

Margaux Bouzin

Curriculum Vitae

Personal Information

Place and date of birth: Milano (I), November 20, 1988

Nationality: Italian, French

Work address: Dipartimento di Fisica G. Occhialini, Università degli Studi di Milano-Bicocca, Piazza della Scienza 3, 20126, Milano (I)

Contacts: margaux.bouzin@unimib.it, (0039) 02 64482438

Education

2012-2015: Ph.D. in Physics, Università degli Studi di Milano-Bicocca, Milano, I

Thesis Title: *Image Correlation Methods to Follow Dynamic Processes in Biological Systems*

Supervisor: Prof. M. Collini

Defence Evaluation Committee: Prof. G. Cerullo, Prof. F. Pavone, Prof. C. Eggeling

2010-2012: M. Sc. in Physics (110/110 e lode), Università degli Studi di Milano-Bicocca, Milano, I

Thesis Title: *Optical Super-Resolution of Single Molecules by Stimulated Emission Depletion*

Supervisors: Prof. M. Collini, Prof. G. Chirico

2007-2010: B. Sc. in Physics (110/110 e lode), Università degli Studi di Milano-Bicocca, Milano, I

Thesis Title: *Size Characterization of Anisotropic Gold Nanoparticles by Fluorescence Correlation Spectroscopy*

Supervisors: Prof. M. Collini, Prof. G. Chirico

Academic Positions

- ▶ January 1, 2022 – : Ricercatore a tempo determinato (RTDa), Dipartimento di Fisica G. Occhialini, Università degli Studi di Milano-Bicocca, Milano, I;
- ▶ January 1, 2018 – December 31, 2021: Assegnista di Ricerca ('art. 22, Legge 240/2010'), Dipartimento di Fisica G. Occhialini, Università degli Studi di Milano-Bicocca, Milano, I. Supervisor: Prof. M. Collini;
- ▶ May 1, 2016 – October 28, 2017: Postdoctoral Research Scholar, Laboratory for Fluorescence Dynamics, University of California – Irvine, CA, USA. Supervisor: Prof. E. Gratton.

Academic Teaching Experience

- ▶ 2022-2023: 'Laboratorio di Biofotonica I', Laurea Magistrale in Fisica, Università degli Studi di Milano-Bicocca;
- ▶ 2022-2023: 'Laboratorio I', Laurea Triennale in Fisica, Università degli Studi di Milano-Bicocca;
- ▶ 2021-2022, 2020-2021, 2019-2020, 2018-2019: 'Laboratorio I', Laurea Triennale in Fisica, Università degli Studi di Milano-Bicocca ('Professore a Contratto', 50 hours);
- ▶ 2022-2023, 2021-2022, 2020-2021, 2019-2020, 2018-2019: 'Biostatistica e Fisica Medica', Laurea Magistrale in Medicina e Chirurgia, Università Vita-Salute San Raffaele ('Professore a Contratto', 28 hours);
- ▶ 2017-2018, 2014-2015: 'Esperimentazioni di Biofisica', Laurea Triennale in Fisica, Università degli Studi di Milano-Bicocca ('Professore a Contratto', 32 hours);
- ▶ 2017-2018: 'Fisica III', Laurea Triennale in Fisica, Università degli Studi di Milano-Bicocca (Tutor, 24 hours);
- ▶ 2013- : co-supervisor for sixteen theses for the B. Sc. (Laurea Triennale) in Physics and three theses for the M. Sc. (Laurea Magistrale) in Physics, Università degli Studi di Milano-Bicocca;
- ▶ 2018: Biophysics Week (March 12-16, 2018) – Seminar for the students of the Physics Dept., Università degli Studi di Milano-Bicocca ('La biofotonica applicata a sistemi biologici complessi');
- ▶ 2017, 2016: Lectures and laboratory activities at the 11th and 12th LFD Workshop in Advanced Fluorescence Imaging and Dynamics, University of California - Irvine;
- ▶ 2017, 2016: Lectures and laboratory activities at the COSMOS (California State Summer School for Math and Science) initiative, Keck NanoImaging Lab. and Laboratory for Fluorescence Dynamics, University of California - Irvine;
- ▶ 2017, 2016: Lectures and laboratory activities at the Undergraduate Student Initiative for Biomedical Research (USIBR), University of California - Irvine;
- ▶ 2013-2015: LABEX Program, Università degli Studi di Milano-Bicocca.

Research Activity

MB's research activity lies in the field of biophysics (FIS/07). MB has developed a solid experience in the application of optical microscopy, both in confocal mode and with non-linear excitation, to complex biological systems with the design of optical setups for sensing and imaging applications and with the development of image-processing algorithms mainly based on image correlation spectroscopy. Major research interests are summarized in detail in the following.

▸ **Super-resolution photo-activated infrared imaging.** MB's recent postdoctoral work has been centered on the development of a novel super-resolution image-acquisition method in the field of photo-activated infrared thermography. The approach takes advantage of the centroid localization of sparse temperature increments primed by modulated raster-scanned focused laser light, and enables the reconstruction of sub-diffraction thermal images at tunable $\sim 10\text{-}100\ \mu\text{m}$ resolution. The first experimental demonstration of super-resolved thermography has been reported on explanted murine tissue sections treated with photo-thermal cubic nanoparticles. Further application is currently being directed towards the characterization of the absolute molar concentration and spatial distribution of melanin pigments in murine melanoma biopsies (collaboration with Prof. F. Granucci, Università degli Studi di Milano-Bicocca, I), and towards the optimization of the thermal properties of proteinaceous multi-photon fabricated meso- and micro-structures.

