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**Título:**

Solar Atmospheric Seismology

**Resumen de la Memoria:**

Solar atmospheric seismology is based on the combined use of observations of wave activity in coronal magnetic and plasma structures together with predictions from magnetohydrodynamic (MHD) wave theory to obtain information about difficult to measure physical parameters in those structures. The final aim is to increase our knowledge about the complicated structure and dynamics of the solar atmosphere. This is important in connection to space-weather applications that aim to predict, for example, the arrival of charged particles that affect our geomagnetic environment. This relatively novel solar physics research branch has experienced a great boost in the last decade, motivated by the increase in the quantity and quality of wave activity observations obtained from space-borne observatories (TRACE, Hinode, SDO) and the refinement of theoretical MHD wave models. We are now at a stage in which we can truly aim at comparing theory and observations in a confident way, so that we can expect to obtain reliable information about the physical conditions in the solar atmosphere and the nature of the different manifestations of solar atmospheric wave dynamics. The proposed research program aims to lead three aspect that will be crucial in the future development of solar atmospheric seismology. We aim: (1) to include further relevant physics in the current theoretical models used to describe coronal structures and MHD wave propagation in the solar corona; (2) to design and apply novel inversion techniques for the determination of physical parameters in coronal structures. In particular we aim to lead the application of statistical techniques (such as the Bayesian analysis for parameter inference and model comparison) to solar atmospheric seismology. These techniques have already been used successfully in other areas of Physical Sciences, such as cosmology or planet detection; and (3) to design and apply forward modelling techniques to predict observational signatures, based on a given theoretical model, that will be compared to observations. Forward modelling remains largely a concept in our research area, waiting to be developed and fully exploited. It will enable us to obtain conclusions about different interpretations about the nature of dynamic phenomena in terms of e.g. waves or flows, assess the relevance of different competing wave damping mechanisms, or quantify the real contribution of MHD waves to coronal heating.

**Resumen del Curriculum Vitae:**

I obtained my Physics degree, with specialization in Astrophysics at the University of La Laguna, Tenerife, and the PhD in Physics at the Universitat de les Illes Balears (2003) with a thesis on magnetohydrodynamic (MHD) waves in solar coronal magnetic structures. My research is focused on the interpretation of wave activity in the solar atmosphere in terms of MHD waves, the development of theoretical models for the explanation of this wave phenomena, and the design of inversion tools for the determination of difficult to measure relevant physical parameters in coronal structures, by a combination of observed and theoretically determined wave properties. The results obtained from this kind of research are important for our understanding of the complex dynamics of the solar atmosphere, the coronal heating, or the acceleration of the solar wind, that are the physical drivers of the influence of solar activity on Earth. During my research career I have participated in seven projects with national and international funding. I have published my results in thirty articles in international peer reviewed and high impact journals (The Astrophysical Journal Letters, The Astrophysical Journal, Astronomy and Astrophysics, Space Science Reviews, and Solar Physics) as well as in twenty-two chapters of books and conference proceedings. I am the author of five invited articles for the Basque Encyclopedia of Science and Technology. I serve as referee for The Astrophysical Journal Letters, Monthly Notices of the Royal Astronomical Society, Astronomy and Astrophysics, Solar Physics and Space Science Reviews. I was member of the jury in three PhD thesis committees and I am currently co-supervising a PhD student that will defend the thesis in 2011. My CV contains more than seventy contributions to conferences, more than half of them oral. I have benefited from research stays and delivered seminars in several international research institutions, such as the Center for Plasma Astrophysics, K.U. Leuven, Belgium; Sterrenkundig Instituut Utrecht, The Netherlands; Royal Observatory of Belgium; Department of Applied Mathematics, University of Sheffield, United Kingdom; Basque Center for Applied Mathematics, Spain. I have an extensive network of active research collaborations with colleagues in United States, United Kingdom, Belgium, Australia, and Spain.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Título:**

Neutrinos and other probes for new physics

**Resumen de la Memoria:**

The major goal of this project is the study of the evidence for Physics beyond the Standard Model (SM) with particular emphasis in neutrino phenomenology. Fundamental neutrino properties, such as the value of neutrino masses and their hierarchical pattern, their Dirac vs Majorana nature, or the existence of leptonic CP violation are still unknown. This research is extremely timely since, at present, a new generation of accelerator, cosmological and laboratory experiments/probes is addressing these open questions. In the coming years, the analysis and interpretation of all these data will thus be of fundamental importance to complete our picture of the neutrino sector and constitutes one of the main research goals for the project. Depending on the results found by these experiments, a new generation of facilities will be necessary to complete the picture they reveal. Their optimization will depend crucially on the findings of the present generation of experiments and constitutes the second goal of the present proposal. From the theoretical point of view, the underlying physics mechanism responsible for the neutrino masses and mixings is still unknown and its discovery could provide the key to the puzzles of flavor or the origin of the observed matter-antimatter asymmetry. Thus, the research project also proposes the study of the phenomenological signatures of models of neutrino masses as well as the strategies to probe neutrino data for signals of new physics. In this context, collider experiments such as the LHC with unprecedented energy and luminosity will provide exceptional tools. The interplay between particle physics and cosmology also provides further evidence for physics beyond the SM through the unknown dark matter and dark energy sectors. Therefore, a secondary research line of this proposal will be to explore and optimize best probes to these unknown physics as well as the phenomenological implications of different theoretical models aiming at their explanation. Finally, the results of the LHC collider will cast all these puzzles in a new light and will be incorporated to their study. Any of the research lines proposed offer interesting possibilities for possible PhD theses under my supervision.

**Resumen del Curriculum Vitae:**

Awarded "Introduction to research" fellowship in Summer 2002. I participated in a two-month research project at the CSIC institute "Daza de Valdés" under the supervision of Dr. Priscila García Fernández in the field of quantum information, which led to the publication of an article. Physics degree at the Universidad Complutense de Madrid in 2003. PhD in theoretical physics in 2007 by the Universidad Autónoma de Madrid under the supervision of Prof. Belen Gavela and Dr. Andrea Donini with grade "Sobresaliente cum laude". During my PhD my research was on the field of neutrino phenomenology. During my PhD studies I participated in numerous research projects and was awarded two scholarships. Postdoctoral contract at the Max Planck Institute for Physics in Munich between 2007 and 2010. During my stay at the Max Planck I participated in several research projects. During these years I continued and expanded my research in neutrino physics and started a new line of research in the field of dark energy. I also co-developed a program which implements Markov Chain Monte Carlo parameter sampling in neutrino oscillation experiments. I was awarded a CERN fellowship which I started in October 2010. I am currently continuing with my research activities in the fields of neutrinos and dark energy and I am expanding them with new research in the areas of dark matter and collider physics. During my PhD and postdoctoral studies I have published 26 research articles, with two more to be published with a total of 873 citations.



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**Título:**

From Ultra-Cold Atoms to Quantum ChromoDynamics

**Resumen de la Memoria:**

The proposed project is interdisciplinary and connects ultracold atoms, condensed matter and hadronic/high energy physics. One of the key elements which make ultracold atom physics appealing and useful for other fields is the large degree of control attainable experimentally. This enables to mimic any sort of interaction between the atoms trapped in a variety of geometries [1,2]. Thus, this field provides quantum mechanical systems with a large number of degrees of freedom whose properties are controllable almost at will. An interesting and fast growing research field opened when external gauge fields were simulated by means of cold trapped atoms in optical lattices [1,3]. These experimental systems can provide, under the appropriate conditions, important tools to disentangle the static and dynamic properties of other quantum theories which may not be easily solvable, like quantum chromodynamics (QCD) in the non-perturbative domain. A well known consequence of confinement in QCD is the existence of a spectrum of baryon resonances. In the naïve quark model picture the resonances appear as spin-isospin-orbital excitations of the three spin 1/2 constituent quarks inside the nucleon, while in full QCD they arise from the involved dynamics of quarks and gluons. The main objectives of this project are: a) the study of feasible experimental conditions for cold atoms with multi-particle interactions to mimic relevant aspects of gauge theories. This will be pursued in close contact with experimental groups [4]. b) The characterization of the properties of the strongly correlated states of cold atoms in artificial gauge fields. The ultimate goal is to build the connection between the physics of ultracold atoms trapped in optical lattices and non-perturbative low energy phenomena in QCD-like theories. This will be achieved by providing suitable theoretical and experimental configurations which contain the main elements of lattice gauge theories. Different challenging research lines ranging from understanding the role played by chiral symmetry in the appearance of mass or the exact mechanisms controlling confinement in QCD-like theories will be ultimately pursued. In this way we will address several long standing problems in QCD from a completely different, novel and promising point of view.[1] Ultracold atomic gases in optical lattices: mimicking condensed matter physics and beyond M. Lewenstein, A. Sanpera, V. Ahufinger, B. Damski, A. S. De, U. Sen, *Advances in Physics* Vol. 56 Nos. 1-2, 243-379 (2007).[2] Simulating dense QCD matter with ultracold atomic boson-fermion mixtures K. Maeda, G. Baym, T. Hatsuda, *Phys.Rev.Lett.* 103, 085301 (2009).[3] Quantum Gauge Theories and Ultracold Atoms, European Research Council, Adv. Grant project (09/13), PI: M. Lewenstein (ICFO). [4] Group of Prof. J. Dalibard ( École Normale Supérieure, Paris).

**Resumen del Curriculum Vitae:**

I graduated in Physics at the University of Seville in 1998, then I got an FPI grant to do my PhD at the University of Salamanca under the supervision of A. Valcarce on baryon-baryon interactions in quark models. My PhD (2003) received the  $\zeta$  premio extraordinario de doctorado. In 2003, right after defending my PhD, I was hired by the Helsinki Institute of Physics to work under the supervision of D. O. Riska on baryon structure using relativistic quark models. Our work on baryon electromagnetic form factors in collaboration with F. Coester is well known (+50 citations) in the field. I presented our work on a number of international conferences. During the next years I continued collaborating with Riska through 2 invited stays at the insitute. In late 2004 I was hired by the the University of Pittsburgh under the supervision of F. Tabakin and later by CEA/Saclay under the supervision of B. Saghai. During this period we developed a well known coupled-channels model of kaon production reactions, which was later employed in several proposals at Jefferson Laboratory (PI: A. Sandorfi). During this years I started several collaborations, e.g. with J. He and Y.B. Dong at Beijing University and F. Froemel in Giessen. Also I started a line of research together with Tabakin on simulation of quantum computers using Mathematica, QDENSITY. In 2006 I was hired as  $\zeta$  Juan de la Cierva  $\zeta$  researcher at the University of Barcelona. During the three years of the contract I worked mostly on the electromagnetic and strong production of one or two mesons in the region of nucleon resonances. I was an important player in the development of the Excited Baryon Analysis Center at Jefferson Lab, led by T.S.H. Lee. I spent up to 10 months as invited visiting researcher at Jefferson Lab. I got several supercomputer allocations at the Barcelona Supercomputing Center during this time and organized 2 international meetings. My work was largely recognized as seen for instance in the three invitations as plenary speaker at international conferences, EFB07, MENU10, Baryons10. Simultaneously I taught Analisis Matematico I for first year students in Physics and wrote a textbook on the subject used nowadays by first year students. In 2009 I was hired as postdoc by the Centro Nacional de Particulas, Astroparticulas y Nuclear (CPAN) and continued working on the physics of nucleon resonances. In parallel I started in collaboration with A. Polls, M. Guillaumeas and J. Martorell several lines of research in cold atom physics and strongly correlated states in many body systems. Currently I am hired by an U. Barcelona and Institut de Ciencies Fotoniques project under the supervision of N. Barberan working mainly on strongly correlated states in artificial gauge fields. I am supervising two PhD thesis. I am the author of 40 peer reviewed articles in international journals (*Phys Rev Lett*, *Phys Lett B*, *New J Phys*, *Phys Rev A*, *Phys Rev C*, *Nucl Phys A*, *Comp Phys Comm*, *Eur Phys J A*), 3 of them with more than 50 citations. My work has received ~ 480 citations. I am referee for *Phys. Rev. C*, *Nucl. Phys. A*, *Comp. Phys. Comm*, *Europhysics Letts*, *Phys. Letts. B*, and *Eur. Phys. J. A*. I have been invited to give oral presentations at 13 international conferences, and have presented my work in more than 40 conferences. I have organized 2 international conferences.



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**Título:**

Contribution to the Super Flavour Factories Belle-II/SuperB

**Resumen de la Memoria:**

One of the main challenges of Particle Physics in the next decade is to find new elements and mechanisms beyond the Standard Model that help to solve the present problems of Fundamental Physics. The flavour sector is well-suited to search for quantum effects originating from New Physics by studying observables involving decays of heavy quarks and leptons. To study these effects a large amount of data are needed. A new generation of e+e- experiments working at the Upsilon(4S) energy with very high luminosity, the so called super flavour factories, are at present being developed. They are two international projects: SuperKEKB, in Tsukuba (Japan) and SuperB in Italy. Quantum effects observed in these installations can be due to new heavy particles, in the energy range of the LHC collider (~TeV) or even larger (around 100 TeV). In addition the results from the super flavour factories will allow to distinguish among different New Physics scenarios by studying the couplings to the Standard Model particles. Both projects are finishing their Technical Design phase (TDR). Both have been approved and are being funded, although they present different time scales. In these installations one of the key detectors for the track reconstruction and identification, decisive for searching New Physics, are the silicon vertex detectors. The research line proposed in this memory is the participation in the design and construction of the vertex detector for the new super flavor factories, following the data exploitation once the experiments are in operation. The contribution to the design, construction, and data analysis of a new super flavor factory is the only project of Particle Physics with accelerators in addition to, and competitive with, the results obtained by the hadronic collider LHC, in the time scale of the next decade (2010-2020). This research line is in the framework of the National Project for Fundamental Research FPA2010-21549-C04-04 for the Development of New detectors for Future Colliders in Particle Physics, coordinated Spanish project with the Instituto de Física Corpuscular de Valencia (IFIC), Barcelona University (UB) and the Santiago de Compostela University (USC).

