

## PERSONAL DATA

Francesco Merola



francesco.merola@cnr.it,

Date of birth

Citizenship

## CURRENT POSITION

Researcher at the Institute of Applied Science and Intelligent Systems of the National Council of Research (ISASI-CNR)

## WORK EXPERIENCE

December 2018

Permanent position as Researcher at the National Council of Research of Italy.  
*Action of the Central Administration of the CNR in 27.12.2018.*

Main topics:

- Circulating tumor cells identification and 3D rendering by in-flow holographic microscopy (liquid biopsy);
- Microplastics analysis in marine samples and identification/counting by digital holography and machine learning

November 2017

Admission, after National Contest, to the waiting list for open-ended contract as Researcher at the National Research Council, Institute of Microelectronics and Microengineering. CALL N. 367.9 DSFTM IMM RIC.  
*Action of the Central Administration of the CNR in 8.11.2017.*

April 2017

National Scientific Licence, Area 02/B1 – Experimental Physics of Matter.  
VALID FROM 12/04/2017 to 12/04/2023.  
*Positive Board judgements: 5/5.*

October 2015

Scientific Mission at the Institute of Applied Physics of the Münster University (GER), in the “Nonlinear Photonics Group” headed by Prof. Cornelia Denz, under the European Program “COST Action” 2015.

- Optical Tweezers experiments for the optical manipulation of red blood cells and image reconstruction by digital holography for medical diagnostic purposes.

March 2015

Joining the new “Institute of Applied Science and Intelligent Systems” of the CNR (ISASI), Director Dr. Pietro Ferraro.

July 2012 – December 2018

Fixed-term contract as Researcher at the National Institute of Optics in Napoli and from 2015 at ISASI.  
*Protocol: CNR-INO n°5854 of the 14/06/2012*  
*Contract duration: 2/7/2012 – 26/12/2018*

During this time I have built-up a special optofluidic platform for lab-on-chip applications, made up by an optical tweezers module, an holographic module and a fluorescence one, with the aim of manipulating biological matter and simultaneously retrieve the 3D structure of the sample. In particular, I have analyzed biological specimens such as sperm cells, red blood cells, diatom algae, cancer cells, bacteria, but also microplastics, graphene and carbon nanotubes, obtaining accurate reconstructions of the cells inner structure, a kind of tomography useful for diagnostic purposes. An application is for example the study of patients affected by iron deficiency anaemia, or other blood disorders, or the search for circulating tumor cells in the blood stream (liquid biopsy). I have also worked at the interferometric characterization and photonics applications of polymeric microstructures fabricated in our Labs by pyroelectric techniques, exploiting the properties of Periodically Poled Lithium Niobate (PPLN), microengineered by lithographic techniques. In particular, I have demonstrated the application of PDMS micro-axicon lenses as optical tweezers. Moreover, I work on patterning and self-assembling of liquid crystal nanodrops, deposited or embedded onto polymer-coated PPLN substrates, exploiting thermal effects. In the last months, I focused on the identification and analysis of microplastics dispersed in seawater using microscopy tools in combination with machine learning techniques, with the aim of monitoring ecosystems' health.

November 2011

Admission, after National Contest, to the waiting list for open-ended contract as Researcher at the National Research Council, National Institute of Optics. CALL N.364-97, Physical Sciences.

*Protocol: Central Administration of the CNR N. 0080520, date: 11/11/2011.*

February 2010 – June 2012

Research grant at the CNR-INO (National Institute of Optics), section of Napoli.

*Protocol N. 319 of the 27/01/2010*

- “Characterization of microstructures on ferroelectric crystal substrates with holographic techniques”

2007

Scholarship at the CNR-INO, section of Napoli.

*Protocol N. 571 of the 14/03/2007*

2006-2009

PhD in Fundamental and Applied Physics at the University “Federico II” of Napoli, cycle XXII.

2005-2006

Work of thesis carried out with the “Materials Optics” Group of the Physics Department at “Federico II” University, supervised by Prof. Pasquale Maddalena

## EDUCATION AND TRAINING

December 2009

PhD in Fundamental and Applied Physics

Università degli Studi di Napoli “Federico II”

Thesis title: “Lithium Niobate: optical properties and applications”

Supervisors: Prof. Pasquale Maddalena, Dr. Pietro Ferraro

March 2006

MS in Physics Summa cum Laude

Università degli Studi di Napoli “Federico II”

Thesis title: “Analisi spettroscopica di superfici e interfacce mediante generazione di seconda armonica ottica” (Spectroscopic analysis of surfaces and interfaces by means of optical second harmonic generation).

Supervisor: Prof. Pasquale Maddalena

July 2000

Diploma achieved at the High School "Umberto I" in Napoli.

## PERSONAL SKILLS

Mother tongue Italian

## Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
Summer Course "Standard General English Course", level C1, at the School "English in Margate", Margate, Kent, England (accredited by British Council), July-August 2014.					
French	A2	A2	A2	A2	A2

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user  
[Common European Framework of Reference for Languages](#)

## Organisational / Managerial Skills

- In charge of the Opto and micro-fluidic Lab (Designed with Protocol CNR N.0000712 of the 17/04/2015).
- Training course for Laboratory Responsibles (Protocol N. 0002369 of the 3/12/2015).
- In charge for the Confocal Microscope Equipment (*Nikon Eclipse Ti2*) of the Institute ISASI in 2017-2018.

## Other Skills

- Officer for the Prevention and Protection Service for the Institute ISASI and member of the First Aid Unit, designed with protocol N. 0000681 of the 9/4/2015, updating in 22/2/2018 protocol N. 529.
- Member of the Fire Team with Training Course in 21/4/2016.