Upon the development of super-resolution thermography, MB has exploited both numerical simulations and the analytical 3D heat equation in the presence of a focused laser source to extend the technique at the quantification and high-resolution spatial mapping of absolute thermal conductivity values. Thermal conductivity measurements have already been performed on eighteenth-century tin organ pipe fragments (collaboration with Prof. G. Gorini, Università degli Studi di Milano-Bicocca, I) in the framework of a non-destructive investigation of the sample conservation state in the presence of tin-pest related oxidation.

▸ **Fluorescence-based particle sorting.** In the framework of one of the five core projects of the Laboratory for Fluorescence Dynamics (LFD, University of California-Irvine, CA, USA), MB has been responsible for the development of a novel fluorescence-based particle sorting device aimed at the detection, identification and isolation of pathogens at ultra-low concentration ($\sim 1\text{-}10^3$ units/mL) in biological (turbid bodily) fluids. The particle sorting device relies on a scanning confocal fluorescence microscope to enable the fast (minute-to-hour) quantification and isolation of low-abundant targets, directly from whole-blood clinical samples, with single-cell sensitivity and no need for culture-enrichment steps. MB has been responsible for constructing the first-generation sorter prototype, coding the real-time particle detection-and-sorting algorithm and performing proof-of-principle sorting experiments. Clinically relevant application has already been demonstrated by the extraction of antibiotic-resistant bacteria (10^3 units/mL) from raw blood samples followed by bacterial identification and antibiotic-susceptibility testing.

▸ **Fluorescence Correlation Spectroscopy (FCS): anomalous transport in biological systems.** A third major research interest consists in the development of novel image-processing methods aimed at the investigation of diffusive, active and anomalous transport processes in complex biological systems by confocal and non-linear (two-photon excitation) microscopy.

In-vivo hemodynamics studies have been tackled by the development of an image-processing approach which applies fluorescence cross-correlation to a single raster-scanned image, to recover and map the blood flow velocity in geometrically complex vessel networks with sub-second resolution and single-capillary sensitivity. MB has contributed to the conceptualization of the theoretical framework and has applied the technique to the characterization of the blood flow in zebrafish embryos and in the murine hepatic microcirculatory system (collaboration with Prof. M. Iannacone, IRCCS Ospedale San Raffaele, Milano, I). The results have been complemented with correlation-based microfluidic flow measurements under dual-spot and aberration-corrected fluorescence detection, and with microfluidic flow measurements in Single Plane Illumination (SPIM) Microscopy.

At the sub-cellular scale, image correlation spectroscopy has been employed for the investigation of the intracellular dynamics of anisotropic gold nanoparticles (collaboration with Prof. P. Pallavicini, Università degli Studi di Pavia, I). MB has extended the theoretical framework of Fourier-space spatio-temporal correlation spectroscopy; by the combination of image correlation, numerical simulations and a Bayesian (Hidden Markov Model-based) analysis of single particle tracking data, MB has characterized and modelled the super-diffusive intermittent dynamics exhibited by endocytosed nanoparticles in living cancer cells.

▸ **Fluorescence Correlation Spectroscopy in medicine.** MB has applied single-point FCS for the characterization of the aggregation state of HIV viruses opsonized with HIV-specific monoclonal and polyclonal antibodies. Results have been part of a collaboration with Prof. D. Forthal (School of Medicine, University of California – Irvine, CA, USA) aimed at identifying the association between virus aggregation and antibody-dependent phagocytosis.

► **Non-linear fluorescence microscopy.** In the field of non-linear fluorescence microscopy, MB has collaborated in the development of an image-processing method aimed at a multi-parametric morphological and structural characterization of histopathological tissue sections. A combination of the well-established phasor approach with clustering algorithms, applied to the second-harmonic-generation signal, has allowed mapping the spatial heterogeneity of the anisotropy and orientation of collagen fibrils at the mesoscale in mm-sized tissue sections explanted from murine cancer xenografts. By highlighting the tumor edges, the method opens the possibility of their automatic segmentation as a complementary support tool to standard histopathology in disease diagnosis.

► **STED nanoscopy and single-molecule spectroscopy.** MB's research activity in the field of STED (STimulated Emission Depletion) nanoscopy has led to the development of a novel protocol exploiting single-molecule sequential confocal and STED imaging for the simultaneous characterization of the effective confocal and STED point-spread-functions, of the STED laser intensity distribution and of the photostability of the employed dye. By a four-level model for the vibrational and electronic singlet states of the dye, the experimentally measured point-spread-functions have been related to the STED laser intensity profile, reconstructed thereby, and to the dye stimulated emission cross-section. For the first time, the stimulated emission cross-section has been inferred, for synthetic dyes and fluorescent proteins, from images of sub-resolved size fluorescent objects.

Participation to Research Projects

► 2021- : Participation (WP responsibility) to the four-year project 'IN2SIGHT', funded by the EU under the call H2020-FETOPEN-2018-2020 (FET open – novel ideas for radically new technologies) aimed at a breakthrough in the biocompatibility tests of biomaterials by in-vivo optical imaging (€3M grant, coordinator Prof. G. Chirico). Project kick-off: March 2021, project duration: 2021-2025;

► 2020, 2015: Participation to research projects funded by Università degli Studi di Milano-Bicocca under the call 'Fondo di Ateneo – Quota Competitiva' to Prof. G. Chirico and Prof. L. Sironi;

► 2016-2017: Participation to a NIH-funded research project (R01 \$5M grant to Prof. W. Zhao, NIH-R01AL117061) aimed at the development and validation of a novel diagnostic platform for the fast and specific identification of low-abundant antibiotic-resistant bacteria in whole-blood clinical samples;

► 2016-2017: Participation to one of the five core projects of the Laboratory for Fluorescence Dynamics (grant NIGMS-P41GM103540 to Prof. E. Gratton) for the conceptualization and development of a novel fluorescence-based particle sorting device for the isolation of pathogens at ultra-low concentration.