**Resumen del Curriculum Vitae:**

During the four years of my doctorate and seven years of postdoctoral period I have acquired the experience and capabilities to perform data analyses in different experimental frameworks (DELPHI, BaBar) and I have performed very accurate measurements. I was responsible at CERN for a detector of the DELPHI experiment and worked in the machine-detector interface of the PEP-II accelerator at SLAC. I have performed stays in distinguished foreign research centres during about five years. I have about 500 published journal articles as member of the DELPHI and BaBar Collaborations, being a main author in eighteen of them. The latter articles sum 171 citations. I have participated in different research projects and I have collaborated with foreign research centres and institutes. I am the research leader of three international cooperation agreements. I have been invited to present the results of my work in 21 conferences and international seminars, including plenary talks and experimental reviews on behalf of the BaBar and Belle Collaborations. I have collaborated in the guidance of a Master and two Ph.D. theses; the latter defended in April 2008 and July 2009 and qualified as *¿Mention Très Honorable¿*. I have participated in the organization of several scientific workshops. I participate in the preparation of a new international project. I have taught courses of the Master in Advanced Physics at the University of Valencia during three years. I have been associated professor of the Atomic, Molecular and Nuclear Physics department at the University of Valencia teaching courses for the Degrees in Chemistry and Physics. I have guided several works of introduction to the research for students at the end of their studies or during the Master. I have been part of the evaluation committee of a Ph.D thesis and part of the jury for the theses of the end of Master of Advanced Physics for the academic year 2009-2010 and 2010-2011. I am in the referee committee of the ANEP (National Agency of Evaluation and Prospective) and of the AVAP (Valencianish Agency of Evaluation and Prospective).



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**Título:**

Quantum transport in graphene and topological insulators

**Resumen de la Memoria:**

Within condensed-matter physics, the interest over two different kinds of materials, but with deep connections, expands at a surprising rate. They are  $\zeta$ graphene $\zeta$ , recently highlighted with the 2010 Nobel award in Physics, and  $\zeta$ topological insulators $\zeta$ , thought to be useful for the realization of fault-tolerant quantum computation. The general objective of my research is to advance in the theoretical understanding of the electronic properties of these systems as well as in the design of nano-devices with potential useful applications. Building on my past experience in graphene physics, transport through hybrid superconductor-normal junctions and entanglement in solid-state physic, I plan to follow several lines of research where quantum phenomena and phase coherence are key. Some examples are in order. A) Quantum transport in graphene: A1) Adiabatic and non-adiabatic pumping in graphene and graphene-superconductor heterostructures- We started this subfield in graphene with the study of adiabatic pumped charge through wide and short flakes. I will analyze extensions to this system in which the pumping region is connected to one or two superconducting contacts, bilayer flakes, the case of finite-width pumps or the response to driving by other parameters, etc. Apart from charge transport, I will consider shot noise and the full transport statistics, in search of signatures of carrier chirality. A2) Elastic deformations in graphene- Suspended graphene flakes are subject to strains due to contacts and temperature. I plan to study the interplay between elastic deformations and electronics, as well as the possibility to engineer strain patterns for electron control. A3) Nanoribbons with closed edges, squashed nanotubes and grafold- After heating graphene flakes, extensive multiple-layer reconstructions at the edges lead to the formation of unique carbon nanostructures, which offer the possibility to engineer novel nano-devices with complex topologies, and new transport phenomena. B) Quantum transport in topological insulators and topological superconductors: B1) Topological insulator/metal heterostructures: Transport through such junctions will be considered, as well as local density of states and local current distribution, in graphene and in other 2D quantum spin Hall insulators, like HgTe/CdTe quantum wells. B2) Majorana fermions in condensed-matter heterostructures: I plan to study junctions between topological superconductors and magnetic insulators, 2- and 1-dimensional structures where Majorana fermions appear, and its signal in Josephson effect, NS current and higher order cumulants. I will also explore entanglement generation within these structures. B3) Adiabatic and non-adiabatic pumping with topological insulators/superconductors: I will investigate how non-trivial electronic topologies impact the response to driving. I will naturally remain open to any important new developments in these fields.

**Resumen del Curriculum Vitae:**

After finishing my BSc in Physics in 1999 at the Universidad Autónoma de Madrid (UAM), I enjoyed a prestigious grant at Telefónica de España Corporation where I published 3 papers on Telecommunications. Then I came back to the academia and I started my PhD under the direction of Prof Fernando Sols at the UAM. I devoted four years to the study of solid-state-based quantum communication (generation of non-locally spin entangled electron pairs from superconductors heterostructures). Towards the end of this period I got a grant to visit Prof Rosario Fazio in Scuola Normale Superiore of Pisa, Italy, for 3 months, where I learnt about entanglement evolution in nanostructures and detection by means of Bell-type inequalities. After a maternity leave I obtained a Marie Curie Early Stage Researcher contract and I went to Karlsruhe University, Germany, with the group of Prof Gerd Schoen. There I finished my thesis including new results in the field of decoherence and subsequently started my first postdoc. At that time a new material had been synthesized for the first time in a lab, called graphene, and an enormous deal of attention by the community and possibilities had opened by this discovery. I decided to pursue this line of research and brought it for the first time to Schoen's group. After 3 years in Karlsruhe and a second maternity leave, I took up a one year Marie Curie postdoc position with Prof. H. Schomerus in Lancaster University, one of the most active European nodes of graphene research. In 2009 I moved back to Madrid, with a JAE-Doc contract in the Instituto de Ciencia de Materiales de Madrid (CSIC), with Prof. Luis Brey, a world expert in graphene. During 4 years of graphene research I have studied many aspects unique to this material, including the phenomenon of pseudodiffusion, pseudospintronics, the effect of disorder in quantum transport characteristics (current, noise and full counting statistics), the interplay between elasticity and electronics, magnetotransport, nanoribbons, quantum pumping, QHE in folded structures, etc. During my career I have published 12 papers in high impact journals (including 2 Phys Rev Letts and 7 Phys Rev B). In 7 of them I am first author and I have obtained 150 citations (h-index=8). I have attended 23 conferences where I have personally presented 9 posters, 5 oral contributions and 4 invited talks. I have also given several talks (5 invited seminars and 6 group seminars) in different universities across Europe (in the UK, in Germany, in Italy and Spain). I have participated in the organization of two scientific events: a summer school on graphene in Bad Herrenalb, Germany, in 2007 and the 2003 Annual Meeting Nanoscale Dynamics, Coherence and Computation, Mallorca, Spain. I have co-supervised the Master Thesis of Petra Dietl, Karlsruhe University (2008-2009). I have taught a master course on  $\zeta$ Numerical simulations in materials and nanostructures $\zeta$  at the UAM. In the last year I have been very involved in the activity of outreach. I have 4 articles in the press (2 in El País, 1 in El Mundo, and 1 in rtve.es), 3 interviews in the radio (in Onda Cero Radio, in Cadena Ser Radio and RNE), and 5 interviews in TV (in CNN+, in Telediario Cuatro, in Telediario TVE1, in TVE2, and in a documentary as part of the course on Scientific Journalism).



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**Título:**

Natural drivers controlling marine ecosystems on the continental margin

**Resumen de la Memoria:**

Over the past decade Marine Geosciences research has become increasingly involved in giving answers to ecological issues such as the characterisation of the structure and dynamics of deep-sea ecosystems. Indeed major questions about the functioning of marine ecosystems concern their interrelationship/dependence on physical and geological processes, e.g. morphology and geochemical composition of seabed, characteristics of currents and water masses, input and availability of organic matter. Besides, there is the need to answer societal demand about climate change and man's impact on marine ecosystems issues, such as trends in temperature, occurrence of high impact weather events, overexploitation of fisheries, etc. It's essential a better knowledge of marine ecosystems in a rapid changing environment, thus urgent questions to be addressed are: What are the natural drivers controlling marine ecosystems? How do these natural drivers influence biological communities? What are the direct effects of man's impact and climate change on the natural drivers controlling marine ecosystems? What changes are expected in deep-sea ecosystem functioning? Answering these questions require an effort to integrate scientific results with various disciplines in order to establish the relationships between the physical environment and the processes that drive it, and the biological components, including living resources. The main axis of my research is to characterise and quantify mass and energy fluxes on continental margin environments. Based on a detailed characterisation of physical (water column and near-bed current regime, sediment transport and accumulation), and biogeochemical (organic matter origin, distribution and trophic status, trace element composition) forcing conditions at each studied environment (submarine canyons, open slopes and base of the slopes), I aim at elucidate the natural drivers regulating diversity and faunal distributions. This integration is used to reduce uncertainties and predict the response of marine ecosystems to future climatic and man's impact changes.

**Resumen del Curriculum Vitae:**

After graduating in Environmental Sciences in 1999 (University of Girona) I was involved in marine sciences research at the Consolidated Research Group of Marine Geosciences of the University of Barcelona. During the PhD I focused my efforts on characterising the processes controlling carbon fluxes and the efficiency of the biological pump in the Western Mediterranean. This included the examination of the use of Barium as a proxy for paleo-organic carbon fluxes, performed during a 6-month stay at the internationally renowned W.M. Keck Collaboratory for Plasma Spectrometry (Oregon State University, US). After obtaining the PhD (2005) I was granted a Marie Curie Intra-European Fellowship from the FP6 of the European Commission and I moved to the Centre de Formation et de Recherche sur l'Environnement Marin (CNRS, France), where I supervised and participated actively in biogeochemical (particle flux and geochemical composition) and physical (current, meteorological and hydrological conditions) data acquisition as well as data processing and interpretation of several EC-funded projects (HERMES -which was selected as one of the TOP 40 projects in the whole of FP6, SESAME and BIOFUN). In addition, I was in charge of the calibration and start-up of a mass spectrometer that allowed me to characterise, for the first time, the isotopic composition ( $\delta^{13}C$  and  $\delta^{15}N$ ) of organic matter transported during a dense shelf water cascading event in the Western Mediterranean. This provided important insights into the impact of physical exchange processes in the continental margin on the amount and quality of particulate matter exported to the deep basin. In 2008 I rejoined the CRG Marine Geosciences at the University of Barcelona, where I supervise and coordinate most of the activities of the EC- and Spanish-funded PROMETEO, REDECO and HERMIONE projects. With the aim of examining the various facets of the cascading of dense shelf waters already investigated in the Mediterranean Sea, the HERMIONE project has recently offered me the opportunity to launch an ambitious experiment with an array of mooring lines deployed in summer 2010 in the Arctic ocean off the Svalbard Islands. This will allow to assess the impact of high-latitude cascading on arctic ecosystem functioning and benthic biodiversity. In addition, I benefit from a 3-year European Reintegration Grant with the ARISTEUS project, funded by the FP7 of the European Commission, which aims at providing financial assistance to experienced researchers. I have supervised 2 Master theses, 2 Bachelor theses, and I co-supervise 2 PhD theses which completions are planned for April 2011 and December 2014. During my research career I have participated in 30 oceanographic cruises resulting in more than 300 days of seagoing experience. Overall, I have been very active within the scientific and academic world during the last 12 years, as is well reflected in the co-authorship of 27 scientific papers (of which 25 included in the JCR of the ISI), the guest-editorial of 1 special volume and the 57 presentations at international conferences and meetings. In addition, I have acted several times as referee for international journals such as Marine Chemistry, Biogeochemistry, Progress in Oceanography, Deep-Sea Research I and Geophysical Research Letters.



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**Título:**

Diseño, Síntesis y Aplicaciones de Ftalocianinas Solubles en Agua como Fotosensibilizadores

**Resumen de la Memoria:**

Phthalocyanines (Pcs) are an important class of non-natural organic pigments which find applications in different technological areas, e.g., photodynamic therapy (PDT) and organic photovoltaics. In PDT, Pcs with stringent requirements such as photostability, solubility in water, large extinction coefficients and high fluorescent quantum yields are necessary. Water-soluble Pcs are also of potential interest for the processing of green organic solar cells, due to the fact that water is environmentally friendly. Water-soluble Pcs functionalized with ammonium, sulphate or oligo(ethylene glycol) moieties are known, but they are structurally very simple, with inadequate functional groups for their selective transport through the organism or their incorporation into nanostructures. Hence, here is proposed the use of novel methodologies, classified as click reactions (i.e., reactions happening in water, under mild conditions, with high yields and an easy purification) to prepare water-soluble Pcs with one or two clickable groups (e.g., maleimide, azide, alkyne, thiol and 1,2-dithiolane). The goal is to obtain a set of powerful and versatile synthons for the bioconjugation of Pcs with virus capsid proteins or N-cadherin targeting peptides bearing a complementary clickable group (i.e., the complementary functionality in the clickable pairs azide-alkyne and maleimide-thiol). With this strategy, the transport of the photosensitizer to the diseased tissue would be facilitated by the biocompatibility of the mentioned biomolecules and their specific interaction with target cells. The same clickable units could be used to connect the synthesized hydrophilic Pcs to a hydrophobic polymer, leading to amphiphilic Pc derivatives that could be incorporated into liposomes. Thiols and 1,2-dithiolanes are easily attachable to gold nanoparticles, which are also considered good candidates as drug carriers for PDT agents. Finally, this methodology would enable the functionalization of water-soluble Pcs with other water-soluble photoactive molecules (e.g., oligo(p-phenylenevinylene) and oligothiophene moieties), opening the way to organic solar cells processed from water solutions.

**Resumen del Curriculum Vitae:**

I obtained my Chemistry Degree at the Universidad Autónoma de Madrid (UAM) in 2000 (3rd best grade of my promotion). My doctoral studies were performed in the group of Prof. Torres (Universidad Autónoma de Madrid), working on the synthesis and study of molecular, supramolecular and polymeric phthalocyanine (Pc) systems for their use in photovoltaic applications. I obtained my Ph.D. Degree in 2005 (cum laude). I was awarded with doctoral fellowships from the UAM, MEC and CAM, as well as with a position as Profesor Ayudante in 2003. I did 2 short stays at foreign institutions: 1 month at the Radboud University Nijmegen (Holland), in the laboratory of Prof. Nolte, learning about microscopy techniques; and 3 months at the California Institute of Technology (USA), under the supervision of Prof. Grubbs (awarded with the Nobel Prize in 2005), synthesizing new polymers with Pc and C60 units as pendant groups. In total, 10 publications (9 in highly ranked journals) from my doctoral studies (I being first author in 6 of them). My major findings were the observation that Pcs can self-organize by donor-acceptor interactions, and the use of this new recognition motif and others to produce long-lived photoinduced charge-separated states in supramolecular Pc/C60 ensembles. In 2006, I started a postdoc in the Radboud University Nijmegen, in the laboratory of Prof. Nolte and Prof. Cornelissen. For funding, I was awarded with the prestigious Marie Curie Intra-European Fellowship. My work was focused on exploring the use of virus capsids in nanotechnology. Among the major findings, I showed the ability of empty virus capsids to template the production of monodisperse inorganic nanoparticles, as well as the hierarchical self-assembly of ssDNA, a chromophore and a virus protein into micrometer-long rod-like structures. In 2009, I went back to the Universidad Autónoma de Madrid, where I hold a position as Profesor Ayudante Doctor. Since then, I am trying to make use of all the knowledge acquired, during my doctoral and postdoctoral studies, to exploit the photoexcited states of Pcs for PDT and photovoltaic applications. Most notably, I have coordinated a research initiative on the encapsulation of water-soluble Pcs into virus capsids as potential vehicles for PDT. In total, 7 publications in highly ranked journals resulted from my postdoctoral studies. I am first author in 5 of these publications, and in the last 3 ones I am corresponding author. Some other results were published as 4 PMSE Proceedings. As other merits, I have acquired wide teaching experience: 680 hours imparted in 2nd, 3rd and 4th undergraduate organic laboratory courses; 3 bachelor students and 3 master students supervised; member of a thesis committee; currently accredited by the ANECA for the position of Profesor Contratado Doctor. In summary, I have participated in 6 national and 2 international funded projects; 18 oral and poster communications presented in national (2) and international (16) conferences and meetings; 16 publications in indexed journals (most outstanding articles: 1 Angewandte, 3 JACS, 2 Chem. Commun., 1 JOC, 1 Org. Lett., 2 J. Mat. Chem., 1 Chem. Asian J., 1 Biomacromolecules) and 5 communications published in conference proceedings. My articles have received 394 citations. The average impact factor of my publications is 7.54. My h index is 10.



