing programs for the study, with multi-spectral-range photo-polarimetry, of bright gamma-ray blazars with the Calar Alto 2.2m Telescope, the IRAM 30m Millimeter Radiotelescope, the European VLBI Network, and the Very Long Baseline Array in the USA. I keep international collaborations for the study of blazars at virtually all available spectral ranges with more that 10

teams in 7 countries in Europe and America. I present 125 scientific publications that accumulate 2073 citations (according to the NASA Astrophysical Data System) and give a h-index=28. Among these, 70 of them were refereed (15 of them as first author), and 58 of them were published in journals on the top 25% in Astronomy & Astrophysics (12 of them as first author). These 12 first author publications accumulate 365 citations (including Agudo et al. [2001] with 94 cites and Agudo et al. [2011a,b] with 89 and 51 cites, respectively). I presented my work in 41 international meetings and conferences that I attended. Among my publications, there are also 7 general outreach publications (including 2 popularization web pages at the NRAO site), and two press releases (covered by tens of different international media) from some of my scientific results. Among my 33 (8) oral (poster) contributions at international meetings, I have given 5 invited talks. I have also given 8 seminars at 5 different research institutes.

I am principal investigator and coordinator of a NASA-Fermi Guest Investigator research project and of other 5 funding projects for conferences and visit exchange programs, 3 of the latter with funding from outside Spain. I have been reviewer of the NASA Postdoctoral Program, the Shota Rustaveli National Science Foundation, and I have been member of two PhD. committees, and referee for ApJ, ApJS, MNRAS, A&A, and IJMP. Member of the Local Organizing Committee of 4 international conferences, and Scientific Organizing Committee member of 2 of them.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **LUGARO , MARIA ANNA**
Referencia: RYC-2013-12778
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: maria.lugaro@monash.edu

Título:

Giant stars as drivers of cosmic chemistry

Resumen de la Memoria:

My research investigates stars like the Sun but of old age, when they expand to giant proportions and end their lives being eroded by strong, dusty winds. I research the role of these stars in the Universe as the cosmic nuclear reactors that create the abundances of many of the elements heavier than iron in the universe and have calculated a large number of the currently available model predictions of the slow neutron-capture reactions that produce the elements up to lead in these stars. I have used these results to address debated questions related to the composition of the oldest stars and stellar clusters in our Galaxy. I also investigate giant stars as the dust factories that produce a large fraction of cosmic dust. Some of this dust travelled to the location where the Solar System formed, was preserved inside meteorites, and is now recovered from primitive meteorites and analysed in laboratory. I have exploited meteoritic stardust to constrain many of the current major uncertainties in our understanding of stellar evolution and nuclear reactions inside stars and to understand the evolution of our Milky Way galaxy and dust formation processes around stars. Another strength of my research lies in collaborating with nuclear physicists to better understand nuclear properties, test experimental and theoretical evaluations of nuclear reaction rates together with their uncertainties, and pinpoint nuclear inputs that have a significant impact on the stellar model results and on their interpretations in relation to observational constraints. Finally, my work involves modeling the production of radioactive nuclei in stars, which is required to improve our understanding of the radioactive memory of planetary systems and its effect on their evolution.

Resumen del Currículum Vitae:

I started my academic career at the University of Torino (Italy) in 1995, and given my final degree mark (110/110 cum laude) as well as my coauthorship in several publications of the Torino group I was awarded a scholarship by the Australian Overseas Postgraduate Research Scheme to move to Monash University and study for my PhD under the supervision of Prof John Lattanzio. After obtaining my PhD in 2001 I started working on fully independent research programs, supported by research positions and prestigious grants involving international collaborations with colleagues from several different countries. I was first at the Institute of Astronomy in Cambridge (UK), where I held a postdoctoral fellowship for three years. In 2005, I moved to Utrecht (Holland) to take up a VENI grant from The Netherlands Organisation for Scientific research. I returned to Australia at the end of 2008 with a 5-years research grant from Monash University, which was followed in 2010 by a prestigious Australian Research Council "Future Fellowship" and a continuing position as a Senior Lecturer. Overall, I have published more than 100 works, including 49 fully refereed papers on high-impact journals and have a total of more than 2500 citations to my work with an h-index of 25 (as of January 2014). International, interdisciplinary collaborations are an integral part of my research and I have published with colleagues from many different institutions in several countries. Furthermore, I am well-known in the community for having been the Chair of the organising committee of the 12th conferences in the series on "Nuclei in the Cosmos" (August 2012), the premier gathering in the field of Nuclear Astrophysics. I had three major interruptions in my academic career related to the birth of my 4 children in 2002, 2005, and twins in 2009.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **MASSIGNAN , PIETRO**
Referencia: RYC-2013-14311
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: pietro.massignan@gmail.com

Título:

Strongly-interacting Quantum Mixtures, and Stochastic Models for Classical/Quantum Systems

Resumen de la Memoria:

I am a theoretical condensed matter physicist with a broad spectrum of activities, dealing with a variety of problems at the intersection of ultracold quantum gases, atomic physics, quantum simulation and dynamics of stochastic systems.

My career followed a markedly international path from its very start, as I have been pursuing research in five different european institutes, each of those ranking amongst the most recognized in its own country in the fields of quantum physics and quantum optics.

I am currently employed as a senior post-Doctoral Research Fellow, with tasks ranging from pure research to grant acquisition and managing. I particularly enjoy the stimulating and motivating contact with students. I have acquired a valuable teaching experience, going from tutoring and lecturing bachelor, master and graduate students, to supervising PhD candidates. Moreover, I have been involved in various outreach activities, such as organizing physics exhibitions and summer camps, and writing a general public review.

In the course of my career I worked on a broad range of topics in the theory of ultracold gases and quantum engineering of novel states of matter, attacking problems from both the few- and the many-body sides. My research aims at understanding, proposing and realizing strongly-interacting and topological phases, exploring applications in quantum simulation and high-resolution metrology. In parallel, I am investigating stochastic systems, with a particular focus to applications in quantum Brownian motion and biological compounds.

My lines of research activity may be grouped under the following headers:

i) Strongly-interacting quantum mixtures
- quasiparticle properties of impurities and itinerant ferromagnetism in ultracold Fermi and Bose gases
- BEC-to-BCS crossover, radiofrequency spectra and collective oscillations

ii) Topological excitations and artificial gauge fields for ultracold atoms
- Majorana fermions in Bose-Fermi mixtures, p-wave superfluids, and two-component Fermi gases
- synthetic gauge fields, fractal spectra ("Hofstadter butterfly") and edge states for atoms in "D+1 dimensions" (where D is the spatial dimension, and the spin states of the multi-component quantum gas are coupled sequentially to yield an additional degree of freedom)

iii) Few-body physics
- multi-channel model for three-body (Efimov) states
- long-lived Efimov states under strong confinement (from continuous to discrete scaling symmetry)

iv) Confinement-induced resonances, Anderson localization, and dirty bosons on a lattice
- proposal for inducing strong disorder for neutral trapped atoms
- analysis of confinement-induced resonances in mixed-dimensional systems (i.e., two component systems where only one species is deeply trapped)
- phase diagram of weakly-interacting Bose gases in optical lattices with onsite disorder

v) Stochastic models for quantum random walks, and transport and self-organization in biological systems
- development of a class of models describing Brownian motion in an inhomogeneous background; the resulting dynamics displays sub-diffusion, aging, and non-ergodicity
- analysis of experimental single-particle trajectories of biological compounds on cellular membranes in terms of stochastic sub-diffusive models; characterization of the explored space
- Brownian motion in quantum mixtures, and quantum random walks

Resumen del Currículum Vitae:

I obtained my Master "cum laude" in Theoretical Physics in 2002 from the Univ. of Milan, with a Thesis on theory of Bose-Einstein

Condensation developed at the European Laboratory for Non-linear Spectroscopy (LENS) in Florence. At LENS I continued researching under a European grant, while completing my first paper.

I left Florence for Denmark in 2003, as I obtained a PhD grant from the Niels Bohr Institute (NBI) of Copenhagen to continue my studies on quantum gases. Within my PhD, I spent nine months at Ecole Normale Superieure (ENS) in Paris. I completed my PhD studies at NBI in exactly three years, with the final grade of "Excellent".

After graduation, I worked under a two-year grant as a PostDoc at the Institute for Theoretical Physics in Utrecht, applying many-body diagrammatic techniques to strongly-interacting Fermi gases and Efimov physics. During this period I returned to Paris, where I worked as an ENS PostDoc while attending an "International Trimester".

Between Oct.2008 and Dec.2010 I worked as a PostDoctoral Research Fellow in a collaboration between the Inst. of Photonic Sciences (ICFO, Barcelona) and Univ. Autonoma de Barcelona (UAB). Since 2011 I moved full-time to ICFO, where I work on unitary Fermi gases, exotic (higher partial waves) superfluids, Efimov physics, disordered interacting gases, topological systems and synthetic gauge fields. At ICFO I also study stochastic models of anomalous transport and (fractal) self-organization in biological systems.

I am currently author of 24 works (including 1 invited review) published in peer-reviewed journals such as Nature, Rep. Prog. Phys., Phys. Rev. Lett., New J. of Phys., and Europhys. Lett. among others. I appear on my papers mostly as first or last author, usually with one or two co-authors at max., totaling 371 citations to date, with less than 8% self-citations, and with an h-index of 12 (source: ISI-Web of Science, Feb. 2014). Google scholar, which includes citations from arXiv manuscripts, today reports instead 539 citations and an h-index of 13. On the side, I have written a large public outreach review on Quantum Technologies and Society.