► 2011: Participation to the research project 'Microscopia in super-risoluzione' (Fondo Grandi Attrezzature di Ateneo to Prof. M. Collini, Università degli Studi di Milano-Bicocca) for the preparation of the M. Sc. thesis.

Submitted Research Projects

► 2018: "Bando per la raccolta di progetti congiunti di ricerca di grande rilevanza tra Italia e Stati Uniti". The collaboration with the LFD on the cell-sorting research project has led to a project submission within the Italy-USA science and technology cooperation call for joint research proposals.

Patents

► 2022: Patent Application: M.T. Raimondi, G. Cerullo, C. Conci, A. Nardini, G. Chirico, M. Bouzin, M. Marini, L. Sironi, M. Collini, R. Osellame, R. Martinez Vazquez, M. Farsari, E. Kambouraki, "Piattaforma impiantabile per l'imaging in-vivo";

► 2019: E. Gratton, M. Bouzin, W. Zhao, "A particle-sorting device for the isolation, separation and enrichment of particles at ultra-low concentration". Patent International Publication Number WO 2019/204333 AI, publication date October 24, 2019.

Awards and Awarded Research Grants

► 2021: FLIR Prize 2021 for the best oral presentation at the Course "Progress in photo-acoustic and photo-thermal phenomena" of the International School of Quantum Electronics (Erice, Italia, October 16-23, 2021);

► 2020: Travel grant of the Italian Biophysical Society (SIBPA) for the attendance at the 64th Biophysical Society Annual Meeting (San Diego, CA, USA, February 15-19, 2020);

► 2018: Premio Giovani Talenti, awarded by Università degli Studi di Milano-Bicocca and Accademia dei Lincei ('primo premio area Fisica', 5000 €);

► 2018: Travel grant of the Italian Biophysical Society (SIBPA) for the attendance at the XXIV SIBPA conference (Ancona, Italia, September 10-13, 2018);

- 2018-2021: Post-doctoral research fellowship ('assegno di ricerca') funded by Università degli Studi di Milano-Bicocca;
- 2014: Travel grant of the Italian Biophysical Society (SIBPA) for the attendance at the XXII SIBPA conference (Palermo, Italia, September 21-24, 2014);
- 2013-2015: Ph.D. fellowship at the Physics Department, Università degli Studi di Milano-Bicocca.

Publications

1. Scodellaro, R., Cesana, I., D'Alfonso, L., **Bouzin, M.**, Collini, M., Chirico, G., Colombo, R., Miglietta, F., Celesti, M., Schuettemeyer, D., Cogliati, S., Sironi, L. *A Novel Hybrid Machine Learning Phasor-Based Approach to Retrieve a Full Set of Solar-Induced Fluorescence Metrics and Biophysical Parameters*, *Remote Sens. Environ.* 280, 113196 (2022); DOI: 10.1016/j.rse.2022.113196
2. Marini, M., **Bouzin, M.***, Scodellaro, R., D'Alfonso, L., Sironi, L., Granucci, F., Mingozi, F., Chirico, G., Collini, M. *Quantitative Active Super-Resolution Thermal Imaging: The Melanoma Case Study*, *Biomol. Conc.*, 13, 242-255 (2022); *corresponding author; DOI: 10.1515/bmc-2022-0015
3. **Bouzin, M.***, Marini, M.*, Chirico, G., Granucci, F., Mingozi, F., Colombo, R., D'Alfonso, L., Sironi, L., Collini, M. *Melanin Concentration Maps by Label-free Super-Resolution Photo-thermal Imaging on Melanoma Biopsies*, *Biomed. Opt. Expr.*, 13, 3 (2022); *co-first authors; DOI: 10.1364/BOE.445945
4. **Bouzin, M.**, Zeynali, A., Marini, M., Sironi, L., Scodellaro, R., D'Alfonso, L., Collini, M., Chirico, G. *Multiphoton Laser Fabrication of Hybrid Photo-activable Biomaterials*, *Sensors*, 21, 5891 (invited review - 2021); DOI: 10.3390/s21175891
5. Stucchi, S., Colombo, D., Guizzardi, R., D'Aloia, A., Collini, M., **Bouzin, M.**, Costa, B., Ceriani, M., Natalello, A., Pallavicini, P., Cipolla, L. *Squarate Cross-linked Gelatin Hydrogels As 3D Scaffolds and Drug Delivery Platform for Biomedical Applications*, *Langmuir*, 37, 14050-14058 (2021); DOI:10.1021/acs.langmuir.1c02080
6. Grisoli, P., De Vita, L., Milanese, C., Taglietti, A., Diaz Fernandez, Y., **Bouzin, M.**, D'Alfonso, L., Sironi, L., Rossi, S., Vignani, B., Sperandeo, P., Polissi, A., Pallavicini, P. *PVA Films with Mixed Silver Nanoparticles and Gold Nanostars for Intrinsic and Photothermal Antibacterial Action*, *Nanomaterials*. 11, 6, 1387 (2021); DOI: 10.3390/nano11061387
7. Marini, M.*, **Bouzin, M.***, Sironi, L., D'Alfonso, L., Colombo, R., Di Martino, D., Gorini, G., Collini, M., Chirico, G. *A Novel Method for Spatially-Resolved Thermal Conductivity Measurement by Super-Resolution Photo-Activated Infrared Imaging*, *Mater. Today Phys.* 18, 100375 (2021); *co-first authors; DOI: 10.1016/j.mtphys.2021.100375
8. Hedde, P. N.*, **Bouzin, M.***, Abram, T. J., Chen, X., Toosky, M. N., Vu, T., Li, Y., Zhao, W., Gratton, E. *Rapid Isolation of Rare Targets from Large Fluid Volumes*, *Sci. Rep.* 10, 1 (2020); *co-first authors; DOI: 10.1038/s41598-020-69315-1
9. Zeynali, A., Marini, M., Chirico, G., **Bouzin, M.**, Borzenkov, M., Sironi, L., D'Alfonso, L., Pallavicini, P., Cassina, V., Mantegazza, F., Granucci, F., Marongiu, L., Polli, D., De La Cadena, A., Collini, M. *Multi-Photon Fabrication of Proteinaceous Nanocomposite Microstructures with Photo-thermal Activity in the Infrared*, *Adv. Optical Mater.* 2000584 (2020); DOI: 10.1002/adom.202000584
10. Borzenkov, M., Chirico, G., Pallavicini, P., Sperandeo, P., Polissi, A., Dacarro, G., Doveri, L., Collini, M., Sironi, L., **Bouzin, M.**, D'Alfonso, L. *Nanocomposite Sprayed Films with Photo-thermal Properties for Remote Bacteria Eradication*, *Nanomaterials* 10, 786 (2020); DOI: 10.3390/nano10040786
11. **Bouzin, M.***, Marini, M.*, Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Photo-Activated Raster-Scanning Thermal Imaging at Sub-Diffraction Resolution*, *Nat. Commun.* 10, 5523 (2019); *co-first authors; DOI: 10.1038/s41467-019-13447-0
12. Scodellaro, R., **Bouzin, M.**, Mingozi, F., D'Alfonso, L., Granucci, F., Collini, M., Chirico, G., Sironi, L. *Whole-Section Tumor Micro-Architecture Analysis by a Two-Dimensional Phasor-Based Approach Applied to Polarization-Dependent Second Harmonic Imaging*, *Front. Oncol.* 9, 527 (2019); DOI: 10.3389/fonc.2019.00527
13. Collini, M., Radaelli, F., Sironi, L., Ceffa, N., D'Alfonso, L., **Bouzin, M.**, Chirico, G. *Adaptive Optics Micro-Spectrometer for Cross-Correlation Measurement of Microfluidic Flows*, *J. Biomed. Opt.* 24, 2, 025004 (2019); DOI: 10.1117/1.JBO.24.2.025004
14. Collini, M., **Bouzin, M.**, Chirico, G. *Out of the Randomness: Correlating Noise in Biological Systems*, *Biophys. J.* 114:2298-2307 (2018); DOI: 10.1016/j.bpj.2018.01.034
15. Ceffa, N. G., **Bouzin, M.**, D'Alfonso, L., Sironi, L., Marquezin, C., Auricchio, F., Marconi, S., Chirico, G., Collini, M. *Spatio-Temporal Image Correlation Analysis for 3D Flow Field Mapping in Microfluidic Devices*, *Anal. Chem.* 90, 3, 2277-2284 (2018); DOI: 10.1021/acs.analchem.7b04641