MINISTERIO  
DE CIENCIA  
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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** SOLA OLLER, JORDI

**Referencia:** RYC-2011-08925

**Area:** Química

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**Título:**

Towards artificial small enzymes: supramolecular assembly of secondary structures; application to molecular recognition and catalysis

**Resumen de la Memoria:**

The general concept of this proposal is to employ self-assembled molecules with well-defined secondary structures (foldamers) to recognise potential substrates (guests) and ultimately induce asymmetry in catalytic transformations. Multicomponent catalyst assemblies are easily accessible, modular, and a reduced number of building blocks make a multitude of combinations possible. We will rely on the structural features of the molecule as a whole, rather than a single point, to catalyse asymmetric reactions. There are a vast and varied number of stable and predictable folded structures with different functionalities (polyureas, secondary and tertiary amides, ureas, and imides). Combination of two or more of these supramolecular structures through reversible reactions (dynamic covalent chemistry) or other recognition events (hydrogen bonding, pi stacking, metal coordination, etc) will result in the creation of new supramolecular architectures. In the presence of our guest we expect a positive discrimination of the mixture to the ligand with higher affinity to the substrate. When a recognition event takes place bonds become polarised and we can use these interactions to catalyse reactions (metal catalysis, hydrogen bond catalysis, Brønsted acid catalysis). Our research proposal will be divided in 3 main research sub-lines.  $\zeta$  Synthesis, structural analysis and characterization of the new macromolecules formed by self assembly of foldamers. We will study the thermodynamics of these systems in the presence and absence of relevant guests. We envisage that new molecular cages will be created and that our substrates may be placed in a  $\zeta$ pocket $\zeta$  of our structures resembling of those found in enzymes. We will also perform binding studies to biologically relevant molecules.  $\zeta$  Study of the catalytic properties of our systems. When a guest is recognised by our supramolecular system then we will study the reactivity of our substrate in the presence of the macromolecular ligand. We expect that asymmetric induction can be achieved by the ordered secondary structures as shown by literature precedents.  $\zeta$  Synthesis and study of new foldamers. Well ordered structures are an attractive field of research. We will focus on oligoamides and oligoimides of polyaromatic compounds as they are found to adopt usually well defined helices.

**Resumen del Curriculum Vitae:**

I obtained my PhD Degree in December 2006 under the supervision of Dr X. Verdagué (Universitat de Barcelona). I worked on developing an asymmetric variation of the Pauson-Khand reaction (PKR). Using non-classical hydrogen bonding interactions we achieved recognition between the ligand and the metallic cluster, obtaining great levels of selectivity in the course of the reaction. Using this strategy we developed the first examples of an asymmetric intermolecular PKR using alkyne cobalt complexes. We also synthesised a new class of ligands, based on a sulfonamide backbone. The new ligands improved the selectivity on the aforementioned reaction and led to the development of a new methodology for the synthesis of chiral phosphines. As a result a new research line was started in my former group with several researchers currently working on this topic. My PhD research led to eight international peer-reviewed publications, most of them as first author, including the top rated chemical journals JACS (2005) and ACIE (2007). We also filed a patent in collaboration with industry. In 2007, I joined the research group of Prof Jonathan Clayden, as a postdoctoral research associate at the University of Manchester. At first I was funded by EPSRC but later I was awarded a  $\zeta$ Beatriu de Pinós $\zeta$  Post-doctoral fellowship. I worked in long-range stereochemical control using helical peptides. During this time I was responsible for a research project that involved over 3 years a total of other 9 researchers (3 post-doc, 1 PhD and 5 project/Erasmus students). We demonstrated that chiral information can be transferred over 21 amino acids (4 nm) using helicity as an information conveyor. We set the bases to extend this area of research to systems that can transfer information in a  $\zeta$ real life $\zeta$  situation, for example through a cell membrane. To this end we started collaborations with the groups of Dr S. Webb (MIB) and Prof G. Morris (University of Manchester). Using NMR techniques we studied the kinetics and thermodynamics of helical inversion on this class of peptides, being able to quantify, for the first time, the handedness of the peptides in solution. We expect that our results will provide for a new tool for other researchers to identify and quantify the presence of secondary structures in artificial systems as well as 'in vivo'. This work resulted in six publications plus several more in preparation (see CV), four of which are in top-rated journals (ACIE, 2009, 2010; JACS, 2010 and in press), and an oral presentation in a high impact international conference (ESOC, 2009). It is worth mentioning that Prof J. Clayden has recently been awarded an ERC grant to further extend these results. In September 2010 I moved to the group of Prof David Leigh at the University of Edinburgh as a senior post-doctoral associate. I was appointed team-leader and I am currently responsible for two different research lines involving 5 different graduate researchers (3 graduate students and 2 post-docs). We are currently working on the design, synthesis and operation of new molecular machines and nanodevices that can operate autonomously fuelled by chemical energy.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Referencia:** RYC-2011-08888

**Area:** Tecnología Química

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**Título:**

Development of micro-architected catalysts for selective catalysis

**Resumen de la Memoria:**

The objective of this project is achieving process intensification, through the introduction of micro-architected catalyst by developing a novel film micro-coated catalyst. The engineering of these new reactor concepts will be driven by the understanding and quantification of the mass transport and kinetics on the structured material. The applications to which this project is devoted involve the research lines that I have been involved dealing screening of materials for gas separation, PSA application and catalysis. The integration of catalysis and separation from nano to micro-scale will achieve breakthrough in catalytic membranes materials and processes: - to enable selective conversion through the design of new structured materials- to enhance reactor performances by developing a new concept integrating separation and reaction- to intensify processes by combining selective reactions to overcome energy intensive separation tasks. The project will overcome the key issues limiting application of catalytic membranes reactors. The multidisciplinary approach addresses three levels: 1.- by comprehension of fundamental phenomena at the interface membrane/catalyst and the mismatch between intrinsic rate of transport through the membrane and the reaction kinetics. Innovation will be embedded through the development of novel model material systems, film's architectures and characterization tools for probing the films, to understand and quantify intrinsic properties of the structured materials, as mass transport, diffusion coefficients and kinetic rates. After the synthesis of selected materials, modification of the materials can be performed. 2.- by novel reactor concepts integration separation and catalysis to enable to control reaction conditions. An original concept of micro-designed membrane reactor is when the permselective membrane is coated on the catalyst grains. The permselective membrane controls the traffic of both reactants and products to and from the catalyst. The concept revealed an original way to use coatings in catalytic reactors. Coating catalyst particles with a selective layer can reveal useful for selective addition of reactants to the reaction zone. 3.- by developing process schemes for utilisation of raw feedstock which are not possible with conventional technology, but can only be realized using CMR's or original materials based on nano-architected catalysts coated with a selective layer. At long term, the project will research innovative key areas identified by the European Platform for Sustainable Chemistry: (i) increasing efficiency of (CO<sub>2</sub> free) energy production and hydrogen production with a special focus on ammonia production; (ii) increasing selectivity and feedstock options for the production of C<sub>3</sub>-C<sub>4</sub> oxygenates; and (iii) open new pathways for the production of alkenes and aromatics by direct or oxidative dehydrogenation.

**Resumen del Curriculum Vitae:**

My research activity started in 2000 at Zaragoza University in the Group of Catalysis, Molecular separation and Reactor Engineering working in my dissertation entitled: "Removal of pollutants from indoor air using zeolite membranes". For carrying out this thesis, I got a grant from DGA. During those Ph.D. studies I learned to use different techniques for the synthesis and characterization of microporous zeolites, silica, and mesoporous nanostructured materials (MCM's). The deposition of those materials on different supports was also a part of my research, and the prepared membranes were used in the removal of Volatile Organic Compounds (VOCs) at ppm level, by separation or combustion. My postdoctoral experience started in the Delft University of Technology (The Netherlands) in the Department of Catalysis Engineering, hired by a project involving the company Shell GS. I studied the development of synthesis methods to eliminate the formation of defects in zeolite membranes with a continuous feeding of nutrients to the support, defining conditions leading to a more predictable scale-up. From April 2008, I have been working with a contract at Institut de recherches sur la catalyse et l'environnement de Lyon-CNRS (France) as postdoctoral researcher. During these years at IRCELYON, I have been involved in several European/French projects, which gave me the opportunity to work in different aspects of the material science and engineering, and to reach remarkable results. At the beginning, I was hired to create a MOF membrane able to separate CO<sub>2</sub> from a gas stream. This task was split in two, discover a good material for CO<sub>2</sub> removal, and find suitable MOFs to grow on ceramic tubes as membranes. The former one allowed me to perform high throughput synthesis of MOFs with high adsorption of CO<sub>2</sub>. It was then when I developed a new Metal Organic Framework (SIM-1, substituted imidazolate material). This material has notable qualities. It can be prepared as supported materials, on different support morphologies (tubes, fibres, monoliths, beads, discs). SIM-1 has a very strong adsorption of CO<sub>2</sub>, with a good selectivity in separation and total regenerability, features that make it a very useful material for industrial separation processes. We got the international patent of this material, we are in process of a new patent for its utilization as adsorbent, and discussions are done to seriously consider the SIM-1 as an available commercial product. The second task, the preparation of MOF films, provided me information about the mechanism of MOF growing on ceramic supports. In fact, I was able to assert a hypothesis about the growth mechanism of imidazolate materials. During these research years I published 15 articles in journals of high reputation in materials science, I have 4 more submitted and several ones in preparation. Although I am not able to supervise any thesis, due to the lack of stability of the postdoctoral contracts, I have been supervisor of Master students, 2 during my PhD and 5 in The Netherlands. The work developed during these research years has been presented as oral in international conferences 20 times (15 presentations given by myself), and also showed as a poster 30 times. In the field of technology transference, I obtained 3 patents, one of them of international impact, and another one in process. A serious economic study is carrying out for the introduction of SIM-1 on the market by the company Johnson Matthey.



**Nombre:** CAYUELA GARCIA, MARIA DE LA LUZ

**Referencia:** RYC-2011-08667

**Area:** Agricultura

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**Título:**

Residuos de bioenergía y biochar como enmiendas de suelo: dinámicas de C y N relevantes desde el punto de vista del calentamiento global /  
Bioenergy residues and biochar as soil amendments: climate relevant C and N dynamics in soil

**Resumen de la Memoria:**

This research proposal is highly multidisciplinary, since it gathers aspects related to sustainable agriculture, bioenergy production, waste management, soil quality and climate change. Biomass is the most common form of renewable energy and recently, much attention has been paid to identifying suitable biomass sources which can provide high energy outputs to replace conventional fossil fuels. An important, but little understood issue surrounding biofuels (fuels obtained from biomass) is the overall impact on global C and N cycling. Probably the increase of energy production from biomass will lead to higher input of its by-products to the soil as amendments or fertilizers. However, it is still unclear how these novel by-products of bioenergy production will influence microbial transformation processes in soil, and thereby its greenhouse gas balance and organic matter reserves. Particular attention has to be paid to changes in the C balance of the soil and changes in N<sub>2</sub>O emission of the soil, as these may negate any benefits made by biofuel production in terms of Global Warming Potential. With this new research line, I aim at studying the impact of different bioenergy by-products on C and N biogeochemical cycles. Thus, I propose to investigate residues from different current bioenergy chains: sludges from anaerobic digestion, different plant meals from biodiesel and bioethanol production and biochar from pyrolysis. Subsequently, any other residues from bioenergy resulting from new developing technologies would be included (such as residues from third-generation biofuels from algae). C and N mineralization in soil will be followed using a combination of <sup>15</sup>N and <sup>13</sup>C labeling units. Dynamics of CO<sub>2</sub> and N<sub>2</sub>O will be studied in the field and under controlled conditions (laboratory experiments). N<sub>2</sub>O emitted per unit stabilized C will be quantified. This novel efficiency parameter  $\zeta$  for C sequestration will be related to the different properties of the biofuel by-products in various agro-ecosystems. The integrated results of these experiments will help to understand the impact of the different bioenergy chains on C and N cycles, which may have a high impact on life cycle analysis calculations for the different bioenergy chains.