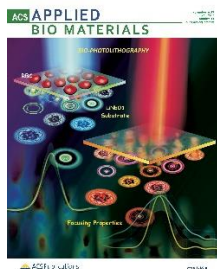
Driving Licence B

## ADDITIONAL INFORMATION

Publications  
 (about 50% as first or  
 corresponding author)

## Articles on peer-reviewed Journals:

- M. Moros, A. Lewinska, **F. Merola**, P. Ferraro, M.Wnuk, A. Tino, and C. Tortiglione, "Gold Nanorods and Nanoprisms Mediate Different Photothermal Cell Death Mechanisms In Vitro and In Vivo", *ACS Applied Materials & Interfaces* 12 (12), 13718-13730, **2020**. DOI: 10.1021/acsami.0c02022.  
**Impact factor 2018: 8.456**
- Cutolo\*, V. Pagliarulo\*, **F. Merola\***, S. Coppola, P. Ferraro M. Fraldi, "Wrinkling predictor formation and evolution in thin films adhering on polymeric substrata", *Materials and Design* 187, 108314, **2020**. DOI: 10.1016/j.matdes.2019.108314.  
**\*Co-First Author**  
**Impact factor 2018: 5.770**



- M. Mugnano, **F. Merola** et al., "Cellular Uptake of Mildly Oxidized Nanographene for Drug-Delivery Applications", *ACS Appl. Nano Mater.* 3, 428–439, **2020**. DOI: 10.1021/acsnm.9b02035  
**Impact factor: n.a.**
- V. Bianco, P. Memmolo, P. Carcagnì, **F. Merola**, M. Paturzo, C. Distanto, P. Ferraro, "Microplastic Identification via Holographic Imaging and Machine Learning", *Adv. Intell. Syst.* 1900153, **2020**. DOI: 10.1002/aisy.201900153.  
**Impact factor: n.a.**
- L. Miccio, J. Behal, M. Mugnano, P. Memmolo, B. Mandracchia, **F. Merola**, S. Grilli, P. Ferraro, "Biological Lenses as a Photomask for Writing Laser Spots into Ferroelectric Crystals", *ACS Appl. Bio Mater.* 2, 4675–4680, **2019**. DOI: 10.1021/acsnbm.9b00569  
**Impact factor 2018: n.a.**  
**Front Cover of the Journal in November 18, 2019, Volume 2, Issue 11.**
- Memmolo P, Miccio L, **Merola F**, Mugnano M and Ferraro P, "Hydrodynamic Red Blood Cells Deformation by Quantitative Phase Microscopy and Zernike Polynomials", *Front. Phys.* 7:111, 1-8, **2019**. DOI: 10.3389/fphy.2019.00111.  
**Impact factor 2018: 1.895**
- M. Mugnano, P. Memmolo, L. Miccio, **F. Merola** et al., "In vitro cytotoxicity evaluation of cadmium by label-free holographic microscopy", *J. Biophotonics* **2018**; e201800099.  
DOI:10.1002/jbio.201800099.  
**Impact factor 2017: 3.768**  
**Citations: 6 (Scopus). Average: 6/year**
- F. Merola**, P. Memmolo, V. Bianco, M. Paturzo, M.G. Mazzocchi and P. Ferraro, "Searching and identifying microplastics in marine environment by digital holography", *Eur. Phys. J. Plus* 133, 350, **2018**. DOI: 10.1140/epjp/i2018-12190-y  
**Impact factor 2017: 2.240**  
**Citations: 2 (source Scopus).**  
**Highlighted for Springer Nature Grand Challenges Programme (7 Sept 2018)**
- M. Mugnano, P. Memmolo, L. Miccio, **F. Merola**, V. Bianco, A. Bramanti, A. Gambale, R. Russo, I. Andolfo, A. Iolascon, P. Ferraro, "Label-Free Optical Marker for Red-Blood-Cell Phenotyping of Inherited Anemias", *Anal. Chem.* 90, 7495–7501, **2018**.  
**Impact factor 2017: 6.042**  
**Citations: 4 (Scopus). Average: 4/year**  
**The article got a lot of attention from italian mass media (Il Mattino, La Repubblica, Le Scienze, Superquark 10-8-2018).**
- F. Merola**, P. Memmolo, L. Miccio, M. Mugnano, P. Ferraro, "Phase contrast tomography at lab on chip scale by digital holography", *Methods* 136, 108-115, **2018**.  
**Impact Factor 2016: 3.802**  
**Citations: 6 (Scopus). Average: 6/year.**
- M. Villone, P. Memmolo, **F. Merola**, M. Mugnano, L. Miccio, P. L. Maffettone and P. Ferraro, "Full-angle tomographic phase microscopy of flowing quasi-spherical cells", *Lab Chip* 18, 126, **2018**. DOI: 10.1039/c7lc00943g  
**Impact Factor 2016: 6.045**  
**Citations: 24 (Scopus). 12/year.**
- M. Paturzo, V. Pagliarulo, V. Bianco, P. Memmolo, L. Miccio, **F. Merola**, P. Ferraro, "Digital Holography, a metrological tool for quantitative analysis: Trends and future applications", *Optics and Lasers in Engineering* 104, 32–47 **2018**.  
**Impact Factor 2016: 2.769**  
**Citations: 20 (Scopus). 10/year.**
- F. Merola\***, A. Barroso, L. Miccio, P. Memmolo, M. Mugnano, P. Ferraro, C. Denz, "Biolens

Behavior of RBCs Under Optically-Induced Mechanical Stress", *Cytometry Part A*, 91A: 527-533, **2017**. DOI: 10.1002/cyto.a.23085. Special issue on *Quantitative Phase Imaging for Label-Free Cytometry*.