16. Gach, S. J., **Bouzin, M.**, Wong, M. P., Chromikova, V., Gorlani, A., Yu, K., Sharma, B., Gratton, E., Forthall, D. N. *Human Immunodeficiency Virus Type 1 Evades Antibody-Dependent Phagocytosis*, Plos Pathog. 13, 12, e1006793 (2017); DOI:10.1371/journal.ppat.1006793
17. **Bouzin, M.**, Sironi, L., Chirico, G., D'Alfonso, L., Inverso, D., Pallavicini, P., Collini, M. *k-Space Image Correlation to Probe the Intracellular Dynamics of Gold Nanoparticles*, JINST 11:C04018 (2016); DOI: 10.1088/1748-0221/11/04/C04018
18. **Bouzin, M.**, Sironi, L., Chirico, G., D'Alfonso, L., Inverso, D., Pallavicini, P., Collini, M. *An Intermittent Model for Intracellular Motions of Gold Nanostars by k-Space Scattering Image Correlation*, Biophys. J. 109(11):2246-2258 (2015); DOI: 10.1016/j.bpj.2015.10.025
19. Sironi, L.*, **Bouzin, M.***, Inverso, D., D'Alfonso, L., Pozzi, P., Cotelli, F., Guidotti, L. G., Iannacone, M., Collini, M., Chirico, G. *In vivo Flow Mapping in Complex Vessel Networks by Single Image Correlation*, Sci. Rep. 4, 7341 (2014); *co-first authors ; DOI: 10.1038/srep07341
20. Pozzi, P., Sironi, L., D'Alfonso, L., **Bouzin, M.**, Collini, M., Chirico, G., Pallavicini, P., Cotelli, F., Foglia, E. A. *EM-CCD Based Fluorescence Cross-Correlation Spectroscopy for Blood Velocimetry on Zebrafish Embryos*, J. Biomed. Opt. 19, 067007 (2014); DOI: 10.1117/1.JBO.19.6.067007
21. **Bouzin, M.**, Chirico, G., D'Alfonso, L., Sironi, L., Soavi, G., Cerullo, G., Campanini, B., Collini, M. *Stimulated Emission Properties of Fluorophores by CW-STED Single Molecule Spectroscopy*, J. Phys. Chem. B 117, 16405-16415 (2013); DOI: 10.1021/jp409330t

