Paolo Minzioni – last updated July 2017

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Education

2002: Master Sc. degree ("Laurea") in Electronic Engineering at the University of Pavia (110/110 cum laude). (Prize as best laureate of the year for the whole Engineering faculty)

2006: Ph.D. in Electronics at the University of Pavia
Thesis title: “Devices for Next Generation Optical Networks”.

2006-2008: Holder of three research grants (Jan. 2006 – Dec. 2008), from University of Pavia, regarding the study of ferroelectric crystals for nonlinear optics applications and the characterization of their properties.

Since Dec. 2008: Assistant Professor at the University of Pavia (Italy) for the scientific sector "Physics of the matter".

Oct – Dec 2016: Visiting Professor at Tufts University, Medford, MA, USA

April 2010: National Scientific Habilitation (Abilitazione Scientifica Nazionale)
for both Associate Professor and Full Professor position

Teaching activity and seminars

More than 500 h of students tutoring and Physics seminars during the years 1998/2010.

Professor of “Physics 2” since academic year 2010/11, till 2014/15.
Professor of “Physics 1” since academic year 2015/16.

Supervisor of more than 30 students for their Bachelor and Master thesis preparation activity, in Electronics Engineering and Biomedical Engineering; tutor of 3 Ph.D. students.

Professor of “Fiber Communication Systems” and “Microfluidics” Master courses at IUSS (Istituto Universitario di Studi Superiori) in Pavia, Italy.

External member of the commissions for final Ph.D. exams at the University of Padova (four times) and at the Aston University, Birmingham, UK (twice)

Author of different invited seminars on integrated optical devices for biomedical applications and transmission systems in Italy and abroad: Centro Nazionale Interuniversitario per le Telecomunicazioni (Pisa, Italy), Aston University (Birmingham, UK), University of California Irvine (Irvine, USA), University of California Los Angeles (Los Angeles, USA), Nankai University (Tianjin, China), Peking University (Beijing, China), Chinese Academy of Sciences (Beijing, China).

Member of the OSA Traveling Lecturer Program.

Scientific Publications & Patents

Author of 80+ contributions to international conferences with peer-review

Author of 50+ scientific papers, on peer-reviewed journals and of 2 book chapters

Co-inventor of 6 international patent applications, regarding optical transmission systems (4 applications) and optical tweezers for single-particle trapping and manipulation (2).

Reviewer for different journals, edited by: Nature Publishing Group, Institute of Electrical and Electronics Engineers, Royal Society of Chemistry, Optical Society of America, Elsevier, Multidisciplinary Digital Publishing Institute, Springer, Taylor & Francis, Institute of Physics, Wichtig.

Reviewer for Projects and Papers evaluations for the Italian Ministry of University and Research.

Editorial activities

Member of the Editorial Board of Scientific Reports (Nature Publishing Group)

Member of the Editorial Board of Applied Sciences (MDPI)

Guest Editor of the Special Issues on “Silicon Photonics Components and Applications” published by MDPI Applied Sciences

Guest Editor of the Special Issues on “Cell manipulation and analysis in microfluidic chips” published by De Gruyter Optofluidics, Microfluidics and Nanofluidics

Guest Editor of the Special Issue “Micro-opto-fluidics: from fundamental research to applications in chemistry, physics, biology, and medicine” organized by the MDPI Journal Micromachines

Guest Editor of the “Roadmap Paper on Optofluidics” published by Institute of Physics, Journal of Optics

Editor of the book “Optical and Wireless Technologies: Proceedings of OWT 2017” by Springer

Additional data & roles covered

Organizer of the International workshop “*Recent trends in nonlinear optics and ultra-short pulse generation*” in 2003.

Involved in different outreaching activities: Italian LASERFEST exhibit; scientific exhibit “*Ondivaghiamo*”; Pavia event for the International Year of Light in September 2015; member of the “*BergamoScienza*” selection committee since 2010.

Member of the “Giunta di Dipartimento” for the Dept. of Electrical, Computer, and Biomedical Engineering

Member of the “Consiglio Direttivo di Facoltà” for the School of Engineering University of Pavia, Italy

Member of the “Commissione Paritetica Docenti-Studenti” of the School of Engineering University of Pavia, Italy

Participation since 2010 to the “Collegio Docenti” of the Ph.D. School in Electronics, Computer Science and Electrical Engineering of the University of Pavia

Research activities

My activity has always been characterized by a strong collaboration with different universities and companies, both in Italy and in other countries. The performed research activity has been focussed on the following topics:

- DESIGN AND CHARACTERIZATION OF INTEGRATED-OPTIC DEVICES FOR OPTICAL COMMUNICATIONS

Integrated optics devices, based on SiO_2/SiON/Si, with high performance have been designed (and characterized), by using an innovative technique that allows tailoring separately the amplitude and phase of a 1D photonic-crystal's transfer function. This technique allows obtaining optical filters with an almost-ideal transfer function, and hence they can be successfully exploited to filter optical signals with very high bit-rate. Recently a large part of the research activity has been devoted to the study of Si-based optical components (waveguides, filters, couplers, etc…) suitable to realize the integrated devices required for high bit-rate passive optical networks (PONs).

- FIBER OPTIC NONLINEAR EFFECTS: ANALYSIS AND STUDY OF POSSIBLE COMPENSATION TECHNIQUES

In this research field a method for the compensation of nonlinear optical distortions has been identified and demonstrated, both theoretically and experimentally. This result, obtained by an appropriate use of nonlinear devices for optical phase conjugation, opened the way to the possibility of implementing real optical-transmission systems realizing simultaneous dispersion and nonlinearity compensation.

- STUDY AND CHARACTERIZATION OF INNOVATIVE NONLINEAR OPTICAL MATERIALS:

The use of lithium niobate (LN) crystals for nonlinear optics applications is strongly limited by the photorefractive effect, which causes a distortion of the refractive indices of the material, and can also produce a complete distortion of the propagating optical beam, thus making the crystal unusable. The performed research has demonstrated that a relevant reduction of LN photorefractivity can be obtained by doping the crystal with a small quantity of tetravalent ions, without producing a significant change of crystal quality. Moreover very interesting results were obtained regarding the possibility to use semiconductor waveguides (using different geometries and materials) for the realization of integrated nonlinear optical devices allowing all-optical wavelength conversion and switching.

- DESIGN AND REALIZATION OF MICRO-STRUCTURED AND INTEGRATED OPTICAL DEVICES FOR BIOPHOTONIC APPLICATIONS

The research activity carried out in this field included two main aspects: the realization of a fiber-based 3D-optical-tweezer, and that of an integrated optical stretcher/sorter. Regarding the fiber-optic tweezer, the most significant result has been the first-ever demonstration, in 2007, of the possibility to use optical beam output from a fiber to trap and move microscopic particles (thanks to the radiation pressure) without any physical contact. Regarding the integrated optical stretcher/sorter, we demonstrated the first fully-integrated micro-fluidic chip including both a square-section micro-channel and the optical waveguides required to trap, stretch and sort single-cells.