

Curriculum vitae di *Lorenzo Pavesi*

Sottosettori ERC primari: PE7_5 (Micro- and nano-) electronic, optoelectronic and photonic components; PE2_12 Optics, non-linear optics and nano-optics; PE2_13 Quantum optics and quantum information
Eventuali sottosettori ERC secondari (max 3): PE3_10 Nanophysics, e.g. nanoelectronics, nanophotonics, nanomagnetism, nanoelectromechanics; PE7_9 Man-machine interfaces

PERSONAL DETAILS

Family name, First name: Pavesi, Lorenzo

Birthdate: 21/11/1961

Researcher unique identifier(s):

ORCID <http://orcid.org/0000-0001-7316-6034>

Web of Science ResearcherID: ACW-4934-2022 <https://www.webofscience.com/wos/author/record/3026826>

Google scholar <https://scholar.google.it/citations?user=5WnxJ4cAAAAJ&hl=it>

Scopus <http://www.scopus.com/authid/detail.url?authorId=7006812149>

Linkedin <http://it.linkedin.com/pub/lorenzo-pavesi/14/38/43b/en>

URL for web site:

University personal web page <https://webapps.unitn.it/du/en/Persona/PER0003263/Curriculum>

Nanoscience Laboratory <http://nanolab.physics.unitn.it/>

• Education and key qualifications

(11.1990) PhD Degree in Physics, Institute of Micro and Optoelectronics of the Swiss Federal Institute of Lausanne (Switzerland) Thesis: Hydrogen passivation of III-V semiconductors Thèse No 898 (1990)

(12.1985) Master Degree (Laurea) in Physics (summa cum laude), University of Trento (Italy)

• Current position(s)

(2006 -)

Founder and head

Nanoscience Laboratory

Department of Physics

University of Trento (Italy)

(2002 -)

Full professor of Experimental Physics

Department of Physics

University of Trento (Italy)

• Previous position(s)

(from 11.1999- to 8.2002)

Associate professor in Experimental Physics

Department of Physics, University of Trento (Italy)

(from 7.1990 – to 10.1999)

Assistant professor (Ricercatore) in Physics of the Matter

Department of Physics, University of Trento (Italy)

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

Professor Lorenzo Pavesi has significantly advanced silicon photonics, notably through investigations into optical gain within silicon nanocrystals, a key finding published in Nature. He has also contributed substantially to the understanding and application of porous silicon, exploring its "quantum sponge" structure for optoelectronic devices. His work extends to the manipulation of optical properties in silicon waveguides, as demonstrated by his research on second-harmonic generation via strain engineering. Furthermore, he has explored light transport in quasicrystalline structures. More recently, he has concentrated on novel computational schemes based on emerging paradigms, such as quantum integrated photonic circuits and hybrid biological/artificial neuronal networks. Additionally, he is active in non-Hermitian photonics and exceptional point physics.

Bibliometric parameters

Total number of publications in peer-review journals: 534

Total number of citations: 19626

H index: 65 (Scopus), 63 (WOS), 79 (Scholar)

10 relevant publications (last 10 years)

