

# Guido Goldoni - Curriculum Vitae

(May 2022, synthesis)

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**Place and date of birth** Carpi, Italy, September, 16th 1963.

**Orcid id** 0000-0002-6870-2071

**RESEARCHER ID** D-8271-2013

**Academic degrees** Physics degree *cum laudae*, 1988, University of Modena (supervisor Prof C Calandra)  
Ph.D. in Physics of Condensed Matter, 1993, International School for Advanced Studies (SISSA), Trieste (supervisor Prof A Fasolino)

**Current position** Full professor in the Physics of Matter, Department of Physics, Informatics and Mathematics, University of Modena and Reggio Emilia (SSD FIS/03, SC 02/B2)

**Previous positions**

2013-2021	Associate Professor, Dept. FIM-UNIMORE
2001-2013	Assistant Professor, Dept. of Physics, UNIMORE
9/2009	Visiting professor, Dept. of Physical and Analytical Chemistry, University of Castello, Spain
1996-2000	post-doc, Dept. of Physics, University of Modena
1994-1995	post-doc, Dept. of Physics, University of Antwerp (Belgium)
1989-1993	Ph.D. fellow, International School for Advanced Studies (SISSA), Trieste

**Memberships** Associate researcher at CNR-Institute of Nanoscience  
Member of the board of the *Graduate School in Physics and Nanoscience* at UniMoRe

**Didactical activity** Since 2001 I taught Condensed Matter Physics, Statistical Physics, Theoretical Physics and Computational Physics within the B.Sc. and M.Sc in Physics, and the Graduate School of Physics and Nanoscience at UniMoRe

**Academic management**

2021-present	Department Coordinator for internationalization
2016- 2021	Director of the M.Sc. in Physics program
2012-2016	Department Coordinator for public engagement and high-school educational activities
2008-2015	Member of the executive board of the department

**Evaluation committees** Research project reviewer for several agencies and programs, including MIUR (REPRISE, VQR), EU Rita Levi Montalcini, EU PRACE, SNSF (CH), CINECA (IT), CNR (IT)  
Member of several committees for the selection of academic staff in Italian universities (UniPv, PoliTo) as well as in selection and final dissertation of international PhD programs in Italy (UniMoRe, PoliTo) and abroad (Spain, Iceland)

**Research fundings** EU - Marie Curie IIF "Optical properties of hybrid organic/inorganic nano-particles for photovoltaic applications: toward a predictive computational approach" (2010/2012)  
Executive Program of Science and Technology Cooperation Italy-Japan "Control and manipulation of spin states in nano-scale quantum devices" ("projects of special interest"), (2008/2009).

EU - Marie Curie IEF "Signatures of few-body quantum correlations in semiconductor nanostructures" (2006/2008)

MIUR-FIRB "Quantum Phases in semiconductor heterostructures at very low electronic density" (2002/2005).

UNIMORE, Grant "Nano- and emerging materials and systems for sustainable technologies" (2014)

#### **HPC projects**

Supercomputing projects within the Parallel Computing Initiative (INFM)

HPC projects within the Italian SuperComputing Resource Allocation (ISCRA)

#### **Recent collaborations**

P. Wójcik (U. Krakov); L. Sorba (SNS, Pisa); S. Corni (U. Padova); V. Pellegrini (NEST-NANO CNR, Pisa); J. Planelles (Universitat Jaume I, Castello); M. Gurioli (University of Firenze); P. Hawrylak (NRC-IMS, Ottawa); F. Valee (CNRS, Lyon); U. Banin (Hebrew Univ., Jerusalem); G. Abstreiter (WSI, Munich); P. Plochocka (University of Toulouse)

#### **Past collaborations**

A. Fasolino (U. Nijmegen), U. Hohenester (U. Graz), F. M. Peeters (U. Antwerpen), R. Cingolani (U. Lecce); S. Tarucha (U. Tokyo); M. J. Caldas (U. Sao Paulo); F. Rossi (Politecnico di Torino);

#### **Editorial activities**

Associate Editor of *Physica Scripta*

Editor of the proceedings of the 17th Int Conf on Electronic Properties of Two-Dimensional Systems (EP2DS-17)