**Impact Factor 2016: 3.18**

**Citations: 8 (Scopus). 4/year.**

- **F. Merola**, P. Memmolo, L. Miccio, R. Savoia, M. Mugnano, A. Fontana, G. D'Ippolito, A. Sardo, A. Iolascon, A. Gambale, P. Ferraro, "Tomographic Flow Cytometry by Digital Holography", *Light: Science & Applications* 6, e16241 (**2017**). DOI:10.1038/lsa.2016.241

**Impact Factor 2015: 13.6**

**Citations: 87 (Scopus). 43/year**

**Award certificate by the Journal Board as an "outstanding paper in 2018".**

- P. Memmolo, **F. Merola**, L. Miccio, M. Mugnano, P. Ferraro, "Investigation on dynamics of red blood cells through their behavior as biophotonic lenses", *J. Biomed. Opt.* 21(12), 121509 (**2016**). doi:10.1117/1.JBO.21.12.121509

**Impact factor 2015: 2.556**

**Citations: 14 (Scopus). 5/year**

- S. Fusco, P. Memmolo, L. Miccio, **F. Merola**, M. Mugnano, A. Paciello, P. Ferraro and P. A. Netti, "Nanomechanics of a fibroblast suspended using point-like anchors reveal cytoskeleton formation", *RSC Adv.* 6, 24245, **2016**.

**Impact Factor 2014: 3.84**

**Citations: 9 (Scopus). 3/year.**

- G. Di Caprio, M. Ferrara, L. Miccio, **F. Merola**, P. Memmolo, P. Ferraro, and G. Coppola, "Holographic imaging of unlabelled sperm cells for semen analysis: a review", *J. Biophotonics* 8(10), 779-89 (**2015**).

**Impact Factor 2013: 3.856**

**Citations: 37 (Scopus). 9/year.**

- L. Miccio, P. Memmolo, **F. Merola\***, P.A. Netti & P. Ferraro, "Red blood cell as an adaptive optofluidic microlens", *Nature Comm.* 6, 6502 (**2015**).

**Impact Factor 2013: 10.742**

**Citations: 80 (Scopus). 20/year**

- **F. Merola**, P. Memmolo, L. Miccio, V. Bianco, M. Paturzo, P. Ferraro, "Diagnostic Tools for Lab-on-chip Applications Based on Coherent Imaging Microscopy", *Proc. of the IEEE*, 103, 192-204 (**2015**).

**INVITED for the Special Issue Global Healthcare by IEEE Photonics Society**

**Impact Factor 2016: 9.237**

**Citations: 78 (Scopus). 20/year**

- P. Memmolo, L. Miccio, **F. Merola**, O. Gennari, P. A. Netti, and P. Ferraro, "3D morphometry of red blood cells by digital holography", *Cytometry part A* 85A, 1030-1036, **2014**.

**Impact Factor 2013: 3.066**

**Citations: 75 (Scopus). 15/year**

- V. Bianco, **F. Merola\***, L. Miccio, P. Memmolo, O. Gennari, M. Paturzo, P. Netti and P. Ferraro, "Imaging adherent cells in the microfluidic channel hidden by flowing RBCs as occluding objects by a holographic method", *Lab Chip* 14, 2499, **2014**.

**Impact Factor 2012: 6.11**

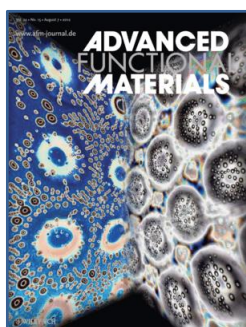
**Citations: 44 (Scopus). 9/year**

- P. Memmolo, V. Bianco, **F. Merola**, L. Miccio, M. Paturzo, and P. Ferraro, "Breakthroughs in Photonics 2013: Holographic Imaging", *IEEE Phot. J.* 6, 0701106, **2014**.

**INVITED for "Breakthroughs in Photonics 2013" by IEEE Photonics Society**

**Impact factor 2012: 2.32**

**Citations: 73 (Scopus). 15/year**



- L. Miccio, P. Memmolo, **F. Merola\***, S. Fusco, A. Paciello, M. Ventre, P. A. Netti, and P. Ferraro, "Particle tracking by full-field complex wavefront subtraction in digital holography Microscopy", *Lab Chip* 14, 1129–1134, **2014**.  
Impact Factor 2012: 6.11  
Citations: 68 (Scopus). 14/year
- P. Memmolo, L. Miccio, **F. Merola**, A. Paciello, V. Embrione, S. Fusco, P. Ferraro, P. Netti, "Investigation on specific solutions of Gerchberg–Saxton algorithm", *Optics and Lasers in Engineering* 52, 206–211, **2014**.  
Impact Factor 2012: 1.916  
Citations: 18 (Scopus). 3.5/year
- **F. Merola\***, L. Miccio, P. Memmolo, G. Di Caprio, A. Galli, R. Puglisi, D. Balduzzi, G. Coppola, P. Netti and P. Ferraro, "Digital holography as a method for 3D imaging and estimating biovolume of motile cells", *Lab Chip* 13, 4512–4516, **2013**. DOI: 10.1039/C3LC50515D.  
Impact Factor 2012: 5.697  
Citations: 109 (Scopus). 18/year  
The article got a lot of attention from italian mass media (Il Mattino, La Repubblica, Le Scienze, La Stampa, TV news Rai2).
- **F. Merola\***, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna and P. Ferraro, "Manipulation of nematic liquid crystal micro-droplets by pyroelectric effect", *Mol. Cryst. Liq. Cryst.* **572**, pp. 66–71, **2013**.  
Impact Factor 2012: 0.58
- **F. Merola**, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna and P. Ferraro, "Manipulating liquid crystals by pyroelectric effect", *SPIE Newsroom* (December **2012**). DOI: 10.1117/2.1201211.004574  
INVITED
- P. Ferraro, S. Grilli, A. Finizio, **F. Merola**, S. Coppola, and V. Vespini, "3D lithography by freezing liquid instabilities at the nanoscale", *SPIE Newsroom* (July **2012**). DOI: 10.1117/2.1201206.004239  
INVITED
- **F. Merola**, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna and P. Ferraro, "Reversible fragmentation and self-assembling of nematic liquid crystal droplets on functionalized pyroelectric substrates", *Adv. Func. Mat.* 22, 3267–72 (**2012**). DOI: 10.1002/adfm.201200323  
Impact factor 2011: 10.179  
Citations: 29 (Scopus). 4/year  
Selected by "Wiley" among the Hot Topics 2012. "Front cover" of the 7th August 2012 number of the Journal.
- **F. Merola**, S. Coppola, V. Vespini, S. Grilli and P. Ferraro, "Characterization of Bessel beams generated by polymeric microaxicons", *Meas. Sci. Tech.* vol. 23, 065204 (**2012**).  
Impact factor 2010: 1.353  
Citations: 20 (Scopus). 3/year
- **F. Merola**, L. Miccio, P. Memmolo, M. Paturzo, S. Grilli and P. Ferraro, "Simultaneous Optical Manipulation, 3-D Tracking, and Imaging of Micro-Objects by Digital Holography in Microfluidics", *IEEE Phot. J.* 4, pp.451–454 (**2012**).  
INVITED for "Breakthroughs in Photonics 2011" by IEEE Photonics Society  
Impact factor 2010: 2.344  
Citations: 31 (Scopus). 4.5/year
- S. Grilli, S. Coppola, V. Vespini, A. Finizio, **F. Merola** and P. Ferraro, "Micro-optical Foundry: "Freezing" Polymer Liquid Instabilities", *Opt. & Phot. News* 22, p.46 (**2011**).
- S. Grilli, S. Coppola, V. Vespini, **F. Merola**, A. Finizio, and P. Ferraro, "3D lithography by rapid