**Resumen del Curriculum Vitae:**

I finished my studies on Chemistry in 1999 at the University of Murcia. One year later I defended the  $\zeta$  Tesina de Licenciatura  $\zeta$  in the Department of Analytical Chemistry. On January 2001 I started my PhD studies in the Department of Soil and Water Conservation and Waste Management in CEBAS-CSIC. The PhD Thesis (2004), entitled  $\zeta$  Industrial production of ecological compost from olive mill wastes  $\zeta$ , was awarded with a prestigious National Prize (Premio Fertiliberia). I have more than 5 years of international postdoctoral experience (2x24months postdoctoral stays in Italy (Council of Agricultural Research, CRA) and The Netherlands (Wageningen University), and several short stays (3-4 months) in Italy (CRA), The Netherlands (Alterra) and USA (ARS-USDA). During this period I collaborated also with other research institutes: Rothamsted Research (UK), University of Innsbruck (Austria) and Alterra (The Netherlands), which led to the publication of several communications at conferences and peer-reviewed articles. I have 22 publications in journals included in SCI (in addition I have 1 submitted publication and 3 in preparation). More than 70% of my publications are within the first quartile (Q1), being the rest also published in acknowledged high-quality journals such as Biology and Fertility of Soils (Q2) or Applied Soil Ecology (Q2). The authorship is as follows: (11+2) publications as first author, 7 publications as second author, (8+3) publications as corresponding author, (1+1) publications as senior author. Most of my publications are very recent, but some have already been highly cited: Waste Management 2006 (61 cites), Process Biochemistry 2006 (36 cites), Biology 7/38 Engineering, Environmental) for a Special Issue devoted to the OECD Conference: Soils and Waste Management: a challenge to Climate Change held in Gorizia (Italy). I was selected as European expert within the  $\zeta$  European orientation group  $\zeta$  in the project «Integrated Systems to enhance sequestration of carbon, producing energy crops by using organic residues» -  $\zeta$ Seq-Cure  $\zeta$  (2007/2010). I regularly work as referee for 10 SCI journals. I have been awarded numerous prestigious (highly competitive) fellowships to develop research projects on my own initiative: Fulbright fellowship (2005); Postdoctoral Fellowship (Fundación Séneca, Regional Agency for Science and Technology. Murcia) (2006); European Science Foundation exchange grant (2007); Marie Curie Fellowship for career development  $\zeta$ PEOPLE  $\zeta$  - Call FP7-PEOPLE-2007-2-1-IEF  $\zeta$  Proposal N° 220868 (2008); JAE-Doc 2009 (CSIC) (2010); Marie Curie Re-Integration Grant  $\zeta$ PEOPLE  $\zeta$  - Call FP7-PEOPLE-2010-2-1-ERG Proposal N° 277069 (2010); OECD Fellowship (Cooperative Research Programme: Biological Resource Management for Sustainable Agricultural Systems) (2010). I have supervised 2 Master students and a Bachelor student during my postdoctoral period at Wageningen University.



**Nombre:** ALDAI ELKORO-IRIBE, NOELIA

**Referencia:** RYC-2011-08593

**Area:** Ganadería y Pesca

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**Título:**

Evaluation and production of high quality meat from ruminants for human consumption

**Resumen de la Memoria:**

The current researcher is faced with a unique dilemma; the consumer has a preference for healthier and more nutritious foods, while the industry is continually seeking to reduce costs, and now there is growing concern about the welfare of animals. Fat has always been an issue related to the consumption of ruminant meats because of its high content of saturated fatty acids and cholesterol. For the past 15 years this candidate has acquired extensive experiences to improve the nutritional and sensory quality of meat, having conducted studies in well recognized research centres in Europe, Canada, Australia and Spain using dietary and genetic means to improve and evaluate products, and acquiring and developing methods necessary for these assessments. The candidate is well qualified to establish and conduct a comprehensive research program specifically suited for Spain that incorporates local breeds, available natural resources (i.e., pastures), and specific dietary supplements to enhance healthy fats in beef. Her familiarity in the use of the most up-to-date analytical techniques to evaluate fats and sensory parameters, the established network of specialists around the world with whom she has and continues to interact and cooperate, her ability and willingness to cooperate and establish team work within and outside the centre makes the candidate highly qualified. The strategies are primarily focused on designing appropriate feeds to specific beef breeds to increase the polyunsaturated to saturated ratio, reduce the omega-6 to omega-3 ratio, increase the omega-3, vaccenic (11trans-18:1) and rumenic (9cis,11trans-18:2) acid content, and decrease the trans isomers associated with increased risk of cardiovascular disease. Both the feeding and genetic strategies are designed to not only enhance fat composition but also achieve improvements in economically important traits related to meat quality such as tenderness, colour, etc. Integrated cooperation with industry and a coordinated effort with other members of the center should provide for a successful and practical strategy to produce high quality ruminant meat (i.e. beef, lamb) in terms of nutritional, technological and sensorial parameters.

**Resumen del Curriculum Vitae:**

After finalizing both University Degrees, Agricultural Engineering (Agri-Food Industries) and Food Science & Technology, the candidate continued the Degree Thesis (tesina) for which she obtained the Extraordinary Award (Univ. of the Basque Country, 2000/01). Before starting her PhD studies in the Livestock Production Dpt. at SERIDA in Asturias, she spent 6 months in the Meat Technology Dpt. of the prestigious National Food Centre (NFC) in Dublin (Ireland) under the supervision of internationally known Mr. Troy. During the PhD program, the candidate carried out a second 3 month stay at NFC. The candidate's PhD thesis on evaluating the beef quality of several cattle breeds was published in 6 internationally prestigious journals while the PhD thesis obtained the maximum qualification and the candidate received the Doctor Europaeus Degree in July 2006. Following graduation the candidate received a postdoctoral scholarship funded by the Basque Government (2006/08). She joined the Lacombe Research Centre in Alberta (Agriculture and Agri-Food Canada) in western Canada, famous for its major work on meat quality and its interaction with the beef industry. The candidate continued her research in Canada with an EU funded project (June 2008) when she received the International Outgoing Marie Curie Fellowship (SPACANBEEF: Modifying and controlling the trans 18:1 and CLA isomers in beef). The studies were conducted in the laboratories of Drs. Dugan and Aalhus (AAFC-Lacombe, AB), Prof. Kramer (AAFC-Guelph, ON) and Dr. McAllister (AAFC-Lethbridge, AB). All the proposed objectives of the ambitious project were met resulting in the publication of a high number of quality research papers dealing with the development of new analytical techniques, comprehensive assessments of meat quality and lipid profiles in beef and pork, and evaluating and developing practical feeding strategies to provide science base solutions to animal industry challenges. Towards the end of the Fellowship the candidate spent 7 months with Dr. Klieve at Animal Research Institute of Queensland Government (Australia) where she investigated the influence of rumen microorganisms on lipid metabolism. At the moment the candidate is completing the return phase of the Fellowship at IGM (Instituto de Ganadería de Montaña) of CSIC in León (Spain) where under the supervision of Prof. Angel Mantecón, she is involved in several research projects related to in vitro polyunsaturated fatty acid metabolism by rumen bacteria and beef quality and fatty acid assessments. Overall, the candidate's CV reflects the dedication to university studies, the effort during the PhD Thesis, and the leader research capacity demonstrated during almost 4 years of postdoctoral studies at AAFC (Canada), Queensland Government (Australia) and IGM-CSIC. During the professional carrier the candidate has achieved 30 peer-reviewed scientific publications (further 2 under review). In addition, over 50 presentations has been presented at national and international scientific conferences, several practical and theoretical teaching and/or supervising activities were given, and numerous reviews were done for 10 international peer-reviewed journals. The candidate has recently been offered a Lecturer position in Tissue and Meat Science in the School of Animal Studies at the University of Queensland (Gatton Campus, Qld, Australia).



**Nombre:** GATTA , CARLO

**Referencia:** RYC-2011-08174

**Area:** Ciencias de la Computación y Tecnología Informática

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**Título:**

Advanced Image Processing and Machine Learning for the Analysis of Cardiac Images and Computer Assisted Diagnosis

**Resumen de la Memoria:**

Research in the Medical Imaging field requires the use of diverse techniques from the image processing and pattern recognition fields. The candidate main research line is the investigation on novel advanced techniques both in image processing and pattern recognition, with the aim to tackle complex problems in the Medical Imaging field. In the case of Intra-Vascular Ultrasound imaging (IVUS), the nature of the image itself is very challenging in its processing, analysis and automatic interpretation. Moreover, the IVUS modality is used in coronary arteries, where the heart beat induces several motion artifacts that make the analysis of the IVUS sequence even more complicated. The aim of the candidate is to investigate on the most relevant topics in the IVUS, X-Ray and CT modalities, also considering topics of great medical interest, as e.g. the fusion between Computer Tomography (CT) and X-Ray angiography. Regarding IVUS: since this modality is unique in the resolution it can provide about internal vessel structures, the candidate is willing to investigate on computer assisted methods able to extract quantitative information from large sets of data (more than 3000 frames per sequence) by using state-of-the-art machine learning technique and also proposing novel general purpose methodologies, as the author did with the Multi-Scale Stacked Sequential Learning technique. State-of-the-art and novel methodologies in the field of image processing (as e.g. non-linear anisotropic filtering) and pattern recognition (as e.g. graph matching, SOM and SVM) will be used to highlight clinically salient parts of the sequence in a highly automated way. Regarding the X-Ray modality the candidate will deepen the investigation on the Myocardial Blush detection and quantification, a topic that can improve the diagnosis of patient successful recovery after total occlusion revascularization. Finally, it is important to stress that the research will be conducted in strict collaboration with expert Medical Doctors, with the aim to provide effective solutions to real clinical problems.

**Resumen del Curriculum Vitae:**

Carlo Gatta obtained his M.Sc. in Electronic Engineer from *Università degli Studi di Brescia* (Italy), and his Ph.D. degree in Computer Science at *Università degli Studi di Milano* (Italy) with the maximum mark *Excellent*. He has been a post-doc research at the *Università Bicocca* (Milan, Italy), then at the Computer Vision Centre (Barcelona, Spain), and it is now a post-doc researcher at the *Universitat de Barcelona*. His research interest is focused on image processing/analysis, pattern recognition and computer vision applied to medical imaging. He collaborated with diverse European centers and universities: Chalmers University, Laboratoire d'Informatique et d'Imagerie Informatique de l'Université de La Rochelle, Institute of Computer Graphics and Algorithms - Vienna University of Technology, Imaging & Vision Laboratory *DISCO* - University of Milano Bicocca. He participates (or have participated) in 7 competitive research projects, 4 research contracts with companies and/or private or public funding bodies. He leaded, as principal investigator, one project of technology transfer for the Boston Scientific Corporation (funded with 150.000 USD). He is the principal investigator of a research contract financed with 76.005. The contributions of his research have been published in 12 international peer-reviewed indexed journals (plus 1 paper submitted), 10 book chapters and 19 papers at international conferences. The average impact factor of his last 5 years journal publications is 1.9. His research contributions sum up a total of approximately 250 citations (the article with more cites having 80), with an h-index of 8 (source: Harzing's Publish or Perish). He is the first author of one patent, filed by Boston Scientific Corporation, the leading company in Intra-Vascular Ultrasound catheters and related imaging hardware and software. He has been a lecturer for two courses in two different Italian universities. He is reviewer for the IEEE ICIP and IAPR ICPR. He is reviewer for the IEEE Transaction on Image Processing, IEEE Computer Graphics and Applications, SIGCHI reviewer Special Interest Group on Computer-Human Interaction of ACM and for the Journal of Electronic Imaging. Within the Medical Imaging Group, leaded by Dr. Petia Radeva, he is the Leading Investigator of 3 projects on different medical image modalities: - Intra-Vascular Ultrasound Image Analysis and Registration. - Fusion of 3D CT angiographic data with 2D X-ray data. - Myocardial perfusion detection and quantification in X-ray images.



**Nombre:** KOPSINIS , YANNIS

**Referencia:** RYC-2011-08110

**Area:** Ciencias de la Computación y Tecnología Informática

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**Título:**

Development of linear complexity methods for online sparse system and signal estimation suitable for non-stationarity conditions and distributed processing

**Resumen de la Memoria:**

Compressed sensing (CS) is a novel emerging technology which has stemmed from the field of sparse signal representations. CS provides the means and theoretical foundations for sampling, reconstruction and estimation of signals involving a significantly lower number of measurements than that implied by the Nyquist-Shannon Sampling theorem. Although CS is in its infancy, its principles have already found application in diverse fields such as medical (it has already enabled a 4-fold reduction in acquisition time for Magnetic Resonance Imaging (MRI) scans) or astronomy (Herschel, European Space Agency's cutting-edge space observatory launched in Spring 2009, carries CS technology in its Photodetector Array Camera and Spectrometer (PACS) instrument). Recently, the applicant developed a sparse signal reconstruction method which approaches the problem in an alternative way. It is based on set theoretic principles and evolves according to an Adaptive projection-based Learning (APL) algorithmic framework. This first attempt has shown a great potential and the task of this proposal is to further develop APL along the following research lines: a) Development of APL-based CS methods adequate for streaming signals and signals having time-varying characteristics: This is possible since APL methods are inherently online, in contrast to conventional CS techniques which operate in batch mode. Such an achievement would extend the potential applications of CS. Two examples from the medical field could be heart signal monitoring and dynamic (2D CINE) MRI. b) Reduction of computational complexity: A disadvantage of CS methods is their excessively high computational complexity. The APL algorithmic framework involves only simple projections onto convex sets which, in principle, allow for the development of reduced  $\zeta$  even of linear  $\zeta$  complexity sub-optimal variants. c) Extension of the APL framework for distributed operation: The low computational complexity is translated into energy efficiency. The proper redesign of APL methods according to distributed signal processing principles will allow the application of CS in wireless sensor networks. Moreover, APL algorithms have a built-in potential for enhanced parallelism. This is a positive indication of the ability of APL to handle distributed processing after proper adjustments. d) Nonlinear CS: APL is extendable to Reproducing Kernel Hilbert Spaces (RKHS). This provides an opportunity to investigate the potential of nonlinear mapping that may lead to an even higher sparsity, especially in cases where the system that generates the signal of interest is nonlinear. Possible applications are numerous, such as the analog to digital conversion of nonlinear optical communication channels. e) Theoretical analysis: The APL algorithmic framework offers a rich mathematical toolbox to deal with theoretical issues such as monotonicity and convergence. This provides guarantees that the produced algorithms will also be accompanied with concrete mathematical analysis of their convergence characteristics.

