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## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

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SUBDIRECCIÓN GENERAL  
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### Título:

Physics of topological materials, graphene and low-dimensional systems

### Resumen de la Memoria:

I have been involved in four main subfields of solid state theory in the last years: strong electronic correlations in nanoscale structures (PhD), spin-qubit dynamics and control for quantum computation, graphene physics and topological materials. The first two fields gave me a strong expertise of mesoscopic physics and semiconductors, and on very powerful formal tools. As a highlight from this period, I proposed the first all-electric manipulation scheme of spin qubits through geometric quantum phases, and the prediction of an associated spin relaxation mechanism. Since 2009 my activity is concentrated on the latter two fields, graphene and topological materials. Regarding graphene, I have made numerous contributions to the understanding of its unique transport properties, and of the interplay between its electronic and elastic properties. Recently, I have made significant contributions to the physics of graphene multilayers, in particular the electronic structure of twisted bilayers, their electronic topology, the dynamics and control of stacking solitons and their effect on transport in bilayers. Topology is one specific aspect which has pervaded my recent work. I have pursued physical implications of this powerful mathematical concept, in particular in the new class of topological materials. I have produced powerful solutions to the problem of generating and detecting Majorana fermions in topological superconductors, by analyzing the transport properties of topological Josephson junctions. Both graphene and topological materials have important technological implications, and I have been, and continue to be, actively involved in experimental efforts with world-class groups, including Nobel laureates Andre Geim and Konstantin Novoselov, and renowned experimentalists Brian LeRoy, Leo Kouwenhoven and Francesco Giazotto.

I currently enjoy complete research independence, and very high integration in my scientific environment, both locally and internationally. My extensive experience in physical modeling, non-perturbative techniques and numerical simulations position me as valuable and respected member in this kind of collaborations.

### Resumen del Currículum Vitae:

I began my PhD work in 2000, in which I worked in the area of strong electronic correlations in mesoscopic systems and granular metals. I specialized in non-perturbative techniques, Green's functions, effective actions, quantum dots, Kondo and Mott physics.

I then did a 3 year postdoc in Karlsruhe University, where I continued working on quantum dots, from the point of view of spin-qubits, quantum information and dissipative dynamics. I proposed a technique to perform coherent spin-qubit manipulations without magnetic fields. I also predicted a new type of geometric spin relaxation channel that was soon confirmed experimentally in the Kouwenhoven group. I also started working in graphene, which had been recently discovered.

In a subsequent 1-year postdoc, in Lancaster University, I continued working in graphene, particularly in transport, quantum pumping and the implications of pseudodiffusion. I also developed MatG, a state-of-the-art computational toolbox for quantum transport and spectroscopy, soon to be released as an open source project.

I returned to Spain with a JAE-doc contract, and continued working on graphene, particularly in its elastic properties and their interaction with electronic degrees of freedom. I also entered into the field of topological materials. In particular, I began a series of works on the problem of generating and detecting Majorana fermions in semiconductor nanowires.

This effort, together with my graphene work, continued after being hired in the ICMM-CSIC, under an European contract in 2012, where I now work. I have built a considerable network of collaborators, specially world-class experimental groups, with which I maintain an intense activity. In particular, I have been recently involved with the B. LeRoy group in Arizona, in an experimental work that demonstrates that stacking boundaries in graphene multilayers may be manipulated, dragged and strained using only electric fields (currently with referees in Nature Materials). I have also worked with Nobel laureates A. Geim and K. Novoselov in the problem of why many graphene bilayers appear insulating to transport, and have connected this to the existence of the same type of stacking domain walls. Also of note are my current collaborations with the experimental groups of F. Giazotto and L. Kouwenhoven, both in the problem of unambiguous detection of Majorana fermions in the solid state, to which I have made a number of proposals. In all these collaborations I am the leader of the theory side.



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I have published 31 papers on international journals (3 more currently with referees), which have received a total of 824 citations to date (606 citations since 2009, h-index=16, i10-index=18). I have personally made 27 contributions to international conferences, three by invitation, plus numerous seminars in different research institutions. I have offered several interviews in El Mundo and other newspapers, taught at the undergraduate and master level, mentored two diploma theses, and gave many outreach talks in primary and secondary education institutes on material science and graphene.



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### Título:

Unprecedented Water Reactivity - Synthetic Small-Molecule Walkers - Novel Synthetic Strategy based on Multimetallic Systems

### Resumen de la Memoria:

During my research career I have developed three main research lines:

#### A. Unprecedented water reactivity

Water is vital in many fundamental processes in Nature that are still not completely understood. Within this research line, experimental and theoretical evidences have proved that, by interaction with some transition metal complexes, the Hydrogen Atom Transfer (HAT) from water is possible. Water was therefore used in radical reductions, developing synthetic methodologies for the reduction of epoxides, carbonyl compounds, alkenes or alkynes.

This research line also deals with a fundamental process, the electron transfer between metal complexes in water. A novel mechanism for long-range electron-transfer reactions in aqueous media was studied in which water acts as a hydrogen-atom wire connecting metal centres and mediating electron transfers through the cleavage and formation of several H-O bonds. Those results may settle a new understanding for water-mediated long-range electron transfer processes.

#### B. Synthetic small-molecule walkers

Among the biological motors, Kinesin is a remarkable motor protein that moves directionally along microtubule filaments. Mimic this action in a synthetic molecular system means to learn how to build artificial structures that can control and exploit molecular level motion, which will potentially impact on every aspect of functional molecule and materials design.

