

CURRICULUM VITAE

Born in Como, 31/07/1984
 Civil status: married, two children
 Office: Polifab – Department of Physics, Politecnico di Milano, via G. Colombo 81, 20133 Milano
 E-mail: christian.rinaldi@polimi.it
 Telephone: +39 02 2399 9661
 Orcid: [0000-0001-6930-211X](https://orcid.org/0000-0001-6930-211X)
 Scopus ID: [36545363200](https://scopus.com/authid/detail.url?authorid=36545363200)
 Research ID: [A-5686-2018](https://pubs.rsc.org/authenticate/doi/10.1039/A5686-2018)
 Web site: rinaldi.faculty.polimi.it/



I am an Associate Professor at Politecnico di Milano working on novel materials and phenomena related to spin-orbit physics (**spin-orbitronics**), research motivated by the willingness to exploit the spin of carriers in innovative electronic devices beyond CMOS.

I started my career with a PhD in semiconductor spintronics. I explored the physics of optical spin orientation and spin transport in germanium. I developed efficient spin-photodiodes that detect the degree of light helicity by spin filtering (**Adv. Mater. 2012**). As a visiting researcher at the Institute of Physics of the Czech Republic (Prof. T. Jungwirth), I contributed to the field of antiferromagnetic spintronics with a seminal study on CuMnAs, laying the ground to the all-electric read and write of antiferromagnets (**Nature Commun. 2013**).

Afterwards, I invested my energies towards the combination of ferroelectricity and spin physics, to seek the electrical controllability of either magnetism or spin transport. I contributed to the classic, non-volatile electric control of magnetization in artificial multiferroics (**Nature Commun. 2014, Adv. Electron. Mater. 2016**). I was able to set my independent research path on the development of spin-textured ferroelectrics as ferroelectric Rashba semiconductors. I authored the first spectroscopic investigation of germanium telluride (**Adv. Mater. 2016**). I demonstrated that those materials allow for an unprecedented non-volatile, electric control of bulk Rashba spin-texture (**Nano Lett. 2018**) and spin-to-charge conversion in silicon-compatible semiconductors (**Nature Electr. 2021**). Such discoveries open a *brand new field* and give birth to a new class of devices beyond CMOS, capable of memory and spin-based computing with ultralow power consumption for the electronics of the next decades.

EDUCATION

2010 – 2013 *PhD* Physics, Department of Physics, Politecnico di Milano, Milan, Italy
 Dissertation: *Ge-based photodiodes for spin-optoelectronics*.
cum laude (top 10% of the students). Supervisor: Prof. Riccardo Bertacco

2008 – 2009 *M.Sc.* Engineering Physics, Department of Physics, Politecnico di Milano, Milan, Italy
cum laude (top 12% of the students)

CURRENT POSITION

2023 **Associate professor** and group leader
 Department of Physics, Politecnico di Milano

PREVIOUS POSITIONS

2016 – 2022 *Research Fellow / Group Leader*
 Department of Physics, Politecnico di Milano and National Research Council Institute of Photonics and Nanotechnology (CNR-IFN), Italy

2013 – 2016 *Postdoctoral Fellow* @ Department of Physics, Politecnico di Milano, Milano, Italy

2012 *Visiting researcher* @ Institute of Physics - Academy of Science of Czech Republic

FELLOWSHIPS AND AWARDS

2023 **Early Stage Researcher Award (3rd edition)** at the International conference “Trends in Magnetism” (TMAG 2023) - Members of the evaluation committee: Prof. Kai Liu (IUPAP-C9 chair); Prof. Hyunsoo Yang (IEEE Magnetics Society – chair of the Educational Committee); Dr. Matt Eager (American Physical Society – Managing Editor). For more information: <https://www.petaspin.com/tmag2023/awards/>.

2019 Nano Letters 18, 2751 (2018) selected for the volume gathering the best publications achieved at the synchrotron radiation facility (“Electra Highlights 2018-2019”).

2016 APL Mater. 4, 32501 (2016): Editor’s pick; Top 10 accessed articles of 2016

2013 – 2021 Cover of scientific journals: Adv. Science (July 2021), Adv. Funct. Mater. (June 2021), Nano Letters (May 2018), Adv. Electron. Mater. (July 2016), Nuovo Cimento C (2013).