**Resumen del Curriculum Vitae:**

The applicant finished his undergraduate studies in the Department of Informatics and Telecommunications, University of Athens, Greece in 1998 and then he pursued a Phd (obtained in 2003) in the same department under the supervision of Prof. Sergios Theodoridis. For the next two years (2004-2005) he was a research fellow (postdoc) in the Institute for Digital Communications - Joint Research Institute in Signal and Image Processing, in the school of Engineering and Electronics, the University of Edinburgh, under the supervision of Prof. Bernard Mulgrew. From Jan. 2006 to Sept. 2009 he worked as a senior research fellow in the same department under the supervision of Prof. Stephen McLaughlin. He has participated in 3 research programs and he has produced 14 publications in peer-reviewed journals (2 under review) and 19 publications in peer-reviewed conferences (2 under review). He is the first author in more than the 70% of his publications and in the rest of them (with one exception) he is the second author. Moreover, one of his conference papers has received the best paper award. The applicant is the co-author of two books about algorithms and programming which are appropriate for the students of the last class of the high school who are preparing themselves for the university entrance national exams. Moreover, he has served as a Guest editor in the Journal on Advances in Signal Processing in the special issue  $\zeta$  Biologically inspired signal processing: Analysis, algorithms and applications. He has also served as a reviewer in prestigious Journal publications in the field such as IEEE trans. on Signal Processing, IEEE trans. on Information Theory, IEEE trans. on Neural Networks, IEEE trans. on Communications, IEEE trans. on Wireless Communications, IEEE Transactions on Circuits and Systems-Part II, IEEE journal of Lightwave Technology, IEEE Signal Processing letters, IEEE Photonics Letters, Elsevier Signal Processing, Elsevier Digital Signal Processing, EURASIP Journal of Advances in Signal Processing.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** MONTESANO , LUIS

**Referencia:** RYC-2011-09002

**Area:** Ciencias de la Computación y Tecnología Informática

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**Título:**

Learning and decision making for intelligent systems

**Resumen de la Memoria:**

Recent technological developments have started to take robots out of the factories and laboratories to the real world. The research line of this application is centered on the development of learning algorithms to create intelligent robots able to deal with the open-ended and dynamic environments where these systems have to operate, the interaction with humans and the massive amount of information they collect during operation. This research field lies at the intersection of machine learning, computational statistics and robotics, and takes inspiration and ideas from neuroscience and developmental psychology. Research will focus on several open problems in this general context. On one hand, I will study the problem of creating and abstracting task representations that can interpret the environment in terms of robot's actions and consequences, generalize to novel situations and their use as building blocks for more complex tasks learned by demonstration. This type of representations will be coupled with reliable control algorithms able to work on non linear / non Gaussian continuous space problems. Progress in these fields will lead to a considerable step forward in intelligent system leveraging their real application. On the other hand, among the wide range of applications (monitoring and surveillance, unmanned vehicles, home assistants), the research and technological transfer efforts will focus on one of the main social challenges of the Spanish society: the increase of the number of dependent people due to aging or illness. Robotics is one of the most promising technologies to improve the quality of live of impaired people, since robots can help to restore or substitute motor functions. The long-term vision of such a system would be a robotic device controlled by the user in a natural way, for instance, through a brain-machine interface, to execute (or help dependent people to execute) daily actions.

**Resumen del Curriculum Vitae:**

Luis Montesano obtained his PhD in Computer Science from the University of Zaragoza in 2006. From 2006 to 2009, he was a post-doctoral researcher at the Instituto Superior Técnico in Lisbon, Portugal. His research focuses on developing and applying learning algorithms to create intelligent robots that can operate in open-ended environments, learn through experience and adapt to new situations. Over the last years, he also conducts research on brain-machine interfaces to decode brain activity that will allow the user to control and interact with an intelligent robot in the context of assistive devices and rehabilitation. He has published in total more than 40 papers in international journal and conferences. He is author of seven journal papers (two Transactions on Robotics (JCR 1 in Robotics), one Autonomous Robots (JCR 2), 1 Transactions on Neural Systems and Rehabilitation Engineering (JCR 2 on Rehabilitation), 1 Neural Networks (JCR 30 on Artificial Intelligence), 1 Journal of Advanced Robotics (JCR 8 in Robotics)); two book chapters and over 30 international conferences and workshops at the most important conferences in his field (ICRA, IROS, RSS, ECCV, NIPS). In the last two years, he has been invited speaker at two workshops at ECCV2010 and NIPS 2009, has participated as programme committee on several conferences such as RSS, AAMAS, AI-STATS, IC DL and ICPRAM. He has participated in several FP6 and FP7 EU projects such as ROBOTCUB, CONTACT, FIRST-MM or ROBOEARTH. He was finalist to the best 2006 Spanish thesis in Robotics. He organized the 2009 summer school on Robot Learning, was part of the organization committee of Robotics Science and Systems 2010 and is currently organizing the HYPER summer school on emergent technologies for rehabilitation that will take place in September 2011.



Nombre: BENI, VALERIO

Referencia: RYC-2011-09272

Area: Tecnología Electrónica y de las Comunicaciones

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**Título:**

Development of an integrated bench-top instrumentation for genetical analysis.

**Resumen de la Memoria:**

El objetivo general del proyecto es el desarrollo de un sensor electroquímico de parámetros múltiples y su integración en un instrumento  $\zeta$ bench-top $\zeta$  automático. La plataforma de detección, basada en la tecnología de biosensores, consistirá en el uso de un elemento desechable de bajo coste producido por fotolitografía estándar o mediante  $\zeta$ screen printing $\zeta$ . En el proyecto se propone el uso de receptores de ADN específicamente modificados (faros moleculares,  $\zeta$ Molecular Beacons $\zeta$ ) y ensayos de estudio de la temperatura de fusión por vía electroquímica, para el desarrollo de una plataforma de medición capaz de proporcionar la especificidad y la sensibilidad necesaria sin la necesidad de lavado y adición de ningún reactivo. La estrategia de inmovilización de los receptores de ADN en los electrodos será optimizado para lograr la mínimas interacciones no-específicas, alta estabilidad y reproducibilidad en la preparación de la superficie. Por último, la plataforma de detección después de su integración en un dispositivo microfluídico se integrará en el instrumento que proporcionará la corriente, comunicaciones, hardware, software y la manipulación de forma automática de las muestras y de los reactivos/fluidos. Los principales logros serán: i) desarrollo de una plataforma de detección robusta y fiable, ii) la identificación de una estrategia de detección  $\zeta$ reagent-less $\zeta$  y la identificación de estrategias robustas, sencillas y fiables para la integración e interconexión de la plataforma de detección con sus módulos periféricos. El modelo utilizado en este proyecto es la detección de la predisposición, a través de análisis genético (tipificación HLA), a la enfermedad celiaca. Este es un modelo muy interesante por varias razones: i) el diagnóstico de esta enfermedad es especialmente difícil debido al hecho de que éste comparte síntomas con un gran número de diferentes enfermedades, ii) la genética asociada está bien establecida, y iii) la plataforma desarrollada puede ser considerada como versátil y se puede adaptar de manera sencilla para el diagnóstico y / o análisis de otras enfermedades o análisis medioambientales y de seguridad alimentaria (Ej. patógenos). El proyecto propuesto es altamente interdisciplinario y será llevado a cabo a través de colaboraciones existentes con instituciones europeas de probada experiencia en sus respectivas áreas. El candidato estará directamente involucrado en todas las fases del proyecto, aunque su principal contribución será el desarrollo y validación de los sensores, el diseño, fabricación y caracterización de la plataforma de detección, la definición de las estrategias de integración y diseño del protocolo para la automatización del ensayo. Una parte del financiamiento para el desarrollo del proyecto se obtendrá del proyecto integrado  $\zeta$ CD-MEDICS: Coeliac Disease Management Monitoring and Diagnosis using Biosensors and an Integrated Chip System $\zeta$  (FP7-2007-ICT-1 216031) de la Comisión Europea y de la beca Marie Curie RG  $\zeta$ CD-MB: Development of an electrochemical Molecular Beacon based DNA Chip for Coeliac disease predisposition diagnosis $\zeta$  (ERG-256542)

**Resumen del Curriculum Vitae:**

Dr. Valerio Beni estudio química en la  $\zeta$ Università degli Studi di Firenze $\zeta$ , Firenze, Italia donde desarrollo estudios de química analítica interesándose en la aplicación de la electroquímica en el análisis clínico y medioambiental. En el 2001 se traslado a Irlanda para iniciar estudios de doctorado en el National Microelectronics Research Centre (RMN), University College Cork, bajo la supervisión del Dr. Damien Arrigan. Durante su estudio, titulado " electroanalysis with solid electrode and liquid liquid interface " investigo  $\zeta$  varios aspectos de la electroquímica: (i) el uso e integración en instrumentación de campo de electrodos sólidos sin mercurio para la detección de metales pesados y (ii) electroanálisis en la interfase entre dos soluciones electrolíticas inmiscibles (ITIES). En 2004 comenzó un periodo de investigación de post-doctorado en el Tyndall National Institute, Cork, Irlanda, como investigador principal en un proyecto orientado a la industria (ELEMENKIT) destinado a desarrollar una herramienta electroquímica, que incluía los sensores e la instrumentación para la detección de metales en la célula biológica (metalloidic). En este trabajo adquirió conocimientos en el diseño, fabricación (mediante técnicas de fotolitografía), ensamblado y caracterización de arreglos de microelectrodos. Como resultado de este proyecto se obtuvo una estación de trabajo portátil electroquímica, integrada con una celda electroquímica para la medición de 8 parámetros. En 2007 se traslado a la Universidad Rovira i Virgili, Tarragona, España en el grupo de la Dra. Ciara K. O'Sullivan, donde empezó a trabajar en el desarrollo de genosensores y aptasensores electroquímicos así como en su integración en plataformas de detección automática. En 2008, como reconocimiento de su crecimiento continuo como científico, fue premiado con una Becas intraeuropeas (FEI) Becas Marie Curie ( $\zeta$ Nanoparticles: their application in the development of electrochemical molecular beacon biosensors $\zeta$ ) para explotar el uso de nano - partículas y auto montaje de moléculas para la nano-estructuración de superficies en el desarrollo de genosensores basados en  $\zeta$ molecular beacons $\zeta$  e en 2010 Dr. Valerio Beni fue premiado con una ulterior Beca Marie Curie (Reintegration Grant)  $\zeta$ CD-MB: Development of an electrochemical Molecular Beacon based DNA Chip for Coeliac disease predisposition diagnosis $\zeta$  (ERG-256542), enfocada en el promover su estabilización en la URV. Su trabajo ha dado lugar a 18 publicaciones en revistas internacionales, 3 proceedings en conferencias y en la preparación de una patente (actualmente en la fase de evaluación por parte de la oficina de IP de la Universitat Rovira i Virgili). Su trabajo ha sido citado 156 veces, lo que le da un índice H= 8 (de ISI Web of Knowledge). Además, ha difundido su trabajo a través de muchas conferencias internacionales (5 presentaciones orales y 27 posters). En su carrera ha supervisado o co-supervisado 13 estudiantes entre estudiantes de final de carrera (4), Master (6) y Ph.D (3) de las Universidades de España e Irlanda. A partir de 2008 estuvo involucrado en la enseñanza en el master "Nanociencia y Nanotecnología" en la Universitat Rovira i Virgili. Adicionalmente, ha sido involucrado en la preparación y gestión de proyectos nacionales e internacionales de los cuales ha conseguido financiación para 3 de los mismos.



**Nombre:** BATISTA DE CASTRO MENEZES, MOZART

**Referencia:** RYC-2011-08762

**Area:** Economía

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**Título:**

Facility Reliability Issues in Network Problems: Planning for Mitigation

**Resumen de la Memoria:**

A current common practice when designing supply chain networks is to consider reduced level of inventory, Just-in-Time deliveries, and minimal redundancy in the network. Clearly, these practices reduce operational costs to a minimum. However, the side effect of these cost-reduction actions is the increase in exposure of the supply chain to disruptions which can have severe economic repercussions. A small failure in operations (e.g. a supplier delay in the shipment of an item) can stop the whole supply chain. Additionally, terrorist attacks, contagious diseases that may cause worldwide pandemics in a relatively short period of time, and political instabilities have the potential to close-down facilities and bring down a whole supply chain or even countries, economies, and cause severe short term unbalance of supply-demand. Within this context, my research line aims to shed some light in the role of facility location in mitigating the effect of facility failure in supply chains, networks and consequently, on the long run cost of operating those supply chains. In order to perform the analysis, Operations Research techniques are utilized. Specifically, combinatorial optimisation techniques are used extensively; in addition there are opportunities for using game theoretical techniques in particular scenarios. The basic approach utilised generalises the classical p-median and p-center problems on a network to explicitly include the failure probabilities, and analyse structural and algorithmic aspects of the resulting model. The objective is to study two variants of both problems. In one, the customers have full information on the status of facilities - operational or non-operational. In the other, no such information is available and the customers must travel to a facility to obtain the information.

**Resumen del Curriculum Vitae:**

As it can be seen in my detailed curriculum vitae, I have a balanced business/academic profile. On the one hand, my industrial background has enabled me to understand the business and operational needs. On the other hand, my academic career has been fruitful: up till now, I have published 6 papers, 5 of them in top JCR journals and have 4 additional JCR publications under 2nd (2) or 1st (2) round of review. I have also performed 34 presentations in congresses and participated in 5 research projects. I have worked as referee (ad-hoc) for 8 journals, and am an Editorial Board member of IJBEX, International Journal of Business Excellence. My career has had a strong international component, as I have worked in Brazil, and at Research Institutions in Canada, France and Spain. I have also performed research stays in Japan, Belgium and United States. All the above has enabled me to lead at ZLC a research line in the business economics field, specifically Supply Chain Network Design. My first start in academia, after my business background, were a Master of Sciences in Civil Engineering with emphasis in project management and a Master of Sciences degree in Industrial Administration. Those two master level degrees were obtained at Clemson University in the United States of America. Afterwards, I started a PhD program at the Rotman Business School at University of Toronto in the subject Operations Research (dissertation: Reliability Issues in Strategic Location Problems) under the guidance of professors Oded Berman and Dmitry Krass. Both are well known professors in the field of Facility Location Theory. The partnership with the two cited professors stays strong until today. After five years of doctoral studies and two-and-half years of master level studies I entered the academia as professor. I stayed for four years at HEC School of Management where I developed a strong partnership with professors in what is considered the best Grande Ecole in France. I have been now four years at the Zaragoza Logistics Center. ZLC is a partnership between the Massachusetts Institute of Technology (MIT) and the government of Aragon through the University of Zaragoza. I also hold the position of research affiliate at the Center for Transportation and Logistics at MIT. This has opened a large window of opportunities for staying at MIT and work with some of the greatest leaders of our time. At the MIT-Zaragoza Logistics Program I have expanded my training experience due to my years as PhD Program Director, as well as to my role as scientist in charge for several mobility grants regionally funded for incoming fellows from China and Mexico. Next year I will act as host scientist for an incoming fellow from France in the recently awarded Marie Curie-IEF FLOUE project. All this has allowed me to maintain active collaborations in Europe, Asia, USA, Canada and Latin America. I am currently enjoying my sabbatical year, where I will perform joint research through 2 to 3-month stays in the following internationally recognized institutions: the University of Tsukuba in Japan, Solutia in Brussels, Belgium, General Motors in Detroit, US and the Center for Transportation and Logistics at MIT in Boston, US.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** ROMANOS FRAILE, EDUARDO

**Referencia:** RYC-2011-07596

**Area:** Ciencias Sociales

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**Título:**

Digital Insurgency: Performance and Outcomes of the Modern Threat to Power

**Resumen de la Memoria:**

My main research line in the field of contentious politics and social movements explores the relationship between power, protest and technology in the context of the study of different kinds of cyberactivism and hacktivism. The Internet and the spread of computer mediated communication have undoubtedly affected the dynamics of social movement processes. However, the extent of this impact needs further research. The broad research line involves studies of culture, identity and collective action. I will examine and compare different organizations and activist groups involved in interconnected, transnational campaigns for freedom of expression, the autonomy of horizontal networks of communication and against corruption and abuses carried out by power-holders. The Internet and ICT have not only allowed the development of new forms of collective action but have also become an arena of contestation where different actors interact in a symbolic struggle whose outcome could determine the structures and functions of civil society. I will examine the participation of cyberactivists in this conflict focusing on the processes of frame coding, identity building, and the elaboration, adoption and diffusion of new repertoires of action. These processes are intrinsically interconnected, and I will analyze them using an updated version of the interactionist approach I developed in previous research on the symbolic dimension of collective action. My research line also includes historical comparative analysis to assess to what degree this new form of transnational activism involves elements belonging to existing social movements and political traditions. The main hypothesis related to this is that certain forms of cyberactivism and hacktivism have given birth to and shaped a new subculture within the global justice movement, some of whose stated values (horizontality, antipoliticism, the struggle against the abuse of power and so on) would allow us to think of a renewal of anarchism. By way of comparison I will incorporate my previous experience in the study of international anarchism from the perspective of social movements. Additionally, I will expand my research into the impact of cyberactivism on political legitimacy, policy-making, and the media. In this research line, I will use a triangulation of different data-collection techniques, drawing upon a variety of sources around historical comparisons across transnational campaigns. This research line aims to make empirical and theoretical claims. Empirically, it will develop an innovative comparative approach to this emergent phenomenon. Theoretically, the research aims to advance hypotheses on social movement development and outcomes.

