

PERSONAL INFORMATION

Family name, First name: **Casanova, Jorge**
Nationality: Spanish
ID: 45674028F
ORCID code: 0000-0002-6110-671X
URL for web site: https://arxiv.org/a/casanova_j_1.html (link to my publication list in arXiv)
Google Scholar profile URL: <https://scholar.google.es/citations?user=X5vxnU4AAAAJ&hl=en>

SUMMARY

I am a **Ramon y Cajal and Ikerbasque** researcher leading the **Quantum designs and nanoscale technologies group** at University of the Basque Country (Spain). In my group, we investigate in **nanoscale nuclear magnetic resonance**, pursuing innovative and world-leading research lines in close contact with world-renowned leaders in the field, both experimentalist and theoreticians. In addition, we are also focused on the theoretical development of **quantum simulations and quantum algorithms**, in different aspects of the **fundamental light-matter interaction**, in **classical processing of experimentally harvested data** using machine learning and Bayesian methods, as well as in the **design of high-fidelity quantum information processing methods** using detailed models of different quantum platforms.

So far, I have published more than **65** articles, and submitted several others (see full list of publications under the ORCID identifier or my arXiv in the following link https://arxiv.org/a/casanova_j_1.html). This list includes, among others, **3** Nat. Comm., **1** npj Quantum Information, **2** Sci. Rep., **1** Phys. Rev. X, **15** Phys. Rev. Lett. (one of them Editor's Suggestion), **6** Phys. Rev. Applied, **3** Phys. Rev. B, **16** Phys. Rev. A (including 2 Rapid Communications), and **3** New J. Phys. In addition, these works have been highly cited with a **number of citations > 2500** and with a **h-index of 25** (according to Google Scholar). My work has attracted significant experimental interest and have influenced a variety of implementations, up to **16** in different quantum platforms (see latter in section "Experimental Impact"), while I have directly participated in **5** of these experiments.

I have **9** invited talks at international conferences (including one Plenary talk), **7** contributed talks, and more than **10** invited seminars at different academic institutions in distinct countries. During my career I have received different research prizes, won research projects, and been awarded with several research grants. Hence, another aspect to remark in my scientific profile is my capacity to attract scientific funding from national and international funding agencies.

EDUCATION

2012 **PhD in Theoretical physics** (*cum laude*), Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.
2010 **Master in Chemistry of surfaces and materials**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

CURRENT POSITION

2020 – 2025 **Ramón y Cajal Researcher (tenure-track position)**. Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

PREVIOUS POSITIONS

2018 – 2023 **Ikerbasque Research Fellow (tenure-track position)**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.
2018 – 2020 **Juan de la Cierva Postdoctoral researcher**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.
2016 – 2018 **Postdoctoral researcher**, Ulm University, within the ERC synergy grant "Diamond Quantum Devices and Biology", Institut für Theoretische Physik, Universität Ulm, Germany.
2014 – 2016 **Alexander von Humboldt Postdoctoral Researcher**, Institut für Theoretische Physik, Universität Ulm, Germany.
2013 – 2014 **Postdoctoral Researcher**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

FELLOWSHIPS GRANTS AND AWARDS

- 2019 **Ramón y Cajal Research Fellowship**, tenure-track position awarded by the Spanish Ministry of Science. €166k
- 2018 **Ikerbasque Research Fellowship**, tenure-track position awarded by Ikerbasque Foundation (Basque Foundation for Science). €185k
- 2018 **Juan de la Cierva (Incorporation) Research Fellowship**, awarded by the Spanish Government. €64k
- 2016 **Forschungsbonus** (an award to perform independent research). The University awards three prizes annually for all areas of knowledge, awarded by Universität Ulm, Germany. €10k
- 2015 **Extraordinary price for a PhD in Sciences**, University of the Basque Country, Spain.
- 2014 **Humboldt Research Fellowship** awarded by the Humboldt Foundation, Universität Ulm, Germany. €66,6k
- 2014 **Postdoctoral Fellowship**, awarded by the Basque Government to realize a two-year postdoctoral stay at Universität Ulm. *Awarded, not taken, for being in possession of the Humboldt research fellowship.* €110k
- 2013 Income by the Basque Government because my Ph.D. thesis was awarded with mark “Cum Laude”. The latter is the highest mark in the Spanish academic system. €4.5k
- 2013 **Postdoctoral Fellowship** awarded by University of the Basque Country. €10.4k
- 2008 **PhD Fellowship** awarded by the Basque Government. €70.7k