- M. Mancinelli, A. Trenti, S. Piccione, G. Fontana, J.S. Dam, P. Tidemand-Lichtenberg, C. Pedersen, L. Pavesi "Mid-infrared coincidence measurements on twin photons at room temperature", Nature Communications 8, 15184 (2017).
- Claudio Castellan, Alessandro Trenti, Chiara Vecchi, Alessandro Marchesini, Mattia Mancinelli, Mher Ghulinyan, Georg Pucker, and Lorenzo Pavesi "On the origin of second harmonic generation in silicon waveguides with silicon nitride cladding" Scientific Report 9, 1088 (2019).
- S. Paesani, M. Borghi, S. Signorini, A. Mainos, L. Pavesi, and A. Laing "Near-ideal spontaneous photon sources in silicon quantum photonics", Nature Communications 11, 2505 (2020).
- Stefano Azzini, Sonia Mazzucchi, Valter Moretti, Davide Pastorello, Lorenzo Pavesi "Single-Particle Entanglement", invited review Advanced Quantum Technologies 3, 2000014 (2020).
- A. Munoz de las Heras, R. Franchi, S. Biasi, M. Ghulinyan, L. Pavesi, and I. Carusotto "Non-linearity-Induced Reciprocity Breaking in a Single Non-Magnetic Taiji Resonator", Physical Review Applied 15, 054044 (2021).
- Massimo Borghi, Stefano Biasi, and Lorenzo Pavesi "Reservoir computing based on a silicon microring and time multiplexing for binary and analog operations", Scientific Reports 11, 15642 (2021).
- Emiliano Staffoli, M Mancinelli, Paolo Bettotti, and Lorenzo Pavesi "Equalization of a 10 Gbps IMDD signal by a small silicon photonics time delayed neural network", Photonics Research 11, 878-886 (2023).
- Matteo Sanna, Davide Rizzotti, Stefano Signorini, and Lorenzo Pavesi "2 μ m Ghost Spectroscopy with an Integrated Silicon Quantum Photonics Source" Advanced Quantum Technologies 7, 2300159 (2023). <https://doi.org/10.1002/qute.202300159>
- Stefano Biasi, Giovanni Donati, Alessio Lugnan, Mattia Mancinelli, Emiliano Staffoli, and Lorenzo Pavesi, "Photonic neural networks based on integrated silicon microresonators" Intelligent Computing 3:0067 (2024). doi:10.34133/icomputing.0067.
- Alessio Lugnan, Stefano Biasi, Alessandro Foradori, Peter Bienstman, and Lorenzo Pavesi "Reservoir Computing with All-Optical Non-Fading Memory in a Self-Pulsing Microresonator Network", Advanced Optical Materials 2403133 (2025) <https://doi.org/10.1002/adom.202403133> .

Edited books and monographs (last 10 years)

Light Localisation and Lasing: Random and Pseudorandom Photonic Structures Mher Ghulinyan and Lorenzo Pavesi editors, Cambridge University Press (2015)

Silicon Photonics III: Systems and Applications, Lorenzo Pavesi and David J. Lockwood editors, Topics in Applied Physics, Springer vol 122 (Springer Verlag, Berlin 2016).

Optical Switching in next generation Data Centers editors Francesco Testa and Lorenzo Pavesi, (Springer Verlag, Berlin 2017)

Silicon Photonics IV: Innovative Frontiers, David J. Lockwood, Lorenzo Pavesi editors, Topics in Applied Physics, Springer vol 139 (Springer Verlag, Berlin 2021)

Peer recognition

Awards

2012 – now elected Visiting Lecturer for SPIE
2019 fellow Member of SPIE
2019 fellow Member of AAIA
2018 ERC Advanced Grant Winner
2018 fellow Member (socio Benemerito) of the Italian Physical Society
2016 fellow Member IEEE
2010 – 2012 Elected Distinguished Lecturer of the IEEE Photonics Society
2001 Awarded the title Cavaliere for scientific merits by the Italian President

National Grants (last 10 years)

2013-2016 PAT GRANDI PROGETTI: SIQURO “On silicon chip quantum optics for quantum computing and secure communications” 715K€ - PI
2017-2020 PRIN2015 – MIUR NEMO “Nonlinear dynamics of optical frequency combs” 230K€ -- PI Trento unit
2018-2019 LESSO – ASI Laser etero-integrato a stato solido per trappole ottiche 32 K€ - PI Trento unit
2019-2020 PRIN2017 – MIUR PELM “Photonic Extreme Learning Machine: from neuromorphic computing to universal optical interpolant, strain gauge sensor and cancer morphodynamic monitor” 265 K€ - national PI

International Grants (last 10 years)

2013-2015 ITPAR Green Photonics using semiconductor nanostructures 133K€ - Italian PI
2013-2016 FP7-ICT-2013-10 SYMPHONY Integrated SYsteM based on PHOtonic Microresonators and Microfluidic Components for rapid detectioN of toxins in milk and diarY products 291K€ - PI Trento unit
2014-2017 FP7-ICT-2013-11 IRIS Integrated Reconfigurable Silicon photonic Switch 356K€
2018-2022 ITPAR A cheap, light, compact source for QKD based on intra-particle entanglement in an integrated photonic circuit 115K€ - PI Trento unit
2018-2023 ERC Advanced Grant BACKUP Unveiling the relationship between brain connectivity and function by integrated photonics 2.5 M€ - PI
2018-2021 FET QT FLAGSHIP QRANGE Quantum Random Number Generators: cheaper, faster and more secure 300K€ - PI Trento unit
2020-2023 H2020-FET OPEN-2020 EPIQUS "Electronic-photonic integrated quantum simulator platform" 386K€ - PI Trento unit
2020-2022 ERC PoC ALPI "All-optical photonic neural network (NN) integrated in the optical transceiver module" 150K€ - PI
2021-2023 H2020-MSCA-IF-2020 “An integrated setup for in-vitro optogenetic experiments using AI to localize stimulation with a feedback of electrophysiological signals” Marie Currie fellow Ilya Auslender – PI
2023-2025 HORIZON-MSCA-2021 “Artificial intelligence enabled by automatic dynamic exploration of integrated photonic spiking neural networks” Marie Curie fellow Alessio Lugnan –PI
2024-2027 HORIZON-WIDERA-2023-ACCESS-02 “Towards an excellence centre on quantum photonics in Latvia” 297K€ - PI Trento unit