**Resumen del Curriculum Vitae:**

Having earned a BA in Sociology at the Universidad Pública de Navarra (UPNA) in 2001 (Extraordinary Distinction for Best Academic Record), I worked as a postgraduate fellow at the Centro de Investigaciones Sociológicas, Madrid. In 2002 I was awarded a 3+1 fellowship from the Spanish Ministry of Foreign Affairs to pursue a PhD at the European University Institute (EUI) in Florence. At the EUI, I received a Master of Research in 2004 and the title of Doctor of Political and Social Sciences in December 2007. My doctoral research combined the sociology of social movements and the history of political concepts in a longitudinal study of the historical development of the anarchist political tradition in Franco's Spain. Peter Wagner and Donatella Della Porta were the supervisor and second reader of my thesis, respectively. I received a European Doctorate certificate in Social History after spending the first half of 2007 at the University of Groningen as a Marie Curie Fellow (Early Stage Research Training Programme). In 2007, the Spanish Association of Contemporary History awarded me second prize in their Young Researcher Award with the publication of an article in the Association's journal, *Ayer*. Following the completion of my PhD, I worked as a research assistant on the project *Diaspora and Transnationalism*, which was co-funded by the EUI and the IMISCOE Network of Excellence under the supervision of Rainer Bauböck. In 2008-2009 I worked as a Postdoctoral Fellow in the Dep. of Sociology and Social Research at the University of Trento, under the supervision of Mario Diani. This fellowship was funded by the Provincia Autonoma di Trento. Since October 2009 I am a Juan de la Cierva Fellow in the Dep. of Sociology at UPNA, carrying out a project on protest movements in postwar Europe. I am also participating in the teaching of seminars both at undergraduate and Master's level, and in the Spanish Ministry of Science and Innovation project *Political Leadership Styles* (Plan Nacional de I+D+i; CS02008-04213). I have regularly attended and presented papers in 17 conferences (13 of which were international) in the fields of sociology, history and political science. I have published the findings of my projects in peer-reviewed journals in the ISI-Web of Knowledge. Among the most recent publications are the articles *Factionalism in Transition: A Comparative Analysis of Ruptures in the Spanish Anarchist Movement* (Journal of Historical Sociology, forthcoming) and *Emociones, identidad y represión: el activismo anarquista durante el franquismo* (REIS 134, 2011); the volume *Protest Beyond Borders: Contentious Politics in Europe since 1945* (Berghahn, 2011, ed. with H Kouki), and my contribution to *The Blackwell Encyclopedia of Political and Social Movements* (forthcoming). I am a reviewer for international journals and publishers, such as *International Review of Social History*, *The Historical Journal* and *Berghahn Books*. Additionally, I have worked as archival assistant at the International Institute of Social History in Amsterdam (2005 and 2007), and as a translator of academic manuscripts (the most recent, *Social Movements: An Introduction*, by D Della Porta and M Diani, Blackwell, 2006, which is about to be published in the CIS<sub>2</sub> Series Debate Social). In recent years I have also participated in the construction of various international networks of young researchers, most notably the one dedicated to the study of European Protest Movements Since The Cold War.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

**Nombre:** BOUZOUITA , MIRIAM

**Referencia:** RYC-2011-07747

**Area:** Filología y Filosofía

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**Título:**

Towards the History of Spanish in Majorca

**Resumen de la Memoria:**

The research I intend to conduct concerns the development of various morpho-syntactic phenomena in the history of Spanish and its dialects. More specifically, the historical development of Spanish in contact with Catalan remains by and large unstudied. This study aims to address this void in the literature by examining several verb-related features that characterise current Majorcan Spanish from a historical perspective in order to determine how contact with Catalan has contributed to the linguistic make-up of this Spanish dialect. Building further on work carried out for the Majorcan Spanish CHARTA project, I will first compile a historical corpus for Majorcan Spanish by transcribing previously unedited judicial documents that contain eyewitness accounts and, thus, colloquial treats. Subsequently, Majorcan Spanish data will be collected for various grammatical features that are alleged to be contact-induced changes from Catalan, such as the preference for the morphological future in comparison to the periphrastic future. I will also examine the use of clitic pronouns in cluster combinations as both languages involved differ considerably in this respect. Comparative analyses with contemporary and earlier stages of Spanish, using control corpora, will determine (i) whether these cases are instances of change or of continuity and (ii), in the former case, whether they are the result of language contact or of internal evolution. Although it has been established in contact linguistics that language contact can accelerate internally-motivated changes, the opposite remains to be scrutinised. Therefore, this study will also examine whether contact with Catalan can act as an inhibitor of linguistic change in order to verify the exact role that language-contact situations can play in the historical development of a language/dialect. Once the exact role of language contact has been established, analyses will be formulated within a processing-oriented grammar formalism, such as Dynamic Syntax. The proposed research will be of interest not only to historical Hispanic or Ibero-Romance linguists but also to philologists, those interested in contact linguistics, formal linguistics, and the history of Majorca and its inhabitants.

**Resumen del Curriculum Vitae:**

I studied Romance Languages. I'm also preparing 3 articles, 2 authored books and 1 edited book. I have given more than 40 presentations, of which 9 were invited talks (e.g. at Cambridge University, Exeter University etc.). I have undertaken stays in Cambridge University, MIT & Harvard University and UNAM. In sum, my scholarly interests range widely from Hispanic philology, palaeography to formal linguistics and, as can be seen from my CV, I am very international-minded and dynamic.



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Referencia:** RYC-2011-07591

**Area:** Filología y Filosofía

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**Título:**

Fama, teatro y poder en el Siglo de Oro a través de la obra de Lope de Vega

**Resumen de la Memoria:**

Lope de Vega (1562-1635) es uno de los autores más conocidos y mejor estudiados de nuestro Siglo de Oro. A pesar de lo cual, las dimensiones prácticamente inabarcables de su obra y el esfuerzo desigual según qué títulos ha dejado zonas significativas de su literatura en sombras. Así, todavía hoy, decenas de sus comedias permanecen inéditas, algunos episodios de su biografía siguen siendo un misterio y las polémicas político-literarias que le acompañaron toda su vida son en ocasiones malinterpretadas por la crítica. Así, ya desde mi etapa de doctorando, mostré una especial preocupación por estas deficiencias, intentando arrojar algo de luz sobre ellas. En consecuencia, he tratado de rescatar del silencio algunas de aquellas comedias ¿olvidadas¿, como fue el caso de La doncella Teodor, desvelar la incógnita sobre si sirvió o no como soldado en el artículo «En la boca del mentiroso hasta lo cierto se hace dudoso» y reconstruir la famosa controversia de la Spongia, que tantos problemas le acarrearón dentro y fuera de la Corte. Por otro lado, el legado literario de Lope se nos presenta como un caudal de información valiosísimo para entender una etapa tan convulsa de la Historia de España, y, en especial, acerca del reinado de Felipe IV, donde Lope afronta su vejez con una mezcla de estoicismo senequista, ironía mordaz y sátira metaliteraria a través de máscaras, personas y disfraces poéticos, como demostré en «Las bizarrías de Belisa o la última bala contra los ¿pájaros nuevos¿». Un campo de investigación muy atractivo para poder descubrir, estudiar y desarrollar las complejas relaciones entre los difíciles condicionantes sociales y la creación literaria, ciñéndonos a la producción artística de uno de los más grandes escritores de nuestra literatura, mediante el análisis de un corpus literario extenso, pero bien delimitado y con un indudable valor estético.

**Resumen del Curriculum Vitae:**

Desde mi etapa de becario F.P.U en la Universidad de Sevilla (2003-2006), como doctorando en el Departamento de Literatura Española, le he dado siempre una especial relevancia a mi formación como investigador. Así, primero viajé a EEUU, donde completé una estancia investigadora en la Universidad de Yale. Un par de años más tarde me trasladé a Italia, donde gracias a otra estancia, esta vez en la Universidad Ca¿Foscari de Venecia, logré satisfacer los requisitos necesarios para la obtención del grado de Doctor Europeo, como finalmente conseguí en octubre de 2006. Mi tesis doctoral alcanzó la máxima calificación (sobresaliente cum laude por unanimidad) bajo la dirección de la profesora Mercedes de los Reyes, fue galardonada con el Premio Extraordinario de Doctorado de la Universidad de Sevilla y publicada por la editorial Reichenberger (2008). Como resultado de mi preparación a ambos lados del Atlántico, mi tesis doctoral recogió en buena medida aquella síntesis, pues lo que comenzó siendo el estudio y edición crítica de una de las comedias olvidadas de Lope de Vega: La doncella Teodor, acabó derivando en un extenso recorrido por la literatura medieval europea y el folklore oriental. Asimismo, según iba completando la tesis fui publicando los primeros resultados (Analecta Malacitana, 2007; Quaderni Ibero-americani, 2005; y Boletín Hispánico Helvético, 2006). Por otro lado, mi colaboración con el grupo PROLOPE, para quienes llevé a cabo una de las ediciones críticas contenidas en la Parte IX (2007), me permitió además ahondar en el peso de la tradición clásica en Lope (Anuario Lope de Vega, 2006 y 2007; y Cuadernos de Filología Clásica, 2008). Al completar mi doctorado decidí ampliar mi formación como especialista en el Siglo de Oro entrando en el campo de la literatura colonial americana. Obtuve un contrato como Investigador doctor en el Proyecto de Excelencia ¿Herencia cultural de España en América¿ (Junta de Andalucía, HUM-611) por dos años. Aquel proyecto me permitió la publicación de un segundo libro: ¿Un viaje de ida y vuelta: América en las comedias del primer Lope (1562-1598)¿ (2008). Otros frutos de mi trabajo fueron dos artículos: el primero publicado en la revista Atenea (2010) y el segundo en un volumen colectivo (2008). Paralelamente fui abriendo nuevas líneas, como el estudio de la transformación estética que sufrió la prosa barroca camino de la novela moderna (NRFH, 2009; y RFE, 2010). Asimismo, no dejé de lado mi investigación principal, dando a la imprenta un par de artículos (Monteagudo, 2008; y Rilce, 2011). En 2009, obtuve una Ayuda postdoctoral (antigua Beca postdoctoral) del Ministerio de Ciencia e Innovación para una estancia bianual en la Universidad Ca¿Foscari. Dicha estancia me ha permitido trabajar bajo la dirección de Marco Presotto, uno de los mejores especialistas en Lope de Vega. Como resultado de mi investigación en tan prestigioso centro he concluido un libro: La Expostulatio Spongiae. Fuego cruzado en el nombre de Lope (Reichenberger, en prensa) y tres artículos (Monteagudo, 2010; Bulletin of Hispanic Studies y Revista de Literatura, ambos en prensa). Asimismo, mis vínculos con PROLOPE se extendieron a la participación en los congresos que el grupo organiza periódicamente y de cuya colaboración surgió un tercer trabajo (2009). Por último, de forma paralela continué profundizando en las huellas de la tradición clásica en Lope con un estudio sobre Plutarco (en prensa).



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**Título:**

Neurobiology of kisspeptin: Role in neurogenesis and other functions

**Resumen de la Memoria:**

Kisspeptin came to fame in 2003 for its role in the brain to control the onset of puberty and adult reproductive function. Humans and mice with a mutation affecting the kisspeptin signaling are infertile due to an inactivation of the neurons that release a neurohormone called GnRH. My postdoctoral studies have mainly focused on understanding the role of the kisspeptin neurons in the hypothalamus. The receptor Gpr54 to kisspeptin is expressed in the hypothalamus where it contributes to control GnRH neurons activity, but also in regions of the brain that are well known for their neurogenic properties: the subventricular zone and the hippocampus. Testing the effect of kisspeptin on neural stem cells suggested a potent stimulating effect on neural stem cells proliferation. Based on these new findings and my postdoctoral work, I will focus my research on three important aspects of the kisspeptin neurobiology. The role of kisspeptin on neurogenesis, the role of kisspeptin in the neuroendocrine brain and the kisspeptin access to the brain. This research program will use mouse models such as existing knockout mice and generate new strains as well as in vitro experiments to address the questions. I aim to define the level of expression of Gpr54 in neural stem cells (NSCs) in vivo and determine the effects of kisspeptin on self-renewal, differentiation development, migration and asymmetrical division of the NSCs. I will try to dissect the mechanism of action of kisspeptin on these NSCs and identify the intracellular pathways that are involved. Neural stem cells biology holds great potential for therapy and kisspeptin may turn out to be an important intrinsic factor to regulate the development of NSCs. I also plan to further study the access of kisspeptin to the brain and the role of kisspeptin neurons in the hypothalamus. A better knowledge of kisspeptin action is crucial in future therapeutic treatment of fertility disorders. All together these studies will contribute to the understanding of the physiology and the role of kisspeptin at different levels of the brain. From the ability of injected kisspeptin to cross the blood-brain-barrier to activate the GnRH neurons network and regulate the reproductive function; to stimulate neurogenesis in the stem cell niches of the brain. This will have a real impact in brain fundamental research and in therapeutic.

