

Philippe GOLDNER, born 1966, Saint-Avold, France

Senior Researcher (Directeur de recherche) at CNRS (National Center for Scientific Research)

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EDUCATION

2003 : 'Habilitation à Diriger des Recherches', Université Pierre et Marie Curie, Paris

1990-1993 : PhD in material science, Université Pierre et Marie Curie, Paris

Topic: Upconversion processes in rare earth doped pairs. Supervisor: Dr. F. Pellé

1987-1990 : Ecole Centrale Paris graduate school (ranked among the top 3 French graduate schools)

POSITIONS HELD

2020 : CNRS Senior scientist, Chimie ParisTech (Directeur de Recherche DR1)

2012-2016 : CNRS Scientific Excellence Award (PES)

2002- : Head of the team "Crystals and Quantum State Dynamics", Chimie Paristech

2008-2010 : Head of the "Materials for Photonics" group, Chimie Paristech

2006- : CNRS Senior scientist, Chimie ParisTech (Directeur de Recherche DR2)

1995-1999 : Visiting scientist, French National Center for Telecommunications, Bagneux, France

1993-2006 : CNRS Junior scientist (Chargé de Recherche CR2), CNRS Meudon-Bellevue, France

RESEARCH

PhD work focused on luminescence and energy transfer processes in a rare earth doped bromide crystal. Later studies on clustering in telecom glasses revealed by optical spectroscopy and crystals for high power lasers.

Current work deals with optical and spin quantum state dynamics in rare earth doped crystals for applications to optical quantum information processing, signal processing, metrology and medical imaging (see <http://www.cqsd.fr> for more details).

4 invited papers, 3 review papers, 1 book, 3 book chapters, more than 160 articles in peer-reviewed journals, 36 invited conferences, 51 invited seminars, more than 130 oral presentations. $h=33$, 4400 citations.

Coordinator of the H2020 FET Open project NanOQTech (Rare earth doped nanoscale systems for optical quantum technologies), 9 EU partners, 3.3 M€ budget.

Winner of the ERC Advanced Grant RareDiamond in 2021 (Rare Earth - Diamond Hybrid Materials for Photonics), 2.5 M€ budget.

THESIS SUPERVISION

E. Lafitte-Houssat, A. Fossati (2019), M. Scarafagio (2019), S. Welinski (2018), K. de Oliveira Lima (2015), B. Tumino (2013), R. Marino (2011), F. Beaudoux (2010), P-O. Petit (2009), P. Higel (2006), J. Petit (2006), B. Schaudel (2000).

POSTDOCTORAL RESEARCHER SUPERVISION

F. Chiossi, M. Persechino (2019), S. Liu (2017-2019), Z. Zhang (2018-2019), J. Karlsson (2016-2017), J. Bartholomew (2015-2016), N. Kunkel, S. Ilas (2014-2015), A. Arcangeli (2012-2014), M. Lovric (2012), D. Paboeuf (2009-2011), J. Vincent (2007), V. Escax-Basquet (2005), B. Savoini (2001).

AWARDS AND FELLOWSHIPS

- 2020 : Stars of Europe (France)
- 2017 : French-Brazilian Excellence Chair at the University of São Paulo, Brazil,
- 2015 : Erskine fellow, University of Canterbury, Christchurch, New-Zealand

TEACHING

- 2021- : "Materials for optical quantum technologies", Master 2, PSL
- 2020- : "Rare Earths for quantum technologies", Master 2, Ecole polytechnique
- 2020- : "Mathematics applied to physics", Chimie Paristech
- 2014-2018 : "Quantum information processing and communication", Institute of Technology and Innovation, PSL
- 2009-2018 : "Introduction to quantum information processing", master course, Université Pierre et Marie Curie
- 2008-2013 : "Optical processing of information", master course, Universidad Autónoma, Madrid
- 2008-2013 : Head of quantum mechanics and math teaching, Chimie Paristech
- 2004-2013 : "Optical materials", master course, Chimie Paristech
- 2003-2013 : "Mathematics applied to physics" first year students, Chimie Paristech
- 1996-2000 : "Quantum mechanics", tutorials, Ecole centrale Paris

FUNDING

French National Research Agency, French Defense Agency, French Medical Research Agency, EADS, Corning, Thales, European Community (FP5, FP7, H2020), Paris area regional funding.