Patents

WO2008117249A1 Integrated optical waveguide amplifier or laser with rare earth ions and sensitizer elements codoped core and related optical pumping method,
WO2005064394A1 Method for producing an integrated fabry-perot microcavity device with silicon technology,
US2002163003A1 Laser device based on silicon nanostructures,
WO2016016741A1 True random number generator,
WO2018073802A1 Improved random number generator, in particular improved true random number generator,
WO2021/186292A1 An apparatus for producing a multicliplty of photons comprising quantum-entangled single photon states,
WO2021/152563A1 Interferometric gain laser device
US 2024/0202523 (PCT/IT2022/050113) Optical transmitting-receiving module with Neural network
GB2005827.7 Optical apparatus.
PCT/EP2022/087869 Opto-electronic device for the detection of substances dispersed in a fluid

Organisation of conferences/scientific meetings

Promoter, organizer and member of the Advisory Committee of the “Optoelectronic and Photonic Winter Schools” held in Trento, Italy, every two years; the last edition is 13th Optoelectronics & Photonics Winter School: Artificial Intelligence for Telecom (19-25 January, 2025 Monte Bondone).

Member of the Program Committee of the series of symposia on “Photonic Materials, Devices, and Applications” and of the SPIE International Symposium on “Microtechnologies for the New Millennium”;

Member of the Program Committee and of the International Advisory Board of the series of conferences of the IEEE Photonics Society on Group Four Photonics up to 2016;

Co-organizers of the symposia “Integrated Optics, Silicon Photonics, and Photonic Integrated Circuits” during the conference SPIE Photonics-Europe up to 2016;

Conference co-chairman of the 5th international conference on “Group Four Photonics”, 17-19 September 2008 Sorrento, Italy;

Symposium chair at the E-MRS spring meeting: symposium “K Rare Earth Doped Materials for Optical Based Technologies”, 7-11 June 2010 Strasbourg, France;

Member of the Nanophotonics Committee for the general IEEE Photonics conference for the year 2011-2012.

General chair of the 103rd Italian Physical Society Conference (11-15 September 2017 Trento, Italy).

General chair of the Italian Conference on Optics and Photonics (15-17 June 2022 Trento, Italy)

Major invited presentations(2020-2023)

Neuromorphic Photonics as a route to hybrid artificial intelligence, plenary talk at SPB-POEM 2020 | Photonic & OptoElectronic (27-30 April 2020),

The past, the present and the future of silicon photonics : a personal view , plenary talk at International FDP on Advances in Optics and Photonics (4-8 August 2020), Lorenzo Pavesi

The past, the present and the future of silicon photonics: a personal viewpoint, invited talk at World Nano Congress on advanced science and technology (8-13 March 2021, Vellore, India, online)

Quantum silicon photonics, invited talk at International Webinar on Advances in Electronic, Optoelectronic and Photonic Materials and Devices (17-19 March 2021, IEST Shibpur, India, online)

The past, the present and the future of silicon photonics : a personal view, Plenary talk at International eWorkshop on Science and Technology of Emerging Materials (eSTEM-21) (19-21 April 2021, Karur, Tamil Nadu India, online)

Quantum silicon photonics, plenary talk, The 4th international conference Quantum Optics and Photonics 2021 (22-23 April 2021, Riga, online)

Silicon Photonics: what next? Keynote talk, Recent advances in photonics and Optics (RAPO-2021 Isbat University Uganda 15 May 2021, online)

Neuromorphic photonic platform for hybrid artificial intelligence? Invited talk at SPB-POEM 2021 | Photonic & OptoElectronic (25th May 2021)