I have given 26 invited talks at international conferences in world-wide recognized physics centers (ITAMP-Harvard, Aspen Center for Theor. Physics, KITP-Santa Barbara, Aarhus Institute for Advanced Studies, and IHP-Paris between others). I am presently referee of the European Commission (FP7 and CoFund calls), and of 7 international physics journals.

I have been co-supervising one PhD students, I am presently co-supervising two more, and I tutored other three. I taught various courses, including Atom Optics at a "Joint Master in Photonics" (UPC-UB-UAB-ICFO), Electromagnetism (bachelors), Solid State Physics (masters), and Experimental Physics.

I am actively participating in several collaborations with experimental groups in Innsbruck (Grimm, Ferlaino), NIST (Spielman), Florence (Inguscio), Paris (Salomon), Hamburg (Sengstock), Amsterdam (Schreck), and ICFO (Tarruell, Garcia-Parajo). On the theoretical side, I am collaborating with physicists in Cambridge (Levinsen), London (Parish), Paris (Castin, Sanchez-Palencia, Chevy), Beijing (Yu), Aarhus (Bruun), Tucson (Wehr), Darmstadt (Birkl), Trento (Recati), Bangalore (Shenoy), Southampton (Lobo), Vilnius (Juzeliunas), Bruxelles (Goldman), and Copenhagen (Pethick).

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **OLMO ALBA, GONZALO**
Referencia: RYC-2013-13019
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: gonzalo.olmo@csic.es

Título:

Limits of General Relativity

Resumen de la Memoria:

My research activity so far has focused on the study of new physics beyond the limits of classical General Relativity in both classical and quantum scenarios, and in regimes where theoretical arguments or observations suggest that new physics should be playing a relevant role. This broad field includes quantum phenomena in black hole space-times and cosmology, as well as the study of modified theories of gravity with astrophysical and cosmological applications.

I have contributed to the understanding of quantum radiation problems in curved backgrounds (cosmology and black hole space-times) developing an approach in terms of correlation functions which allows to exploit the underlying symmetries of the system under study and offers an alternative to the standard formalism of Bogolubov coefficients. This approach has been particularly useful in the analysis of the so-called trans-Planckian problem, which can be treated as a short-distance problem in position space rather than as a high-energy problem in momentum space. It has also been used to show that the full spectrum of thermal radiation of scalar particles by rotating (Kerr) black holes can be explicitly derived on the basis of a conformal symmetry arising in the wave equation near the horizon.

I have applied methods of renormalization of quantum fields in curved spaces to study physical properties of matter fields and gravitational waves in inflationary scenarios. The underlying idea is that expectation values of quantum operators associated to cosmological observables in the semiclassical approach exhibit a divergent behavior at coincident points when a position space representation is used. This forces the use of renormalization methods in curved space-time to consistently remove the infinities and obtain finite quantities which can be interpreted as valid physical observables. This procedure has a non-trivial impact on the definition of the primordial power spectra for scalar and tensorial perturbations. A related essay on this topic was awarded 4th Prize by the Gravity Research Foundation in 2009.

I am author of a number of works on extended theories of gravity (3 papers with 100+ and 3 with 50+ citations in SPIRES) with applications to the cosmic speed-up problem and quantum gravity phenomenology. I have studied the weak-field limit of various theories proposed to address the cosmic speed-up problem, stellar structure and other astrophysical questions, and have worked out some gravitational alternatives to the dark matter/energy paradigm. My most recent works deal with quantum corrections to the internal structure of black holes, having found that singularities can be replaced by wormholes, which turns black holes into solitonic objects and allows for non-singular and horizonless black hole remnants. This might have relevant implications for cosmology and quantum information, and provides new phenomenology for black holes in particle accelerators.

I have active collaborations with researchers in Spain, Portugal, Italy, Belgium, UK, Germany, Norway, Israel, Mexico, Brazil, and the USA. I am the Principal Investigator of an i-LINK project of CSIC and have won a "Special Visiting Researcher" contract (aimed at senior researchers with recognized international leadership) to carry out a 3-year research project with the Universidade Federal da Paraíba (Brazil).

Resumen del Currículum Vitae:

Licenciado en Físicas (U. de Valencia, 1996-2001) con media de 9.05/10 tras superar 321 créditos de 300 exigidos. Doctorado (U. de Valencia, 07/2005) con Sobresaliente Cum Laude y Premio Extraordinario de Doctorado. Mi tesis versaba sobre correlaciones cuánticas, agujeros negros y cosmología. Mi doctorado y 3 estancias predoctorales (total 12'5 meses) que realicé en la Univ. of Wisconsin-Milwaukee (UWM, USA) fueron financiados por el Gobierno de Valencia. De 2005 a 2007 tuve un contrato postdoctoral con Leonard Parker, director del "Leonard Parker Center for Gravitation, Cosmology, and Astrophysics" de la UWM y pionero en el estudio de la teoría cuántica de campos en espacios curvos. Continué mi formación postdoctoral en Perimeter Institute (Canadá) con financiación del MEC (2007-2008) y regresé a España con un contrato Juan de la Cierva en el Inst. de Estructura de la Materia – CSIC. En Junio de 2010 me trasladé al Inst. de Física Corpuscular–CSIC (Valencia) con financiación del CPAN, donde actualmente soy contratado JAE-doc.
He publicado 19 "proceedings" de conferencias, 2 capítulos de libros, y 52 artículos (9 como autor único) en revistas internacionales de alto impacto con más de 1100 citas en SPIRES (h-index=17). Cuento con 6 publicaciones en Phys.Rev. Letters y en 2 de ellas soy autor único. En 2009 obtuve el 4º premio de la Gravity Research Foundation por el ensayo "Inflation, Quantum Fields, and CMB Anisotropies". Mis trabajos sobre gravedad modificada han sido pioneros y han tenido un gran impacto: 3 artículos con 100+ citas y 3 con 50+ citas en SPIRES. Estos trabajos son considerados referencias fundamentales en el tratamiento post-Newtoniamo de teorías de gravedad modificada y en el

formalismo métrico-afín (Palatini), el cual es particularmente apropiado para describir fenomenología de gravedad cuántica. Por mis contribuciones y experiencia en estos temas, fui invitado a escribir un "Invited Review" titulado "Palatini approach to modified gravity: f(R) theories and beyond", IJMPD20 (2011)413, un artículo en la sección "Expert Opinion" de Annalen der Physik (AdP 524 (2012) 87-88), y a ser editor del libro "Open Questions in Cosmology" de InTech Publishers (2012).

Mantengo colaboraciones activas con investigadores en Alemania, Bélgica, Brasil, España, Israel, Italia, México, Noruega, Portugal, Reino Unido y USA. Colaboro como "referee" con múltiples revistas científicas internacionales, habiéndo sido nombrado "Outstanding Referee" por la American Physical Society (2014). He actuado como evaluador para el FNRS de Bélgica (2010, 2012, 2013). He impartido seminarios técnicos y coloquios divulgativos en centros de investigación de excelencia americanos, europeos y españoles, así como cursos especializados de doctorado en universidades españolas (Granada, Valencia y Valladolid), americanas (UWM en USA y UNAM en México) y europeas (Salerno en Italia y Graz en Austria). Actualmente soy director de dos tesis doctorales y 3 tesis de Máster en la Universidad de Valencia y he dirigido dos tesis de máster y un trabajo de grado. Mi investigación está financiada por el CSIC mediante un contrato JAE-doc y un proyecto i-LINK, del que soy investigador principal, y por el gobierno de Brasil mediante un contrato del programa "Pesquisador Visitante Especial" para atraer investigadores senior con reconocido liderazgo internacional.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **DIAZ BLANCO, CRISTINA**
Referencia: RYC-2013-14586
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: cristina.diaz@uam.es

Título:

Surface dynamics: Dynamics of elementary processes relevant to heterogeneous catalysis

Resumen de la Memoria:

Reactions of molecules with metal surfaces are of tremendous importance, since the production of most synthetic chemical compounds involves heterogeneous catalysis by a metal surface. A detailed description of the sequence of elementary molecule-surface reactions by which vast quantities of chemical products are produced is crucial to improve the catalytic reactions involved in chemical industrial processes. Interactions of atoms and molecules with semiconductor surface, such as Si(111), also present a great practical importance, for example, organic-terminated Si surfaces exhibit high oxidative electrochemical stability for applications, such as photoelectrodes in electro-chemical cells and biosensing electronic. A complete description of these interactions is basic to propose new "organic terminations" with higher oxidative stability. Also practical importance present molecular superstructures and self-assembly on metals and graphene adsorbed on metal. These new materials are attracting much attention due to their potential applications in microelectronic, sensing and graphene-based spintronic. Once again, a detailed description of the interactions between the organic molecule and the surface is on the bases of the development of these materials.