Conference Proceedings

1. Conci, C., Jacchetti, E., Sironi, L., Gentili, L., Cerullo, G., Martinez R., Osellame, R., Marini, M., **Bouzin, M.**, Collini, M., D'Alfonso, L., Kabouraki, E., Farsari, M., Ranella, A., Kehagias, N., Chirico, G., Raimondi, M. T. *A Miniaturized Chip for 3D Optical Imaging of Tissue Regeneration In Vivo*, Proceedings of SPIE, 12144, 12144D (2022);
2. Scodellaro, R., **Bouzin, M.**, Mingozzi, F., Granucci, F., D'Alfonso, L., Collini, M., Chirico, G., Sironi, L. *Collagen Micro-Architecture Investigation in Tumor Sections by Means of Second-Harmonic Generation Signal Multiphasor Analysis Coupled with Non-supervised Machine Learning Techniques*, Il Nuovo Cimento C, 44, 139 (2021);
3. Zeinali, A., Marini, M., Collini, M., **Bouzin, M.**, Sironi, L., D'Alfonso, L., Pallavicini, P., Chirico, G. *Multiphoton fabrication of flexible photo-thermally active proteinaceous microstructures*, Chem. Eng. Trans. 84, 235-240 (2021);
4. Chirico, G., Sironi, L., **Bouzin, M.**, D'Alfonso, L., Collini, M., Ceffa, N. G., Marquezin, C. *Single Image Correlation for Blood Flow Mapping in Complex Vessel Networks*, Proceedings of SPIE, Vol. 9529, 95290F (2015);
5. Ceffa, N. G., Pozzi, P., **Bouzin, M.**, Marquezin, C. A., Sironi, L., D'Alfonso, L., Collini, M., Chirico, G. *Fluorescence Cross-Correlation Spectroscopy for Time Dependent Flows: a Numerical Investigation*, Proceedings of SPIE, Vol. 9320, 93200R (2015);
6. Pozzi, P., Rossetti, L., Sironi, L., Freddi, S., D'Alfonso, L., Caccia, M., **Bouzin, M.**, Collini, M., Chirico, G. *Structured Illumination Fluorescence Correlation Spectroscopy for Velocimetry in Zebrafish Embryos*, Proceedings of SPIE, Vol. 8580, 85800V (2013).

Books and Book Chapters

1. Sironi, L., D'Alfonso, L., **Bouzin, M.**, Ceffa, N.G., Collini, M., Chirico, G., Blinder, P. *Optical Blood Flow Measurement in Microcirculatory Systems*, SPIE Press Spotlight Book (2016);
2. Sironi, L., Borzenkov, M., Collini, M., D'Alfonso, L., **Bouzin, M.**, Chirico, G. *Interactions of Gold Nanostars with Cells*, Chapter 4 in *Gold Nanostars: Synthesis, Properties and Biomedical Application*, Springer Briefs in Materials, Springer International Publishing (2015).

Roles in the organization of conferences/schools

► Scientific Secretary for the Course 210, “Multimodal and Nanoscale Optical Microscopy”, of the International School of Physics “E. Fermi” (July 10-15, 2022, Varenna, Italia).

Editorial Activity

► Guest Editor for the Proceedings of the International School of Physics “E. Fermi” (Course 210, “Multimodal and Nanoscale Optical Microscopy”, July 10-15, 2022, Varenna, Italia).