2013 Best contributed talk (travel grant), International Conference on Magnetism (ICM), Korea

2012 Best oral contribution, XCVIII Congress of the Italian Physical Society (SIF), Napoli, Italy

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

- present *As a professor:* 1 PhD / 3 Master students
 2016 - now *As a tenure track:* supervision of 1 Postdoc (Luca Nessi, winner of a grant at ETH Zurich, now at MIT Boston) / 1 PhD student (Federico Fagiani, now at cigNanoGune, Spain) / 4 master students;
 2013 - 2016 *As a postdoc:* 1 Postdoc / 3 PhD students (L. Baldrati, then a Marie Curie fellow @ Univ. of Mainz, Germany, S. Varotto, now postdoc @ CNRS, Thales, France) / 8 M.Sc. students
 2010 - 2012 *As a PhD student* (day-by-day supervisor), 8 Master students

TEACHING ACTIVITIES

- 2023 Professor in charge – PhD course in ferroelectrics (“Playing with ferroic materials”)
 2019 – 2023 Professor in charge – Experimental Physics, Politecnico di Milano, Italy
 2017 – 2019 Professor in charge – Electromagnetism and waves, Politecnico di Milano, Italy
 2010 – 2023 Teaching assistant in Mechanics, Thermodynamics, Politecnico di Milano, Italy

ORGANISATION OF SCIENTIFIC MEETINGS

- 2023 Communication Manager for the International Conference on Magnetism 2024 (ICM2024)
 2023 One-day workshop Ferroics in 2D and beyond, 10 eminent European speakers, Milano, Italy
 2023 Italian School of Magnetism (Information processing in spin-based systems), Milano, Italy
 2020 Two-day workshop *Electric control of spin transport*, with 15 eminent European academic speakers and supported by the IEEE Magnetic Society, Milano, Italy
 2018-present Organization of remote monthly scientific seminars (<http://tweet.spin.cnr.it>), Italy
 2014 Session Chair, Optical spin pumping, Spintronics VII at SPIE Optics+Photonics, CA, USA
 2012 Organizing committee, Conf. on Superconductivity and Functional Oxides, Como, Italy

INSTITUTIONAL RESPONSIBILITIES

- 2021 – present Member of the Governing Council, Italian Association of Magnetism (AIMagn), Italy
 2020 – present Website developer, Italian Association of Magnetism (AIMagn), Italy

REVIEWING ACTIVITIES

- 2023 Referee and panel member, PhD defence, Università Federico II di Napoli
 2021 Referee and panel member, PhD defence, Universitat Autònoma de Barcelona, Spain
 2021 – 2023 External reviewer for proposals, National Science Centre (NSC), Poland
 2020 Evaluation committee for the realization of a cleanroom (ISO06, 300 m²), Milano, Italy
 2019 – 2021 Editorial Board (topic: Spintronics), journal Electronics (MDPI, ISSN 2079-9292)
 2019 External reviewer, Icelandic Research Fund (IRF), Iceland
 2018 – 2023 More than 60 *peer reviews* for Nano Letters, IEEE Magn. Lett., APL, APL Materials, npj Asia Materials and npj Materials (Nature family), Appl. Surf. Sci., JAP and others

MEMBERSHIPS IN SCIENTIFIC SOCIETIES

- 2014 – present Member of the *Society of Photo-Optical Instrumentation Engineers* (SPIE)
 2018 – present Member of the *IEEE and IEEE Magnetic Society*
 2018 – present Member and member of the governing council of the *Italian Association of Magnetism*

MAJOR COLLABORATIONS

- 2023 – present Dr. L. Hueso and F. Casanova, cigNanoGUNE, Donostia-San Sebastian, Spain
 2021 – present Prof. P. Gambardella, ETH Zürich, Switzerland
 2020 – present Prof. Manuel Bibes, Unité Mixte de Physique, CNRS, Thales, Palaiseau, France
 2019 – present Dr. Laurent Vilà and Prof. J.-P. Attané, Univ. Grenoble Alpes, CNRS, Grenoble, France
 2019 – present Prof. Marco B. Nardelli, University of North Texas, USA / Prof. Jagoda Slawinska, Zernike Institute for Advanced Materials, Univ. of Groningen, The Netherlands
 2019 – present I Fina and J. Fontcuberta, ICMAB-CSIC, Spain
 2014 – present Dr. Stefano Cecchi and Dr. Raffaella Calarco, Paul-Drude-Institut, Berlin, Germany
 2014 – present G. Panaccione and Ivana Vobornik, CNR-IOM Elettra Synchrotron of Trieste, Italy
 2012 – present Dr. Silvia Picozzi, Consiglio Nazionale delle Ricerche (CNR-SPIN), Chieti, Italy

