

Part A. PERSONAL INFORMATION		CV date	26/11/2019
First and Family name	Javier Prior Arce		
Social Security, Passport, ID number	48476826W	Age	40
Researcher numbers	Researcher ID	P-9944-2017	
	Orcid code	0000-0002-0872-1465	

A.1. Current position

Name of University/Institution	Universidad Politécnica de Cartagena Instituto Carlos I de física teórica y computacional (Universidad de Granada)		
Department	Departamento de física aplicada y tecnología naval		
Address and Country	Universidad Politécnica de Cartagena, Paseo Alfonso XIII, 30203 Cartagena (Spain)		
Phone number	868071230	E-mail	javier.prior@upct.es
Current position	Profesor Titular de Universidad	From	2017
Espec. Cód. UNESCO	22117, 221023, 221029		
Palabras clave	Quantum sensing, quantum biology, open quantum systems		

A.2. Education

PhD	University	Year
Physics	Universidad de Murcia	2006

A.3. JCR articles, h Index, thesis supervised...

I am the author, in the last 12 years, of 33 publications in peer-reviewed journals, including two in the Nature group (*Nature Physics* and *Nature Communications*), and five *Physical Review Letters*. Since 2010, my articles have obtained more than 1130 citations with an h-index of 15 according to Web of Science (1630 citations with an h-index of 19 according to Google Scholar). I am regularly invited to give talks at international conferences or research institutes, with already more than 30 invited and plenary talks in my CV.

I am the founder and co-organizer of the conference “*New Trends in quantum complex systems dynamics*” which every two years take place in Cartagena or Venice. It has established itself (4 editions 2013/2015/2017/2019) as one of the main workshop in the field. I have been PI of four research projects from the national research plan. In addition, within the few years that I have worked at UPCT, my group has been officially recognized as a *Group of Excellence of the Region of Murcia*. I am the PI of another Regional project.

Part B. CV SUMMARY (max. 3500 characters, including spaces)

Javier Prior (PhD 2006). I am a group leader at the *Universidad Politécnica de Cartagena* (Spain), working in theoretical quantum physics, researcher at the Institute Carlos I for Theoretical and Computational Physics, *Universidad de Granada* and academic visitor at the Institute for Theoretical Physics at the University of Ulm, Germany since 2010.

I have significant international research experience. I was a post doc for two years (2007 and 2008) at the University of Oxford and one year at Imperial College University (London, England) in 2009.

Innovation - My main research focus is on basic and fundamental science, however, I am always looking for practical applications for my results. This has driven me to contribute to diverse fields, such as quantum biology, quantum sensing, open quantum systems, condensed-matter theory.

Numerical quantum techniques - I have made fundamental contributions to the implementation of Density Matrix Renormalization Group (DMRG) in new areas of

application. Specifically, I developed one of the most successful techniques for the study of open quantum systems strongly interacting with their environments: the TEDOPA method. Furthermore, I contributed to the development of the Heisenberg-picture version of DMRG and its applications to non-equilibrium many-body problems.

Condensed-matter physics - I have also made fundamental contributions to condensed-matter theory, specifically the topic of Anderson localization, where I provided an analytic distribution function for the conductivity of disordered two-dimensional systems in the localized regime. I have also contributed to the study of variable-range hopping in one and two-dimensional systems studying quantum fluctuations effects in hopping.

Quantum biology – I have contributed to the interpretation of coherent effects in multidimensional spectra, by introducing a quantum description of vibronic coupling and its role in environment-assisted transport in biological systems. My group works on ultrafast quantum dynamics in the presence of decoherence. We have developed significant new simulation tools designed to capture the transient quantum effects which may appear in complex, multi-scale open system processes. We have also pioneered the use of methods from signal processing (compressed sensing, wavelet transformations) for the analysis and/or rapid calculation of 2DES data.

I also have extensively collaborated with internationally renowned experimental groups, having been a co-author on 4 experimental papers. I have been a regular visitor in the experimental group of Prof. Jürgen Hauer at the Technological University of Munich since 2012. I have been collaboration the last two years with the experimentalist Prof. Fedor Jelezco.