Editor of the proceedings of the 13th Int Conf on Modulated Semiconductor Structures (MSS-13)

#### **Scientific publications**

Co-author of >125 publications, and 3 contributions to monographs. The publications have received >1600 citations (without self-citations), H-index 27 (Data WoS, May 2022)

#### **Conference organization**

(chair) Int'l Workshop on Hybrid Excitations in Nano-Materials - HYEX 2011, Modena, 18-20 December, 2011 (hyex2011.nano.cnr.it)

(organizing committee) 17th Int Conf on Electronic Properties of Two-Dimensional Systems (EP2DS-17), Genova, 2007

(organizing committee) 13th Int Conf on Modulated Semiconductor Structures (MSS-13), Genova, 2007

#### **Mentoring (last 10 years)**

5 PhD students

7 post-docs (most currently holding a permanent position)

#### **Honours**

Outstanding referee for APS, year 2016

Outstanding referee for IOP, year 2017

#### **Research group**

The joint UNIMORE-CNR-NANO research group, composed by two permanent staff members (GG, A. Bertoni), hosted several Ph.D. and Post-docs over the years. A. Delgado (Private company), N. Climente (U. Jaume I), M. Royo (U. Barcelona), F. Buscemi (Private company), G Ferrari (Private company), F. Grasselli (SISSA), G. Perez (U. Padova), E Cancellieri (U. Lancaster)

#### **Scientific activity**

Scientific activities focus on the quantum theory of condensed matter, with a theoretical/computational character, and emphasis on spin-tronics and spin-orbitronics, coherent dynamics in electronic and excitronic systems, and correlation effects in nano-

structures for quantum technologies, particularly multi-electron quantum dots and nanowires.

Recent research topics of interest for the present project include:

- Spin-orbit coupling in nanowire-based heterostructures
- Quantum simulation of excitronic devices
- Ab-initio modelling of nano-molecules and nano-hybrids

Theoretical methods are chosen as to provide a quantitative description of, and direct comparison with, optical and transport spectroscopies, using or developing in-house state-of-the-art methods. These include:

- K.p formulations with inclusion of non-perturbative electric and magnetic fields
- Atomistic descriptions (tight-binding or pseudo-empirical Hamiltonians)
- mean-field methods (density functional or Hartree-Fock)
- configuration interaction methods
- evolutionary methods for optimization.

#### Didactical innovation

I co-manage a running project ([www.nanolab.unimore.it](http://www.nanolab.unimore.it)) for didactical innovation and teachers training to develop hands-on, nano-material based teaching modules to foster physics of matter in high-school curricula. The project led to several teacher's training courses, a self-training website, a school textbook on nanotechnology, and the formulation of laboratory kits.