SELECTED PROJECTS

- 2021-2026 : Rare earth-diamond hybrid materials for photonics ERC Advanced Grant (EU H2020)
- 2020-2024 : Ultra-high-resolution optical spectroscopy of nano particles (French ANR, coordinator)
- 2018-2021 : Advanced Science and Technology for Enhancing Metrology Through Diamond (EU Quantum Flagship H2020)
- 2018-2021 : Scalable Rare Earth Ion Quantum Computing Nodes (EU Quantum Flagship H2020)
- 2016-2019 : Nanoscale Systems for optical quantum technologies (EU FET Open H2020-coordinator)
- 2015-2017 : Suppressing dephasing by controlled chemical disorder (French ANR, coordinator)
- 2014-2015 : Crystals and optical information processing (French PSL, coordinator)
- 2013-2015 : Random Materials with long optical coherence lifetimes (French ANR, coordinator)
- 2013-2015 : Rare earth doped crystals for ultra-high stability (French DIM Nano-K)
- 2012-2015 : Coherent Information Processing in Rare Earth Ion Doped Crystals (EU Marie-Curie ITN, FP7, WP leader)
- 2010-2012 : Quantum Repeaters for Long Distance Fiber-Based Quantum Communication (EU FP7, WP leader)
- 2003-2005 : Experimental realization of quantum gates and development of scalable quantum schemes in rare-earth doped inorganic crystals (EU FP 5)

MISCELLANEOUS

- 2017- : Associate Editor, Journal of Luminescence
- 2009-2012 : Associate Editor, Optics Express, OSA
- 2016 : Chairman, 19th International conference on Dynamical Processes in Excited States of Solids - DPC'16, Paris
- 2007 : Co-chairman, EMRS Spring Meeting, Symposium "Rare Earth Doping for Photonics Applications", France
- 2010 : Co-chairman of the International Symposium on Optical Manipulation of Quantum

Information in Solids (ISOMQIS 2010), Paris, France

2010- : International Committee Member, International Conference on Luminescence (ICL)

2013- : International Committee Member, International Conference on Dynamical Processes
in Excited States of Solids (DPC)

2013- : Chairman of the International Committee International Conference on Dynamical
Processes in Excited States of Solids (DPC)

Referee : Nature Physics, Nature Communications, Physical Review Letters, Physical Review
B, Optica, Journal of Applied Physics, Applied Physics Letters, Optics Letters,
Optics Express, Journal of Luminescence, Journal of Physics: Condensed Matter,
JOSA B, Optical Materials and others.

Expert for ANR (France), DFG (Germany), NWO (The Netherlands), Marsden Fund
(New-Zealand), FWF (Austria), for promotions of French Professor (University of
Caen), Senior Lecturer at ANU (Canberra, Australia) and Associate Professor at
Princeton University (USA).

SELECTED RECENT PAPERS

K. S. Kumar, D. Serrano, A. M. Nonat, B. Heinrich, L. Karmazin, L. J. Charbonnière, P. Goldner, and M. Ruben, Optical Spin-State Polarization in a Binuclear Europium Complex towards Molecule-Based Coherent Light-Spin Interfaces, **Nature Communications** 12, 2152 (2021).

B. Casabone, C. Deshmukh, S. Liu, D. Serrano, A. Ferrier, T. Hümmer, P. Goldner, D. Hunger, and H. de Riedmatten, Dynamic Control of Purcell Enhanced Emission of Erbium Ions in Nanoparticles, **Nature Communications** 12, 3570 (2021).

S. Welinski, A. Tiranov, M. Businger, A. Ferrier, M. Afzelius, and P. Goldner, Coherence Time Extension by Large-Scale Optical Spin Polarization in a Rare-Earth Doped Crystal, **Phys. Rev. X** 10, 031060 (2020).