curing of the liquid instabilities at nanoscale", *Proc. Natl. Acad. Sci.* 108, pp.15106- 15111 (2011).

Impact factor 2010: 9.771

Citations: 67 (Scopus). 8.5/year

Elected by OSA (Optical Society of America) among the "Best of 2011" in Optics and Photonics News, i.e. among the best 25 publications in 2011 on international Journals in the Field of Optics and Photonics. Front Cover of the volume 108 of the Journal.

- **F. Merola**, L. Miccio, M. Paturzo, A. Finizio, S. Grilli, and P. Ferraro, "Driving and analysis of micro-objects by digital holographic microscope in microfluidics", *Opt. Lett.* 36, pp. 3079-3081 (2011).

Impact factor 2010: 3.059

Citations: 47 (Scopus). 6/year

- **F. Merola**, L. Miccio, S. Coppola, V. Vespini, M. Paturzo, S. Grilli and P. Ferraro, "Exploring the capabilities of Digital Holography as tool for testing optical microstructures", *3D Research* 02, pp.01003(3) (2011).

Citations: 21 (Scopus). 2.5/year

- M. Paturzo, **F. Merola\***, P.Ferraro, "Multi-imaging capabilities of a 2D diffraction grating in combination with digital holography", *Optics Letters* 35, pp.1010-1012 (2010).

Impact factor 2009: 3.772

Citations: 10 (Scopus). 1/year

- **F. Merola**, M. Paturzo, S. Coppola, V. Vespini and P. Ferraro, "Self-patterning of a polydimethylsiloxane microlens array on functionalized substrates and characterization by digital holography", *J. Micromech. Microeng.* 19, 125006 (5pp) (2009).

Impact factor 2008: 2.233

Citations: 28 (Scopus). 3/year

- **F. Merola**, L. Miccio, M. Paturzo, S. De Nicola, P. Ferraro, "Full characterization of the photorefractive bright soliton formation process using a digital holographic technique", *Meas. Sci. Technol.* 20, 045301 (10pp) (2009).

Impact factor 2008: 1.493

Citations: 6 (Scopus).

- M. Paturzo, **F. Merola**, S. Grilli, S. De Nicola, A. Finizio and P. Ferraro: "Super-resolution in digital holography by a two-dimensional dynamic phase grating", *Optics Express* 16, p.17107-17118 (2008).

Impact factor 2007: 3.880

Citations: 115 (Scopus). 10.5/year

- S. Lettieri, **F. Merola**, P. Maddalena, C. Ricciardi, F. Giorgis : "Second Harmonic Generation Analysis in Hydrogenated Amorphous Silicon Nitride Thin Films", *Applied Physics Letters* 90, art. n. 021919, p.1-3 (2007).

Impact factor 2006: 3.726

Citations: 10 (ISI Web). 1/year

\*Corresponding author

#### Informative articles:

1. **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, "Microgocce di cristalli liquidi: potenzialità e sviluppi tecnologici", *Le Scienze Web News*, 18-6-2012.