Within this research line, the first wholly artificial chemical system which displays the mechanical property of sequential processivity and directional movement was developed. The walker is able to walk directionally and in either direction along a four-foothold molecular track, depending on the sequence of application of four external stimuli: acid, base, UV light, and visible light with iodine.

We also reported a small synthetic molecule able to walk back-and-forth upon a five-foothold pentaethylenimine track by a Michael-retro-Michael addition mechanism between adjacent amines while performing a task, quenching the fluorescence of an anthracene group sited at one end of the track. The extension of this concept to longer (up to nine footholds) tracks showed that the dynamics of the walker migration is well described by the random walk of a Brownian particle in one dimension.

#### C. Novel synthetic strategy based on multimetallic systems

This research line has resulted in the successful development of a novel synthetic strategy which combines radical chemistry of bis(cyclopentadienyl)titanium(III) chloride (Cp<sub>2</sub>TiCl) with late transition metal complexes (Ni(II) and Pd(II) complexes) and its application to new C-C bond forming reactions. A new useful and versatile chemical tool which allowed an easy access to highly functionalized compounds using very simple and easy accessible building blocks and very mild reaction conditions has been developed within this third research line.

### Resumen del Currículum Vitae:

I graduated in Chemistry from the University of Granada in 2004. A predoctoral grant (FPU, MEC) allowed me to get my PhD from the same university in December 2008 with the Doctoral Thesis entitled: "Water as a source of hydrogen in organic synthesis. New synthetic methods based on multimetallic systems", supervised by Prof. Juan M. Cuerva and Prof. J. Enrique Oltra. During my PhD studies, I acquired extensive knowledge in organic synthesis, especially in the development of new synthetic methodologies based on organometallic chemistry using Ti/Pd and Ti/Ni systems (Angew Chem, 2008 among other highly relevant articles) and in radical chemistry of Ti(III) (Angew Chem, 2006 and others). During this period I carried a short predoctoral stay of 3 months at the University of Aarhus (Denmark), under the supervision of Prof. Troels Skrydstrup, developing new reactions of C-C bond formation based on the use of SmI<sub>2</sub> (Tetrahedron, 2008). In February 2009 I joined the group of Prof. Diego J. Cárdenas at the Universidad Autónoma de Madrid, working on theoretical studies to explain the mechanisms involved in the reduction of free radicals mediated by Ti(III) and water as well as the mechanism of cyclization of enynes catalyzed by Au (I). The results were reported in 3 highly relevant scientific papers in prestigious multidisciplinary chemistry journals (J Am Chem Soc, 2010; Chem Eur J 2011; Chem Asian J, 2011). Nowadays, I maintain a collaboration with Prof. D. J. Cárdenas focused on the study of the behaviour of water in long-range electron transfer processes. Subsequently, in October 2009, I joined the group of Prof. David A. Leigh at the University of Edinburgh (UK) as a postdoctoral fellow (funded initially by Fundación Ramón Areces and EPSRC afterwards) working in the area of molecular machines and supramolecular chemistry, particularly in the synthesis and operation of new synthetic molecular walkers. To date, the results obtained during this postdoctoral stage have been reflected in 3 landmark publications in high-impact journals (Angewandte Chemie, 2011 and 2012 and JACS, 2013). Since February 2012, I have been a



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postdoctoral researcher within the 'Juan de la Cierva' program (MICINN) in the group of Prof. Juan M. Cuerva (University of Granada), where I became in charge of the development of one of the research lines within the group, cosupervising a doctoral thesis (Dr. Alba Millán) and a Master Thesis (Eng Irene R. Márquez). At the moment, I am also cosupervising a doctoral thesis (Eng Irene Rodríguez, predoctoral fellow, from FPU program).

Currently, I am author of 27 scientific publications in prestigious scientific journals, including two as corresponding author, two reviews and one book chapter, derived from my participation in fifteen research projects, including two European projects funded by the EPSRC and ERC, respectively. I am also the Principal Investigator in two research projects (CEI BioTic and UGR). Moreover, the results obtained have been presented in 20 communications to national and international conferences, including the three oral communications I gave, two of them in international conferences.



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**Título:**

The Economic Effects of Institutions and the Spatial Distribution of Economic Activity

**Resumen de la Memoria:**

Dr Ponzetto studies the economic effects of institutions and the spatial distribution of economic activity. His work has appeared in some of the top journals in economics. He has written on the dynamics of city growth, human capital and innovation; and on legal institutions and the development of legal rules. His main line of research focuses on political institutions and particularly on the impact of asymmetric information on policy outcomes.

1. ♦Strategic Extremism: Why Republicans and Democrats Divide on Religious Values♦ with E Glaeser and J Shapiro. Q J Econ 120(4): 1283-330 (Nov 2005)

We develop an electoral model of rational partisanship. Parties need to induce their core constituents to turn out. Rival candidates♦ policy proposals diverge if voters are more informed about their preferred party. The model predicts that the political relevance of religion is highest when about half the voters attend church regularly. Evidence across countries and within the US supports the prediction. The paper has 130 citations (Google Scholar).

2. ♦Why Does Democracy Need Education?♦ with E Glaeser and A Shleifer. J Econ Growth 12(2): 77-99 (June 2007)

We motivate empirically and model a causal mechanism explaining the positive correlation of education and democracy. Education teaches people to interact with each other and raises the benefits of civic participation. Hence, it raises bottom-up incentives to support broad-based democracy relative to top-down incentives to support narrow-based dictatorship. The paper has 293 citations (Google Scholar).