INVITED TALKS

I participated in more than 40 international conferences about Magnetism, Spintronics and materials science (MMM, JEMS, INTERMAG, SPIE, EMRS, NANO etc.) with 40 talks and several posters. I gave **20 invited talks, 1 keynote speech, and 2 lectures on Spintronics**. (+40 speeches and +11 other invited talks by coworkers). Here is a list of some recent invited talks:

- 2023-12 Lecturer - PhD School of Applied Spintronics (Messina, Italy). Invitation by Prof. Giovanni Finocchio
 2023-03 Kick-off meeting - IEEE Magnetic Society Italian Chapter, Torino. Invitation by Prof. V. Puliafito
 2023-03 Seminar at CIG nanoGUNE (Donostia-San Sebastian, Spain). Invitation by L. Hueso & F. Casanova
 2022-08 Intl. conference SPIE 2022 (CA, USA) by Prof. F. Ciccacci.
 2022-06 9th Forum on New Materials @ CIMTEC2022 (Perugia, Italy). Invited by Dr. S. Spiga.
 2022-02 Seminar at Zernike Institute for Adv. Mater., Groningen, Netherlands. Invited by J. Sławinska.

2021-09 Intl. conference German DPG 2021 (Berlin, Germany). Invitation by Prof. Ingrid Mertig.
 2021-08 Intl. conference SPIE 2021 (San Diego, CA, USA). Invitation by Prof. Henri Jaffrés.
 2020-02 **Lecturer**, Italian School of Magnetism (Rome, Italy). Invitation by Dr. Gaspare Varvaro.
 2020-01 Seminar at University of North Texas (Texas, USA). Invitation by Prof. M. B. Nardelli.
 2019-11 Intl. conf. Magnetism and Magnetic Materials (NV, USA). Invitation by Prof. Julie Karel.
 2018-08 Intl. conference SPIE 2018 Nanoscience+Engineering (San Diego, CA, USA) by Prof. H. Jaffrés.
 2018-06 **Keynote speech** at Intl. conf. on nanostructured materials NANO (Hong Kong). Invitation by Dr. Elisabetta Agostinelli.

AUTHOR RECORD

About 60 publications in peer-reviewed journals [including 1 Nature Electronics, 3 Adv. Mater., 2 Nature Commun., 1 Nano Letters, 1 Phys. Rev. Lett., 3 Adv. Mater. family, 1 single-author paper, 1 invited APL Mater.]; *H-index*: 17 ([Scopus/WoS](#)), 19 ([Google Scholar](#)); ~900 citations (excluding self-citations).
 11 publications as first author, 12 as a corresponding author; 19 publications without my PhD supervisor despite we work at the same facility; 3 as leading (last) author (one is a Nature Electronics).

GRANTS

2024 **Fondazione Politecnico di Milano** - Programma Switch 2 Product, "Electronics with Ferroelectricity and Spin-orbit coupling (EFESO)". **30 k€** | CEO / Principal investigator.
 2023 – 2025 **Ministero dell'Università e della Ricerca (MUR)**, PRIN, "Spin-ORBit Effects in Two-dimensional magnets (SORBET)". **260 k€** | Unit coordinator and work package leader
 2023 – 2025 Partenariato Infrastrutture - **Piano Nazionale di Ripresa e Resilienza (PNRR)** - **5 M€** | Responsible for an ultra-high vacuum cluster tool (MBE+ARPES, 1.5 M€)
 2021 – 2022 Spanish National Research Council, "Electrocaloric effects in CMOS compatible ferroelectric oxides for cooling application". Unit coordinator. Funding 24 k€
 2019 – 2023 **Ministero dell'Università e della Ricerca (MUR)**, PRIN, "Towards ferroelectricity in two-dimensions (TWEET)". **650 k€** | Unit coordinator and work package leader
 2018 - 2019 **Cariplo Foundation** and Regione Lombardia, Cariplo ERC, "Electric Control Of Spin transport in ferroelectric Rashba semiconductors" (ECOS). **120 k€** | **Principal investigator**
 2014-2019 Three **granted beamtimes** for spin and angular resolved photoemission spectroscopy at the Elettra Synchrotron Radiation Facility (APE beamline), Trieste, Italy. **Principal investigator**