To tackle the description of these primary physical mechanisms, we propose to develop a general method to build potential energy surfaces (PESs), describing the electronic structure of molecule/surface systems, including the full-dimensionality of the problem, i. e., including the motion of the surface atoms (phonons). This new interpolation method, based on the so-called Shepard method, will be useful to build PESs based on both standard density functional theory (DFT) and its van der Waals versions. In order to carry out dynamics on these complex systems, beyond classical dynamics or low dimensional time-dependent wave packet (TDWP) dynamics, we will adapt the multiconfiguration time-dependent Hartree (MCTD) code. These theoretical tools will be used to study a wide variety of systems such as, CH3-Si(111), H2/LiF(001), H2/(2x1)H-Pd(110), O2/CuRu(0001), He,Ne,Ar/metal surfaces and TCNQ,F4TCNQ/Graphene/Ir(111).

Resumen del Currículum Vitae:

Cristina Díaz obtained her bachelor degree in physics at the Universidad Autónoma de Madrid (UAM) in 1999. That year she started her scientific career, at the department of Chemistry (UAM), and in July 2001 she obtained her M.Sc. thesis degree with a project entitled "The role of dynamics correlation in double ionization of He by high-energy protons and antiprotons". In 2001 she was granted with an FPU (Formación del Profesorado Universitario) fellowship awarded by the MECD (Spain), starting her Ph.D under the supervision of Prof. Fernando Martín (UAM) and Prof. Antoine Salin (Université Bordeaux I). In September 2004 she obtained her Ph.D. in Chemistry (Sobresaliente Cum laude, Ph.D award and mention of European Ph.D.) by the Universities Autónoma de Madrid and Bordeaux I, with a work entitled " Molecular scattering by metal surfaces: H2/Pd(111) y H2/Pd(110)". In December 2004 she was hired by the Leiden Institute of Chemistry (LIC), Leiden University (The Netherlands), within the framework of the research training network (RTN) "Predicting Catalysis" No. HPRN.CT-2002-00170 funded by the European Commission. At the LIC she worked in the group of Prof. Geert-Jan Kroes. In April 2006 she obtained a FPI (Formación del Personal Investigador) postdoctoral fellowship funded by the MECD (Spain), to continue her work at LIC (Leiden University). In February 2008 she was granted with a Juan de la Cierva research fellow, funded by the MICINN (Spain), and since November 2009 she junior assistant professor (profesor ayudante doctor) at the UAM, ending her contract in October 2014. During her scientific career, she has been involved in 13 national and European research projects, including a COST action, a RTN and an ERC advance grant. Her scientific work has yielded 46 peer-reviewed publications, 42 of them in indexed international journals (research ID: D-4532-2012), including: 1 Science, 1 Nature Physics, 1 PNAS, 1 ACS Nano and 5 Phys, Rev. Lett.. 28 of this peer-reviewed papers have been published during the last five years. In 18 of her publications she is the first author, including a Science paper, and in 12 of them she is the corresponding author, including 2 Phys Rev. Lett.. According to the ISI web of knowledge (Google Scholar) her papers have being cites 489 (636) times, her h-index is 13 (15) and her i10-index is 18 (22). The results she has obtained during her research activity have been presented in numerous national and international workshops and conferences, including 5 oral contributions and 13 invited talks. She has also been invited to be discussion leader at the GRC (Gordon Research Conference) on Dynamics at Surface in 2009, and at the workshop "Dynamical Phenomena at Surfaces" in 2012. Beyond her research activity she has supervised 1 Ph.D. Thesis, defended in October 2013, and 1 M. Sc. thesis, defended in July 2012. And she is currently supervising 1 Ph.D. student and 2 M.Sc. students. She has also supervised several final course projects. Beyond her research activity she have also been involved in teaching activities, in both theoretical and laboratory courses. In 2008 she obtained the ACAP accreditation to become assistant professor (Contratado doctor).

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

Nombre: **NOVELLA GARIJO, PAU**
Referencia: RYC-2013-13028
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: pau.novella@in2p3.fr

Título:

Física Experimental de Neutrinos: Oscillationes y Desintegracion Doble-Beta

Resumen de la Memoria:

Mi linea de investigación se ha centrado en la física experimental de neutrinos. En particular, he trabajado en experimentos y proyectos cuyo objetivo es aportar conocimiento sobre las propiedades básicas de los neutrinos. Dichos experimentos pueden ser divididos en dos categorías: oscilaciones y búsqueda del proceso de desintegración doble beta sin emisión de neutrinos (bb0nu). Mientras que de la oscilación de neutrinos se concluye que son partículas masivas que se propagan bajo distintas mezclas de sabor leptónico, la eventual observación del proceso bb0nu probaría que los neutrinos son partículas de Majorana (equivalente a sus antipartículas).

Comencé mi trayectoria investigadora en 2003, al obtener financiación del programa de Formación de Personal Investigador (FPI) para realizar mi tesis doctoral en el grupo experimental de neutrinos del IFIC. Tras unos primeros estudios de diseño del experimento de T2K, me uní a la colaboración HARP (CERN) para trabajar en la medida de secciones eficaces de producción hadrónica de gran importancia para diversos experimentos de oscilaciones, en particular K2K y MiniBooNE. Posteriormente me uní a K2K con el objetivo de calcular y reducir los errores sistemáticos en el análisis de oscilaciones atmosféricas gracias a los datos de HARP. En 2005, K2K publicó la primera medida de la oscilación de neutrinos mediante un haz generado con un acelerador, confirmando así la naturaleza masiva de estas partículas. Tras este análisis, pasé a trabar en los experimentos de búsqueda del proceso bb0n NEMO (análisis de datos) y SuperNEMO (diseño y optimización). En 2008, resumí todos los resultados de mis estudios en mi tesis doctoral por la Universidad de Valencia: "Experimental Studies of Neutrino Nature: from K2K to SuperNEMO".

En 2008 obtuve mi primer contrato post-doctoral en el CIEMAT, donde me incorporé a las colaboraciones NEXT (bb0nu) y Double Chooz (oscilación de neutrinos generados en reactores nucleares). Dentro de la colaboración NEXT, coordiné los grupos de trabajo de física y software con el objetivo de optimizar el diseño del experimento y calcular su sensibilidad a la desintegración bb0n. Paralelamente, trabajé en la operación, toma de datos y análisis de oscilaciones en Double Chooz, que finalmente publicó en 2011 la primera indicación del oscilaciones en el llamado sector de interferencia por medio de neutrinos de reactores. En 2012, obtuve un contrato Marie Curie IEF de la Comisión Europea para continuar con mi trabajo en Double Chooz, trasladándome al instituto APC (CNRS-U.Paris7, Francia). Actualmente me encuentro finalizando el proyecto de física presentado a la Comisión Europea, consistente en preparar la segunda fase del experimento Double Chooz (operación de un segundo detector) y en desarrollar nuevos análisis de oscilación con los datos obtenidos hasta la fecha.

Resumen del Currículum Vitae:

Realicé mi doctorado en el IFIC con la financiación del programa FPI, trabajando la oscilación de neutrinos de aceleradores y la búsqueda de la desintegración doble beta sin neutrinos (bb0nu). En particular, formé parte de las colaboraciones HARP, K2K, NEMO y SuperNEMO, desarrollando mi trabajo en diversos centros de investigación: IFIC (España), CERN (Suiza) y KEK (Japón).. Comencé 2008 un post-doc en el CIEMAT (España) para trabajar en los experimentos Double Chooz (oscilación de neutrinos generados en reactores nucleares) y NEXT (búsqueda del proceso bb0nu). Desde 2012, disfruto de un contrato Marie Curie IEF (Comisión Europea) en el laboratorio APC (CNRS, Francia), donde desarrollo análisis de oscilaciones en Double Chooz. Además de la investigación, he desarrollado actividad docente en la Universidad de Valencia y he participado en actividades de difusión científica.

Dentro del campo de las oscilaciones de neutrinos, he trabajado en la medida de los parámetros de oscilación en los llamados sectores atmosféricos y de interferencia. He contribuido a diversos proyectos de oscilación de neutrinos generados con aceleradores: 1) diseñando o proponiendo futuros experimentos (T2K, SciBooNE, HERO); 2) midiendo secciones eficaces de producción hadrónica (HARP); 3) midiendo la oscilación en el sector atmosférico (K2K). En particular, los resultados obtenidos en K2K han sido de gran impacto, al haber proporcionado la primera confirmación de la oscilación de neutrinos mediante aceleradores. Por otra parte, he contribuido a la medida del ángulo de mezcla responsable de la oscilación en el sector de interferencia (theta13) en el experimento Double Chooz. Dicha medida es de gran importancia dado que confirma la oscilación de neutrinos en un escenario de tres sabores y abre la posibilidad de medir la violación de CP con leptones. En particular, he participado en la primera indicación de un valor no nulo de theta13 usando reactores nucleares, la primera medida analizando el espectro energético de los neutrinos, y la primera medida independiente de los ruidos de fondo.

En el campo de la búsqueda del proceso bb0nu, he trabajado en los experimentos internacionales NEMO-3, SuperNEMO y NEXT. El análisis

de los datos de NEMO ha conducido a la observación y medida de la desintegración con neutrinos (bb2nu) en varios isótopos, y a algunos de los mejores límites al proceso bb0nu. Tras mi contribución a NEMO-3, he trabajado en el diseño y optimización de su evolución natural (SuperNEMO), fijando parámetros básicos y los limites de radiopureza del futuro detector. Por otra parte, he he participado activamente en el diseño y caso de física del experimento NEXT. He dirigido durante la primera fase del proyecto los grupos de Física y Software de la colaboración, contribuyendo así a la Letter of Intent del experimento, que ha sido aprobado por el comité científico del LSC.