3. ♦Heterogeneous Information and Trade Policy♦ CEPR DP8726 (Dec 2011) R&R Rev Econ Stud

I develop an electoral model of tariff formation that accounts for the protectionist bias of trade policy, the electoral popularity of protectionism, and a Dracula effect reducing trade barriers when voters are more informed. The model predicts less protection in sectors with more media coverage. This is confirmed by evidence across US manufacturing industries, using data on non-tariff barriers and a new measure of newspaper coverage of trade policy for each sector.

4. ♦Shrouded Costs of Government: The Political Economy of State and Local Public Pensions♦ with E Glaeser. NBER WP18976 (Apr 2013) R&R J Public Econ

We study the differences between local and centralized control of public pensions. We develop an OLG model of housing markets and policy-making. The shrouding of pension promises induces inefficient back-loading of public-sector compensation. A local system is less subject to pressure by government employees, who may not vote locally; but also less scrutinized by statewide media. If local news is informative enough, centralization increases efficiency.

5. ♦Centralization and Accountability: Theory and Evidence from the Clean Air Act♦ with F Boffa and A Piolatto. CEPR DP9514 (June 2013)

We develop a model of fiscal federalism when regions differ in voters♦ ability to monitor politicians. Centralization then reduces aggregate rent extraction. If the central government sets a uniform policy, each region benefits inversely to its residents♦ information. This prediction is supported by evidence on pollution across the US. The 1970 Clean Air Act turned environmental regulation from a local to a federal responsibility. Less informed states enjoyed a faster decrease in pollution after centralization.

**Resumen del Currículum Vitae:**

Giacomo Ponzetto earned a PhD in Economics from Harvard University in 2009. Since then he has been a researcher at CREI and assistant professor at Universitat Pompeu Fabra and the Barcelona Graduate School of Economics. Since 2011 he has been a CEPR research affiliate.



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Before his graduate studies he had been a junior researcher at the Center for Research on Pensions and Welfare Policies (University of Turin and Collegio Carlo Alberto).

As a member of the CREI research team he has participated in several R&D projects financed by competitive grants from the Ministry of Science and Innovation: most recently on the effects of globalization (PI: J. Ventura) and on international technology transfers and firm strategies (PI: G. Gancia). In 2010 he was awarded a Juan de la Cierva fellowship. A research team composed of Drs Ventura, Gancia and Ponzetto has been awarded the 2013 grant of the Institut d'Estudis Autònoms (Generalitat de Catalunya) for a project on Globalization and Political Structure: The Case of the European Union.

Within UPF and the Barcelona GSE Dr Ponzetto has taught graduate courses in political economics, urban economics and international trade. He has been active more broadly in supervising the training of young researchers. In 2013-14 he is the faculty organizer of the weekly International Economics lunch seminar at which PhD students present their work. In a more formal advising relationship, he sits on the thesis committee of a graduating PhD student (M. Goñi) and is the main advisor of two other students currently in the process of writing their PhD theses, respectively in political economics (O. Anguera) and international and urban economics (A. Potlogea).

Dr Ponzetto has been regularly invited to present his research at the main international conferences in economics, including the annual meetings of CEPR, NBER, RES, SAET and SED. He was a member of the scientific committee for the 38th Annual Meeting of the Spanish Economic Association (Dec. 2013), and a co-organizer of the CEPR-CREI Workshop on Politics, Information and the Macroeconomy (May 2011) and of the Barcelona GSE Summer Forum Workshop on Trade, Growth and Income Distribution (June 2013). He is co-organizing three workshops to be held in June 2014: the 3rd IEB Workshop on Urban Economics, and the Barcelona GSE Summer Forum Workshops on Trade, Growth and Income Distribution, and on the Economic Analysis of Electoral Politics.

Dr Ponzetto has substantial international experience as an evaluator of research projects. He has been called upon to evaluate research proposals for the Social Sciences and Humanities Research Council of Canada, and for the Italian Ministry of Education, University and Research. He is a referee for over thirty scholarly journals, including the American Economic Review, Journal of Political Economy, Quarterly Journal of Economics and Review of Economic Studies. In 2011 he was awarded the annual referee prize by the Economic Journal.

In recognition of Dr Ponzetto's academic merits and achievements, of the international relevance of his publications, and of his potential for directing a leading independent research agenda, the 2012-13 Italian National Scientific Qualification has awarded him qualifications for the positions of full professor of Economic Policy and of Public Economics, and associate professor of Applied Economics.



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### Título:

◆Expanding the vascular field◆. Research initiative in Molecular Vascular Anaphylaxis.

### Resumen de la Memoria:

The main research line that I carried out as a younger researcher was that Angiotensin peptides (AngII, AngIV and Ang(1-7)), acting through its specific receptors(AT1, AT2, IRAP/AT4 and Mas) present proinflammatory properties and participates in the pathogenesis of several cardiovascular and renal diseases. During years as a PhD student, I was also studying AngII-related targets and pathways involved in fibrotic processes (CTGF and SMAD proteins) and REDOX signaling, characterizing new mediators of tissular damage caused by AngII and performing proteomic studies in hypertension animal models comparing long-term treatments with blood pressure blockers (ACE inhibitor or an AT1 antagonist). In 2006, I get the extraordinary award from the UAM for my thesis titled ◆Papel de los péptidos de Angiotensina y sus receptores en la Respuesta Inflamatoria◆.

As a PhD, I continued working in the AngiotensinII field of research but focused in the regulation of the CN/NFAT pathway in vascular diseases. My studies contributed to increase the acknowledgements in AngII/CN/Rcan1 pathway focused in vascular field establishing an important regulation of this pathway and showing Rcan1 as a key molecule in vascular remodeling. This achievement allowed me the development of other investigations not only in vascular damage (related with aneurysms and restenosis pathologies) if not in atherosclerotic processes and vascular reactivity processes.