#### Selected research papers

- M. Rontani et al., C. Cavazzoni, D. Bellucci, G. Goldoni, Full configuration interaction approach to the few-electron problem in artificial atoms, *J. Chem. Phys.* 124, 124102 (2006)
- D. Bellucci, M. Rontani, G. Goldoni, E. Molinari, Quantum phases of correlated electrons in artificial molecules under magnetic fields, *Phys. Rev. B* 74, 035331 (2006)
- J. I. Climente, A. Bertoni, G. Goldoni, M. Rontani, E. Molinari, Magnetic field dependence of triplet-singlet relaxation in quantum dots with spin-orbit coupling, *Phys. Rev. B* 75, 081303(R) (2007)
- Bertoni, G. Goldoni, Phase lapses in scattering through multielectron quantum dots: Mean-field and few-particle regimes, *Phys. Rev. B* 75, 235318 (2007)
- D. Kammerlander, D. Prezzi, G. Goldoni, E. Molinari, U. Hohenester, Biexciton stability in carbon nanotubes
- *Phys. Rev. Lett.* 99, 126806 (2007)
- S. Kallias, M. Rontani, V. Pellegrini, C. P. Garcia, A. Pinczuk, G. Goldoni, E. Molinari, L. N. Pfeiffer, K. W. West, A molecular state of correlated electrons in a quantum dot, *Nature Physics* 4, 467 (2008)
- M. Abbarchi, F. Troiani, C. Mastrandrea, G. Goldoni, T. Kuroda, T. Mano, K. Sakoda, N. Koguchi, S. Sanguinetti, A. Vinattieri, M. Gurioli, Spectral diffusion and line broadening in single self-assembled GaAs/AlGaAs quantum dot photoluminescence, *Appl. Phys. Lett.* 93, 162101 (2008)
- J. I. Climente, M. Korkusinski, G. Goldoni, P. Hawrylak, Theory of valence band holes as Luttinger spinors in vertically coupled quantum dots, *Phys. Rev. B* 78, 115323 (2008)
- G. Ferrari, G. Goldoni, A. Bertoni, G. Cuoghi, E. Molinari, Magnetic states in prismatic core multi-shell nanowires, *Nano Letters* 9, 1631 (2009)
- E. Cancellieri, F. Troiani, G. Goldoni, Optimal generation of indistinguishable photons from non-identical artificial molecules, *Optics Express* 19, 17156-17163 (2009)
- E. Shaviv, O. Schubert, M. Alves-Santos, G. Goldoni, R. Di Felice, F. Valle, N. Del Fatti, U. Banin, C. Sönnichsen, The absorption properties of metal-semiconductor hybrid nanoparticles, *ACS Nano* 5, 4712-4719 (2011)
- Bertoni, M. Royo, F. Mahawish, G. Goldoni, Electron and hole gas in modulation doped GaAs/AlGaAs radial heterojunctions, *Phys. Rev. B* 84, 205323 (2011)
- S. Funk, M. Royo, I. Zardo, D. Rudolph, S. Morkötter, B. Mayer, J. Becker, A. Bechtold, S. Matich, M. Doblinger, M. Bichler, G. Koblmüller, J. J. Finley, A. Bertoni, G. Goldoni, and G. Abstreiter, High mobility

one- and two- dimensional electron systems in nanowire-based quantum heterostructures, Nano Letters 13, 6189-6196 (2013)

- J. Jadczyk, P. Plochocka, C. A. Mitroglu, I. Breslavetz, M. Royo, A. Bertoni, G. Goldoni, T. Smolenski, P. Kossacki, A. Kretinin, H. Shtrikman, and D. K. Maude, Unintentional high-density p-type modulation doping of a GaAs/AlAs core-shell nanowire, Nano Letters 14, 2807-2814 (2014)
- F. Grasselli, A. Bertoni, G. Goldoni Exact two-body quantum dynamics of an electron-hole pair in semiconductor coupled quantum wells: a time-dependent approach Phys. Rev. B 93, 195310 (2016)
- F. Grasselli, A. Bertoni, G. Goldoni Time-dependent scattering of a composite particle: A local self-energy approach for internal excitations Phys. Rev. B 94, 125418 (7 pp) (2016)
- P. Wojcik, A. Bertoni, G. Goldoni, Tuning Rashba spin-orbit coupling in homogeneous semiconductor nanowires, Phys. Rev. B 97, 165401 (2018)
- P. Wojcik, A. Bertoni, G. Goldoni, Enhanced Rashba spin-orbit coupling in core-shell nanowires by the interfacial effect, App. Phys. Lett. 114, 073102 (2019)
- Wu, Shiyao; Peng, Kai; Battiato, Sergio; Zannier, Valentina; Bertoni, Andrea; Goldoni, Guido;
- Xie, Xin; Yang, Jiangnan; Xiao, Shan; Qian, Chenjiang; Song, Feilong; Sun, Sibai; Dang, Jianchen; Yu, Yang; Sorba, Lucia; Li, Ang; Li, Bei-Bei; Rossella, Francesco; Xu, Xiulai
- Anisotropies of the g-factor tensor and diamagnetic coefficient in crystal-phase quantum dots Nano Research 12, 2842-2848 (2019)
- P. Wojcik, A. Bertoni, G. Goldoni, Anisotropy of the spin-orbit coupling Phys. Rev. B 103, 085434 (2021)