A. Fossati, S. Liu, J. Karlsson, A. Ikesue, A. Tallaire, A. Ferrier, D. Serrano, and P. Goldner, A Frequency-Multiplexed Coherent Electro-Optic Memory in Rare Earth Doped Nanoparticles, **Nano Lett.** 20, 7087 (2020).

S. Liu, A. Fossati, D. Serrano, A. Tallaire, A. Ferrier, and P. Goldner, Defect Engineering for Quantum Grade Rare-Earth Nanocrystals, **ACS Nano** 14, 9953 (2020).

T. Zhong and P. Goldner, "Emerging rare-earth doped material platforms for quantum nanophotonics," **Nanophotonics** 8, 2003–2015 (2019).

A. Ortu, A. Tiranov, S. Welinski, F. Fröwis, N. Gisin, A. Ferrier, P. Goldner, and M. Afzelius, "Simultaneous coherence enhancement of optical and microwave transitions in solid-state electronic spins," **Nature Materials** 17, 1–6 (2018).

D. Serrano, J. Karlsson, A. Fossati, A. Ferrier, and P. Goldner, "All-optical control of long-lived nuclear spins in rare-earth doped nanoparticles," **Nature Communications** 9, 2127 (2018).

J. G. Bartholomew, K. de Oliveira Lima, A. Ferrier, and P. Goldner, "Optical Line Width Broadening Mechanisms at the 10 kHz Level in Eu³⁺:Y₂O₃ Nanoparticles," **Nano Letters**, vol. 17, 778–787 (2017).

C. Laplane, E. Zambrini Cruzeiro, F. Fröwis, Ph. Goldner, and M. Afzelius, "High precision measurement of the Dzyaloshinsky-Moriya interaction between two rare-earth ions in a solid," **Phys. Rev. Lett** 117, 037203 (2016).

G. Wolfowicz, H. Maier-Flaig, R. Marino, A. Ferrier, H. Vezin, J. J. L. Morton, and P. Goldner, "Coherent Storage of Microwave Excitations in Rare-Earth Nuclear Spins," **Phys. Rev. Lett.** 114, 170503 (2015).

K. J. Tielrooij, L. Orona, A. Ferrier, M. Badioli, G. Navickaite, S. Coop, S. Nanot, B. Kalinic, T. Cesca, L. Gaudreau, Q. Ma, A. Centeno, A. Pesquera, A. Zurutuza, H. de Riedmatten, P. Goldner, F. J. G. de Abajo, P. Jarillo-Herrero, and F. H. L. Koppens, "Electrical control of optical emitter relaxation pathways enabled by graphene," **Nature Physics** 11, 281–287 (2015).

P. Goldner, A. Ferrier, and O. Guillot-Noël, "Rare Earth Doped Crystals for Quantum Information Processing," in **Handbook on the Physics and Chemistry of Rare Earths** Volume 46, J.-C. G. Bünzli and V. K. Pecharsky, Eds. (Elsevier B.V., Amsterdam, 2015).

R. M. Macfarlane, A. Arcangeli, A. Ferrier, and P. Goldner, "Optical Measurement of the Effect of Electric Fields on the Nuclear Spin Coherence of Rare-Earth Ions in Solids," **Phys. Rev. Lett.** 113, 157603 (2014).

F. Bussièrès, C. Clausen, A. Tiranov, B. Korzh, V. B. Verma, S. W. Nam, F. Marsili, A. Ferrier, P. Goldner, et al., "Quantum teleportation from a telecom-wavelength photon to a solid-state quantum memory," **Nature Photonics** 8, 775–778 (2014)

SELECTED INVITED CONFERENCES

Material Design for Solid State Quantum Memories

Ph. Goldner, O. Guillot-Noël, F. Beaudoux, Y. Le Du, J. Lejay, T. Chanelière, J.-L. Le Gouët, A. Amari, A. Walther, L. Rippe, and S. Kröll