My expertise in vascular field has led to design a new project called RIMVA (Research Initiative for Molecular Vascular-Anaphylaxis). Anaphylaxis has been usually studied from an immunological point of view, but the main lethal effects of anaphylaxis are mediated through the vasculature as massive vasodilatation leading to drop in blood pressure and vascular leakage leading to edema formation. The global scale of allergies and asthma and the enormous associated costs make it clear that there is an urgent need for advances in the treatment/prevention of this problem. This is a highly relevant issue that is largely supported by experimental observations made, until now, only from an immunological point of view. The hypothesis at the basis of my research is that in anaphylaxis, there is a close interaction between immune cells and vascular cells. Vasoactive molecules such as Histamine or CGRP may regulate Rcan1 molecules and play an important role in the leakage process accounting in anaphylaxis but further studies are necessities to determine molecular and mechanistically these processes.

Just say as a brief summary that it is highlighted in my career description that I am more than qualified in basic research. From my C.V you could observe the wide list of skills and qualifications than I have been involved, so honestly, although I had not the opportunity signing manuscripts as a IP yet, in my experience there is no doubt that my proficiencies are very appropriate for it. Therefore, it represents the chance for the Ministerio de Economía y Competitividad to support a young researcher with pioneering ideas who aims to investigate a very relevant issue in the vascular related field.

### Resumen del Currículum Vitae:

My scientific career started, after my Biology degree in the Universidad Autónoma de Madrid (2000), at the Renal and Vascular Pathology laboratory at Fundación Jimenez-Díaz in Madrid. I was first awarded with a Fellowship BEFI from Instituto de Salud Carlos III (ISCIII) in 2001. In 2006, I got my Ph.D degree in Life Sciences as well as the Research contract ◆Postdoctoral de Perfeccionamiento◆ from ISCIII. In January 2007, I incorporated as a Ph.D in the Vascular Biology and Inflammation Department Group in CNIC where I worked during 5 years (except time working abroad). Due to the relevance of my skills, I had the opportunity to get an associated contracted in the Epidemiology, Atherothrombosis and Imaging Department Group where I was working as a collaborator and supervisor of Master students and PhD students during 2012. Along last years in CNIC, I designed a Research Initiative for Molecular Vascular-Anaphylaxis (RIMVA) project that I am currently performing at Gentofte Hospital in Denmark where I am a researcher from beginning 2013.

The most relevant thing as a younger researcher has been the publication record in the field of CardioVascular and Renal diseases. I have been working on research during the last 13 years, being very productive for the Scientific Community, publishing many articles (28 original manuscripts, 7 of them as first authorship) and several reviews and book chapters (10). In particular the last two first author papers published in the prestigious Journal of Experimental Medicine (J Exp Med. 2011 Sep 26;208(10):2125-39) and EMBO Molecular Medicine (EMBO mol med. 2013 Dec;5(12):1901-17), deserves mention. Most of our manuscripts have been published in prestigious journals as Circ Res, Circulation, ATVB, JASN, Kidney Int, etc◆ that have received more than 1650 citations with a high average of Citations per Article and a h-INDEX; 21 (information available in ResearchID resource).

Many of these achievements are due to my own research added to the large number of collaborations maintained, particularly with other qualified groups in Spain as well as with other international groups, all highly regarded in their fields. I have participated in more than 15



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multidisciplinary projects some of which included international collaboration and working abroad. I had the opportunity to move to two excellent foreign centres: Nephrology Center (University of Munich) and CHARITE (Berlin), Germany and many others centres in Spain. Although still at an early career stages, I was always well regarded and highly respected being considered an expert in the vascular field and I have participated in the co-supervision of at least 3 PhD students and 4 Master undergraduate-students. Besides, I have contributed to the transfer of our research with participation in more than 20 international and 15 national congresses.

Finally, I established a research (independent supervision) with Dr. Lars.K Poulsen in the Allergic Clinic in Copenhagen, University Hospital at Gentofte, Denmark where I am leading the RIMVA project. In my experience, there is no doubt that my skills are very appropriate for develop projects as IP, because I have the appropriate education and experience to put in motion all the experimental procedures planned for the next years.





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### Título:

Advanced human cancer: Therapies guided by mutational signatures

### Resumen de la Memoria:

I am a scientist with a background of 16 years of specialized research focused on the study of the molecular mechanisms that control human cancer dynamics and pathobiology. During my pre-doctoral training, I studied the biological and mechanistic activity resulting from the signaling crosstalk between multiple oncogenes (with special interest in RAS and MYC oncogenes). I developed this activity in human cancer models where RAS/MAPK activity elicited non-proliferative or transforming effects and hence provoked cells to undergo differentiation or induce cytotoxicity. Later I received a five year post-doctoral training at NIH (USA) under the supervision of Dr. J.S. Gutkind who gave me the opportunity to start my own research activity. Based on my previous experience I decided to develop an integrative approach combining multiple intracellular signaling pathways and the dynamic regulation of transcriptional events that control cell proliferation, transformation and differentiation. This was tested in multiple biological models that included drosophila, primary and immortalized mouse and human cell lines as well as a variety of ex-vivo and in-vivo human cancer models including melanoma and head and neck cancer. During this stage I learned to work independently in a time-efficient manner but moreover it provided me with the opportunity to establish highly productive and long-lasting collaborative efforts like those with Claudia Lanari (Conicet, Argentina) or WenJun Chen (NIH, USA). My strongest implication in this role has been probably one of my best achievements and has enabled the publication of important contributions in research fields like breast cancer and T-cell biology. In 2011, I was recruited by Dr. MA. Piris to join efforts and start a cancer genomics laboratory in IFIMAV (Santander, Spain). Our goal was to develop cancer research projects clearly oriented towards the clinic. Based on my mechanistic background and taking advantage of our clinical environment, my current research line consists on developing the ability to generate targeted next-generation sequencing (NGS) data of human cancer samples, identify actionable targets and develop pre-clinical models where to test individualized combinatory therapies derived from the mutational data. Our primary focus consists on B-cell and T-cell lymphomas, colorectal cancer, melanoma, Merkel cell carcinoma and hepatocellular carcinoma for which I have managed to generate close and effective collaborations with a number of clinicians to help developing specifically each research project. These clinicians range from oncologists to surgeons, pathologists, hematologist, dermatologists, etc, from Hospital Marqués de Valdecilla as well as other national and international hospitals and will serve as critical collaborators to develop my current and future translational research activity. Finally as a direct result of this, in this relatively short period of time, I was lucky to successfully receive as a PI, competitive funding to develop one of our projects (in this case, melanoma) as well as generated a number of publications that directly derive from our ongoing efforts.