Classical and Quantum Silicon Photonics tutorial during the annual IEEE Photonics Conference 2021 (18-21 October 2021, online)

Time Multiplexed Photonic Reservoir Computing, invited talk, 1st Workshop on Neuromorphic Photonics (6-7 December 2021, University of Thessaloniki, online)

Physics and Applications enabled by integrated silicon photonic circuits, Keynote talk, International Conference on Advanced Materials for Innovation and Sustainability (ICAMIS-2022 18-19, February Hyderabad 2022, online)

Neural Networks integrated in silicon photonics, invited talk IEEE Workshop on Recent Advances in Photonics WRAP'2022 (4-6 March, 2022, Mumbai-India, online)

Photonics and the brain: hybrid integrated intelligence, Plenary talk at ICTP / 10th International Symposium “Optics & its Applications” (OPTICS-10) December 5-9, 2022, Cali-Armenia, Colombia

Classical and Quantum Silicon Photonics: few examples, Plenary talk at International Conference on Electronic and Photonic Integrated Circuits 15-17 December 2022 SRM University (India)

A platform for Artificial Intelligence: neuromorphic silicon photonics, Plenary talk at 5th Anniversary International Conference of NSP FOTONIKA-LV Quantum sciences, Space sciences and Technologies – PHOTONICS RIGA 2023 20–21 April 2023, Riga

ADDITIONAL INFORMATION

Other contributions to the research community

Institutional responsibilities

(2021 - 2024) Director Quantum at Trento, the joint lab between University of Trento, Bruno Kessler Foundation, INFN and CNR

(2012 - 2018) Head of the Department of Physics, University of Trento

(2008 - 2011) Coordinator of the PhD school in Physics of the University of Trento

(2006 - 2011) Director of the second-degree professional master in Nano and Micro technology of University of Trento

Commission of trust

- (2021-2023) President of the national evaluation committee (abilitazione scientifica nazionale) ASN 2021 for the sector 02B2 (Fisica della materia teorica)
- (2022,2021, 2020, 2019, 2017) Panel chair for Nanotechnology and Physics, different programs (Fundacao para a Ciencia e a Tecnologia, Portugal)
- (from 2002) Member of the evaluation committee for professorships in different Italian universities (Catania, Pisa, Salerno, Bari, etc.), for INRIM and for the directors of CNR institutes
- (from 2000) Evaluation of research proposals for EC, NATO, MIUR, ERC, ETF, BSF, ANR, ARC, PAT, PIA, EPSRC, GACR, GIF, BSF, GNSF, ISF, CIVR, SNSF, and others. I sat in several committees for project evaluation or professor selections; in 2015 and 2016 I participated in the evaluation panels for research programs in photonics of Canada Innovation Foundation and Academy of Finland.
- (1998-2001) member of the directive council of Laboratorio Europeo Non lineari Spettroscopie (LENS) - Florence (Italy)

Service to scientific societies

- 2022 member of the SPIE nominating committee
- 2021- 2023 member of the SPIE Publications Committee
- 2021- now member (since 2023 chair) of the Emerging Technologies Task Force of IEEE Photonics Society
- 2019 member of the fellow selection committee of the IEEE Photonics society
- 2012 – now Visiting Lecturer for SPIE
- 2010 - 2012 Elected Distinguished Lecturer of the IEEE Photonics Society
- 2009-2012 Founder and first president of the Italian chapter of the IEEE Nanotechnology council
- 2002-2005 member of the Board of Delegates of E-MRS

Mentorship of students/young researchers/fellows

Supervised 53 master thesis students, 49 PhD students and 38 post-docs.

Editorial activities since 2020-, Series editor Photonics Materials and Applications, a joint initiative of Elsevier Inc. and SPIE

since 2017- member of the editorial board of the ETRI Journal

from 2016 to 2019 member of the Editorial Advisory Board of APL Materials

from 2014 to 2025, Specialty chief editor Frontier in Physics: Optics and Photonics, Frontiers

Other

Member of the scientific advisory board of Glass-to-Power, an Italian startup.

Scientific Council Member of the National Science Platform FOTONIKA-LV, in Quantum Sciences, Space Sciences and Related Technologies at the University of Latvia (Riga, Latvia)

International Advisory Committee Member for the Centre for Advanced Electronics , IIT Indore (India)