Además de los resultados científicos relacionados con los citados experimentos (publicados en diversas revistas), he asistido regularmente a conferencias de ámbito internacional (TAUP, ICHEP, Rencontres de Moriond, Neutrino, LowNu) con el objetivo de presentar mis resultados. Así mismo, he sido invitado a dar varios seminarios y presentaciones sobre oscilación de neutrinos en diversos centros de investigación (Roma-Tre, IFAE, KEK, J-PARC) y conferencias (BLV, IMFP).

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **GARCIA HERNANDEZ, DOMINGO ANIBAL**
Referencia: RYC-2013-14182
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: agarcia@iac.es

Título:

Nucleosynthesis and molecular processes in the late stages of stellar evolution

Resumen de la Memoria:

Most of the stars (M < 8 solar masses) in the Universe end their lives with a phase of strong mass loss and experience thermal pulses on the Asymptotic Giant Branch (AGB), just before they form Planetary Nebulae (PNe), being one of the main contributors to the gas and dust enrichment of the interstellar medium (ISM). More specifically, the more massive AGB stars form very different isotopes (such as 87Rb, 7Li, 14N) from the isotopes formed by lower mass AGB stars and Supernova explosions, as a consequence of different dominant nuclear reaction mechanisms. Stars evolving from the AGB phase to the PN stage also form complex organic molecules (such as polycyciclic aromatic hydrocarbons (PAHs), fullerenes, and graphene) and inorganic solid-state compounds. The ~100-10,000 years of evolution following the end of the AGB phase represents a most fascinating laboratory for Astrochemistry. More specifically I am interested in: i) the nucleosynthesis of light elements and heavy neutron-rich elements in the more massive AGB stars and how they contribute to the progressive enrichment of the ISM, where new stars and planets are born, and to the chemical evolution of galaxies; ii) the understanding of the formation process of fullerene and graphene structures in space to unveil key unsolved problems in Astrophysics and Astrochemistry with important implications for the enrichment of the early Solar System and on the origin of life on Earth (e.g., fullerenes have been found in meteorites carrying extraterrestial gases). My recent findings in the latter field have opened up a new field of interdisciplinary research, crossing the boundaries between astronomers, chemists, and physicists, to unveil the role of fullerene and graphene structures in circumstellar/interstellar Chemistry and Physics with potential applications in technology research and industry. The wide expertise that I have acquired during my scientific trajectory (IAC->ESA->W.J. McDonald Observatory-USA->IAC) and that defines my main line of research has permitted me to collaborate with word-leading scientists and participate in several national and international research projects, thus building a large world-wide network of collaborations (Europe, USA, Canada, Australia, India). Especially relevant is my participation in the next Sloan-IV collaboration, which dramatically increases my science potential for the upcoming years. Motivated by my recent findings in my research field, I propose to address fundamental and unsolved questions about nucleosynthesis in massive AGB stars as well as the formation pathways of organic and inorganic compounds in space, by combining a variety of observational, theoretical and laboratory data. In particular, I will examine the s-process and hot bottom burning chemical patterns in massive AGBs by applying, for the first time, more realistic atmosphere models, and then extend the study to stars in Local Group galaxies. Finally, I intend to investigate whether the formation mechanism of fullerenes and graphene structures is related to the decomposition of hydrogenated amorphous carbon (HAC), with the ultimate goal of clarifying the role of fullerenes and fullerene-analogues in circumstellar/interstellar Chemistry and Physics as well as their possible connection to the long-standing astronomical problem of identifying the diffuse interstellar band carriers.

Resumen del Currículum Vitae:

CURRENT SITUATION: Postdoctoral Fellowship position at the Instituto de Astrofísica de Canarias (IAC). MAIN RESEARCH LINE: My research focuses on the nucleosynthesis and molecular processes in the late stages of stellar evolution and how they contribute to the progressive enrichment of the ISM and to the chemical evolution of galaxies. SCIENTIFIC TRAJECTORY: Degree in Astrophysics at the University of La Laguna (ULL) (1999). Resident Astrophysicist Position at IAC (1999-2004; Dr. A. Manchado) to carry out my PhD on the study of the transition phase between AGB stars and PNe. PhD in Astrophysics at ULL. Research Fellow Position at the European Space Agency (ESA, 2004-2006; Dr. P. García-Lario). Postdoctoral Fellowship at the W. J. McDonald Observatory, The Universtiy of Texas at Austin (2006-2007; Prof. D. L. Lambert). Support Astronomer position at the IAC (2007-2009). Postdoctoral Juan de La Cierva Position at IAC (2009-2012). REFEREED PUBLICATIONS AND ORAL CONTRIBUTIONS: 50 publications in high impact refereed journals accumulating more than 1054 citations (present H-index=18) and including 19 articles as first author (one paper in Science, 5 Letters in ApJ and 2 Letters in A&A) and 11 as second author (including one paper in M&PS and a Letter in A&A). Referee for high impact astronomical journals like PNAS, ApJ, A&A, MNRAS, AJ, and for observing proposals of large-telescopes such as Gemini South. My work has been also presented in 20 contributed talks in international conferences. A clear indication of the impact my research has had in my field is the fact that I have been invited to give reviews on "Molecular Processes from the AGB to the PN stage" and on "Carbon-rich Materials in Space" at the most important conferences as well as to give seminars and colloquia at several national and international research centres. PARTICIPATION IN RESEARCH PROJECTS AND COLLABORATIONS: My scientific trajectory has allowed me to build up a large world-wide network of collaborations (Europe, USA, Australia, India). Co-investigator (co-I) of several research projects funded by the Spanish Ministry of Science and Innovation and a multi-disciplinary international project funded by the Australian Research Council. Participation in large national and international collaborations such as HORUS/GranTeCan, Sloan III/APOGEE, and Sloan IV/APOGEE-2. USE OF OBSERVING FACILITIES: Extensive experience in spectroscopy/imaging, both observational (> 200 nights) and with the data reduction/analysis from the optical to the infrared both from

ground (e.g., ESO-VLT/UVES; WHT/LIRIS, ESO-VLT/ISAAC) and space observatories (e.g., HST, Spitzer, AKARI, Herschel). PI and co-I of many successful observing proposals at several telescopes with very different instrumentation around the world (ESO-VLT/UVES-CRIRES-ISAAC, 2.7m Harlan J. Smith/CDES, TNG/SARG-NICS, Gemini-S/PHOENIX, 9.2m HET/HRS, etc.). In addition, co-I of 4 Spitzer programs, 3 AKARI proposals (PI in one of them), and PI of two Herschel proposals. OUTREACH ACTIVITIES: Participation in the book "Astronomía Made in Spain" as one of the Spanish astronomers that has published as first author in the journals Science or Nature. Press releases, articles in newspapers and magazines around the world, and radio interviews about my work. NASA press releases and articles in national and international media about my Spitzer works.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

Nombre: **BROOK , CHRIS**
Referencia: RYC-2013-12784
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: cbabrook@gmail.com

Título:

Galaxy Formation in a Cosmological Context

Resumen de la Memoria:

My expertise is in modelling the physical processes of galaxy formation within a cosmological context, and using the outputs of such models to interpret observations and enhance our understanding of galaxy formation and cosmology. I highlight important studies in which I was a major driver of the concepts and analysis, reflected in the fact that I am lead or second author.

• Proposed a new mechanism for thick disk formation
I proposed that gas rich mergers in the early Universe were the primary process in forming thick discs (Brook et al. 2004; 05; 12). This scenario continues to gain strength as observations become more detailed (e.g. Sales et al. 2009; Sun Lee et al. 2011; Wilson et al 2011; Liu & van de Ven 2012; Minchev et al. 2014).

• Predicted the distribution of 1st/2nd generation stars within the Milky Way
We derive the z=0 distribution in the Milky Way of primordial stars (Brook et al. 2007, see also Scannapieco, Kawata, Brook et al. 2006). We show that 1st and 2nd generation stars are distributed throughout the halo region, even though the very oldest stars are in the bulge.

• The first to form bulgeless disc galaxies in cosmological simulations.
In a paper published in Nature, we showed that the formation of a bulge component is not
an inevitable consequence of hierarchical growth, which characterizes cold dark matter
structure formation (Governato, Brook et al. 2010). Richard Bower (University of Durham, UK) considers the research as •one of the best papers I have ever seen•.

• Provided a solution to the •Angular Momentum Problem•.
We show that large scale outflows of low angular momentum gas are crucial in forming disc galaxies which have no bulge component (Brook et al. 2011, see also Brook et al. 2012), reconciling the distributions of angular momentum in discs with that of their host dark matter halos. The paper has been described as •seminal• (Kroupa et al. 2012).

• First to match a range of scaling relations with simulated galaxies
We used the same physical model over a mass range that includes the vast majority of disc galaxies to match relations between luminosity, rotation velocity, size, colour, star
formation rate, HI mass, baryonic mass, and metallicity (Brook et al. 2012b).

• Showed the importance of early feedback from massive stars.
We show that feedback from massive stars prior to supernova explosions is important
in regulating star formation and forming disc galaxies that match a range of properties at high and low redshift (Stinson, Brook et al. 2013; Obreja, Brook et al. 2014).

• Cusps and Cores: Mass dependent Dark Matter Density Profiles
In Di Cintio, Brook et al 2014a,b, where I supervised a UAM PhD student, we propose that dark matter density profiles are affected by baryons in a manner which is systematically dependant on mass; we provide a mass dependant density profile for dark matter halos.