### Book Chapters:

1. S. Grilli, L. Miccio, **F. Merola\***, A. Finizio, M. Paturzo, S. Coppola, V. Vespini, P. Ferraro, "Quantitative phase microscopy for accurate characterization of microlens arrays", Chap.5 in *Coherent Light Microscopy - Imaging and quantitative phase analysis*, Springer Series in Surface Sciences 46, P. Ferraro, A. Wax and Z. Zalevsky Eds. (2011).  
ISBN: 978-3-642-15812-4  
DOI: 10.1007/978-3-642-15813-1  
**\*Corresponding author**
2. M. Paturzo, **F. Merola**, S. Grilli, P. Ferraro, "Improving numerical aperture in DH microscopy by 2D diffraction grating", Chap.12 in *Coherent Light Microscopy - Imaging and quantitative phase analysis*, Springer Series in Surface Sciences 46, P. Ferraro, A. Wax and Z. Zalevsky Eds. (2011).  
ISBN: 978-3-642-15812-4  
DOI: 10.1007/978-3-642-15813-1
3. L. Miccio, P. Memmolo, **F. Merola**, M. Paturzo, R. Puglisi, D. Balduzzi, A. Galli, and P. Ferraro, "Combining digital holographic microscopy with microfluidics: a new tool in biotechnology", Chap.10 in *Biomedical Optical Phase Microscopy and Nanoscopy*, Shaked, Zalevsky, Satterwhite Eds., Elsevier 2012.  
ISBN: 978-0-12-415871-9
4. S. Coppola, V. Vespini, **F. Merola**, M. Paturzo, L. Miccio, O. Gennari, S. Grilli, P. Ferraro, "Electrohydrodynamic Dispenser for Delivering Multiphase Samples at Nanoscale" in A. Cusano et al. (eds.), *Lab-on-Fiber Technology*, Springer Series in Surface Sciences, Volume 56, pp. 251-276, 2015.  
Print ISBN: 978-3-319-06997-5  
DOI: 10.1007/978-3-319-06998-2\_12

### Conferences Proceedings:

1. M. Paturzo, **F. Merola**, S. Grilli, S. De Nicola, P. Ferraro, "Digital holography in combination with diffraction grating to get super-resolution", *Proceeding SPIE Europe* vol. 6995, Optical Micro- and Nanometrology in Microsystems Technology II, Christophe Gorecki, Anand K. Asundi, Wolfgang Osten, Editors, 699505 (2008).  
ISBN: 9780819471932  
DOI: <http://dx.doi.org/10.1117/12.782111>  
**INVITED**
2. P. Ferraro, S. Grilli, L. Miccio, M. Paturzo, **F. Merola**, S. Coppola, V. Vespini, "Self-assembled Liquid Microlens Arrays activated by pyroelectric effect", *LEOS Annual Meeting Conference Proceedings, LEOS '09, IEEE*, pp. 322 - 323, 2009.  
Print ISBN: 978-1-4244-3680-4  
DOI: 10.1109/LEOS.2009.5343256
3. **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, D. Balduzzi, A. Galli, R. Puglisi, "Trapping and manipulating micro-objects by besel beams obtained through polymeric microaxicons", in *International Workshop on BioPhotonics*, pp. 1-3, 2011.  
E-ISBN: 978-1-4244-9835-2  
Print ISBN: 978-1-4244-9836-9  
DOI: [10.1109/IWBP.2011.5954799](https://doi.org/10.1109/IWBP.2011.5954799)
4. **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, "Optical trapping of micro-objects using polymeric microaxicons", in *IEEE Photonics Conference (PHO), 2011*, pp. 489-490, 2011.  
Print ISBN: 978-1-4244-8940-4  
DOI: 10.1109/PHO.2011.6110640
5. L. Miccio, A. Finizio, P. Memmolo, M. Paturzo, **F. Merola**, P. Ferraro, G. Coppola, G. Di

- Caprio, M. Gioffrè, R. Puglisi, D. Balduzzi, and A. Galli, "Detection and visualization improvement of spermatozoa cells by digital holography", *Proc. OSA/SPIE 8089*, 80890C (2011).  
**ISBN: 9780819486868**  
**DOI: 10.1117/12.889972**
6. S. Coppola, V. Vespini, A. Finizio, S. Grilli, **F. Merola**, P. Ferraro, "Fabrication of functionalized Optical microstructures", in *IEEE Photonics Conference (PHO)*, 2011, pp. 264-265, **2011**.  
**Print ISBN: 978-1-4244-8940-4**  
**DOI: 10.1109/PHO.2011.6110527**
7. L. Miccio, **F. Merola**, A. Finizio, M. Paturzo, S. Grilli, P. Ferraro, "Holographic microscope for quantitative phase-contrast imaging of particles driven by optical forces in microfluidics", *IEEE Photonics Conference (PHO)*, **2011**.  
**Print ISBN: 978-1-4244-8940-4**  
**DOI : 10.1109/PHO.2011.6110825**
8. **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, D. Balduzzi, A. Galli, and R. Puglisi " Fabrication and testing of polymeric microaxicons", *Proc. SPIE 8428*, 84280P (2012).  
**DOI: <http://dx.doi.org/10.1117/12.922572>**
9. L. Miccio, P. Memmolo, A. Finizio, M. Paturzo, **F. Merola**, S. Grilli, P. Ferraro, "3D tracking and phase-contrast imaging by twin-beams digital holographic microscope in microfluidics", *Proc. SPIE 8428*, 842810 (2012).  
**DOI: <http://dx.doi.org/10.1117/12.923004>**
10. P. Memmolo, L. Miccio, **F. Merola**, P. Ferraro, P.A. Netti, "A new iterative Fourier transform algorithm for optimal design in holographic optical tweezers", *Proc. SPIE 8429*, 84291F (2012).  
**DOI: <http://dx.doi.org/10.1117/12.922927>**
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**<http://www.opticsinfobase.org/abstract.cfm?URI=COSI-2012-JW3A.2>**
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- 52.** M. Paturzo; **F. Merola**; V. Bianco; P. Memmolo; L. Miccio; B. Mandracchia; P. Ferraro, "Detection and sorting of microplastics in marine environment by new imaging tools", Speckle 2018: VII International Conference on Speckle Metrology; 108340Q (**2018**) <https://doi.org/10.1117/12.2319400>.  
Event: SPECKLE 2018: VII International Conference on Speckle Metrology, 2018, Janów Podlaski, Poland.
- 53.** Pasquale Memmolo; Massimiliano M. Villone; **Francesco Merola**; Martina Mugnano; Lisa Miccio; Pier Luca Maffettone; Pietro Ferraro, "M e o ion antb

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### Technical Reports:

1. **Technical Report NA/2010/01, date 23/6/2010, filed at the CNR-INO in the framework of the “Sessibov-Sessaggio seme bovino” Project:** F. Merola, S.Grilli, M. Paturzo, P. Ferraro, G. Coppola, G. Di Caprio, “Analisi di spermatozoi bovini mediante olografia digitale e intrappolamento ottico di oggetti micrometrici”.
2. **Technical Report NA/2010/02, date 21/12/2010, filed at the CNR-INO in the framework of the “Sessibov-Sessaggio seme bovino” Project:** F. Merola, S. Coppola, V. Vespini, P. Ferraro, G. Coppola, M. Giofrè, G. Di Caprio, “Analisi di spermatozoi bovini tramite olografia digitale e intrappolamento ottico in canali microfluidici”.
3. **Technical Report NA/2012/03, date 2012, filed at the CNR-INO in the framework of the “Sessibov-Sessaggio seme bovino” Project:** L. Miccio, P. Memmolo, F. Merola, P. Ferraro, G. Coppola, G. Di Caprio, “Analisi di spermatozoi bovini tramite olografia digitale e algoritmi per l'intrappolamento ottico”.
4. **Technical Report NA/2013/04, date 30/01/2013, filed at the CNR-INO in the framework of the “Sessibov-Sessaggio seme bovino” Project:** P. Ferraro, F. Merola, L. Miccio, P. Memmolo, G. Coppola, G. Di Caprio, A. M. Ferrara, A. C. De Luca, “Intrappolamento ottico di spermatozoi bovini e loro caratterizzazione con olografia digitale e spettroscopia Raman”.
5. **Technical Report NA/2013/05, date 31/01/2013, filed at the CNR-INO in the framework of the “Sessibov-Sessaggio seme bovino” Project:** P. Ferraro, F. Merola, L. Miccio, P. Memmolo, S. Coppola, V. Vespini, S. Grilli, M. Paturzo, G. Coppola, G. Di Caprio, A. M. Ferrara, A. C. De Luca, M. Giofrè, “Intrappolamento ottico di spermatozoi bovini in canali microfluidici e loro analisi con olografia digitale”. **Final Report.**

Funded Research Projects  
(that I have contributed to write  
and/or in carrying out the  
activities)

- 1) **SEVENTH FRAMEWORK PROGRAMME THEME FP7-ICT-2007-1**  
**Information and Communication Technologies**  
Project acronym: Real 3D  
Project full title: Digital holography for 3D and 4D real-world objects' capture, processing, and display  
Grant agreement n°: 216105  
Starting date: September 2007
- 2) **Bovine sperm sorting - SESSIBOV**, in collaboration with the “Istituto Italiano Sperimentale Lazzaro Spallanzani” (CR). Funded by the Department of the European and International Policies and of the Rural Development (MiPAF).  
Prot. CNR-INO n. 3937 of the 11/11/2009 and n.438 of the 21/1/2011.  
Activity time frame: 2010-2013
- 3) **PON01\_1209 “Backplane ottico per apparati ICT di alta capacità”**.  
Prot. MIUR (Italian Ministry for University and Research) n° 660/ric/2011.  
Activity time frame : 2011-2015
- 4) **PON04a2\_F “Aquasystem”**, for the management of the water cycle.  
Activity time frame : 2012-2015
- 5) **PON DATABENC** Project SNECS – PON03PE\_00163\_1 “Social Network delle entità dei Centri Storici”, CUP B68F12001400005, Ordinance prot n.790 of the 06-03-2014 by MIUR.  
Activity time frame : 2015-2018
- 6) **PON “SiRiMaP” - Innovative Detection Systems for the Marine Plastic Pollution Monitoring, Recovery and Recycling.** cod. ARS01\_01183  
Funding: € 3.303.118,01  
Activity time frame : 2018-2020
- 7) **PRIN MORphological biomarkers For Early diagnosis in Oncology – MORFEO.**  
Project n. 2017N7R2CJ  
Funding: € 589.619  
Activity time frame : 2018-2021

## Non-funded projects where I was P.I. or Unit Responsible

- 1) **FIRB 2013 (starting line):** Polymer-based micro-photonic devices fabricated by eletrohydrodynamic lithography techniques. Main ERC field: PE. **Role: P.I.**
- 2) **PRIN 2017 (young line):** Engineered Advanced SYstems for REgenerative MEDicine: an integrated approach based on innovative biomimetic platforms and label-free sensing towards stem cell therapy (EASY-REMED). Main ERC field: PE. **Role: Associated investigator.**

## Attended Conferences and Schools (where I have personally presented one or more works)

### 1) National School:

1<sup>a</sup> Scuola di Tecnologie Ottiche per la Caratterizzazione e l'Analisi di Materiali e Sistemi  
Location: Università di Napoli Federico II, Monte Sant'Angelo, Napoli  
Date: January 2007

### 2) International School:

New frontiers in micro and nano photonics - Biophotonics/Molecular Devices  
Location: Palazzo degli Affari, Firenze.  
Date: 23-26 April 2008

### 3) National Conference:

Elettroottica 2008 - "Strumentazione e metodi di misura elettroottici"  
Location: CESI Ricerca, Milano  
Date: 10-12 giugno 2008

Work presented: **F. Merola**, L. Miccio, S. De Nicola, P. Ferraro, "Caratterizzazione del processo di formazione di solitoni fotorefrattivi in un cristallo di niobato di litio mediante una tecnica di olografia digitale" (oral).

### 4) National Conference:

Fotonica 2009 - "11° Convegno Nazionale delle Tecnologie Fotoniche"  
Location: Palazzo dei Congressi, Pisa  
Date: 27-29 May 2009

Works presented: a) **F. Merola**, V. Vespini, S. Coppola, M. Paturzo, L. Miccio, S. Grilli, P. Ferraro, "Self-patterning of PDMS microlens arrays on functionalized crystals" (oral).  
b) **F. Merola**, M. Paturzo, S. Grilli, P. Ferraro, "Tunable phase grating for super-resolution in digital holography" (oral).