MANAGEMENT OF NATIONAL AND INTERNATIONAL RESEARCH PROJECTS, AS WELL AS OF PROJECTS WITH TECH-COMPANIES

- 2021 P.I. of the project **Diseño de una plataforma cuántica basada en el uso de defectos (color centers) en diamante** (granted by the Arquimea company: <https://www.arquimea.com>) €15k.
- 2020-2022 P.I. of the National project **Ingeniería inversa en problemas de resonancia magnética nuclear en la nanoescala** (Europa Excelencia 2020) €60k.
- 2020-2021 P.I. of the project **Hybrid quantum algorithms and optimization for quantum computers** (granted by the IQM company: <https://www.meetiqm.com>) €120k.
- 2019-2021 P.I. of the National project **Temas emergentes en tecnologías cuánticas**. €68k.
- 2020-2022 P.I. of the National project **EHUROPE**. €40k
- 2019-2021 P.I. of the International H2020 European FET Open Grant **QUROMORPHIC**. €300k

PATENTS

One patent application: Patent application number PCT/FI2021/050609.

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL RESEARCHERS

Mentoring as a group leader

- 2021-present** Mentoring as a “host of the partner organization” of the Marie Curie Fellow of **Dr. Ruben Pellicer Guridi**.
- 2021-present** Mentoring of **Dr. Ander Tobalina** for the Ministry of Science and Innovation project **Ingeniería inversa en problemas de resonancia magnética nuclear en la nanoescala**.
- 2019-present** Director of the PhD thesis of **Mr. Carlos Munuera-Javaloy**, FPI researcher for the Ministry of Science and Innovation project **Temas emergentes en tecnologías cuánticas**.
- 2020-2021** Director of the Master thesis of **Mr. José Javier Orquín**.
- 2019-present** Mentoring of **Dr. Yue Ban** for the EU FET Open Grant **QUROMORPHIC**.
- 2019** Director of the Master thesis of **Mr. José Javier Orquín**
- 2017-2021** Director of the PhD thesis of **Mr. Iñigo Arrazola**. This thesis was successfully defended in 12/01/2021.

Mentoring as a postdoctoral researcher

- 2017 Supervising, together with Prof. Martin Plenio (Institut für Theoretische Physik, Universität Ulm, Germany), of the Bachelor thesis of **Mr. Maximilian Fürholzer**, and PhD student **Ricardo Puebla**.
- 2016 Supervising, together with Prof. Martin Plenio and Prof. Susana Huelga, the research of the PhD student **Jan Haase**, Institut für Theoretische Physik, Universität Ulm, Germany.
- 2013 Supervising, together with Prof. Enrique Solano (Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain.) PhD. Student **Roberto Di Candia**. Also Ph.D. Student **Julen Simon Pedernales**.

TEACHING ACTIVITIES

- 2020-present **Teaching** in the Master course on “Quantum Technologies”, University of the Basque Country, Spain.
- 2017 **Teaching assistant** in the course “Advanced Quantum Mechanics”, Institut für Theoretische Physik, Universität Ulm, Germany.

CONFERENCE/SEMINAR ORGANISATION

- 2010 **Local organizer**, International Workshop *Solid State Systems for Quantum Information Processing*. University of the Basque Country, Spain.
- 2009 **Local organizer**, International Workshop *Quantum Information and Solid-State Systems*. University of the Basque Country, Spain.
- 2009 **Local organizer**, International Workshop *Quantum Valves and one-way barriers*. University of the Basque Country, Spain.

EXTERNAL EVALUATOR

- 2019 **Expert Evaluator** in the Physics area of the Spanish Investigation Agency (Spanish Ministry of Science and Innovation).