Conference Presentations and Posters

- September 12 – 22, 2022: 108th SIF National Congress, Milano, Italia
Scodellaro, R., Cesana, I., D'Alfonso, L., Bouzin, M., Collini, M., Miglietta, F., Celesti, M., Schuettemeier, D., Colombo, R., Chirico, G., Cogliati, S., Sironi, L. *i- ϕ -male: A Novel Hybrid Machine Learning Phasor-Based Approach to Retrieve a Full Set of Solar-Induced Fluorescence Metrics and Biophysical Parameters* – oral pres.;
- Collini, M., Bouzin, M., Marini, M., Sironi, L., D'Alfonso, L., Colombo, R., Di Martino, D., Gorini, G., Chirico, G. *Super-resolution Thermography as a Tool for Investigating the Conservation State of Cultural Heritage Artifacts* – oral pres.;
- Sironi, L., Scodellaro, R., Panzeri, D., Pagani, E., Tuzzi, L., Bouzin, M., D'Alfonso, L., Collini, M., Chirico, G., Inverso, D. *Virtual H&E Staining and Automatic Segmentation of Liver Biopsies by Means of a Convolutional Neural Network Coupled to a Phasor-Based Algorithm* – oral pres.;
- September 5-9, 2022: World Congress for Optics and Photonics ICO-25 OWLS-16, Dresden, Germany
Conci, C., Jacchetti, E., Sironi, L., Gentili, L., Cerullo, G., Martinez, R., Osellame, R., Marini, M., Bouzin, M., Collini, M., D'Alfonso, L., Kambouraki, E., Farsari, M., Ranella, A., Kehagias, N., Chirico, G., Raimondi, M. T. *A Miniaturized Structured Chip for In Vivo 3D Optical Imaging of Tissue Regeneration* – oral pres.;
- September 3-7, 2022: 34th European Congress of Pathology, Basel, Switzerland (hybrid event)
Scodellaro, R., Panzeri, D., Pagani, E., D'Alfonso, L., Bouzin, M., Collini, M., Chirico, G., Inverso, D., Sironi, L. *A Novel Machine Learning Pipeline to Analyze Unstained Liver Biopsies and Automatically Quantify Tumor-related Structures* – poster;
- July 27 - August 1, 2022: Photonics Meets Biology, Spetses, Greece
Marini, M., Zeynali, A., Collini, M., Bouzin, M., Sironi, L., D'Alfonso, L., Mantegazza, F., Cassina, V., Chirico, G. *Characterization of the Elastic Properties of Flexible Two-photon Fabricated Proteinaceous Microstructures* – poster;
- June 19 – 24, 2022: ICPPP21 International Conference on Photoacoustic and Photothermal Phenomena, Bled, Slovenia
Bouzin, M., Marini, M., D'Alfonso, L., Sironi, L., Granucci, F., Mingozzi, F., Gorini, G., Di Martino, D., Chirico, G., Collini M. *Imaging Thermal Properties by Super-Resolution Far-Infrared Thermography* – **invited (keynote) oral pres.**;
- May 23-27, 2022: Living Planet Symposium, Bonn, Germany
Scodellaro, R., Cesana, I., D'Alfonso, L., Bouzin, M., Collini, M., Chirico, G., Colombo, R., Miglietta, F., Celesti, M., Schuettmeyer, D., Cogliati, S., Sironi, L. *A Novel Hybrid Machine Learning Phasor-Based Approach to Retrieve a Full Set of Solar-Induced Fluorescence Metrics and Biophysical Parameters from Model Simulations and Field Data* – oral pres.;
- May 12-13, 2022: 5th Retreat Nanoscopy & Nikon Imaging Center, Genova, Italia
Bouzin, M., Marini, M., D'Alfonso, L., Sironi, L., Mingozzi, F., Granucci, F., Di Martino, D., Gorini, G., Chirico, G., Collini M. *Imaging Thermal Properties by Super-Resolution Far-infrared Thermography* – **invited oral pres.**;
- February 19-23, 2022: 66th Biophysical Society Annual Meeting, San Francisco, CA, USA
Scodellaro, R., Panzeri, D., Inverso, D., Bouzin, M., D'Alfonso, L., Collini, M., Chirico, G., Sironi, L. *AI-based Pipelines for the Automated Recognition of Hepatocellular Carcinoma and the Semantic Segmentation of Virtually Stained Liver Biopsies* – poster;
- October 16-23, 2021: International School of Quantum Electronics, 64th Course, Progress in Photoacoustic & Photothermal Phenomena, Erice, Italia
Bouzin M., Marini M., Sironi L., D'Alfonso L., Colombo R., Di Martino D., Gorini G., Chirico G., Collini M. *Thermal Conductivity Imaging on Cultural Heritage Artifacts by Super-Resolution Thermography* – **oral pres.**;
- Marini, M., Bouzin, M., Sironi, L., D'Alfonso, L., Colombo, R., Mingozzi, F., Granucci, F., Chirico, G., Collini, M. *Label-free Super-resolution Thermography as a Tool to Image Melanin in Melanoma Biopsies* – oral pres.;
- September 13-17, 2021: 107th SIF National Congress, Milano, Italia
Scodellaro, R., Cesana, I., D'Alfonso, L., Bouzin, M., Collini, M., Chirico, G., Colombo, R., Miglietta, F., Celesti, M., Schuettmeyer, D., Cogliati, S., Sironi, L. *AI-based Spectral Windows Phasor Approach to Retrieve Solar-Induced Fluorescence Spectra at Top-of-Canopy and Photosystem Level* – oral pres.;
- July 24 – 28, 2021: 13th European Biophysics Conference (EBSA), Wien, Austria
Scodellaro, R., Panzeri, D., Bouzin, M., D'Alfonso, L., Collini, M., Chirico, G., Inverso, D., Sironi, L. *AI-based Virtual Staining and Semantic Segmentation of Anatomopathology Sections* – poster;

- June 28 – July 1, 2021: XXV SIBPA National Congress, Parma, Italy (virtual)
Bouzin, M., Marini, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Chirico, G., Collini, M. *Imaging the Melanin Distribution in Murine Melanoma Biopsies by Label-Free Super-Resolution Thermography* – **oral pres.;**
- June 21 – 25, 2021: SPIE Optical Metrology, Munchen, Germany (virtual)
Marini, M., Zeynali, A., Bouzin, M., Sironi, L., D'Alfonso, L., Pallavicini, P., Collini, M., Chirico, G. *Development and characterization of proteinaceous multiphoton-fabricated microstructures with photo-thermal functionality* – oral pres.;
- June 15, 2021: Workshop Ricerca e Nanomedicina, Pavia, Italy (virtual)
Zeynali, A., Marini, M., Bouzin, M., Pallavicini, P., Collini, M., Chirico, G. *Laser-assisted structuration of proteinaceous photothermally responsive microarchitectures* – oral pres.;
- June 8, 2021: Physics in Bicocca (Department Workshop), Milano, Italy
Bouzin, M. Presentation of the research activity of the Biophysics and Biophotonics group – **oral pres.;**
- May 20 – 21, 2021: Design and Function of Responsive Nanocomposites, Dublin, Ireland (virtual)
Zeynali, A., Marini, M., Bouzin, M., Collini, M., Chirico, G. *Direct laser writing of photothermally active proteinaceous microarchitectures* – oral pres.;
- February 22 – 26, 2021: 65th Biophysical Society Annual Meeting, Boston, MA, USA (virtual)
Marini, M., Bouzin, M., Zeynali, A., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Chirico, G., Collini, M. *Label-free super-resolution photo-thermal imaging on melanoma biopsies* – poster;
Scodellaro, R., Bouzin, M., Remori, V., Panzeri, D., Giampieri, E., Marongiu, L., Mingozi, F., D'Alfonso, L., Collini, M., Granucci, F., Chirico, G., Sironi, L. *Phasor-based approach enhanced by supervised machine learning techniques for collagen micro-architecture characterization and automatic image segmentation* – poster;
- January 17 – 22, 2021: 25th International School of Pure and Applied Biophysics, Venezia, Italy (virtual)
Bouzin, M. *Probing anomalous intracellular diffusion by optical microscopy* – **invited oral pres.;**
- January 11 – 16, 2021: Mediterranean Machine Learning Summer School (virtual)
Scodellaro, R., Bouzin, M., Mingozi, F., Panzeri, D., D'Alfonso, L., Granucci, F., Collini, M., Chirico, G., Sironi, L. *AI-based second harmonic generation signal multiphasor analysis for collagen micro-architecture investigation in tumor sections* – poster;
- September 14 – 18, 2020: 106th SIF National Congress, Italy (virtual)
Scodellaro, R., Bouzin, M., Mingozi, F., Granucci, F., D'Alfonso, L., Collini, M., Chirico, G., Sironi, L. *Collagen micro-architecture investigation in tumor sections by means of second harmonic generation signal multiphasor analysis coupled with non-supervised machine learning techniques* – oral pres.;
- February 15 – 19, 2020: 64th Biophysical Society Annual Meeting, San Diego, CA, USA
Bouzin, M., Marini, M., Zeynali, A., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Photo-Activated Thermal Imaging at Sub-Diffraction Resolution* – **poster;**
- December 11 – 14, 2019: Nano-Day IV, Milano, Italy
Bouzin, M., Marini, M., Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Nanoparticles Localization in Tissues at Sub-Diffraction Level by Infrared Thermal Imaging* – **oral pres.;**
- September 30 – October 4, 2019: FisMat 2019, Catania, Italy
Bouzin, M., Marini, M., Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Thermal Imaging by Sub-Diffraction Localization of Photo-Activated Absorbers* – oral pres.;
- July 20-24, 2019: EBSA 2019, Madrid, Spain
Marini, M., Bouzin, M., Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Super-Resolution Photo-Activated Thermography* – poster;
- July 6-12, 2019: ICPPP20, 20th International Conference on Photo-Acoustic and Photo-Thermal Phenomena, Moscow, Russia
Bouzin, M., Marini, M., Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Super Resolution Imaging by Sub-Diffraction Localization of Laser-Primed Temperature Variations* – **oral pres.;**
Marini, M., Bouzin, M., Zeynali, A., Sironi, L., D'Alfonso, L., Chirico, G., Collini, M. *Measurement of Space-Dependent Thermal Diffusivities by Photo-Activated Thermography* – poster;
- June 24-27, 2019: SPIE Optical Metrology, Munchen, Germany