Part C. RELEVANT MERITS

C.1. Relevant publications

- 1) A Rotem, T Gefen, S. Oviedo-Casado, J. Prior, S Schmitt, L McGuinness, F Jelezko, A Retzker, **Limits on spectral resolution measurements by quantum probes**, *Phys. Rev. Lett.* 122, 060503 (2019).
- 2) VI Novoderezhkin, E Romero, J Prior, R van Grondelle, **Exciton-vibrational resonance and dynamics of charge separation in the photosystem II reaction center**, *Physical Chemistry Chemical Physics* 19 (7), 5195-5208 (2017).
- 3) Elisabet Romero, Javier Prior, Alex W. Chin, Sarah E. Morgan, Vladimir I. Novoderezhkin, Martin B. Plenio, Rienk van Grondelle, Quantum-coherent dynamics in photosynthetic charge separation revealed by wavelet analysis, *Scientific reports* 7, 2890 (2017).
- 4) S Oviedo-Casado, J Prior, AW Chin, R Rosenbach, SF Huelga, MB Plenio, **Phase dependent exciton transport and energy harvesting from thermal environments**, *Phys. Rev. A* 93, 020102(R) (2016).
- 5) MT Mitchison, M Huber, MP Woods, J Prior, M Plenio, Realising a quantum absorption refrigerator with an atom - cavity system, *Quantum Science and Technology* 1 (1), 015001 (2016).
- 6) MT Mitchison, MP Woods, J Prior, M Huber, Coherence-assisted single-shot cooling by quantum absorption refrigerators, *New Journal of Physics* (2015).
- 7) Caycedo-Soler, CN Lincoln, J Prior, H von Berlepsch, Susana F. Huelga Martin B. Plenio, Donatas Zigmantas & Jurgen Hauer, **vibronic origin of long-lived coherence in an artificial molecular light harvester**, [*Nature comm.* 6, 7755 \(2015\).](#)
- 8) A. Chin, J. Prior, R. Rosenbach, F. Caycedo-Soler, S.F. Huelga and M.B. Plenio, **The Role of non-equilibrium vibrational structures in electronic coherence and recoherence in pigment-protein complexes**, [*Nature Phys.* 9, 113-118 \(2013\).](#)
- 9) J Molina-Vilaplana, J Prior, Entanglement, tensor networks and black hole horizons. *General Relativity and Gravitation* 46 (11), 1-23 (2014).
- 10) J. Prior, I. De Vega, A.W. Chin, S.F. Huelga and M.B. Plenio, **Quantum dynamics in photonic crystals**, *Phy. Rev. A* 87, 013428 (2013).
- 11) J. Almeida, J. Prior and M.B. Plenio. **Computation of Two-Dimensional spectra assisted by compressed Sampling**, *J. Phys. Chem. Lett.* 3(18), 2692-2696 (2012).
- 12) Alex Chin, Javier Prior, Susana F. Huelga and Martin B. Plenio. **A variational description of the quantum phase transition in the sub-Ohmic spin-boson model**, *Phys. Rev. Lett.* 107, 160601 (2011).

- 13) Javier Prior, Alex Chin, Susana F. Huelga and Martin B. Plenio. **Efficient Simulation of Strong System-Environment Interactions**, *Phys. Rev. Lett.* 105, 050404 (2010).
- 14) M. J. Hartmann, J. Prior, S.R. Clark and M. B. Plenio. **Density Matrix Renormalization Group in the Heisenberg Picture**, *Phys. Rev. Lett.* 102, 057202 (2009).
- 15) A.M. Somoza, M. Ortuño and J. Prior. **Universal Distribution Functions in Two-Dimensional Localized Systems**, *Phys. Rev. Lett.* 99, 116602 (2007).

C.2. Research projects and grants (only as PI)

- 1) Project: PGC2018-097328-B-I00
Title: Metrología cuántica y coherencia en entornos estructurados.
PI: Javier Prior Arce
Ministerio de Ciencia, Innovación y Universidades
From 01/01/2019 to 31/12/2021
Funds: 29.645€
- 2) Project: FIS2015-69512-R
Title: Transfer excitations in light harvesting networks: From nature to artificial devices.
PI: Javier Prior Arce
Ministerio de Economía y Competitividad
From 01/01/2016 to 31/12/2018
Funds: 60.500€
- 3) Project: GRUPOS DE EXCELENCIA DE LA SENECA. 19882/GERM/15.
Title: Quantum Energy
PI: Javier Prior Arce & Antonio Urbina
Fundación Séneca, agencia para la investigación Región de Murcia
From 01/01/2016 to 31/12/2019
Funds: 200.000€
- 4) Project: FIS2012-30625
Title: Efectos Cuánticos en la Transferencia de Energía en Sistemas Biológicos Fotosintéticos: Modelización y Caracterización.
PI: Javier Prior Arce
Ministerio de Economía y Competitividad
From 01/01/2013 to 31/12/2015
Funds: 29.000€
- 5) Project: FIS2009-13483-C02-02
Title: Estados descritos por redes tensoriales en la imagen de Heisenberg; aplicación a sistemas electrónicos localizados
PI: Javier Prior Arce
Ministerio de Ciencia e innovación
From 31/12/2009 to 31/12/2012
Funds: 29.000€

C.3. Participation in European projects and funds for conferences (European COST actions with open call to organize workshop and conferences)

- 1) Integrated quantum Science and Technology (IQST).
Funds: 10 000 €.
- 2) Control of quantum correlations (CO.CO.MAT).
Fund: 30.000€.
- 3) The Atomic QUantum TEchnologies (AQUTE)
Funds: 10.000€.