### Resumen del Currículum Vitae:

My scientific production, I think that shows an evolution from studying oncogenic interactions and drug effects in human cancer models towards more complex biological as well as mechanistic approaches trying to integrate intracellular signaling into the dynamic control of gene expression. Always working in the field of cancer, I have currently developed a more clinically oriented cancer research initiative trying to integrate my mechanistic view into the development of specific pre-clinical approaches/models where to test novel combinatorial therapies that will depend on individualized NGS-based analyses of human samples from clinically selected cancer patients. I was trained at University of Cantabria (Mater and Ph.D. degrees) where I actively contributed to the generation of twelve original research manuscripts. Later I moved to the NIH to receive postdoctoral training where I also contributed to the generation of nine research manuscripts and one book chapter. In US I have been exposed to start my own research, defend it in public as well as actively set up solid collaborations with important research laboratories that resulted highly productive, as reflected with the number and quality of the contributions generated, and that indeed have resulted crucial to my current activities. Back in Spain I am trying to combine my mechanistic background into a more clinically oriented work. In a short period of time I have collaborated with Dr. MA Piris to start a leading laboratory in cancer genomics (including equipment, personnel, research plan and funding). As of today, this ongoing initiative has proven successful and has rendered the publication of three top contributions to the field and a patent where I am playing a major role. Moreover I have been lucky to receive funding as PI from a highly competitive grant call. I have also participated in a number of congresses and gave oral talks both outside and inside Spain, I have actively participated as a professor in the masters organized by University of Cantabria and CNIO as well as co-directed Nuria García to obtain her masters degree in 2013.



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**Nombre:** RAUL ANDERO GALI  
**Referencia:** RYC-2013-13620  
**Área Científica:** Psicología  
**Correo Electrónico:** randero@emory.edu

### Título:

Translational mechanisms of fear-related brain disorders.

### Resumen de la Memoria:

I graduated in Psychology at the Universidad Autónoma de Barcelona (UAB) in 2003. As graduate student at Dr. Coll-Andreu lab (UAB) I studied memory using deep brain stimulation in rats. We found that electric stimulation of the anterior part of the pedunclopontine tegmental nucleus before training in an active avoidance task enhances memory (Andero et al., 2007). Title of the ASD (DEA) dissertation: Effects of electrical stimulation in the pedunclopontine tegmental nucleus in two-way active avoidance: influence of time and electrode site implantation (2005). Then I moved to the Dr. Armario & Dr. Nadal lab (UAB), where my collaborations resulted in two studies. In the first one, we reported how two different PTSD-like models, immobilization to a wooden board (IMO) or exposure to cat odor, elicit a completely different pattern of the stress hormones ACTH and Corticosterone. Moreover, the levels of these hormones are independent of the long-term anxiety that rats present after exposure to these PTSD-like models (Muñoz-Abellán et al., 2008). In the second study, we described how a repeated dose of amphetamine in rats enhanced locomotor activity whereas it decreased the release of ACTH and Corticosterone. This finding suggests a dissociation of locomotor and stress responses induced by amphetamine (Gagliano et al., 2009). For my doctoral dissertation, I studied memory and stress dysregulation in rodents as models of Posttraumatic Stress Disorder (PTSD). Title: Post-traumatic stress models in rodents: pharmacological activation of TrkB receptors reverses learning and memory deficits. We showed how the first identified small molecule TrkB agonist, 7,8-dihydroxyflavone (7,8-DHF), prevents the appearance of PTSD-like symptoms when given few hours after a traumatic stress exposure in rats (Andero et al., 2012). I visited two times, spending 8 months in total, the prestigious Dr. Ressler's lab, funded by the Howard Hughes Medical Institute at Emory University (USA). In Dr. Ressler's lab I learned techniques in behavior and molecular biology. Two manuscripts were published from the work during these visits. In the first one, we discovered that 7,8-DHF given systemically phosphorylated the TrkB receptor in the amygdala, a key area in fear processing. Fear is a key component of PTSD because individuals who suffer from this disorder present enhanced consolidation of fear memories. Moreover, 7,8-DHF rescued a fear extinction deficit in mice that had been previously exposed to IMO (Andero et al., 2011). In the second study we found that another TrkB agonist, Deoxygedunin, has neuroprotective, anti-depressant and learning enhancement effects. Since 2010, I have been a Postdoctoral Fellow in the Ressler lab. Since beginning this fellowship, I have received training in translational neuroscience combining studies in humans with PTSD and animal models. I have also written about the molecular mechanisms of fear (review by Andero et al., 2012, and a book chapter Andero et al., 2014). Moreover, we have recently discovered that the Oprl1 gene in the amygdala is related to dysregulated fear in a PTSD-like model. In humans, OPRL1 is associated with PTSD symptoms. Our data suggest that activation of the Oprl1 receptor may have implications for prevention of PTSD after a traumatic event (Andero et al., 2013).