• Local Group Dwarfs
I have recently published an ApJLetter (Brook et al. 2014) in which we determine the slope of the stellar-to-halo mass relation for Local Group dwarf galaxies.

I aim to continue to create state of the art simulations of galaxy formation in order to provide an interpretive framework for observations of galaxy evolution. This work will enhance the efforts of Spanish researchers in their quest to unravel the formation and evolution of galaxies.

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Resumen del Currículum Vitae:

I graduated with a PhD from Swinburne University in October 2004. I spent the next four years as a post-doctoral fellow, firstly at Laval University and then at the University of Washington. I was involved in significant amounts of teaching and outreach activities during these positions, as well as publishing research papers.

I spent the next 3 years at the University of Central Lancashire as a research associate under an STFC grant. I lectured at 1st year level, and worked closely with post-graduate students, in a supervisory role.

I am now at the Universidad Autonoma de Madrid, where I teach Galaxy Formation in the Masters course, and supervise Masters students, and help to supervise PhD students.

Throughout this time, I have continued to pursue cutting edge research. My publication record and citations compare favourably on an international scale with researchers with similar experience. Since 2003, I have

- published 54 papers in high profile refereed journals (16 first author, 11 second author, only one paper lower than sixth author).
- my work has been cited more than 2300 times, first author papers cited over 650 times.
- my h-index is 25, at a rate of 2.4/year .
- in each of the past 2 years, my work has been cited more than 600 times.

I have increasingly taken leadership roles in building research programs, and building and enhancing international collaborations. I am co-PI of the Making Galaxies in a Cosmological Context (MaGICC) project, which has involved 35 researchers working in 5 different countries, including 7 students. The MaGICC project has resulted in 24 refereed papers since 2012, in total the papers have already cited more than 350 times. 7 MaGICC papers have been written by students as the first author.

My scientific leadership in my field of galaxy formation and evolution within a cosmological context is also reflected in the fact that I am regularly invited to speak at major international conferences; I have been an invited speaker at 6 international conferences over the past 3 years.

I have integrated within the Spanish astronomical community over the past 2 years, during which time I have published 9 papers which were co-authored by UAM researchers and students. These collaborations will continue to strengthen in the next years.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **VALERIANI , CHANTAL**
Referencia: RYC-2013-12729
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: cvaleriani@quim.ucm.es

Título:

Ordered and disordered assembly of equilibrium and non-equilibrium systems studied via computer simulations

Resumen de la Memoria:

My research interests encompass Soft Condensed Matter and Physical Chemistry studied by means of computer simulations. I have worked on an unusually broad variety of problems ranging from phase transitions, nucleation and aggregation; colloidal glasses; ionic suspensions; active matter; rare-events and free-energies related numerical techniques to anomalous properties of water. I have always been embedded in multidisciplinary environments (from Theoretical Physics, to Biology and Chemistry) in close contacts with experimentalists.
The research groups where I worked are all worldwide recognized Soft and Condensed Matter groups, such as the one of Prof.Sciortino (h-index=62) at the University La Sapienza in Rome where I did my Master project, the one of Prof.Frenkel (h-index=72) at AMOLF (Amsterdam) where I did my PhD, the one of Prof.Dijkstra (h-index=37) and Prof.van Blaaderen (h-index=48) (Utrecht), and the one of Prof. Cates (h-index=66), Poon (h-index=43) and Pusey (h-index=52) (Edinburgh), where I got acquainted with experiments, and the one of Prof. Vega (h-index=38) and Abascal (h-index=29) (Madrid) where I am a Juan de la Cierva and Marie Curie Career Integration Fellow.

My main research lines are: 1) crystallization of ionic and covalent systems and bubble nucleation; 2) novel simulation techniques; 3) devitrification(crystallisation of a glass); 4) self-assembly of active colloids and 5) ice nucleation and anomalous behaviour of metastable water.

1)During my Phd I studied crystallization in ionic, covalent and simple fluids. My most relevant works were the study of crystal nucleation from molten Sodium Chloride (cited 61 times) and of diamond nucleation (a Physical Review Letters, special mention by the Editor, chosen as a cover of the issue, that received the attention of popular Science Journals such as the "New Scientist").

2)Throughout my PhD and postdoctoral research, I was always interested in developing novel simulation techniques to better study the Physics questions I was tackling. These techniques range from studying low-density ionic suspensions or very concentrated colloidal glasses, to simulating rare-events (cited 52 times).

3) In Edinburgh, I investigated crystallization from out-of-equilibrium colloidal glasses, describing the competition between particles' size-polydispersity and crystallization (a Physical Review Letters, cited 72 times) and unraveling the mechanism of crystal formation from an unaged glass (Physical Review Letter) and from an aged one (P.N.A.S., chosen as an article of the PNAS First blog).

4) In Edinburgh, I also studied aggregation of attractive active colloids of different shapes (elongated bacteria in a polymer suspension (P.N.A.S, highlight of Nature Materials and Nature Physics) and spherical attractive colloids (Physical Review Letters, special mention by the Editor and chosen as a Focus article)) to study the assembly of active colloids into functional micro-objects.

5) In Madrid, I worked on metastable water: either its phase transitions to vapor (cavitation) or ice (crystallization) or its anomalous behaviour when doubly metastable (supercooled/negative pressure). This led to a publication in J.A.C.S.

Thanks to my internationally recognized experience in Soft and Condensed Matter Physics, I have built an international (European/American/Australian) scientific network.

Resumen del Currículum Vitae:

My ability to produce innovative research has put me in a position of developing highly competitive work.
As a result of 1 year Master project at the Univ.Rome, 5 years PhD research at AMOLF (Amsterdam), three-months PostDoctoral experience at the Univ.Utrecht, three years and four months at the Univ.Edinburgh (two of them as a PI of a Marie Curie Intra-European Fellowship) and two years and nine months in Madrid as a Juan de la Cierva Fellow (two of them also as a PI of a Marie Curie Career Integration Grant), I have published 33 papers in high impact Physics, Physical Chemistry and Soft Matter journals such as 2 P.N.A.S (one research highlight in Nature Materials and Nature Physics, and one chosen for the PNAS First blog), 1 J.A.C.S (spotlight of the issue) and 7 Physical Review Letters (one special mention by the Editor, cover of the journal and mentioned in the "New Scientist" and one special mention by the Editor and chosen as a Focus article). In every research group I published papers in high impact journals.

Despite my early career stage, I already have a track record in obtaining funds as a Principal Investigator. I was awarded the prestigious and competitive individual Marie Curie Intra-European Fellowship (as a PI) (2008, Univ.Edinburgh) and the individual Marie Curie Carreer Integration Grant (as a PI) (2011, Univ.Complutense Madrid), that gave me the independence to pursue my own research and start leading my own group. During my research experience, I was also a member of International (Dutch, British), National (Spanish) and European (two ITN networks) research projects.

Nowadays, I am internationally recognised by the scientific community as an expert in computer simulations of Soft Condensed Matter Physics.
I gave oral presentations at 26 international conferences/workshops. The most prestigious ones have been: the "Gordon Conference on Thin Films and Crystal Growth Mechanisms", USA (2007); the "Stat-Phys 23 conference", Genova (2007); the "IDMRCS conference" (Barcelona, 2013); the "International Soft Matter conference" (Rome, 2013);
the "Active Processes in Living and Nonliving Matter" (KITP, Santa Barbara USA, 2014), the "WATER 2014" (Les Houches, 2014) and the "Liquid Matter Conference" (Lisbon, 2014) as a keynote speaker.
Moreover, I was invited to give seminars about my research at several Universities, such as the Institute for High Pressure Physics in Moscow in 2005, the University of Mainz in 2008, the Oxford University and the Donosti International Physics Center in 2009, the University of Stuttgart, the University of Lyon and the University of Vienna in 2013.
I am the referee of several peer-reviewed Physics journals, such as Physical Review Letters, Journal of Chemical Physics, Journal of Physical Chemistry B, Soft Matter, Scientific Report, just to mention a few.
In these years, I have been teaching on a voluntary basis several courses in either Physics or Chemistry as an Assistant Professor in Amsterdam, Edinburgh and Madrid (given in English or Spanish). I have co-supervised 7 Master students and 1 PhD student (with Prof.Abascal, Univ.Complutense).
During my scientific career, I have taken courses on acquiring management skills and have always shown strong enthusiasm in joining and organizing scientific activities, such as the Open day (Amsterdam) and the Semana de la Ciencia (Madrid).

