Alberto Giovanni Diaspro

Full professor

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Education and training

1983

'Laurea' Doctoral degree Electronic Engineering

Computational model for a centered optical system under coherent light. - 104/110

University of Genoa - Genoa - IT

Academic experience

2018 - ONGOING

Full Professor

Univeristy of Genoa - Genova - IT

Research and Teaching

2005 - 2018

Associate Professor

Department of Physics School MFN Sciences University of Genoa - Genoa - IT

Basic and applied research Teaching in Applied Physics

2000 - 2005

Researcher

Department of Physics School MFN Sciences University of Genoa - Genoa - IT

Basic and applied research Teaching in Applied Physics

1995 - 2000

Technologist - Tecnico Laureato

Department of Physics School MFN Sciences University of Genoa - Genoa - IT

Basic and applied research Teaching

1987 - 1995

Technologist - Tecnico laureato

Institute of Biophysics School of Medicine University of Genoa - Genoa - IT

Basic and applied research Teaching

1985 - 1987

Contract Professor in Biophysics

School of Medicine University of Genoa - Genoa - IT

Teaching

Work experience

1983 - 1987

Applied resercher

Orsi Automazione - Genova - IT

Software design and programming - Assembler C Fortran

Language skills

English
Proficient

Spanish
Independent

French
Basic

Teaching activity

Applied Physics and Biophysics, Physics.
Physics and Advanced Microscopy Methods, Biotechnology.
Physics and biophysics, Biology.
Currently on leave of absence, art 12/312, as Director of an Institution of National interest, Department of Nanophysics, Istituto Italiano di Tecnologia.

Research interests

My specific research experience is related to the design, realization and utilization of optical and biophysical instrumentation as far-field super-resolution optical microscopy and nanoscopy, conventional and confocal microscopy, two-photon fluorescence microscopy and spectroscopy architecture, differential scanning calorimetry, scanning probe microscopy (STM, SNOM, AFM), polarized light scattering, signal and image digital processing. His main interests are molecular oncology (chromatin, endocytosis and adhesion mechanisms), neuroscience (brain mapping and neuronal network signalling) and smart materials (intelligent drug delivery and nanocomposite materials). LIQUITOPY (liquid tunable microscopy, Nature Photonics editorial 2018) is the brand new paradigm in optical microscopy developed in my lab to attack the central question of the relationship between structure and function of chromatin-DNA in live cells.
Microscopy skills
Super resolved fluorescence microscopy, Correlative Nnaoscopy, Mueller matrix signature, Bioimaging.
Confocal and Multiphoton Microscopy, i.e., FRAP, FRET, SHG, lifetime imaging, spectral fingerprint, single molecule detection, colocalization, 3D/4D.
Live imaging down to molecular resolution, single molecule/particle tracking with 5-10 nm accuray, 100-40 nm resolution, single molecule

sensitivity, Nanoscopy - FCS, TIRF, STED/PALM, IML-SPIM (Individual Molecule Localization - Selective Plane Illumination Microscopy).
4D (x, y, z, t) particle tracking, fast scanning modes - 100 fps, 512x512 pixel, photoactivatable fluo markers - paGFP, other fluo probes.
Active optical microscopy molecular 3D/4D uncaging and events follow up.
Deep imaging towards small animal live imaging, depth penetration, 0.5-1 mm.
Integration with electrophysiological data, multimodal platform for simultaneous imaging and data analysis.
Implementation of a deconvolution and image processing platform powermicroscope - friendly remote web access, correlative microscopy vs. TEM, SEM, AFM.
Today, the main research lines are related to Nanoscopy and deal with the development of novel technologies and instruments for advanced diagnostics at the nanometer scale integrated with focused applications. Within this framework Nikon industries launched the Nikon Imaging Centre NIC@IIT and a NIKON-IIT R&D center for the shared development of new optical technologies.
Activities
The study and characterization of oncological and neurodegenerative diseases at cellular and molecular level (nuclear pore complex and membrane channels dynamics, chromatin-DNA organization and its dynamic changes as potential pre-neoplastic indicators, cellular molecular trafficking, protein accumulation pathways, miRNA traffic and dynamics, cell aggregation and growth),
The study of tissue engineering processes (artificial retina, bone substitutes)
The study of new materials (nanoparticle packing and functioning in nanocomposite materials).In the long term, a new paradigm for microscopy development can be envisaged, such as portable multimodal nanoscopes having the potential of being flexible, low power and tunable. Such a new generation of microscopes could integrate microscopy, spectroscopy and flow cytometry in the same instrument endowed of all the processing and visualization software on-board.The Nanoscopy research activities share with the Nikon Imaging Center a partner portfolio: Nikon, Coherent, JEOL, JPK, PicoQuant, Okolab, Physik Istrumente, Chroma, ISS, Hamamatsu. A long term partnership is also running with Abberior and Leica Microsystems companies.
Projects
The main goals linked with the EU projects Eurobioimaging, SMD, LANIR, RENVISION and the technical scientific collaborations with Nikon, Leica and Coherent focus mainly on:
In-vivo imaging from micro- to nano- spatial resolution scale.
Lab-on-a-chip developments for integration on diagnostic devices and virtual reality platforms.
Optical nanoscopy modules competitive with current electron microscopes both in terms of spatial/temporal resolution and costs.
Correlative nanoscopy including optical super resolution in the far/near field, scanning probe microscopy, pump-probe spectroscopy and electron

microscopy.
Computational methods in optical microscopy and imaging.