### Resumen del Currículum Vitae:

After obtaining my BS in Psychology in 2003 by the Universidad Autónoma de Barcelona (UAB), I joined Dr. Coll-Andreu's lab (UAB) to study memory using deep brain stimulation in rats (Andero et al., 2007 *Neurobiology of Learning and Memory*, IF 3.443). I also was Professor Tutor at the Universidad de Educación a Distancia (UNED) at the School of Psychology, where I taught theory classes of Psychobiology (2004-2005). After obtaining my Advanced Studies Diploma (DEA) (2005), I was awarded with a FPI fellowship (2006-2010) at the lab of Dr. Armario & Dr. Nadal at the UAB to study memory and stress dysregulation in rodents as models of Posttraumatic Stress Disorder (PTSD) (Andero et al., 2012 *Hippocampus*, IF 5.492). In collaboration with Panlab S.L., I developed software and hardware for analyzing behavior in rodents (2007). I received a FPI long-term stay fellowship (2008) to visit the prestigious lab of Dr. Ressler's lab at Emory University which is funded by the Howard Hughes Medical Institute (USA). In this lab, I learned molecular biology and behavior in PTSD models (Andero et al., 2011 *American Journal of Psychiatry*, IF 12.539, 64 citations). In 2010, after obtaining my PhD and receiving the Doctoral Extraordinary Prize by the UAB, I joined Dr. Ressler's lab as Postdoctoral Fellow where I have received further training in translational neuroscience by combining studies in humans with PTSD and animal models (review by Andero et al., 2012 *Genes, Brain and Behavior*, IF 3.597; Andero et al., 2013 *Science Translational Medicine*, IF 2012 10.757, recommended in Faculty1000; book chapter Andero et al., 2014 *PMBTS Book series*). I have worked at Emory University more than 4 years. The average impact factor of my first author publications is 7.2. All my publications are in the first quartile, including the ones I am co-author: *PLoS One*, IF 4.411; *Psychoneuroendocrinology*, IF 3.788; *Psychopharmacology*, IF 4.103. My H factor is 7 and my papers have received 184 citations. I have presented 19 posters in international meetings, and I have been invited to 5 talks including the international meetings Society for Neuroscience (SfN), Society for Biological Psychiatry (SOBP) and International Narcotics Research Conference. I have participated in 28 grants with a total support of approximately 10.674.658 euros (overheads excluded). I am the only co-investigator of a R21 grant, NIH-NIMH (USA), 2013-15, 212.711 euros. I have received postdoctoral travel awards by the Federation of European Neuroscience Societies



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(2012), SOBP and Wisconsin Symposium on Emotion (2013), the NCDEU New Investigator Award by the American Society of Clinical Psychopharmacology (2013), and the Outstanding Postdoc Award by Emory University (2013). I have also been co-reviewer of Science, Molecular Psychiatry, Neuropsychopharmacology, Journal of Neuroscience, Learning and Memory, PLoS One, Neuroscience and reviewer of Biology of Mood & Anxiety Disorders. My scientific publications have been commented in news media of more than 25 countries including National Geographic, Forbes, The Scientist Magazine, Newsweek (USA), El País (Spain). I have also conducted interviews in Los Angeles Times and US News (USA), ABC and Magazine QUO (Spain), El Economista (Mexico), and I have recorded a podcast for Jackson Labs (USA). I am also serving as co-chair of the Amygdala Social at SfN since 2011.



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**Nombre:** HANNEKE DE JAEGER  
**Referencia:** RYC-2013-14583  
**Área Científica:** Psicología  
**Correo Electrónico:** h.de.jaegher@gmail.com

### Título:

Participatory Sense-Making

### Resumen de la Memoria:

I am a cognitive scientist investigating embodied and interactive approaches to social cognition. In my Masters thesis at the Free University of Brussels (2001), and later in my PhD at the University of Sussex (2007), I developed a novel framework for the study of social cognition, entitled participatory sense-making.

The main innovation of this framework is that it proposes that the interactions that people engage in are themselves effective and measurable factors in people's performance on social cognitive tasks. In other words: interaction processes as such can influence, modulate, and transform individual intentions and skills.

My research has one overarching question: What roles do social interaction processes, individual cognitive factors, and personal experience play in different forms of social understanding?

This is divided in four subquestions that guide my research:

1. What role do complex and dynamic social interaction processes play in social cognition?
2. How to conceive and study the function of individual cognitive mechanisms and skills in an interactive framework?
3. What is the relation between social interaction and personal experience?
4. How to understand observational social understanding, from an interactive perspective?

Previously, I worked in 2 consecutive Marie Curie funded post-doctoral positions, first at the University of Heidelberg (2008-2010), and later at the University of the Basque Country (2010-2012).

I have also had the opportunity to get involved in research supervision at the doctoral and post-doctoral levels in a further Marie Curie project, the ITN TESIS (Towards an Embodied Science of InterSubjectivity (FP7-PEOPLE-2010-ITN, 264828), for which I am currently Deputy Training Manager, and which takes my framework as a central theoretical grounding.

My publications are highly cited, and my research is being further elaborated by me, my collaborators, and independent researchers around the world.