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **GERMANI , CRISTIANO**
Referencia: RYC-2013-14801
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: Cristiano.Germani@physik.uni-muenchen.de

Título:

The physics of strong equivalence principle violation

Resumen de la Memoria:

The expansion of our Universe is accelerating. This simple fact is one of the biggest unsolved problems in theoretical physics and its resolution will presumably deeply change our description of Nature.
Classically, the acceleration of the Universe can be easily obtained by considering a vacuum energy permeating the whole Universe, the simplest incarnation being the cosmological constant. A back-of-the-envelope calculation in standard quantum field theory naturally predicts a cosmological constant from the standard model of particle physics that is hugely bigger than the observed one. This is the cosmological constant problem.
Assuming that the quantum vacuum energy can be set to zero, still, one needs to answer the question of what is this mysterious negative pressure, dark energy (DE), which drives the Universe into an accelerated expansion.
A fascinating and very popular possibility is that DE is dynamical and arises from fields. However, this idea is still in need of a consistent realization as a quantum theory. Making a path towards such a realization is a key point of my proposal.
This question is very timely. Soon, the ESA Euclid satellite mission, where I am part of the theory division, is scheduled to be launched. In the next ten years Euclid will probe, with high precision, whether a cosmological constant or a dynamical DE drives our Universe. However, preparatory work is necessary in order to focus the experiment and the analysis of the outcome of the experiment, onto consistent DE models.
At the moment there is a huge proliferation of DE models and the observational tests of them is already an intense subject of research. The theoretical treatment of these models is, nevertheless, still only based on classical physics. In my proposal I aim to go beyond that, including a quantum analysis. This is necessary because most of these models suffer from fine-tuning similar to one appearing in the cosmological constant problem. Specifically, observations require them to mimic a very small and constant vacuum energy for a time comparable to the Hubble scale today (H0). If standard perturbative quantum field theory is applied, quantum corrections become generically important at the scale H0. This, completely spoils the classical analysis making those theories unpredictable at observed scales. For example, Euclid is looking for features of DE at scales that are significantly outside the naïve range of validity of the classical theory, about 3000 Mpc. This unpredictability, however, might just be an artifact of looking at the problem the wrong way, as I shall investigate. Indeed, in the context of inflation, specific theories sharing similarities with DE have already been argued, by my collaborators and I, to have a larger range of validity than the naïve expectations.

Resumen del Currículum Vitae:

My PhD was obtained at the University of Portsmouth (UK) in the institute of cosmology and gravitation in 2003. After that I have been granted a personal PPARC fellowship from the British government. This fellowship was to work three-years in the department of applied mathematics and theoretical physics (DAMTP) at the University of Cambridge (UK), in the Prof. Hawking group. After my PPARC fellowship I have been a research fellow at SISSA (Italy), for two years, a one year postdoc in the observatoire de Paris-Meudon and finally a 5-years research fellow at the Ludwig-Maximilians-Universitataet, in the group of Prof. Dvali, where I am still now. My papers are all in high impact journal, for example I have already four physical review letters. The total number of citations on my 39 papers is 1123 (source INSPIRES-HEP). Lately I have passed the national Italian habilitation for associate and full professor in theoretical physics and associate professor in astrophysics. Related to this, I have taught at undergraduate and graduate level and co-supervised a number of PhD students. Finally, I have been invited to present my work in many prestigious Universities and often my work has inspired new research directions.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **LLOSA LLACER, GABRIELA**
Referencia: RYC-2013-13899
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: gabriela.llosa@ific.uv.es

Título:

Development of detectors for medical imaging

Resumen de la Memoria:

In the initial stages of my career I have worked in detector development for particle physics with which I have achieved a deep training, and a global vision of the different detection techniques, types of existing detectors and most advanced research lines. Later on, I have focused my activities on instrumentation development for medical physics, where I have learned about different medical imaging techniques, in particular positron and single photon emission tomography (PET and SPECT) and Compton Imaging. I have wide expertise with different types of detectors, their operation mode and associated electronics, with particular emphasis in silicon detectors, scintillator crystals and different types of photodetectors. I have become one of the first experts in the world in the novel photodetectors known as Multicell Geiger-mode avalanche photodiodes, or silicon photomultipliers (SiPMs), and their application to different fields.

During my postdoctoral periods I have participated in a collaboration (DASIPM) for the application of SiPMs in medical imaging, calorimetry and astroparticle physics and I have closely participated in their development and application to PET systems.

In the last four years at IFIC I have initiated a new research line based on detector development with SiPMs within the IRIS group at IFIC-Valencia and I lead the activities related to detector development with SiPMs, being the Principal Investigator of two projects. I have started a new project, ASPID, financed with a Marie Curie European Reintegration Grant (ERG) to investigate the use of these photodetectors in PET and other medical applications. The project includes the test of SiPMs from different manufacturers, the use of new materials, novel geometries, and the investigation of the optimal readout electronics.

The ASPID project concerns the development of a small animal PET prototype scanner based on the use of continuous crystals as opposed to pixellated crystal arrays currently employed in conventional PET scanners. This frontier research, carried out by few groups in the world, aims at improving the spatial resolution without the reduction in efficiency inherent to pixellated crystals. I have led the development of a PET prototype based on continuous crystals and SiPMs that has achieved a spatial resolution better than 1 mm, the best in the world with continuous crystals.

My contribution has also been indispensable to initiate the ENVISION project. ENVISION is a European Commission (FP7) funded project for the monitoring of the dose administered to the patient in hadron (proton and heavy ion) therapy, in which the main European groups involved in hadron therapy applications participate. Hadron therapy allows to administer the radiation dose very precisely in the location area of the tumour, but it requires accurate methods for the precise verification of the dose administration. My experience in SiPMs and Compton Cameras is essential in the development of a Compton telescope for this purpose.

Mi main objective is to strengthen and consolidate the research line based on SiPMs, within the projects already established and of future projects.

Resumen del Currículum Vitae:

I have fifteen years experience in detector development. I started working in the construction of detectors for different particle physics experiments and specialized in detectors for medical imaging. I have always worked in the development of novel technologies and techniques at the frontiers of the state of the art.

During my predoctoral period I have worked in different experiments at Paul Scherrer Institut (Switzerland) and at IFIC, Valencia where I have contributed to the development of silicon detectors for different applications. I started with the construction of silicon detectors for the ATLAS SCT, and later on I worked on their application to Compton Cameras, with which I obtained my PhD in 2005.

From 2006 to 2009, I have carried out postdoctoral stays with INFN and Marie Curie EIF fellowships. I have become one of the first experts in the world on the novel photodetectors known as silicon photomultipliers (SiPMs) and their application to Positron Emission Tomography (PET). I am in close contact with the manufacturers and I am also acquainted with their application to different fields.

Since 2009 I have initiated a new research line at IFIC-Valencia for the development of medical imaging detectors based on SiPMs and I

lead the group activities concerning these developments. With the funds of a European Reintegration Grant I have started up a project for the development of a PET detector with continuous crystals coupled to SiPMs that has achieved world record spatial resolution with this type of detectors. I also work on the development of treatment monitoring devices for hadron therapy. I am the principal investigator of two projects related to these topics and I have participated in several European projects and collaborations.

My work is summarized in three book chapters, 41 articles in the main international journals in the field (14 as first author) and 58 publications in conference proceedings. I have also presented it in international congresses (43 presentations 26 talks including 5 invited talks).

I have carried out numerous stays in foreign centers and I have been awarded with prestigious national and international fellowships. I have supervised eight master theses and three PhD theses in course. I participate in the Masters of Medical Physics and Advanced Physics of the University of Valencia. I also contribute to dissemination activities through open doors days, articles, conferences and round tables.

I am well known in the field. I am a member of national and international committees and my work has beer recognized through awards and merits such as the IDEA award of the 'Fundación Ciudad de las Artes y las Ciencias' in 2011 or the selection to participate in the prestigious 62nd Lindau Nobel Laureate Meeting in 2012.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **GONZALEZ HERNANDEZ, JONAY ISAI**
Referencia: RYC-2013-14875
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: jonay@iac.es

Título:

Origin of compact objects and supernovae

Resumen de la Memoria:

During my career in Astrophysics, I have been dedicated to study the chemical composition of stars in different astronomical enviroments, to extract information on their properties, origin and evolution, using large 8-10m class telescopes equipped with high-resolution spectrographs.
My main research line is "The Origin of Compact Objects and Supernovae", and I have contributed with more than 10 publications as first author including high-impact results published as Letters in Nature, ApJ, and MNRAS and presented in international conferences. In total I have 67 papers in refereed journals, 21 as first author.
The main topics I have been investigating are:
(1) the characterization of secondary stars in X-ray binaries to uncover the origin of black holes and neutron stars and the properties of core-collapse supernovae;
(2) the evolution of short-period X-ray binaries, with a recent discovery of the fast orbital decays of black hole X-ray binaries, challenging the classical evolutionary scenario, maybe suggesting non-standard theories of gravity;
(3) the origin of Galactic historical thermonuclear Type-Ia SNe, with the discovery of companion of the white dwarf progenitor of Tycho's SN 1572, and the two white dwarf merger as the progenitor of the SN 1006, the brightest stellar event ever recorded in the Galaxy, that appear as the cover of 27th September 2012 issue of Nature.
As a complementary research lines I have been contributing to: (a) the understanding of Early epochs of Milky Way by analysing ancient metal-poor stars to unveil properties of the first generation of stars and SNe; (b) the properties of planetary systems extracted from detailed abundance patterns of metal-rich planet-host stars; and finally, I am involved in the developments of advanced instrumentation as the laser frequency comb attached to the high- resolution stable HARPS spectrograph and the high-resolution ultra-stable ESPRESSO spectrograph for the VLT, aiming at detecting Earth-like exoplanets.