**Resumen del Curriculum Vitae:**

Bachelor degree in Cell Biology and Animal Physiology at the Université de Reims-Champagne Ardennes (2000). PhD degree in Neuroscience supervised by Dr. Vincent Prevot at the University of Lille 2 (2005), supported by the National Institute for Health and Medical Research (INSERM) and the Nord-Pas-de-Calais region council fellowship. During my PhD, I studied the modulation of the neuronal nitric oxidase synthase (nNOS) in the hypothalamus by its association with the NMDA receptor, the effect of estrogens and the role in the neuroendocrine control of reproduction. This work resulted in 4 publications, 2 as first author: d'Anglemont de Tassigny et al. (J. Neuroscience, 2007); d'Anglemont de Tassigny et al. (J. Neurochem., 2009); Parkash et al. (Endocrinology, 2010); de Seranno et al. (Endocrinology, 2010) and 2 reviews: Prevot et al. (Front. Neuroendocrinol., 2010); Bellefontaine et al. (Neuroendocrinology, in press). I started my postdoctoral training at the University of Cambridge (United Kingdom) with Professor William H Colledge. I studied the role of kisspeptin on the central control of reproduction. Notably the effect of kisspeptin at the nerve terminals of the GnRH neurons and the role of the kisspeptin neurons in integrating extrinsic signals like sex steroids or excitatory amino acids. This work resulted in 7 publications, 3 as first author, one as corresponding author: d'Anglemont de Tassigny et al. (PNAS, 2007); d'Anglemont de Tassigny et al. (Endocrinology 2008); Clarkson et al. (J. Neurosci., 2008); Clarkson et al. (J. Neuroendocrinol., 2009); d'Anglemont de Tassigny et al. (J. Neurosci., 2010); Herbison et al. (Endocrinology, 2010); Liu et al. (J. Neurosci., in press) and 2 reviews: Colledge et al. (Mol. Cell. Endocrinol., 2010); d'Anglemont de Tassigny & Colledge (Physiology, 2010).



Nombre: VICENT CAMBRA, SILVESTRE

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Area: Biomedicina

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**Título:**

Mecanismos de regulación de la progresión y metástasis del cáncer de pulmón inducido por el oncogén KRAS

**Resumen de la Memoria:**

Lung cancer is the leading cause of death by cancer in developed countries, with a 5-year overall survival around 15%. Among the oncogenes and tumor suppressors genes characterized to date, KRAS is the most frequently mutated oncogene in lung cancer. Despite representing a key molecular target, signal transduction regulated by activated KRAS has not been fully characterized. Therefore, there is a need for understanding the molecular mechanisms wired to oncogenic KRAS signaling. We have recently identified WT1 as a modulator of KRAS oncogenesis and senescence using a focused functional shRNA-based screen in mouse primary cells to target a previously described KRAS signature and its transcriptional regulators (Vicent et al. 2010). This study demonstrated that WT1 loss compromises lung cancer in vitro and in vivo in mouse and human models, and this phenotype was associated with induction of senescence. Moreover, unpublished preliminary results indicate that WT1 modulates oncogenic KRAS output by p21Cip1/cdkn1, and that this mechanism could involve miR17-92 cluster. Previous studies in other labs have shown that miR17-92 cluster can regulate p21Cip1 expression. In addition, miR17-92 cluster is a transcriptional target of c-Myc, an oncogene overexpressed in many human cancers. In human, miR17-92 is amplified or overexpressed in several types of NSCLC, and its overexpression is prognostic of poor survival in lung cancer patients. Recently, miR17-92 has been related to the regulation of TGFβ pathway in neuroblastomas specifically in processes associated with a metastatic phenotype, such as advanced progression and adhesion of tumor cells. My research plan focuses on elucidating the fundamental molecular mechanisms that control WT1 function in KRAS-driven oncogenesis, i.e., to investigate the role of WT1 and its putative target miR17-92 cluster at the molecular level in senescence, as well as in tumor progression and metastasis. These studies will help to characterize KRAS-dependent regulators in lung cancer, provide a deeper understanding of KRAS biology, and potentially identify novel therapeutic targets. The research proposal will be focused on the following aims: Aim 1: Characterization of p21Cip1 regulation by WT1 and the role of miR17-92 oncogenic cluster. We will test whether miR17-92 overexpression or loss can either rescue or phenocopy WT1 loss effect in KRAS cells, respectively, in human NSCLC cell lines. Aim 2: Characterization of the transcriptional regulation of miR17-92 cluster by WT1. We will functionally dissect the effect of WT1 on miR17-92 cluster using chromatin immunoprecipitation (ChIP), luciferase reporter assays and other functional assays in vitro. Aim 3: Characterization of the functional role of miR17-92 in lung cancer progression and metastasis. We will interrogate the effect of miR17-92 in lung cancer using functional assays in vitro and in vivo as well as genetically engineered mouse models, including  $\zeta$ K-ras fl/fl Adenovirus Cre $\zeta$ . Results from these studies will characterize KRAS-dependent regulators in lung cancer and provide a deeper understanding of KRAS biology.

**Resumen del Curriculum Vitae:**

EDUCATION Ph.D. in Cellular and Molecular Biology, December 2002. Qualification: Excellent Cum Laude. Thesis title:  $\zeta$ In vitro and in vivo study of elements of the Mitogen Activated Protein Kinase (MAPK) pathway (ERK, JNK and CL100) in lung carcinogenesis.  $\zeta$ Thesis supervisors: Dr. Luis Montuenga Badia and Ramon Gonzalez-Manzano University of Navarra. Department of Histology and Pathology, University of Navarra, (Pamplona, SPAIN). Advanced Studies in Cellular and Molecular Biology, September 1997-June 1999. Qualification: Excellent (9/10) Department of Histology and Pathology, University of Navarra (Pamplona, SPAIN). B.Sc. Biochemistry and Molecular Biology. September 1992- June 1997. Universidad de Navarra (Pamplona, SPAIN). Final qualification: 2.9/4. PRESENT POSITION POSTDOCTORAL FELLOW (September 2006  $\zeta$  present) Stanford University School of Medicine, Cancer Biology Program (Stanford, USA) Dr. Alejandro Sweet-Cordero's laboratory. PREVIOUS POSITIONS POSTDOCTORAL FELLOW (January 2004  $\zeta$  July 2006) Center for Applied Medical Research; Adhesion and Metastasis lab (Pamplona, SPAIN) Dr. Fernando Lecanda's laboratory. Ph.D. STUDENT (September 1998  $\zeta$  December 2002) University of Navarra, Department of Histology and Pathology (Pamplona, SPAIN) Dr. Luis Montuenga's laboratory. VISITING RESEARCHER (July 1999  $\zeta$  September 1999) National Cancer Institute, Cell and Cancer Biology Department (Frederick, USA) Dr. Michael J. Birrer's laboratory. STUDENT VOLUNTEER (June 1998  $\zeta$  September 1998) National Cancer Institute, Cell and Cancer Biology Department (Frederick, USA) Dr. Michael J. Birrer's laboratory. PUBLICATIONS AS FIRST AUTHOR. 1. Ravelo D\*, Anton I\*, Vicent S\*, Hernandez I, Valencia K, Zandueta C, Martinez S, Gurrupide A, Lecanda F. Dual tumor-stromal activities configure bone metastatic colonization in lung cancer (Clin and Exp Metast, under revision). \* Equally contributed. 2. Vicent S, Chen R., Sayles L.C., Lin C., Walker R.G., Gillespie A.K., Root D.E., Subramanian A., Hinkle G, Yang X., Huff V., Hahn W.C., Sweet-Cordero A. Wilms tumor 1 (WT1) regulates Kras-driven oncogenesis and senescence in mouse and human models. Journal of Clinical Investigation (2010). 3. Vicent S, Ravelo- D, Anton I, Garcia-Tunon I, Dotor J, Borrás-Cuesta F, De las J, Lecanda F. A Novel Lung Cancer Signature Mediates Metastatic Bone Colonization by a Dual Mechanism Cancer Research (2008). 4. Vicent S., Garayoa M., Lopez-Picazo J. M., Lozano M. D., Toledo G., Thunnissen E., Manzano R.G., Montuenga. L. M. Mitogen-Activated Protein Kinase (MAPK) Phosphatase-1 (CL100/MKP-1) is overexpressed in Non-Small Cell Lung Cancer (NSCLC) and is an independent predictor of outcome in patients. Clinical Cancer Research (2004). 5. Vicent S., López-Picazo J. M., Toledo G., Lozano M.D., Torre W., Corchón C. G., Quero C., Montuenga L.M., Manzano R. G. ERK1/2 is activated in Non-Small Cell Lung Cancer (NSCLC) and associated with advanced tumors. British Journal of Cancer (2004).



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**SUBPROGRAMA RAMON Y CAJAL  
CONVOCATORIA 2011**

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**Título:**

Lifestyle and genetic determinants of the development of metabolically-healthy and  $\zeta$ unhealthy obesity phenotypes; association of these obesity phenotypes with cancer risk and cancer survival

**Resumen de la Memoria:**

Although no uniform definition for obesity phenotypes has been developed, metabolically-healthy or  $\zeta$ unhealthy obesity have been described on the bases of the absence or presence of any metabolic disorder including type 2 diabetes, dyslipidemia, hypertension, or chronic inflammation in an obese individual (Body Mass Index, BMI  $\geq$  30 kg/m<sup>2</sup>). Different studies have estimated that 10-25% of obese subjects can be classified as metabolically healthy. It is estimated that these phenotypes are heritable traits, with genetics accounting for 25-70% of the observed variability. Little is known about the environmental and lifestyle determinants of healthy and unhealthy obesity phenotypes, but limited data suggest that transition from one to other phenotype is possible through diet, physical activity or bariatric surgery. There is some evidence indicating that metabolically-healthy obese subjects are not at an increased risk of cardiovascular morbidity or mortality compared to non-obese individuals. Whether metabolically-healthy obese individuals remain at a lower risk of developing other obesity-related conditions such as certain cancers has not yet been investigated<sup>1 2</sup>. During the first stage of this research I will seek to ascertain how lifestyle factors (i.e. diet, physical activity, alcohol consumption, smoking) may determine the development of metabolically-healthy or -unhealthy obesity phenotypes, as well as to study the plausible effect of gene\*lifestyle interactions in these phenotypes. In a second stage, I will try to uncover whether having a metabolically-healthy or  $\zeta$ unhealthy obesity phenotype is a better predictor of cancer risk and cancer survival than general obesity, and I will try to unravel the biological mechanisms linking obesity phenotypes to specific cancer types. I plan to use several study populations derived from on-going cohort studies in which healthy- and unhealthy-obesity phenotypes could be defined on the bases of anthropometric, clinical and biological data, with complete baseline information on diet, physical activity, and other lifestyle factors, extensive genotyping, and data on subsequent cancer development at follow-up. Several study designs will be developed, using both cross-sectional and longitudinal data, and appropriate statistical analyses will be applied to answer these research questions.

**Resumen del Curriculum Vitae:**

I graduated in Pharmacy (University of Barcelona, Spain, 1997-2002), got a MSc in Public Health Nutrition (London School of Hygiene and Tropical Medicine, United Kingdom, 2002-2003), and a PhD in Human Nutrition (University of the Balearic Islands, Spain, 2003-2007). My PhD thesis tried to describe the nutritional status and diet quality of populations undergoing the Nutrition Transition. For that, I used data of several epidemiological studies from both developed (Mediterranean) and developing regions. I worked with data from the study ENIB (Nutritional Study of the Balearic Islands), the Greek-branch of the EPIC study (European Prospective Investigation into Cancer and Nutrition), and a nutritional assessment survey carried out in a representative sample from the Andean population living in North-western Argentina. I spent several months at the University of Jujuy (Argentina, 2004-2005) and the University of Athens (Greece, 2006). I specialized on the analyses of dietary patterns, using both hypothesis-oriented (a priori) and data-driven (a posteriori) techniques. At the end of 2007 I got my current position as a Research Associate in Epidemiology at the Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London (United Kingdom), under the supervision of Prof. Elio Riboli. I am working in the EPIC study, as well as in other studies embedded within this large cohort (CRC, INTERACT, PANACEA, DIOGENES). My current research could be summarized as the study of the dietary and genetic determinants of metabolic diseases such as obesity, visceral adiposity, and type 2 diabetes, as well as the association of metabolic abnormalities (metabolic syndrome and chronic inflammation) with cancer risk. I am still interested in the study of hypothesis-oriented scores and dietary patterns and its effects on obesity, abdominal adiposity, type 2 diabetes, and cancer risk. I work with close collaboration with several European research centres, and still keep collaborations with the University of Jujuy and Tucuman (Argentina). I have published more than 30 articles in international journals, and presented my research as invited talks, oral presentations and posters in national and international conferences. I have been successful in at least 4 grant applications. I combine my research with teaching for both undergraduate and postgraduate students.



