

Personal information**Name:** García Fernández, Pedro David (male)**Web of Science Researcher:** Y-4644-2019**ORCID:** 0000-0002-3422-178X**Electronic mail:** david.garcia@icn2.cat**Education**

Ph.D. Degree: Universidad Autónoma de Madrid, Spain. Thesis defense date: **27th March, 2009**. Title: [From Photonic Crystals to Photonic Glasses though disorder](#). Summa cum laude.

M.Sc. Degree: Universidad Complutense de Madrid, Spain. Master in fundamental and solid-state physics. Graduation date: **28th Sept. 2004**.

Languages: Spanish and Catalan (native), English and Italian (proficiency), German and Danish (Basic).

Current position

2017-present [Ramón & Cajal Researcher](#) - [Catalan Institute of Nanoscience and Nanotechnology](#), Spain. This is the most prestigious scientific tenure program funded by the Spanish government which is intended to be the immediate next step before a permanent position at national level. From 2015 to 2017, I was funded by an individual Marie Skłodowska-Curie fellowship.

Previous positions

2012-2015 Assistant Professor - [Niels Bohr Institute](#), University of Copenhagen, Denmark.

2009-2011 Postdoc - [Department of Photonics Engineering](#), Technical University of Denmark.

09-12/2007 Research internship - [European Laboratory for Non-linear spectroscopy](#), Italy.

2004-2009 PhD - [Instituto de Ciencia de Materiales de Madrid](#) - CSIC, Spain.

Fellows and awards

I have been awarded by four top fellowships and contracts in competitive calls at national (Ramón y Cajal, Formación del profesorado and Beatriz de Pinós) and international (Marie Skłodowska-Curie) level. My PhD thesis was evaluated as the best one in the physics department of the Autonomia University in Madrid in 2009. I have been accredited as *profesor contratado doctor* by the national ANECA in 2019

2017 - 2022. Disorder to enhance the light-matter interaction. Ramon & Cajal.

[Ministerio de Ciencia, Innovación y Universidades](#)

308.600 €. Grant number: RYC-2015-18124

2016 - 2017. Complex photon-phonon coupling. Marie Skłodowska-Curie individual fellowship.

[European Research Council](#)

158.121 €. Grant number: 701590

2015 - 2016. Anderson localization of phonons in an optomechanical crystal. Beatriz de Pinós program.

[Agencia de Gestión de Ayudas Universitarias y de Investigación](#)

91.022,4 €. Grant number: BP_B 00206

2005 - 2009. Formación del Profesorado Universitario.

[Ministerio de Educación y Ciencia](#)

Grant number: AP-2005-0285

Direction of PhD students

2015-present PhD advisor of two students at the Catalan institute of Nanoscience and Nanotechnology.

2009-2015 Co-supervision of two PhD students at the Technical University of Denmark and the Niels Bohr Institute University of Copenhagen).

Coordination of lines of research

2016-present I coordinate a line of research within the P2N group at ICN2 working on complex optomechanical nanostructures. We explore the effect of fabrication disorder for the optomechanical coupling of THz photons and GHz phonons. We also explore topological hybrid nanostructures to tailor the photon-phonon interaction. I coordinate the activity in different areas such as the calculation of the eigenmodes of the structures, the fabrication of the devices and their experimental (optomechanical) characterization.

Teaching activities

2014-15 Quantum mechanics II. Bachelor course on electron-spin resonance. **3.5 ECTS per course.**
2012-14 Thermodynamics and First year project. Bachelor course. (Main responsible of the course). **2.5 ECTS per course.**
2011-12 Nanophotonics. Master course on light-matter interaction, cavity-QED. **2.5 ECTS per course.**

Organization of scientific meetings

2020. Co-organizer of a workshop within annual meeting [GEFES 2020](#) dedicated to the New frontiers in photonics: from quantum and nano-optics to topology. Madrid, Spain.
2019. Co-organizer of a focused session on disordered photonics, *Progress in Electromagnetics Research Symposium* ([PIERS](#)), Rome, Italy.
2019. Co-organizer of a focused session on nanomechanics and nanophononics, *International conference on Metamaterials, photonic crystals and plasmonics* ([META](#)), Lisbon, Portugal.
2018. Organizer (sole) of a focused session on optomechanics, [Imagine Nano](#), Bilbao, Spain.
2015. Organizer (sole) of a focused session on disordered photonics, *Progress in Electromagnetics Research Symposium* ([PIERS](#)), Prague, Czech Republic.
2014. Organizer (sole) of a focused session on disordered photonics, *Progress in Electromagnetics Research Symposium* ([PIERS](#)), Guangzhou, China.