Bouzin, M., Marini, M., Zeynali, A., Borzenkov, M., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Chirico, G., Collini, M. *Photo-Activated Thermal Imaging at Sub-Diffraction Resolution* – **invited oral pres.**;

▸ June 7, 2019: Workshop Luce per la Biofisica, Parma, Italy

Bouzin, M., Sironi, L., Marini, M., Scodellaro, R., D'Alfonso, L., Chirico, G., Collini, M. *Spatio-Temporal Image Correlation as a Powerful Tool to Study Complex Diffusion Regimes in Cellular Environments* – **oral pres.**;

▸ May 13-14, 2019: Workshop Women in Sciences, Milano, Italy

Marini, M., Bouzin, M., Zeynali, A., Sironi, L., D'Alfonso, L., Mingozi, F., Granucci, F., Pallavicini, P., Chirico, G., Collini, M. *Photo-Activated Thermal Imaging at Sub-Diffraction Resolution* – poster;

Bouzin, M., *Metodi di Correlazione su Immagini per lo Studio di Processi Dinamici in Sistemi Biologici* – **invited oral pres.**;

▸ May 2-3, 2019: Nanomedicine 2019, Milano, Italy

Bouzin, M., Sironi, L., Marini, M., Scodellaro, R., D'Alfonso, L., Pallavicini, P., Chirico, G., Collini, M. *Reflection Image Correlation Methods Applied to Gold Nanostars Slow Motions in Living Cells* – **poster**;

Collini, M., Chirico, G., Sironi, L., D'Alfonso, D., Bouzin, M., Marini, M., Borzenkov, M., Pallavicini, P. *Photothermal nanoparticles: smart applications and detection* – oral pres.;

▸ January 9-11, 2019: QBI 2019 Conference, Rennes, France

Chirico, G., Collini, M., Bouzin, M., D'Alfonso, L., Scodellaro, R., Sironi L. *Quantitative analysis of collagen microstructure in vitro and in vivo by means of multi-phaser analysis of second harmonic generation microscopy* – poster;

▸ September 10-13, 2018: XXIV SIBPA Congress, Ancona, Italy

Bouzin, M., Sironi, L., D'Alfonso, L., Chirico, G., Collini, M. *Spatio-Temporal Image Correlation as a Powerful Tool to Study Complex Diffusion Regimes in Cellular Environments* – **oral pres.**;

Collini, M., Chirico, G., Sironi, L., D'Alfonso, D., Bouzin, M., Borzenkov, M., Cipolla, L., Colombo, D., Guizzardi, R., Pallavicini, P. *NIR excited photothermally active nanoparticles for smart devices fabrication* – oral pres.;

▸ June 3-7, 2018: IWBM 2018, Helsinki, Finland

Sironi, L., Bouzin, M., Inverso, D., Ceffa, N., Radaelli, F., D'Alfonso, L., Blinder, P., Collini, M., Chirico, G. *Image Correlation Methods to Map Blood Flow Velocities in Complex Vessel Networks* – poster;

▸ April 5-11, 2018: International School of Nanomedicine, Erice, Italy

Bouzin, M., Zhao, W., Gratton, E. *A Fluorescence-based Particle Sorter for the Isolation of Pathogens at Ultra-Low Concentration* – **oral pres.**;

▸ April 9-12, 2017: Focus on Microscopy 2017, Bordeaux, France

Bouzin, M., Sironi, L., D'Alfonso, L., Chirico, G., Borzenkov, M., Inverso, D., Pallavicini, P., Collini, M. *k-Space Scattering Image Correlation from Gold Nanostars Intracellular Motions Reveals Intermittent-Type Transport Phenomena* – **poster**;