Resumen del Currículum Vitae:

Mi CV se puede resumir en los siguientes puntos:
(1) Licenciado en Físicas, especialidad Astrofísica, por la Universidad de La Laguna (ULL) en Julio de 2001 con una nota media de 2.86 (sobre 4), realicé el programa de doctorado en la ULL. Presenté mi tesis doctoral, desarrollada en el Instituto de Astrofísica de Canarias (IAC), con un contrato de Astrofísico Residente, el 7 de Noviembre de 2006, sobre el estudio de la "Composición Química de Estrellas que orbitan alrededor de Agujeros Negros y Estrellas de Neutrones", con la nota de Sobresaliente Cum Laude, y una nota global en el expediente académico, incluyendo la licenciatura y el doctorado, de 2.91 (sobre 4).
(2) En mi primer contrato posdoctoral me trasladé a Meudon (Ile de France, Francia) para trabajar en el Observatoire de Paris-Meudon (OBSPM), como "Early Stage Researcher" en el "CIFIST Marie Curie Excellence Team" para desarrollar el proyecto "Cosmological Impact of the FIrst Stars (CIFIST)". En esta estancia posdoctoral, de 3 años y 8 meses, estuve involucrado principalmente en el análisis químico de estrellas pobres en metales, y la búsqueda de estrellas primigenias de la Vía Láctea con abundancias químicas primordiales. En esta etapa, establecí colaboraciones con distintos grupos internacionales en la caracterización de estrellas con exoplanetas, en la búsqueda de compañeras de los progenitores de supernovas de tipo Ia, y continué con mis investigaciones sobre sistemas binarios de rayos X.
(3) En Mayo de 2009 comencé mi segundo contrato posdoctoral, de 1 año, en el Departamento de Astrofísica de la Universidad Complutense de Madrid (UCM), en el estudio de abundancias químicas en grupos cinemáticos estelares.
(4) En Mayo de 2010 regresé al IAC para iniciar mi tercer contrato posdoctoral como investigador Juan de la Cierva del IAC, y además de continuar con anteriores proyectos de investigación me involucré en los proyectos instrumentales ESPRESSO/8m-VLT, "laser frequency comb" LFC-HARPS/3.5mLaSilla y CARMENES/3.5m-CalarAlto, y en los "survey" ESO-Gaia y SDSS-III. En la actualidad tengo un contrato posdoctoral Severo Ochoa en el IAC.
(5) Desde el año 2004, he publicado unos 67 artículos con árbitro de ámbito internacional (incluyendo revistas de impacto como Nature, ApJ Letters, MNRAS Letters, A&A Letters) de los cuales soy el primer autor en 21 artículos (1 Nature, 2 ApJ Letters, 1 MNRAS letters, 1 A&A Letters, 7 ApJ, 8 A&A, 1 AN).
(6) A lo largo de estos años, he impartido ponencias en 15 congresos de astronomía y astrofísica de carácter internacional (2 IAU Symposia), y he impartido 2 ponencias en dos congresos nacionales de la SEA, éstas en diversos campos de la astrofísica, incluyendo sistemas binarios de rayos-X y supernovas, estrellas pobres en metales y evolución química de la galaxia, la aplicación de modelos 3D de atmósferas estelares, y estrellas con exoplanetas.

(7) He sido investigador principal o colaborador en más de 50 propuestas aceptadas por comités nacionales e internacionales para telescopios de clase 2-10 metros.
(8) Tengo experiencia observacional en telescopios de gran diámetro y en tratamiento de datos espectróscopicos de alta resolución
(9) Desde hace unos años actúo como árbitro de las revistas internacionales A&A y ApJ
(10) Co-superviso en la actualidad la tesis de 4 doctorandos

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **GONZALEZ-NUEVO GONZALEZ, JOAQUIN**
Referencia: RYC-2013-13256
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: gnuevo@ifca.unican.es

Título:

Understanding galaxy formation and evolution through the study of gravitational lensing phenomena in the sub-mm band

Resumen de la Memoria:

Joaquin Gonzalez-Nuevo Gonzalez has always been a person with a wide range of interests and highly self-motivated. His research profile exemplifies these two characteristics: from only a single topic at the beginning of his PhD, he has continuously broadened his research interests, becoming a recognized expert at international level in several of them.

During his PhD, he developed a software able to simulated correlated sources in the sky. This software has become one of the main pieces of the Planck Sky Model and it is still used for current projects as JUBILEE simulations or cross-correlation analysis. At the same time he used such simulations to predict the statistical properties of the sources detected in the microwave/sub-mm band. On the one hand, he make accurate prediction of the radiosources behaviour at high frequencies (>30 GHz) that were then confirmed and extended by himself after the analysis of WMAP and Planck source catalogues and even at higher frequencies (>300 GHz), thanks to the analysis of the Herschel-ATLAS data. The PCCS, Planck catalogue of compact sources, whose production he coordinated, was produced using an improved version of the classical Mexican Hat wavelet proposed by himself. This new wavelet is currently one of the most used and robust algorithms for the production of point source catalogues in recent experiments.

On the other hand, such kind of simulations where used to study and predict the astrophysical and cosmological information achievable with large-scale sub-mm surveys like the Herschel-ATLAS. One of the most spectacular prediction that was confirmed with the first data set of the H-ATLAS project was the existence of strong gravitational lenses in the Far-Infrared band. This important result was published in Science and received a wide media coverage.

Recently, his scientific interest has been caught by the understanding of the formation and evolution of galaxies in the early Universe, best tackled in the IR wavelength regime, and the potential applications of gravitational lensing to address major astrophysical and cosmological issues. In the last couple of years he has became one of the leader of this new line of research and it constitutes the main topic of his current research activities. Only a few scientists are working on this subject in Spain.

Some of his most recent results are: the proposal of a new selection method that will mean the identification of more than 1000 strongly lensed galaxies in the sub-mm band; the detection of a highly significant cross-correlation signal induced by weak gravitational lensing between the Herschel and SDSS galaxies; or the constraint of the galaxy bias through the cross-correlation signal between the CMB Lensing potential and the high redshift Herschel galaxies. Combined together, these results will allow, during the following years, not only to gather valuable information about the galaxy formation and its evolution, but to follow the Dark Matter Halo properties at different epochs and, possibly, to extract independent constrains on some of the cosmological parameters through cosmography.

Resumen del Currículum Vitae:

Joaquin Gonzalez-Nuevo Gonzalez got his PhD in 2005 thanks to two different fellowships (an University of Oviedo and national FPU grants). He obtained a two-year post-doc position at SISSA (2005-2007), extended to a fixed-term research position (3+3 contract) until 2011. Since then, he works at IFCA under a JAE-DOC grant funded by the national CSIC.

During the last eight years he has been working mainly for the ESA Planck mission, where he has gained important responsibility roles. He is coordinator of the LFI core team area "Non-CMB science" and the project "Statistical properties and evolution of radio and submm sources ". He also led and coordinated the activities related with the production of three of the published Planck papers. Note that he is the only Planck Scientist that coordinated one paper in each of the Planck official releases. Moreover, he is the responsible for the production of the PCCS, one of the ESA Planck first official products delivered in early 2013, that were selected as one of the top 10 breakthroughs in physics in 2013, as judged by Physics World magazine. It should be stressed that it is not easy for such a young scientist to gain his high level of visibility and weight in such a big international collaboration.

Since 2008 he is also member of the Herschel-ATLAS collaboration, the largest open-time key project undertaken by Herschel. He participate in a "Science" paper (and its precursor works) that confirmed the existence of strong gravitational lenses in the Far-Infrared band. He proposed the novel HALOS method that will allow the identification of more than 1000 Strong Gravitational Lenses and

demonstrated the existence of a mesurable cross-correlation between high/low redshift galaxies due to weak lensing. Together, both results are opening a new era of lensing analysis with important applications for astrophysical and cosmological studies. Nowadays, he has also became a member of the QUIJOTE CMB experiment, the J-PAS survey, the JUBILEE project and the CoRE/PRISM proposals.

On the other hand, during his research career, he also participated in research teaching and in different outreach activities. His management skills have been expanded by supervising multiple students, organizing courses, seminars and conferences and collaborating as a reviewer for several international scientific journals. Moreover, in 2011 the applicant was the PI of a project (the "Young Researchers Grant" funded by SISSA) devoted to the study and development of the HALOS method. In 2012, he was also selected to represent the Spanish research in physics to the important and exclusive 62nd Lindau Laureates Meeting.

In summary, during his career he has published 93 scientific papers (plus 36 already submitted) in international reviewed journals, eight of which as the main author (plus one submitted). Among these there are 56 papers published outside the Planck Collaboration. According to the NASA ADS service these publications have received more than 6700 citations, 15 of them with more than 100 citations and one with >1000 citations. He has a H-index of 45 (26 without Planck Collaboration papers). Apart of several teaching activities, he has co-supervised five PhD students and followed many others in their research projects. Finally, he has participated in 6 national and 7 international research projects, one of them as PI.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **LAKADAMYALI , MELIKE**
Referencia: RYC-2013-13141
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: projects@icfo.es

Título:

Advanced fluorescence imaging and biophysics

Resumen de la Memoria:

I started my scientific career at a young age, during my undergraduate studies at the University of Texas at Austin. My undergraduate thesis provided a direct observation of a mechanochemical signal transduction pathway in neuronal growth cones (Biophysical Journal, 2009) and I graduated with top honors. During my PhD at Harvard University I worked in a highly multidisciplinary environment, as a member of the research group of Prof. Xiaowei Zhuang, a leading expert in single molecule biophysics. I developed novel methods based on real-time fluorescence imaging and single particle tracking and applied them, for the first time, to study influenza virus infection.