My vision is to build a research group for the interdisciplinary study of social cognition under the embodied, interactive approach I am developing, in close collaboration with the research lines of my current group, the IAS-Research Centre at the University of the Basque Country.

Already, students and post-docs are applying to work with me, and receiving Ramón y Cajal funding would put me in an excellent position to receive, support, and supervise them, and to develop this work in the best way possible.

### Resumen del Currículum Vitae:

#### RESEARCH

Area: Cognitive science, theoretical psychology, philosophy of mind

Topics: Social cognition; autism; methodological, theoretical, and epistemic issues in interdisciplinary research on social cognition

Keywords: Participatory sense-making, enaction, interaction dynamics, dynamical systems, embodiment, psychopathology (especially autism)

#### EDUCATION:

2001 - 2007: D.Phil. (PhD) Philosophy of Cognitive Science, University of Sussex, UK.

1996 - 2001: Licentiate in Philosophy, Free University of Brussels (VUB), Belgium



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### CURRENT POSITION:

Since 08/2012: Deputy Training Coordinator and Research Fellow, Marie Curie Initial Training Network TESIS (FP7-PEOPLE-2010-ITN-264828), Dept. of Logic & Philosophy of Science, University of the Basque Country, Spain

### PREVIOUS POSITIONS since 2008:

08/2010-07/2012: Marie Curie Intra-European Fellow (FP7-PEOPLE-2009-IEF-253883), Dept. of Logic and Philosophy of Science, University of the Basque Country, Spain

02/2008-07/2010: Experienced Researcher (ER), Marie Curie Research Training Network DISCOS (MC-RTN-2006-035975), Department of Psychiatry, University of Heidelberg, Germany

### GRANTS (selection):

#### AS PI:

- 2010-2012 Marie Curie Intra-European Fellowship, ◆INDYNAUTS ◆ Interaction Dynamics and Autonomy in Social Cognition◆ FP7-PEOPLE-2009-IEF-253883 ◆ 147.217

#### AS CO-INVESTIGATOR:

- 2013-2018 Basque Government Financing for Research Groups IAS-Research, Gobierno Vasco, IT590-13, 01-01-2013--31-12-2018, IP: Alvaro Moreno ◆ 226.598

- 2011 - 2015: Marie Curie Initial Training Network FP7-PEOPLE-2010-ITN-264828 ◆TESIS ◆ Towards an Embodied Science of InterSubjectivity◆. University of Heidelberg & University of the Basque Country ◆ 4.300.000

- 2010 DFG (German Research Foundation) funding for Embodiment, Intersubjectivity and Psychopathology Conference, University of Heidelberg, Germany ◆ 18.000

### PEER-REVIEWED PUBLICATIONS (13 in total, selection here):

- Di Paolo, E, DE JAEGER, H & Gallagher, S (2013) ◆One step forwards, two steps back ◆ not the Tango◆ TRENDS IN COGNITIVE SCIENCES 17(7), 303-304.

- DE JAEGER, H (2013). ◆Embodiment and sense-making in autism◆ Frontiers in Integrative Neuroscience 7(15)

- De Jaegher, H (2013) ◆Rigid and fluid interactions with institutions◆ Cognitive Systems Research 25-26(0), 19-25.

- DE JAEGER, H, Di Paolo, E (2012) ◆Enactivism is not interactionism◆ Frontiers in Human Neuroscience 6:345.

- DE JAEGER, H, Di Paolo, E & Gallagher, S (2010) ◆Can social interaction constitute social cognition?◆ TRENDS IN COGNITIVE SCIENCES, 14(10), 441-447

- DE JAEGER, H & Froese, T (2009) ◆On the role of social interaction in individual agency◆ Adaptive Behavior, 17(5), 444-460

- DE JAEGER, H (2009) ◆Social understanding through direct perception? Yes, by interacting◆ Consciousness and Cognition, 18(2), 535-542

- DE JAEGER, H (2009) ◆What made me want the cheese? A reply to Shaun Gallagher and Dan Hutto◆ Consciousness and Cognition, 18(2), 549-550

- DE JAEGER, H & Di Paolo, E. A. (2007) ◆Participatory Sense-Making: An enactive approach to social cognition◆ Phenomenology and the Cognitive Sciences, 6(4), 485-507

### BOOK CHAPTERS: 8 in total

### TRANSLATIONS of papers into Japanese (1) and Spanish (2)

### INVITED PRESENTATIONS at international conferences: 40

### CITATIONS (Google Scholar): 815, h-index: 10, i10-index: 10



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**Nombre:** VICTOR LORENZ FONFRIA  
**Referencia:** RYC-2013-13114  
**Área Científica:** Biología Fundamental y de Sistemas  
**Correo Electrónico:** victor.lorenz@fu-berlin.de

### Título:

structure, dynamics and function of membrane proteins

### Resumen de la Memoria:

I have nearly 10 years of experience as a researcher in Japan (38 months), Spain (44 months) and Germany (>34 months). My research was focused predominantly in the structure/dynamics/function relationship in membrane proteins by means of spectroscopic techniques. I studied a variety of membrane proteins, including pumps (bacteriorhodopsin, halorhodopsin), secondary transporters (melibiose permease, mitochondrial ADP/ATP carrier), GPCR photoreceptors (visual rhodopsin), and channels (channelrhodopsin-1 and channelrhodopsin-2). Some relevant questions I have addressed are the following:

-Role played by buried internal water molecules and how their dynamics affect protein function. We concluded that protein/water fluctuations (inhibited at below 200 K) are required for the physiological changes of internal waters during the photocycle of bacteriorhodopsin. Our results raised concerns about the physiological relevance of the X-ray structures for any protein intermediate trapped at temperatures below 200 K.