PEER REVIEW CONTRIBUTIONS

I serve as a referee for the following journals: *Phys. Rev. X*, *Phys. Rev. Lett.*, *npj Quantum Information*, *Communications Physics*, *Phys. Rev. A*, *New. J. Phys.*, *Scientific Reports*, and *Annals of Physics*.

MEMBERSHIP OF PhD AND MSc EVALUATION PANELS (at University of the Basque Country)

Member of the evaluation committee in the Master Thesis defense of: **Unai de Miguel Sárraga** (21/09/2021); **Santiago Llorens Fernández** (23/09/2021); **Ander Garcia Rodriguez** (22/09/2020); **Aitor Alaña** (21/09/2020); **Bruno Candelas** (23/09/2019); **Dennis Portmann** (25/09/2018); **Hodei Eneritz** (14/09/2016); and **Iñigo Arrazola** (10/09/2015).

OUTREACH AND POPULARIZATION (selection)

- 2019 CSIC-Ikerbasque-UPV/EHU. Press note regarding my work regarding quantum sensors at *Phys. Rev. Lett.* **122**, 010407 (2019).
- 2017 Ulm University. Ceremony of presentation for the Forschungsbonus winners. Participation in the awarding ceremony of the Forschungsbonus Prizes at Ulm University (Germany).
- 2015 Tsinghua University, Dean’s vision. Tsinghua University makes publicity of its more influential results. In this case it reviews my article in *Nat. Commun.* **6**, 7917 (2015).
- 2014 Research that I did during my PhD thesis was written up for the general public on the Science Daily website and the The Phys. Org. website
- 2013 MIT technology review. The MIT technology review website highlighted my article in *Sci. Rep.* **4**, 3589 (2014).
- 2011 Physics Synopsi. The Physics website highlighted my article in *Phys. Rev. Lett.* **106**, 060503 (2011).

MAJOR COLLABORATIONS

Scientific activities with collaborations with scientists, both theoreticians and experimentalists, including:

- **Prof. M. B. Plenio** at Institute of Theoretical Physics (Ulm, Germany). Theory of nitrogen vacancy centers in diamond and dynamical decoupling techniques.
- **Prof. C. Wunderlich** at University of Siegen (Siegen, Germany). Experimental implementation of fast two-qubit gates in microwave driven trapped ions.
- **Prof. F. Jelezko** at Institute for Quantum Optics (Ulm, Germany). Experimental implementation of dynamical decoupling sequences for quantum sensing in nitrogen vacancy centers.
- **Prof. P. Acedo** at Universidad Carlos III (Madrid, Spain). Development of a NV-based laboratory.
- **Prof. J. J. García-Ripoll** at IFF CSIC (Madrid, Spain). Theory of ultrastrong coupling of light and matter.
- **Prof. T. Monteiro** at University College London (London, UK). Theory of quantum sensing.
- **Prof. R. Blatt** at Institute for Quantum Optics and Quantum Information (Innsbruck, Austria). Collaboration on experimental implementations of quantum simulations in laser driven trapped ions.
- **Prof. Alan Aspuru-Guzik** at Harvard Univ. (Cambridge, USA). Theory of quantum chemistry.
- **Prof. K. Kim** at Tsinghua University (Beijing, China). Collaboration on experimental implementations of quantum simulations on laser driven trapped ions.
- **Prof. A. White** at Queensland University (Brisbane, Australia). Collaboration on experimental implementation of quantum simulations in quantum photonics.