### 5) International Conference:

World of photonics congress - "Manufacturing of Optical Components" (EOS)  
Location: ICM, International Congress Centre of Munich, Germany  
Date: 15-17 June 2009

Work presented: **F. Merola**, M. Paturzo, S. Coppola, V. Vespini, and P. Ferraro, "Fabrication and optical characterization of PDMS microlens array" (poster).

### 6) International Conference:

3rd EOS Topical Meeting on Optical Microsystems (OuS'09)  
Location: Palazzo dei Congressi & Hotel "La Residenza", Capri  
Date: 27-30 September 2009

Work presented: a) **F. Merola**, L. Miccio, M. Paturzo, S. De Nicola and P. Ferraro, "Characterization of the photorefractive bright soliton formation process in a lithium niobate crystal by digital holography" (poster).  
b) **F. Merola**, M. Paturzo, S. Coppola, V. Vespini and P. Ferraro, "Self- patterning of PDMS microlens arrays on functionalized crystals and characterization by digital holography" (poster).

**7) International Conference:**

World of photonics congress - "1<sup>st</sup> EOS Optofluidics 2011" (EOSOF 2011)

Location: ICM, International Congress Centre of Munich, Germany

Date: 23-25 May 2011

Work presented: **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, D. Balduzzi, A. Galli, R. Puglisi, "Optical tweezers generated by home-made polymeric microaxicons (oral).

**8) International Conference:**

BioPhotonics 2011

Location: Università di Parma

Date: 8-10 Giugno 2011

Work presented: **F. Merola**, S. Coppola, V. Vespini, S. Grilli, P. Ferraro, D. Balduzzi, A. Galli, R. Puglisi, "Trapping and manipulating micro-objects by besel beams obtained through polymeric microaxicons" (oral).

**9) National Conference:**

10° Congresso Nazionale Società Italiana Cristalli Liquidi (SICL 2012)

Location: Università "La Sapienza", Roma

Date: 21-23 June 2012

Work presented: **F. Merola**, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna, P. Ferraro, "Reversible fragmentation and self-assembling of nematic liquid crystal droplets on functionalized pyroelectric substrates" (oral).

**10) International Conference:**

World of photonics congress - "SPIE Optical Metrology 2013-CLEO Europe 2013

Location: ICM, International Congress Centre of Munich, Germany

Date: 12-16 May 2013

Works presented: a) **F. Merola**, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna and P. Ferraro, "Pyroelectric manipulation of liquid crystal droplets" (oral)  
b) L. Miccio, P. Memmolo, **F. Merola**, S. Fusco, V. Embrione, P. A. Netti, P. Ferraro, "New 3D Tracking Method Exploiting the Capabilities of Digital Holography in Microscopy" (oral).  
c) **F. Merola**, S. Grilli, S. Coppola, V. Vespini, S. De Nicola, P. Maddalena, C. Carfagna and P. Ferraro, "Self-assembling of liquid crystal droplets on lithium niobate substrates driven by pyroelectric effect" (poster).

**11) International Conference:**

5<sup>th</sup> EOS Topical Meeting on Optical Microsystems (OpS'13)

Location: Hotel "La Palma" & Hotel "La Residenza", Capri

Date: 12-14 September 2013

Works presented: a) L. Miccio, **F. Merola**, P. Memmolo, P. Ferraro, "Optical tweezers in combination with digital holographic microscopy for 3D visualization and analysis of in-vitro cells" (oral).  
b) **F. Merola**, S. Coppola, V. Vespini, S. Grilli and P. Ferraro, "Self-assembling of liquid crystal droplets on lithium niobate sub-strates driven by pyroelectric effect" (poster).

**12) International Conference:**

SPIE Photonics Europe 2014

Location: SQUARE Brussels Meeting Centre, Brussels, Belgium

Date: 14-17 April 2014

Works presented: a) **F. Merola**, L. Miccio, P. Memmolo, G. Di Caprio, G. Coppola, P. Netti, P. Ferraro, "3D visualization and biovolume estimation of motile cells by digital holography" (oral)  
b) **F. Merola**, L. Miccio, P. Memmolo, M. Mugnano, S. Fusco, P. Netti, P. Ferraro, "Investigation on dynamics of non-adherent cells under point-like stimuli by Digital Holography and Optical Tweezers" (oral).

### 13) International Conference, **INVITED**:

IEEE Biophotonics 2015

Location: CNR Sesto Fiorentino (Florence)

Date: 20-22 May 2015

Work presented: **F. Merola**, L. Miccio, P. Memmolo, P. Netti, and P. Ferraro, "Red Blood Cell as Optofluidic Tunable Lens" (**INVITED**).

### 14) International Conference:

6<sup>th</sup> EOS Topical Meeting on Optical Microsystems (OpS'15)

Location: Hotel "La Palma" & Hotel "La Residenza", Capri

Date: 17-19 September 2015

Work presented: R. Savoia, P. Memmolo, **F. Merola**, L. Miccio, P. Ferraro, "Full Morphology of in-flow living cells by digital holographic microscopy" (oral).

### 15) International Conference:

3rd Workshop on Surfaces, Interfaces and Functionalization Processes in Organic Compounds and Applications - SINFO III

Location: University of Naples, Scuola Politecnica e delle Scienze di Base Naples, Piazzale Tecchio 80 - Faculty of Engineering Building

Date: 27-29 June 2016

Work presented: **F. Merola\***, S. Grilli, S. Coppola, V. Vespini and P. Ferraro, "Self-assembling of nanoparticles on functionalized Lithium Niobate substrates".