Past grants as principal investigator

2019 - 2022. Optomechanical devices based on active and self-assembled materials
[Ministerio de Ciencia, Innovación y Universidades](#). **Grant number: RTI2018-093921-A-C44**
72.600 €.
2019 - 2024. Dissipationless topological channels for information transfer and quantum metrology.
[FET- Proactive research project. European Commission](#). **Grant number: 824140**
466.458 € granted for the group (5 M€ total grant).
 Principal investigator at the research group.
2013 - 2016. Controlling the conductor-insulator phase transition for light
[Villum Young Investigator. Villum Foundation](#). **Grant number: VKR023116**
463.939 €.

Reviewing activities

Regular peer reviewer of different scientific journals: Physical Review Letters, Nature Photonics Applied Physics Letters. A total of **54** manuscripts reviewed only for the American Physical Society

Major collaborations

1. [Dr. Daniel Lanzilotti-Kimura](#) at CNRS / Paris Sud University (France) on [topological optomechanical layered GaAs/AlAs nanostructures](#).
2. [Dr. Soren Stobbe](#) at DTU (Denmark) on slab optomechanical waveguides.
3. [Dr. Daniel Torrent](#) at UJI (Spain) on developing calculation tools for slab phononic nanostructures.
4. [Prof. Mattias Hammar](#), KTH (Stockholm) on III-V based photonic nanostructures.
5. [Dr. Silvia Vignolini](#), Cambridge University (UK) on nano-cellulose radiative cooling.
6. [Prof. Peter Lodahl](#), Niels Bohr Institute (Denmark) on quantum photonics.
7. [Prof. Cefe Lopez](#), CSIC (Madrid) with impact for the broad audience at [regional](#) and [national media](#).

Early achievements track-record

I am an international expert on disorder in photonic nanostructures. My research interest has focused on understanding how entropy ultimately leads to complexity in photonic nanostructures. I am interested in the role of imperfection and disorder in these systems in both in the classical and the quantum regimes. During my PhD and my postdoctoral research, I have explored in detail the emission and propagation of light in complex structures where the dielectric function is molded at the wavelength scale. I have analyzed in very detail the interplay between order and disorder for 1) the spontaneous and 2) stimulated emission of light in complex media and 3) for light transport in general, as the selected publications below demonstrate. I have developed a deep understanding on the link between backscattering, density of optical states and slow light which puts me in the optimal position to develop this project successfully. Based on my background, I will be able to consolidate a research group fully dedicated to complex nanophotonics profiting my current prestigious Ramon&Cajal tenure at ICN2.

Research highlights

- 2017.** Observation of dynamical chaos in optomechanical systems. **Nature Communications.**
- 2014.** Observation of ultra-stable random lasing in the Anderson-localization regime. **Nature Nanotechnology.**
- 2012.** Observation of non-universal intensity correlations in a random medium. **Physical Review Letters.**
- 2010.** Demonstration of coupling between a single quantum emitter and a single Anderson localized mode. **Science.**
- 2008.** Demonstration of spectral tunability of a random laser. **Nature Photonics.**
- 2007.** Observation of resonant multiple scattering. **Physical Review Letters.**
- 2006.** Realization of a resonant disordered material named *Photonic Glass*. **Advanced Materials.**

Selected publications.

Summary: I have published **31** articles in journals such as Science, Nature Photonics, Nature Nanotechnology, Advanced Materials and Physical Review Letters with a total of **1304/1788** citations (**42/57** citations/paper) and an h-index **18/23** (Source: [Web of Science](#)/[Google Scholar](#)): 50% of them as a first author, 33% as corresponding author and 2 of them as last author. I hold **2** granted patents: **10 selected research publications.** The symbol (*) indicates corresponding authorship:

Spontaneous emission of light in complex dielectric nanostructures:

- 1. PD* Garcia, P. Lodahl.** Physics of Quantum Light Emitters in Disordered Photonic Nanostructures. *Annalen Der Physik* **529**, 1600351 (2017).
CIT = **16/21** and Impact Factor = **3.2**
- 2. PD* Garcia, S. Stobbe, I. Sollner I, P. Lodahl.** Nonuniversal Intensity Correlations in a Two-Dimensional Anderson-Localizing Random Medium. *Physical Review Letters* **109**, 253902 (2012).
Number of citations = **26/37** and Impact Factor = **9.2**
- 3. L. Sapienza, H. Thyrrestrup, S. Stobbe, PD Garcia PD, S. Smolka, P. Lodahl P.** Cavity Quantum Electrodynamics with Anderson-Localized Modes. *Science* **327**, 1352 (2010).
Number of citations = **227/324** and Impact Factor = **41**

Stimulated emission of light (lasing) in complex dielectric nanostructures:

- 1. J. Liu, PD Garcia, et al,** Random nanolasing in the Anderson localized regime. *Nature Nanotechnology* **9**, 285 (2014).
Number of citations = **95/121** and Impact Factor = **43.3**
- 2. S. Gottardo, R. Sapienza, PD Garcia, A. Blanco, DS. Wiersma, C. Lopez.** Resonance-driven random lasing. *Nature Photonics* **2**, 429 (2008). With my PhD supervisor.
Number of citations = **150/124** and Impact Factor = **25**

Light transport in complex dielectric nanostructures:

- 3. G. Arregui, ND Lanzillotti-Kimura, CM Sotomayor-Torres, PD* Garcia.** Anderson Photon-Phonon Colocalization in Certain Random Superlattices. *Physical Review Letters* **122**, (2019).
Number of citations = **3/5** and Impact Factor = **9.2**
- 4. PD* Garcia, G. Kirsanske, A. Javadi, S. Stobbe, P. Lodahl.** Two mechanisms of disorder-induced localization in photonic-crystal waveguides. *Physical Review B* **96**, 144201 (2017).

Number of citations = **9/12** and Impact Factor = **3.7**

5. **PD* García**, A. Javadi , H. Thyrestrup, P. Lodahl. Quantifying the intrinsic amount of fabrication disorder in photonic-crystal waveguides from optical far-field intensity measurements. *Applied Physics Letters* **102**, 031101 (2013).

Number of citations = **22/28** and Impact Factor = **3.5**

6. **PD García**, R Sapienza, A. Blanco, C Lopez. Photonic glass: a novel random material for light. *Advanced Materials* **19**, 2597 (2007). With my PhD supervisor.

Number of citations = **205/263** and Impact Factor = **31**

Topological phononic nanostructures:

7. G Arregui, O. Ortiz, M. Esmann, C. M Sotomayor-Torres, C. Gomez-Carbonell, O. Mauguin, B. Perrin, A. Lemaître, **PD García**, ND Lanzillotti-Kimura. Coherent generation and detection of acoustic phonons in topological nanocavities. *APL Photonics* **4**, 030805 (2019).

Number of citations = **1/2** and Impact Factor = **4.3**

Book chapter publication:

P.D. García, D. S. Wiersma, and C. Lopez, Photonic Glasses: fabrication and optical properties. Chapter 3. *Optical Properties of Photonic Structures: interplay of order and disorder*. Mikhail F. Limonov (Editor), Richard M. De La Rue (Editor), CRC Press, 2012.

Selected list of invited presentations (> 20) in international conferences or invited seminars:

2019. *Optomechanical interaction in complex dielectric media*, invited seminar. C2N – Université Paris-Saclay, Paris, France.
2019. *Optomechanical interaction in complex dielectric media*, invited seminar. DIPC, San Sebastian, Spain.
2018. *Optomechanical interaction in complex dielectric media*, invited talk. PIERS, Toyama, Japan.
2017. *Optomechanical interaction in complex dielectric media*, invited talk. DYNAMO, Iceland.
2016. *Disorder to enhance and tailor the light-matter interaction*, invited talk. META, Torremolinos, Spain.
2016. *Quantum optics in disordered photonic nanostructures*, invited talk. SPIE, Brussels, Belgium.
2015. *Anderson localization in low-dimensional structures for cavity quantum electrodynamics and random lasing*, invited talk. Waves in random media, Paris, France.
2015. *Anderson localization in low-dimensional structures for cavity quantum electrodynamics and random lasing*, invited talk. DYNAMO, Patagonia, Argentina.
2015. *Light-matter interaction in complex dielectric media*, invited seminar. Cavendish Lab, University of Cambridge, UK.
2014. *Anderson localization to enhance light-matter interaction*, invited seminar. Chemistry Department, University of Cambridge, UK.
2013. *Anderson localization in low-dimensional structures for cavity quantum electrodynamics and random lasing*, invited talk. Frontiers in Optics, Florida, USA.

Outreach communication:

2019. Participation in the documentary *Complexity in Nature* produced by French Connection Films for the French National TV channel TV5 filmed in Cambridge (UK).
2018. Talk about disorder and complexity in Nature at CSIC (Dilluns de Ciencia). Barcelona. <https://youtu.be/nebOMIihhiU>.
- 2013 - 2014. Organization of the open days of the Quantum Photonics Lab during the “Kulturnatten” (www.kulturnatten.dk) at the Niels Bohr Institute.

Granted patents

[EP 3286586 A1 20180228](#). A slow-light generating optical device and a method of producing slow light with low losses.

[ES2330714-A1](#). Spectral control method used in emission of random laser in three-dimensional system, involves controlling wavelength of laser action by controlling diameter and refractive index of spherical scatterers.