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**Título:**

ROLE OF SnRK2s AND PP2Cs IN ABA SIGNALLING AND GROWTH CONTROL

**Resumen de la Memoria:**

Group A protein phosphatases type 2C (PP2Cs) and ABA-activated SNF1-related kinases group 2 (SnRK2s), are key regulators of abscisic acid (ABA) signalling. This research line is aimed to get two major objectives: 1) Identification of upstream SnRK2-activating kinases and elucidation of their contribution to ABA signalling, and 2) Identification of key elements linking PP2C-mediated ABA signalling to growth control. ABA is the hormone that coordinates environmental conditions and plant growth. Fundamental biological problems and applied agriculture factors are derived from ABA research. Manipulation of the ABA signalling pathway is a major strategy for obtaining plant varieties with better fitness under stress conditions. A major positive regulator of ABA signalling is the group of ABA-activated SnRK2s. Pharmacological and genetic evidences suggest the existence of upstream SnRK2-activating kinases that might act as a positive input to counteract the negative regulation imposed by PP2Cs. However, the molecular identification of these kinases is currently a major black box in ABA signalling. Group A PP2Cs are key negative regulators of ABA signalling and recent data connecting PP2C function to chromatin remodelling have been reported. Chromatin remodelling complexes (CRCs), are major components of the machinery for the control of plant growth and development. This research proposal will pursue genetic approaches to gain insight into the role of components of CRCs as key elements connecting ABA receptors, PP2Cs and growth regulation. Under basal ABA levels, PP2Cs act as constitutive negative regulators of SnRK2s, which require ABA-induced phosphorylation to activate downstream targets. When ABA levels rise, the PYR/PYL/RCAR ABA-receptors inactivate the PP2Cs, which allows activation of the SnRK2s and transcriptional response to ABA. Genetic evidence has supported the negative role of PP2Cs in ABA signalling, as certain triple loss-of-function pp2c mutants display partial constitutive response to ABA. A molecular explanation for that phenotype is the constitutive activation of SnRK2s. A detailed quantitative estimation of this effect compared to ABA-mediated induction in wild type background has not been performed. Additionally, experiments with the kinase inhibitor staurosporine suggest the requirement of an upstream kinase for SnRK2 activation. Thus, while SnRK2s are sensitive to inhibition by staurosporine, the activation of SnRK2s by hyperosmotic or ABA treatment was not affected, which suggests that autophosphorylation is not the only mechanism involved in the activation of SnRK2s and it indicates the existence of upstream SnRK2-activating kinases (insensitive to staurosporine) required for activation of SnRK2s. For the identification of upstream SnRK2s and elucidation of their contribution to ABA signalling we will 1) Generate combinations pp2c mutants, 2) Compare ABA-induced versus constitutive activation of SnRK2s in combined pp2c mutants, 3) do Yeast two hybrid screening to identify interacting partners of the SnRK2s, 4) Search for staurosporine-insensitive kinases, 5) Perform protoplast kinase activation test, 6) Validate the in vitro assay with mutants, and 7) Generate antibodies for SnRK2s to study their phosphorylation state. For the identification of elements linking PP2C-mediated ABA-signalling to growth control we will 1) do a mutagenesis of pp2c mutants, and 2) Clone the new growth-regulator genes.

**Resumen del Curriculum Vitae:**

During my PhD at the University Miguel Hernandez (Alicante, Spain) I was involved in two different research projects, one related with salt-tolerance and the other with the leaf development, both using Arabidopsis as a genetic model. In relation with the first one, I cloned 3 genes that were finally involved in the ABA biosynthetic pathway. Even when some of those genes were already identified by other labs, I found new aspects that allowed us to publish our results in high impact scientific journals (4 papers, see CV). In relation with the leaf development, I worked with several leaf mutants, and I cloned one of them, a gene called ICU2 encoding the DNA polymerase alpha. We found for very first time in plants that this gene is a link between the DNA replication and the chromatin-mediated cellular memory. This work was considered for oral presentation in several international conferences and was published in the high impact journal Plant Cell. During this predoctoral period I learnt the most important techniques in Molecular Genetics and Molecular Biology such as different PCR techniques including real-time PCR, sequencing, cloning, southern blots, microscopy (optical, electronic and confocal) and QTL and microarray analyses. During my postdoctoral research at CSIRO Plant Industry (Australia) I have learnt how complex the dormancy is and how acts in Arabidopsis, understanding the role of the different seed tissues and also studying the role and the regulation of the ABA, a key hormone in this process. We have been developing new protocols to study the dormancy in Arabidopsis, which are now commonly used in the lab. I first performed a study of all the transcription factors differentially expressed between dormant and non dormant seeds in Arabidopsis. These work was published in Plant Physiology (see CV), and allowed us to identify several dormancy-related genes that were then studied in barley. After that I move my research into cereals and we have performed several microarray analyses of dormant and non dormant barley and wheat grains, and we have discovered that a tissue called coleorhizae is key element in the regulation of the germination (published in Plant Journal). Lately we have generating barley transgenic plants targeting several component of the ABA signalling pathway, to test their effect on seed dormancy. Some of these lines are being tested in the field and could be used in future breeding programs. Our research and models summarize and published on an invited review for a book chapter (see CV). In summary, I have been working with Arabidopsis for 10 years and with monocots like barley, wheat and Brachypodium during the last three. In both my PhD and postdoc I have been working in topics in which ABA is a key factor (salt-tolerance and seed dormancy, respectively), so I have a strong background on this hormone. I have studied the ABA metabolism, performed multiple physiological assays, analysed its effect in different plant tissues, generated mutants in Arabidopsis and barley with impaired ABA synthesis or sensitivity, and I have quantified the content of ABA in different plant tissues using different techniques. I believe that my experience in the field of ABA and in Plant Molecular Biology and Genetics nicely match this research proposal. I think that both my experience and the experience of the host lab complement very well and will allow driving this project to a successful end.



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**Título:**

Fotoproducción de hidrógeno por algas verdes

**Resumen de la Memoria:**

Many of the environmental problems the planet faces today result from our fossil fuel dependence and the related global warming. Investment in removable clean energies will alleviate these problems and can also reduce governments' energy dependence what in turn will have a positive economic impact. Among the emerging renewable clean energies, H<sub>2</sub> has big expectations because it is extremely clean; when it burns, the only byproduct is water. Unfortunately, H<sub>2</sub> is not currently widely used because its elevated production costs. However, H<sub>2</sub> can be bioproduced at low cost using photosynthetic microorganisms and solar energy. The most effective photobiological process for H<sub>2</sub> production is based on microalgae, although sadly, this is still a low-efficient process. *Chlamydomonas reinhardtii* has emerged as the microalgae model organism for investigating H<sub>2</sub> metabolism. Substantial progress has been made in elucidating the mechanisms governing H<sub>2</sub> production, so that H<sub>2</sub> photoproduction efficiency has been improved in this alga. Production of H<sub>2</sub> is achieved when cells are incubated under anaerobic conditions, during which a hydrogenase activity emerges. Hydrogenase enzyme can use low-potential electrons provided by either organic substrate fermentation or light-driven photosynthetic pathways. Moreover, H<sub>2</sub> production can be enhanced under sulfur deficiency conditions through a process not completely understood. Critical aspects regarding metabolic and physiological aspects of the cells during H<sub>2</sub> production conditions remain unresolved and new advances are required to define the metabolic and enzymatic processes influencing H<sub>2</sub> production. My research will focus in a better understanding of the metabolic and physiological relationships among H<sub>2</sub> production, photosynthesis, starch accumulation and sulfur deficiency in *Chlamydomonas*. This knowledge will help to establish new culture conditions leading to a more efficient H<sub>2</sub> production. To address these goals I will apply the experience I have in the physiology of the responses to sulfur deprivation, and its regulation in *Chlamydomonas* cells. Several fascinating mutants linked to sulfur deficiency responses and H<sub>2</sub> metabolism have been already isolated and new ones will be isolated through forward and reverse genetics screenings of insertional mutants. Several molecular biology approaches will be used to generate *Chlamydomonas* strains that could produce H<sub>2</sub> more efficiently. Analytical techniques will be used to detect and measure bioproduced H<sub>2</sub> gas. Photo-bioreactors will be optimized to enhance H<sub>2</sub> production. Emilio Fernandez's lab has been recently equipped with the finest technology required to carry out this project optimally.

**Resumen del Curriculum Vitae:**

Graduated in Biochemistry (Universidad de Córdoba, 1993-1998). Master Science Degree (Tesina) working with the green algae *Chlamydomonas reinhardtii* (University of Cordoba, 1998-2000). Awarded with a predoctoral fellowship from Junta de Andalucía (F.P.D.I program, 2001-2005). PhD degree (Universidad de Córdoba, 2000-2005) supervised by Emilio Fernandez and focussed in the study of the ammonium transporter genes of *Chlamydomonas* and in the regulatory mechanisms that govern the assimilation of both nitrate and ammonium in *Chlamydomonas*. Results were published in *Plant Mol Biol* (2004, 1st author), *Plant Physiology* (2005, 1st author), and *Analytical Biochemistry* (2005, 1st author). Several other publications have arisen from these results, indicating the high impact that this PhD work has. Among these publications I actively participated in some of them: *Plant Cell* (2007, 5th author), *Eukaryotic Cell* (2007; 3rd author). The knowledge I gained about microalgae systems allowed me to participate in the writing of a review in *Trends in Biotechnology* (2004, 2nd author) and two chapters of books of recognised international acceptance (CRC press, 2006, 3rd author; Springer, 2007, 2nd author). On 2006 I moved to Carnegie Institution of Science at Stanford University under the supervision of Prof. Arthur Grossman. Employed by the Carnegie Institution, and later on awarded with postdoctoral fellowships from MEC and from the Marie Curie International program (UE). My postdoctoral work was focused mainly in the study of the acclimation responses to sulfur deprivation, and its regulation, in *Chlamydomonas*. Among other tools I used mutagenesis and large-scale RNA-seq transcriptome analyses. The results were published in *Plant Physiology* (2008, 1st author), *Plant Cell* (2010, 1st author) and *Plant Physiology* (2010, 2nd author). An extra publication has been recently submitted to *Nucleic Acid Research* (February 2011, ID: NAR-00285-2011, 1st author). These works has provided a large amount of valuable information about different cellular processes that occur during sulfur deprivation; among these processes is the generation of hydrogen by *Chlamydomonas* cells. I also participated in the study of the phosphorous deprivation responses in *Chlamydomonas*; results were published in *Genetics* (2009, 2nd author). During my period at Stanford University I interacted with many prominent *Chlamydomonas* researchers and with the U.S. Department of Energy Joint Genome Institute that was in charge of the *Chlamydomonas* sequencing project. The result of these interactions was my participation in the publication describing the *Chlamydomonas* genome, *Science* (Merchant et al., 2010). Furthermore, I was invited to write a review about sulfur metabolism in the prestigious *Chlamydomonas* Source Book, 2nd edition, Elsevier (2009, 1st author). This book summarized each major research area of this alga, and it is an essential reading for anyone interested in using this organism. Other chapters of books of recognised international acceptance where I have participated are: Springer, 2010, 2nd author; Kluwer Academic Publishers, in press 2011, 3rd author. On July of 2010 I moved back to Emilio Fernandez's lab (Universidad de Córdoba) where I joined the projects for hydrogen production and nitrogen assimilation in *Chlamydomonas*. I am teaching Biotechnology of 5th graduate course of Biochemistry as Associate professor, and supervising a PhD student.



MINISTERIO  
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**SUBPROGRAMA RAMON Y CAJAL  
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**Referencia:** RYC-2011-08746

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**Título:**

Effect of chaperone networks in amyloid fibrils assembly.

**Resumen de la Memoria:**

Previous studies have shown that chaperones can use their substrate folding functions on amyloidogenic proteins and thus inhibit the amyloid fibrils assembly. However, most of these studies were focused on individual chaperones, while in nature chaperones realize their functions as  $\zeta$ chaperone networks $\zeta$ . Until now, two networks have been described: Hsp70-CCT and Hsp90-Hsp70. In these networks, chaperones collaborate for substrate folding, most likely via substrate transferring. Furthermore, there are cochaperones that modulate chaperone functions. Yet the exact mechanism of substrate transfer and the influence of co-chaperones on chaperone networks are still elusive. Thus, the main objective of this project is to characterize the effect of both Hsp70-CCT and Hsp90-Hsp70 chaperone networks on the amyloid fibrils assembly of several pathological proteins (Huntingtin, alpha-synuclein, ataxin-3, ABeta-peptide and Amylin). Biochemical and biophysical techniques will be used to characterize the folding products obtained after processing of these proteins by the networks. Their comparison with the products of individual chaperones will allow characterizing the extent of the collaboration among the chaperone networks. Moreover, we will study the function of co-chaperones in this process. I will also characterize the interaction between chaperones forming the network, using x-ray crystallography and spectroscopic techniques (FTIR, CD), as well as the effect of co-chaperones in these interactions and therefore in the network function.

**Resumen del Curriculum Vitae:**

I started my scientific career during my last year of university, 1997. My research work was done at Departamento de Bioquímica y Biología molecular, Universidad del País Vasco, under the supervision of Dr. Arturo Muga Villate and supported by  $\zeta$ Collaboration fellowship $\zeta$  for undergraduates of the Spanish Education and Science Ministry. During this year I studied the effect of crowding agents in the refolding of the chaperone GroEL (J. Biol. Chem. (2001) 276, 957-964). In 1998 I was awarded a pre-doctoral fellowship of Basque Country Government, to continue working in the same group. In 2003 I received my PhD and a one year post-doctoral fellowship of Basque Country University to pursue my postdoctoral studies. My project was focused on the characterization of the role of salt bridges in the allostery of GroEL. Using several biochemical and biophysical techniques (FTIR, DSC, protein folding experiments, Electron Microscopy, enzymology $\zeta$ ) we were able to show that two salt bridges are important for the thermal stability and the allosteric communication dependence on temperature, and hence are responsible of the inhibition of the substrate release at heat shock temperatures. These results were published in four papers (J. Biol. Chem. (2002) 277, 34024-34029; J. Biol. Chem. (2003) 278, 32083-32090; Protein Sci. (2005) 14, 2267-2274; J. Struct. Biol. (2006) 155, 482-492), the last one in collaboration with Dr. DM Guerin group. From 2004 to 2007 I was a post-doctoral fellow at Professor Alan Fersht group in Centre for Protein Engineering, MRC Centre, Cambridge, supported by a Post-doctoral fellowship of Basque Country Government and a postdoctoral contract from the MRC. There I gained knowledge in the biophysical characterization of protein-protein interactions, using fluorimetric techniques, analytical ultracentrifugation and NMR. I studied the interaction of p53 with Bcl-x1 and Bak, two proteins of the Bcl2 family. We determined the p53 domain responsible for the interaction, as well as Bcl-x1 and Bak binding sites (J. Biol. Chem. (2007) 282, 29193-29200). In order to learn crystallography, and improve my knowledge in protein biochemistry and enzymology, in March 2007 I moved to Professor Alfred Wittinghofer group (Max Planck Institute for Molecular Physiology, Dortmund). I was awarded with a 2 year Humboldt Research Fellowship. The focus of my work was the characterization of the mechanism of GTPase Activating Proteins (GAPs) with dual specificity for the G-proteins Ras and Rap, called Rasal and GAP1IP4BP. By using an extensive mutational study, steady state kinetic assays and time resolved FTIR measurements we were able to unravel the mechanism of this specificity shift. These results were published in the EMBO Journal (EMBO J. (2010) 29, 1205-14). I was also interested in the regulation of GAPs by lipids. I introduced to my former group a method for studying the GTPase activity of proteins while attached to vesicles (Cell (2010) 141, 812-21) and obtained interesting results about the regulation of Rasal activity by lipids (manuscript in preparation). In October 2010 I moved to Jose Maria Valpuesta group (Centro Nacional de Biotecnología, Madrid), granted with a JAE-Doc contract, in order to learn Electron Microscopy and study the effect of chaperone networks in amyloidogenic proteins.