C.4. Relevant Invited talks

- 1) Title: **Quantum technologies with color centers in diamond**. Conference: Fourth workshop on Quantum Phase Transitions in Molecular and Nuclear Structure, Universidad de Huelva (Spain), April 2019.
- 2) Title: **Harnessing charge separation. From natural photosynthesis to organic photovoltaic**. Conference: Excitation Energy Transfer Processes in Physical, Chemical and Biological Systems, TUM Science and Study Center Raitenhaslach (Germany), October 2017.

- 3) Title: **Vibrational structures and long-lasting coherence in biological complexes: from microscopic models to actual experiments**. Conference: 14th Granada Seminar. Quantum systems in and out equilibrium: Fundamentals, dynamics and applications Non-equilibrium, Granada (Spain), June 2017.
- 4) Title: **Long-lasting coherence in biological complexes**. Technische Universität Berlin. Invited by Javier Cerrillo Moreno, Berlin (Germany), August 2017.
- 5) Title: **The Origin of Long-lived Oscillations in electronic 2D-spectroscopy**. Conference: Nonequilibrium condensed matter and biological systems, Madrid (Spain), March 2016.
- 6) Title: **Long-lasting coherence in biological complexes: from microscopic models to actual experiments**. Conference: Workshop on coherent energy transport and optimization in photosynthesis, Singapore, May 2015.
- 7) Title: **Time Resolved 2D frequency maps**. Conference: Conference Good Vibrations for Energy Management in Biomolecules, Leiden (Netherlands), February 2015.
- 8) Title: **Non-perturbative simulations of exciton dynamics in complex biological environment**. Conference: 4th summit meeting on vibronic & electronic excitations, Tenerife (Spain), September 2013.

C.5. Relevant public talks

- 1) Title: Limits on spectral resolution measurements by quantum probes. University Trinity College Dublin, Invited by Prof. John Goold, Dublin (Ireland), February 2019.
- 2) Title: Tecnologías cuánticas. Universidad de Murcia, Facultad de Químicas, Murcia (España), October 2018.
- 3) Title: Tensor network states, an introduction & Long-lasting coherence in biological complexes. Yeshiva University. Invited by Prof. Lea Santos, New York (USA), October 2018.
- 4) Title: Long-lasting coherence in biological complexes. Technische Universität Berlin. Invited by Javier Cerrillo Moreno, Berlin (Germany), August 2017.
- 5) Title: Coherencias cuánticas de larga duración en complejos biológicos. Universidad de Málaga. Invited by Juan Antonio Rodríguez Ruiz, Malaga (Spain), April 2017.
- 6) Title: Vibrational structures and long-lasting coherence in biological complexes: from microscopic models to actual experiments. Universidad Complutense de Madrid. Invited by Miguel Angel Martín Delgado, Madrid (Spain), January 2016.
- 7) Title: Vibrational structures and long-lasting coherence in biological complexes: from microscopic models to actual experiments. Universidad de Granada. Invited by Jesús Sánchez-Dehesa, Granada (Spain), December 2015.
- 8) Title: Wavelet Transformation: Signal Processing for Quantum Biology. Technische Universität Wien. Invited by Prof. Jürgen Hauer, Viena (Austria), February 2014.
- 9) Title: Time-adaptative density matrix renormalization group technique: How the method works and how it is implemented. Institut für Theoretische Physik. Invited by Prof. Th. Renger, Linz (Austria), June 2013.
- 10) Título: Science, behind social revolutions: what's next? Quantum Technology. I Congreso Internacional Campus Mare Nostrum de Jóvenes Investigadores en el Mediterráneo, Murcia (España), Octubre 2013.

C.6. Memberships of scientific societies

- 1) Editor of Scientific Reports (nature group).
- 2) I have served as a referee for internationally renowned journals including *Physical Review Letters*, *Scientific report*, *Physical Review A* and *New Journal of Physics*.

C.7. Institutional responsibilities

- 1) "Secretario de la Escuela de Arquitectura y Edificación en la UPCT" from 2010 until 2016.

- 2) "Subdirector de Subdirector de Investigación, Innovación y Postgrado la Escuela Técnica Superior de Arquitectura y Edificación en la UPCT" from 2016 until present.
- 3) Member of the "**Comisión Científico Técnico de Evaluación de las Convocatorias de Proyectos I+D de Retos y Excelencia 2014**". Agencia Estatal de Investigación. Ministerio de Ciencia, Innovación y Universidades".
- 4) Member of the Quanteria panel 2019 (<https://www.quanteria.eu>).