International Conference on Luminescence ICL'08 Lyon July 7-11 2008

Efficient Solid State Memories for Quantum Cryptography

F. Beaudoux, R. Marino, J. Lejay, A. Ferrier, O. Guillot-Noël and Ph. Goldner

International Conference on Dynamical Processes in Excited State of Solids DPC'10, Argonne National Laboratory, USA, June 20-25 2010

Photon echoes in scattering media

Ph. Goldner, J.-L. Le Gouët, T. Chanelière, A. Ferrier

SPIE Photonics West, San Francisco, USA, 22-27 January 2011

Long optical storage in a rare earth doped crystal using dynamical decoupling

M. Lovrić, D. Suter, A. Ferrier and P. Goldner

International Conference on Laser Physics, Calgary, Canada, July 23-27 2012

Rare Earth Doped Crystals and Transparent Ceramics for Coherent Information Processing

P. Goldner and A. Ferrier

OSA Advanced Solid State Lasers International Conference, October 2013, Paris

Quantum storage in rare earth doped crystals

P. Goldner and A. Ferrier

International Conference on Luminescence ICL 2014, July 2014, Wroclaw, Poland

Sub-MHz Optical Homogeneous Linewidth in Rare Earth Doped Nanocrystals

Ph. Goldner, A. Perrot, R. Gonçalves, D. Giaume, M. Lovrić, C. Andriamiadamanana and A. Ferrier

International Workshop on the Physics of Quantum Electronics PQE 2014, January 2014, Snowbird, USA

Magnetic and Electric Fields Control of Nuclear Spin Coherence of Rare Earth Ions in Solids

Philippe Goldner, Andrea Arcangeli, Alban Ferrier, and Roger M. Macfarlane

XIV Brazil MRS Meeting, Rio de Janeiro, September 27 - October 1, 2015

Rare Earth Doped Nanostructures: Quantum Leaps for Optical Technologies

Philippe Goldner

International Conference on Luminescence ICL 2017, João Pessoa, Brazil (plenary talk)

Long Lived Optical and Spin Coherences in Rare Earth Doped Nanostructures

P. Goldner

International Conference on Hole Burning and Single Molecule Spectroscopy, August 2018, Suzdal, Russia

Advances and Challenges in Rare Earth Doped Materials for Quantum Technologies

Philippe Goldner

International Conference on Luminescence ICL 2020, July 2021, Changchun, China

SELECTED INVITED SEMINARS

Photon echoes in scattering media

P. Goldner

Institute for Photonic Sciences ICFO, Barcelona, June 2011

Rare Earth Doped Crystals for Optical Quantum Memories

P. Goldner

EPFL, Lausanne, Switzerland, November 2013

Rare Earth Doped Crystals for Quantum Information Processing

P. Goldner

National Institute for Materials Science, Tsukuba, Japan February 2013

Quantum Storage in Rare Earth Doped Crystals

P. Goldner

University of Pisa, Italy, November 2013

Sub-MHz Optical Homogeneous Linewidth in Rare Earth Doped Nanocrystals

P. Goldner

Stuttgart University, Germany, June 2014

Rare Earth Doped Crystals for Optical Quantum Memories

P. Goldner

University of Canterbury, Christchurch, New-Zealand, February 2015

Rare Earth Doped Crystals for Quantum Memories

P. Goldner

CERN, Switzerland, July 2016

Electrical Control of Nuclear Spin Coherences in Rare-Earth Doped Crystals

P. Goldner

LMU, Munich, December 8th, 2016

Long-lived optical and spin quantum states in rare earth doped nano- and micro-structures

P. Goldner

TUM, Munich, December 2017

Towards Optically Controlled Qubits in Rare Earth Doped Nanoparticles

P. Goldner

Caltech, Pasadena, USA, 2018

Towards Optically Controlled Qubits in Rare Earth Doped Nanoparticles

P. Goldner

Max Planck Institute for the Science of Light, Erlangen, Germany, 2018

Rare Earth Doped Crystals for Quantum Technologies

Princeton University, USA, 2019