▸ April 3, 2017: LFD Advisory Committee Meeting, Irvine, CA, USA

Bouzin, M. *Rare Event Detector – Particle Counter* – **oral pres.**;

▸ February 11-15, 2017: 61st Biophysical Society Annual Meeting, New Orleans, LA, USA

Bouzin, M., Heylman, C., Zhao, W., Gratton, E. *Particle Counting by Confocal Microscopy: Increased Dynamic Range via Multiple-Slits Fluorescence Detection* – **poster**;

▸ October 24-28, 2016: 11th LFD Workshop in Advanced Fluorescence Imaging and Dynamics, Irvine, CA, USA

Bouzin, M. *Scanning Fluorescence Correlation Spectroscopy* – **oral pres.**;

▸ July 18-22, 2015: 10th European Biophysics Congress 2015, Dresden, Germany

Marquezin, C. A., Ceffa, N. G., Bouzin, M., Collini, M., Chirico, G. *Study of Complex Flow Regimes in Micro-Channels via Image Cross-Correlation Microscopy* – poster;

▸ September 7-10, 2015: International Workshop on Imaging 2015, Varenna, Italy

Collini, M., Bouzin, M., Sironi, L., D'Alfonso, L., Pallavicini, P., Chirico, G. *Reflection Image Correlation Methods Applied to Gold Nanostars Slow Motions in Living Cells* – poster;

▸ June 21-25, 2015: CLEO Europe 2015, Munich, Germany

Chirico, G., Sironi, L., Bouzin, M., D'Alfonso, L., Collini, M., *Single image correlation for blood flow mapping in complex vessel networks* – poster;

▸ March 29 - April 3, 2015: Focus on Microscopy 2015, Gottingen, Germany

Collini, M., Bouzin, M., Sironi, L., D'Alfonso, L., Pallavicini, P., Chirico, G. *Reflection Image Correlation Methods Applied to Gold Nanostars Slow Motions in Living Cells* – poster;

Sironi, L., Bouzin, M., D'Alfonso, L., Collini, M., Chirico, G. *In vivo Single Image Correlation to Map Blood Flow in Complex Vessel Networks* – oral pres.;

▸ February 7-12, 2015: SPIE Photonics West 2015, San Francisco, CA, USA

Ceffa, N. G., Pozzi, P., Bouzin, M., Marquezin, C. A., Sironi, L., D'Alfonso, L., Collini, M., Chirico, G. *Fluorescence cross-correlation spectroscopy for time dependent flows: a numerical investigation* – oral pres.;

▸ September 21-24, 2014: XXII SIBPA Congress, Palermo, Italy

Bouzin, M., Pozzi, P., Sironi, L., D'Alfonso, L., Collini, M., Chirico, G., Pallavicini, *Dynamics of gold nanostars in cells by reflection image correlation methods* – **oral pres.**;

▸ March 31 – April 4, 2014: School of Photonics 2014, Cortona, Italy

Bouzin, M., Sironi, L., Pozzi, P., D'Alfonso, L., Chirico, G., Collini, M. *Fluorescence Cross-Correlation for In-Vivo Hemodynamics Measurements* – **poster**;

▸ February 21, 2014: Center for Advanced Numerical Simulation, Università degli Studi di Pavia, Italy

Bouzin, M., Sironi, L., Pozzi, P., D'Alfonso, L., Collini, M., Chirico, G. *Fluorescence Cross-Correlation for In-Vivo Hemodynamics Measurements* – **oral pres.**;

▸ May 13 – 19, 2013: EMBO Practical Course: Super-Resolution and Single Molecule Microscopies in Living Cells, Montpellier, France

Bouzin, M., D'Alfonso, L., Sironi, L., Chirico, G., Collini, M. *Single Molecule Characterization for Super-Resolution Microscopy on a CW-STED Confocal Microscope* – **poster**;

▸ September 9-13, 2013: FisMat 2013, Milano, Italy

Bouzin, M., Collini, M., Pozzi, P., Sironi, L., D'Alfonso, L., Chirico, G., Bassi, A. *Blood Fluxes Studies in Zebrafish Embryos by Cross-Correlation Spectroscopy* – **oral pres.**;

▸ March 24-27, 2013: Focus On Microscopy 2013, Maastricht, The Netherlands

Bouzin, M., D'Alfonso, L., Sironi, L., Chirico, G., Collini, M. *Single Molecule Characterization for Super-Resolution Microscopy on a CW-STED Confocal Microscope* – poster;

Scientific Dissemination Activities

▸ 2018, 2014: MeetMeTonight – European Researchers Night;

▸ 2015: Expo Science Corner, promoted by Università degli Studi di Milano-Bicocca and Comune di Milano.

Scientific Society Membership

▸ SIF, Società Italiana di Fisica: 2011-2012, 2021;

▸ SIBPA, Società Italiana di Biofisica Pura e Applicata: 2014, 2018-2021;

▸ SPIE, International Society for Optics and Photonics: 2015, 2019;

▸ Biophysical Society: 2017, 2020.

References

▸ Prof. Enrico Gratton – Physics and Biomedical Engineering Dept., University of California Irvine, CA, USA - (001) 9498242674 – egratton@uci.edu

▸ Prof. Maddalena Collini – Physics Dept., Università degli Studi di Milano-Bicocca, Milano, I – (0039) 0264482439 – maddalena.collini@unimib.it

▸ Prof. Giuseppe Chirico – Physics Dept., Università degli Studi di Milano-Bicocca, Milano, I – (0039) 0264482440 – giuseppe.chirico@unimib.it