I provided the first direct proof that influenza virus infects cells via multiple molecularly distinct pathways (PNAS, 2003, Nature Structural and Molecular Biology, 2004). I also discovered a novel endocytic pathway that diverges from the well-established endo-lysosomal pathway (Cell, 2006). These results were considered by many experts as "paradigm shifting" and the impact of this work is marked by the high-level of citations that the publications received (>300 each). My work also set the basis for applying these methods to other viruses (poliovirus"PloS Biology, 2007).

During my postdoctoral fellowship at Harvard University, I used my previous background to establish a unique collaboration between the neuroscience laboratory of Prof. Jeff Lichtman and the biophysics laboratory of Prof. Zhuang. I applied the newly developed and exciting tools of super-resolution nanoscopy to the highly challenging problem of tracing neuronal connectivity (PLoS One, 2012). The methods that I developed are now being applied to reconstruct neuronal circuitry in the mammalian brain. The excitement that this work generated is evidenced by the number of international symposia that I was invited to in 2010 and 2011 (see CV) for presenting our results.

I started my independent research career as a tenure-track Group Leader (GL) at ICFO in September 2010. In a short time, I have implemented a fully functional optics lab with a cutting-edge super-resolution microscope, first of its kind in Spain to my knowledge, and a fully equipped biochemistry lab. I have initiated a technology partnership with Nikon Instruments, Europe, which has led to the establishment of "Nikon Center of Excellence in STORM at ICFO". I have also built a dynamic, international research group with stellar members from top universities across the world. Last but not least, I have established solid collaborations some through competitive projects with top-level research groups at the national and international level (Maria Pia Cosma-CRG, Josep Dalmau-IDIBAPS, Staffan Stromblad-Karolinska Institute) and I have been invited to join a prestigious European Network of Excellence.

The mission of my group is to develop advanced microscopy methods and apply these to understand how protein organization, dynamics and stoichiometry impact protein function in health and disease. Our remarkable early success is evidenced by our exciting new results that have been published in top journals (Durisic et al., Journal of Neuroscience, 2012, Balint et al, PNAS, 2013, Durisic et al, Nature Methods, 2013). As recognition of my success as an independent researcher, I have been awarded an ERC-Starting Grant and also an EMBO-Young Investigator Award.

Resumen del Currículum Vitae:

Dr. Melike Lakadamyali obtained her Bachelor of Science (B.S.) degree in Physics at the University of Texas, Austin, in 2001 and her PhD degree in Physics at Harvard University in 2006. During her PhD, she developed novel methods based on real-time fluorescence imaging and single particle tracking to study influenza virus infection at the single virus level, unraveled molecular mechanisms of influenza infection pathway and discovered unique pathways for clathrin-mediated endocytosis of ligands.

Between 2006 and 2010 she was a Postdoctoral Fellow at the Center for Brain Science at Harvard University. There, she facilitated a unique collaboration between the laboratories of Prof. Lichtman and Prof. Zhuang and developed high throughput automated super-resolution imaging methods for tracing neuronal connectivity. Since September 2010, she is the leader of the Advanced Fluorescence Imaging and Biophysics (AFIB) group at ICFO-Institute of Photonic Sciences, a world leading research center dedicated to the science and applications of light. She has supervised 3 master"s thesis, 3 postdoctoral fellows, and two internship students. Currently she is supervising 3 PhD students, 3 postdoctoral fellows, 2 research engineers (and growing).

Her group is developing tools based on single-molecule biophysics (super-resolution fluorescence, single particle tracking) and applying these to study: (i) the molecular mechanisms of intracellular transport; (ii) the dynamics and organization of chromatin; and (iii) the stoichiometry and organization of neuronal receptors.

Dr. Lakadamyali is an internationally recognized, leading expert in the field of super-resolution microscopy and single molecule biophysics and she has authored several papers on these topics in leading journals including Nature Methods, Nature Structural and Molecular Biology, Cell, PNAS and PLoS Biology. Her work has made a big impact with more than 2000 citations as of January 2014 given by Google Scholar. She has been invited to present her work at several top-level universities and international meetings such as "Seeing is Believing, Imaging the Processes of Life" symposium at EMBL, Heidelberg, "Single Molecule Localization Microscopy" symposium, American Biophysical Society meeting and American Society for Cell Biology meeting.

She has taught several courses including an EMBO Practical Course in "Microscopy, Modeling and Biophysical Methods" at EMBL, Heidelberg; and the Master in Photonics course "Advanced Optical Experimental Techniques in Biology" at the Universitat Politecnica de Catalunya, UPC. She is leader of the "Nikon Center of Excellence in STORM at ICFO", organized the first European STORM workshop at ICFO and co-organized the ICREA Symposium "Visualizing signaling nanoplatforms at a higher spatiotemporal resolution" at ICFO.

She is an active, participating member of European projects, such as the Systems Microscopy (Network of Excellence) and has been awarded several European grants including a Marie Curie Re-integration Grant and an ERC-Starting Grant. She has received prestigious awards including Cyprus-America Scholarship Program (CASP) fellowship, the Dean's Honored Graduate Student award at the University of Texas, Austin (only given to few graduating students each year out of thousands) and an EMBO-Young Investigator award.

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2013

Nombre: **PIEDRA GOMEZ, JONATAN**
Referencia: RYC-2013-12706
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: jonatan.piedra@gmail.com

Título:

Física de partículas en colisionadores hadrónicos

Resumen de la Memoria:

Since 1999 I have participated in three big experiments (DELPHI, CDF and CMS) operating in three accelerators (LEP, Tevatron and LHC) at increasing energy scales. I spent the initial five years at Fermilab, first working on the installation of the CDF detector and then developing my thesis. I focused my work on one of the hot topics at the Tevatron at that time, the Bs oscillations. After graduating cum laude I entered my first postdoc at the Universites Paris VI et Paris VII, dedicated to complete my B Physics adventure with the measurement of the Bs oscillations. Then, as a postdoc with the MIT I decided to join the CMS experiment. I participated in the Data Acquisition chain and included multivariate techniques in the Higgs search in the WW channel for the first time. This technique has been used since then, in particular in the Higgs discovery paper Phys. Lett. B716 (2012) 30-61, and in the very recent CMS legacy publication on the subject, JHEP01(2014)096-163, published in January 2014. I was also coordinator of the CMS Data Transfers system. The first LHC collisions were delayed and I joined the University of Florida for my third postdoc. In this period I worked as advisor of one of the graduate students, Nick Kypreos, and supervised a CERN summer student, Lucija Tikvica. With the early LHC data I took my fourth postdoc at the IFCA and University of Oviedo, aimed at joining the Spanish effort in the CMS experiment. I supervised another CERN summer student, Isabel García and, after spending about 6 years at CERN, I came to Oviedo. Here I have advised three students working on their master thesis and I have been teaching Particle Physics Experimental Techniques. It has been a long and rich period, that includes detector activities, software development, coordination, supervision, teaching... and Physics. I am main author in about 20 HEP papers, and I have directly contributed to more than 60 papers. These papers are in B Physics, Higgs Physics, Electroweak Physics, Exotica Physics, Atmospheric Muons and Detector Performance. Three of them have been especially important, either for the HEP Community or for the CDF and CMS Collaborations:

- Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC.
- Observation of B0(s) - anti-B0(s) Oscillations paper.
- Measurement of the charge ratio of atmospheric muons with the CMS detector.

My latest and ongoing measurements are the cross sections of the top-antitop, WW and WZ processes, both at 7 and 8 TeV, which heavily test the Standard Model of Particle Physics. I consider that my expertise in understanding these processes will be crucial for CMS during the LHC RUN 2, from 2015 to 2018. They are all of them part of the so-called CMS High Priority Analyses for that period, and it will be the first time ever to be measured at 13 TeV. In addition, I could continue advising and teaching students.

Resumen del Currículum Vitae:

Previous posts and activities:

- Graduated cum laude in 2005.
- First postdoc with Universites Paris VI et Paris VII from 2005 to 2006.
- Second postdoc with MIT from 2006 to 2008.
- Third postdoc with University of Florida from 2008 to 2010.
- Fourth postdoc with Instituto de Física de Cantabria / Universidad de Oviedo from 2010.

Teaching / advising experience:

- Particle Physics Experimental Techniques at the Universidad de Oviedo.
- Supervisor of two CERN summer students.
- Advisor of four master thesis students.
- Outreach talks about CERN and the Higgs discovery.

Detector hardware experience:

- At CMS with the Data Acquisition system.
- At CDF with the Time-of-Flight detector.

Spanish projects in which I have participated:

- Física en Colisionadores Hadrónicos (Experimentos CMS y CDF), FPA2011-28694-C02-02.
- Física en Colisionadores Hadrónicos (Experimentos CMS y CDF), FPA2011-28694-C02-01.
- Física en Colisionadores Hadrónicos (Experimentos CMS y CDF), FPA2008-06112-C02-01.
- Centro Nacional de Física de Partículas, Astropartículas y Nuclear, CSD2007-042.
- Participación en los experimentos CMS y CDF, FPA2002-01678.

Experience in foreign laboratories since graduation:

- One year at Fermilab.
- Six years at CERN.

Physics:

- I am main author in about 20 HEP papers, and I have directly contributed to more than 60 papers. They are in B Physics, Higgs Physics, Electroweak Physics, Exotica Physics, Atmospheric Muons and Detector Performance.