3. INVITED PRESENTATIONS AT CONFERENCES

- 2021 Diamond based quantum technologies
Quantum Workshop DIPC-UPV/EHU (8-10-2021).
- 2021 *Advanced microwave radiation patterns for nanoscale NMR*
Quantum Optics and Solid State VII (QUOST VII) (19-01-2021)
- 2020 *Coherent control of quantum matter.*
Plenary talk at Jornadas de Jóvenes investigadores en Física Atómica y Molecular (J2IFAM), Bilbao, Spain (05-03-2020).
- 2019 *Dynamical decoupling techniques in trapped-ion based quantum computing.*
Quantum Simulation and Computation, Madrid, Spain (18-10-2019)
- 2019 *Advances in quantum control of trapped ions.*
COST action on Trapped ions: Progress in Classical and Quantum Applications, Granada, Spain, (08-03-2019)
- 2017 *Adaptive pulse sequences for computing and sensing in diamond devices.* Workshop on Quantum Sensing with Quantum Correlated Systems (QUSENC17) Dresden, Germany (29-09-2017).
- 2017 *Adaptive dynamical decoupling sequences for computing and sensing in diamond devices.* Workshop on From Foundations of Quantum Mechanics to Quantum Information and Quantum Metrology & Sensing (Quantum 2017) Turin, Italy (11-05-2017).
- 2016 *Dynamical decoupling for the quantum Rabi model.* Workshop on Ultrastrong Light-Matter Interactions, Bilbao, Spain (21-09-2016).
- 2013 *Embedding quantum simulators.* Centro de Ciencias de Benasque Pedro Pascual, Workshop on “Quantum Simulations”, Benasque, Spain (01-10-2013).

4. INVITED PRESENTATIONS AT LEADING RESEARCH INSTITUTIONS/COMPANIES (selection)

- 2021 *Diamond-based technologies*, Webinar for the company Arquimea, Tenerife, Spain (30-06-2021).
- 2021 *Diamond-based technologies*, Webinar at the Quantum Glue Meetings, UPV/EHU
<https://sites.google.com/view/qgm>.
- 2020 *A tutorial on dynamical decoupling techniques*, Webinar for the IQM company, Munich, Germany (15-10-2020).
- 2019 *Diamond technologies*. Indra, Madrid, Spain (17-06-2019).
- 2017 *Adaptive dynamical decoupling pulse sequences for trapped ions*. Siegen University, Siegen, Germany (14-12-2017).

- 2013 *Embedding quantum simulators*. Macquarie University, Sydney, Australia (01-08-2013).
 2013 *Quantum simulations of unphysical operations and quantum field theories*. Shanghai University, Shanghai, China (01-04-2013).

5. CONTRIBUTED TALKS

- 2017 *Quantum control in diamond devices*
 New Trends in Complex Quantum Systems (Cartagena, Spain) (09-05-2017)
 2015 *EQuaM theory in Ulm (ask for the certificate)*
 EQuaM meeting (Florence, Italy) (02-06-2015)
 2015 *Positioning and control of nuclear spins with NV centers*
 Información Cuántica ICE-2 (Bilbao, Spain) (06-11-2015)
 2013 *Embedding quantum simulators in trapped ions*
 Workshop on “Quantum Applications with Trapped Ions” ITAMP, Harvard Smithsonian Center for Astrophysics (Cambridge, United States) (24-09-2013)
 2012 *Quantum simulation of quantum field theories in trapped ions*
 Información Cuántica ICE-0 (Madrid, Spain) (18-09-2012)
 2011 *Quantum simulation of the Majorana equation and unphysical operations*
 Workshop on “Quantum Simulations”, Centro de Ciencias de Benasque Pedro Pascual (Benasque, Spain) (28-02-2011)
 2010 *Deep strong coupling regime of the Jaynes-Cummings model*
 Workshop on “Circuit QED for Quantum Information”, Facultad de Ciencia y Tecnología del País Vasco (UPV/EHU) (Leioa, Spain) (16-09-2010)

6. EXPERIMENTAL IMPACT

My research has a strong experimental impact leading to, so far, up to 17 published experimental developments in top flight groups in different quantum platforms as NMR, trapped ions, NV centers, and quantum photonics. These are:

- The experiment in arXiv:2102.05409, performed in the group of Prof. L.-M. Duan at Tsinghua University (Beijing, China). This experiment realizes the single qubit phase transition I proposed in Phys. Rev. Lett. **118**, 073001 (2017).
- The experiment in Nature **583**, 780 (2020), performed in the group of Prof. S. Reich at University of Hamburg (Hamburg, Germany). This experiment realizes the deep strong coupling regime I proposed in Phys. Rev. Lett. **105**, 263603 (2010).
- The experiment in Phys. Rev. Lett. 123, 140402 (2019), performed in the group of Prof. F. Jelezko at University of Ulm (Ulm, Germany), implements the dynamical decoupling sequences I designed in Phys. Rev. A **92**, 042304 (2015).
- The experiment in Phys. Rev. Lett. 122, 200403 (2019), performed in the group of Prof. F. Jelezko at University of Ulm (Ulm, Germany), implements the dynamical decoupling sequences I designed for the same paper.
- The experiment in Phys. Rev. B **98**, 214307 (2018) performed in the group of Prof. Nicole Fabbri at University of Florence (Florence, Italy), is based in my proposal in Phys. Rev. A **92**, 042304 (2015).
- The experiment in Nat. Commun. **8** 1715 (2017) explores in a superconducting qubit the deep strong coupling (DSC) regime I proposed in Phys. Rev. Lett. **105**, 263630 (2010).
- The experiment in Phys. Rev. X **8**, 031022 (2018) performed in the group of Prof. Rainer Blatt at Innsbruck University (Innsbruck, Austria) and the experiment in Phys. Rev. A **95**, 020501 (2017), performed in the group of Prof. K. Kim at Tsinghua University (Beijing, China), are based on my proposal in Sci. Rep. **4**, 3589 (2014).
- The experiment in Sci. Rep. **7**, 12797 (2017) performed in the group of Prof. Gui-Lu Long at Tsinghua University (Beijing, China), is based on my proposal in Phys. Rev. Lett. **113**, 020505 (2015).
- The experiment in Phys. Rev. Lett. **116**, 070503 (2016), **in which I am a coauthor**, performed in the group of Prof. A. G. White at University of Queensland (Brisbane, Australia), is based on my proposal in Phys. Rev. Lett. **111**, 240502 (2013).

- The experiment in Phys. Rev. Lett. **116**, 070502 (2016), performed in the group of Prof. J.-W. Pan at University of Science and Technology of China (Hefei, China), is based on my proposal in Phys. Rev. Lett. **111**, 240502 (2013).
- The experiment in Phys. Rev. A **95**, 020501 (2017), performed in the group of Prof. K. Kim at Tsinghua University (Beijing, China), is based on my proposal in Sci. Rep. **4**, 3589 (2014).
- The experiment in Nat. Commun. **9**, 195 (2018), **in which I am a coauthor**, performed in the group of Prof. K. Kim at Tsinghua University (Beijing, China). This experiment is based on my proposal in Phys. Rev. Lett. **107**, 260501 (2011).
- The experiment in Phys. Rev. Lett. **116**, 070503 (2016), **in which I am a coauthor**, performed in the group of Prof. A. G. White at University of Queensland (Brisbane, Australia), is based on my proposal in Phys. Rev. Lett. **111**, 240502 (2013).
- The experiment in Nat. Commun. **6**, 7017 (2015), **in which I am a coauthor**, performed in the group of Prof. K. Kim at Tsinghua University (Beijing, China), is based on my proposal in Phys. Rev. X **1**, 021018 (2011).
- The experiment in Optica **2**, 454 (2015), performed in the group of Prof. A. Szameit at Jena University (Jena, Germany), is partially based on my proposal in Phys. Rev. X **1**, 021018 (2011).
- The experiment in Phys. Rev. Lett. **108**, 163601 (2012), performed in the group of Prof. R. Osellame at Istituto di Fotonica e Nanotecnologie (Milan, Italy), explores the regime I proposed in Phys. Rev. Lett. **105**, 263603 (2010).
- The experiment in Phys. Rev. Lett. **106**, 060503 (2011), **in which I am a coauthor**, performed in the group of Prof. Rainer Blatt at Innsbruck University (Innsbruck, Austria) is based on my proposal in Phys. Rev. A **82**, 020101(R) (2010).

In addition, the pulsed scheme I designed in Phys. Rev. A **97**, 052312 (2018) is being tested in the experimental group of Prof. C. Wunderlich at Univ. of Siegen (Germany). My works in Phys. Rev. Applied **10**, 044072 (2018) and in Phys. Rev. Lett. (2019), are being tested in the experimental group of Prof. Jianming Cai, Huazhong Uni. of Science and Technology (China). *I will be a coauthor of all these ongoing experiments.*

7. CITATION IMPACT

Citations >**2500**, and an h-index of **25** (Google Scholar).