-Molecular mechanism (gate or switch) that ensures vectorial transport in proton pumps. We identified that the  $\diamond$ switch $\diamond$  is unidirectional in bacteriorhodopsin, and likely originates from the irreversible deprotonation of a protonated water cluster (the proton release group).

-Local and global conformational changes upon binding of substrates to secondary transporters. We characterized Na<sup>+</sup> and melibiose binding to the melibiose permease. Studies with site-directed mutants identified residues responsible for Na<sup>+</sup> and melibiose binding, for the Na<sup>+</sup>/melibiose affinity coupling, as well as residues required only for the transport mechanism. Current efforts are in crystallization, and in msec time-resolved studies to discriminate between conformational changes induced by binding and by transport.

-Structural fluctuations in membrane proteins by hydrogen/deuterium exchange (HDX). The dynamic/thermodynamic properties of protein fluctuations can be detected by very few methods, among them by HDX. As an example, we characterized a fluctuation in the retinal binding pocket of bovine rhodopsin by HDX. In parallel, we characterized kinetically the thermal isomerization of the retinal in solution by HPLC. Combination of both experiments led to a model for the thermal activation of rhodopsin that explains the activation enthalpy and the rate of rhodopsin activation in the dark.

-Role of internal proton-transfers and backbone conformational changes in the gating mechanism of channels. Channelrhodopsin is the first and so far only known light-gated channel known in nature. To unravel the underlying molecular mechanism, we measured time-resolved photocurrents, UV/Vis and infrared spectroscopy on wild-type and six single mutants. We resolved several proton transfers, and suggested a connection between them and the gating mechanism. We also observed protein conformational changes that correlate in time with cation permeation.

Currently, besides continuing some of the above research topics and I am also assessing the functionality of membrane proteins crystals by means of infrared microscopy. I am also studying the role of the membrane potential in the function of membrane proteins (e.g., channelrhodopsin), a very important but poorly studied parameter. For that purpose I am using surface enhanced infrared spectroscopy with a gold electrode to apply a voltage.

### Resumen del Currículum Vitae:

Degree in Chemistry (1997) by the  $\diamond$ Universitat de València $\diamond$  and PhD in Biochemistry (2003) by the  $\diamond$ Universitat Autònoma de Barcelona $\diamond$  (UAB), under the supervision of Prof Padrós. Postdoc stage for over 3 years in the group of Prof Kandori (Nagoya Institute of Technology, Japan), with the support of a Fellowship from the Japanese Society for the Promotion of Science. In 2008 moved to the Center for Biophysical Studies (UAB, Spain), awarded by a Marie Curie Reintegration Grant. Since 2011 hired as Research Associate in the Institute of Experimental Biophysics, Freie Universität Berlin.

The applicant's research is focused on the study of the structure, dynamics and function of membrane proteins, namely: the light-gated cation channel channelrhodopsin; the proton/Cl<sup>-</sup> pumps bacteriorhodopsin and halorhodopsin; the GPCR photoreceptor visual rhodopsin; the Na<sup>+</sup>-coupled transporter melibiose permease and the mitochondrial ADP/ATP exchanger.

The Applicant uses multidisciplinary approaches, combining molecular biology and biochemistry methods, art-of-state spectroscopy techniques, and advanced methods of analysis. He has setup and improved several vibrational methods, namely: time-resolved step-scan and rapid-scan FTIR spectroscopy (dynamics in proteins with photocycles from 10 ns up to several minutes), substrate-induced attenuated total reflection (interaction of biomolecules and ions with membrane proteins), polarized absorption and difference absorption IR (orientation changes of transmembrane helices during the function of proteins), hydrogen/deuterium exchange (dynamics/thermodynamics of protein fluctuations from seconds to days), IR microscopy (structure and functionality of protein crystals),



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and surface enhanced IR spectroscopy of protein monolayers bound to a gold surface (to test how an electric potential affects membrane proteins), to name the most important ones.

Simultaneously, the Applicant has developed and improved several advanced methods for data analysis, an essential aspect for the success of his projects, notably: a pioneer approach to invert eigenvalue problems arising in modeling of kinetic data (Lórenz-Fonfría et al. 2009a JACS); Maximum Entropy methods for spectroscopy (Lórenz-Fonfría et al 2005, 2006, 2007 Appl Spectrosc); Bayesian inference with Markov Chain Monte Carlo sampling for global analysis of data (Lórenz-Fonfría et al. 2010 JACS), etc.

Original research papers: 33 (Q1=25 and Q2=8). Books chapters and reviews: 3. First author (including equal contribution): 21 publications, including PNAS (1) and JACS (3). Corresponding author: 14 publications, including PNAS (1) and JACS (2). Publications in the areas of chemistry, biochemistry, biophysics, spectroscopy, and molecular biology: Mol Cell (1), Proc Nat Acad Sci USA (2), J Am Chem Soc (3), J Biol Chem (1), etc. Cumulative Impact Factor: 146. Co-supervisor of two doctoral thesis defended in 2009 and in 2012. Teaching experience: Spain, 174 h of laboratory and 6 h of lectures teaching biophysics in Medical, Biomedical Sciences and Physiotherapy undergraduate/bachelor courses at the Universitat Autònoma de Barcelona (2008/9, 2009/10 and 2010/11). Germany, 247 h of laboratory and 6 h of lectures teaching biophysics/spectroscopy to bachelor/master students of physics and master students of biochemistry at Freie Universitaet Berlin (2010/11, 2011/12, 2012/13, 2013/14).