### 16) International Conference:

World of photonics congress (ECBO – European Conferences on Biomedical Optics, SPIE Optical Metrology)

Location: ICM, International Congress Centre of Munich, Germany

Date: 23-27 June 2017

Works presented: a) **F. Merola\*** et al., "RBCs as microlenses: wavefront analysis and applications" (oral)  
b) **F. Merola\*** et al., "Tomographic Flow Cytometry assisted by Intelligent Wavefronts Analysis" (oral)  
c) **F. Merola\*** et al., "Quantitative phase imaging for improvement of microcytic anemia identification" (oral)

### 17) International Conference:

7<sup>th</sup> EOS Topical Meeting on Optical Microsystems (OpS'17)

Location: Conference Centre of the Consiglio Nazionale delle Ricerche, Via Ceselle, Anacapri (Na)

Date: 10-14 September 2017

Work presented: **F. Merola**, P. Memmolo, L. Miccio, M. Mugnano, P. Ferraro, "Tomography of live cells in microfluidic channels".

### 18) International Conference:

II International Conference on Microplastic Pollution in the Mediterranean Sea (μMED)

Location: Capri, Hotel La Residenza, (Naples, Italy)

Date: 15-18 September 2019

Work presented: M. Paturzo, V. Bianco, P. Memmolo, **F. Merola**, P. Carcagni, C. Distante, P. Ferraro, "IDENTIFICATION OF MICROPLASTICS BY HOLOGRAPHIC MICROSCOPY ENABLED SUPPORT VECTOR MACHINE".

## Conferences/Events Organization

### Technical Committee:

- 6<sup>th</sup> EOS Topical Meeting on Optical Microsystems (OpS'15), 17 - 19 September 2015, Capri (<http://www.myeos.org/events/capri2015>)
- International School on Computational Microscopy 2017, Label free and quantitative phase imaging techniques, Amalfi (Italy), 5-8 September 2017 (<http://iscm2017.isasi.cnr.it/organization>).

- 7th EOS Topical Meeting on Optical Microsystems (OpS'17), 10 September 2017 - 14 September 2017, Capri (<http://www.myeos.org/events/capri2017>)
- 8th EOS Topical Meeting on Optical Microsystems (OpS'19), Anacapri, Island of Capri, Italy 9 -11 September 2019  
<https://www.europeanoptics.org/pages/events/capri/topical-meetings/oms19.html#wl5AvePpvmZKfWcP.99>

## Exhibitions

- Nanoforum – 8th edition of the event which promotes the technology transfer between research and business, in the micro and nanotechnology area.  
24 - 26 September 2012, Facoltà d'Ingegneria Civile e Industriale dell'Università "La Sapienza" di Roma, Via Eudossiana 18.  
<http://www.ing.uniroma1.it/drupal/archivionotizie/nanoforum-2012>
- "Futuro Remoto" – IDIS Foundation, Città della Scienza.  
16-19/10/2015 Napoli, Piazza del Plebiscito.  
Role: Exhibitor at the Pavilion "Corpo e Mente"  
Contribution: Francesco Merola, Lisa Miccio: *Globuli rossi come bio-lenti: un nuovo metodo per la diagnostica di malattie del sangue.*
- "Futuro Remoto" – IDIS Foundation, Città della Scienza.  
7-10/10/2016 Napoli, Piazza del Plebiscito.  
Role: Exhibitor at the Pavilion "Corpo e Mente"  
Contribution: Francesco Merola, Pasquale Memmolo, Lisa Miccio, Martina Mugnano, Pietro Ferraro: *Tomografia olografica dei globuli rossi per la diagnostica di malattie del sangue.*

## Teaching experience

- Lessons and Lab demonstrations to High School students.

## Awards

- 2° prize in the competition for the best presentations in the PhD in Fundamental and Applied Physics for the presentation: "Lithium niobate: optical properties and applications".  
Date: 26 November 2009 - Napoli  
PhD Coordinator: Prof. Lorenzo Marrucci
- "Best of 2011" in Optics and Photonics conferred by **OSA** (Optical Society of America) for the article "S.Grilli et al., *Proc. Natl. Acad. Sci.* 108, pp.15106-15111 (2011)", chosen among the best 25 publications in 2011 on International Journals in the Field of Optics and Photonics.
- Winner of the award "**Young graduated in Physics**" conferred by the Italian Physics Society (SIF) in 2012 for young graduated after May 2005.
- Two times "Artist of the month" (June 2012 and January 2014) for the section "Liquid Crystal Beauty" of the ILCS (International Liquid Crystal Society).  
<http://www.lcinet.kent.edu/ILCS/main/page137/page137.html>
- Award certificate from the Journal *Light: Science & Applications* for the article "Tomographic Flow Cytometry by Digital Holography" as an "outstanding paper" in 2018, also thanks to the very high number of citations received.  
Award Ceremony: 17th July 2019, Chang Chun, China.

## Journal Referee

From 2010 I am referee for International Journals:

- *Optics Letters* (15 ref)
- *IEEE Journal of Display Technology* (5 ref)
- *Journal of Micromechanics and Microengineering* (3 ref)
- *Optics Communications* (2 ref)
- *Microfluidics and Nanofluidics* (2 ref)
- *Journal of Optics (IOP)* (2 ref)
- *Cytometry Part A* (2 ref)

- *Applied Physics Letters* (1 ref)
- *Biomedical Optics Express* (6 ref)
- *Computers in Biology and Medicine* (1 ref)
- *Applied Science* (1 ref)
- *Optics and Lasers in Engineering* (1 ref)
- *Soft Matter* (1 ref)
- *Journal of Biophotonics* (1 ref)
- *Scientific Reports* (1 ref)
- *ACS Photonics* (1 ref)

**Examination Board**

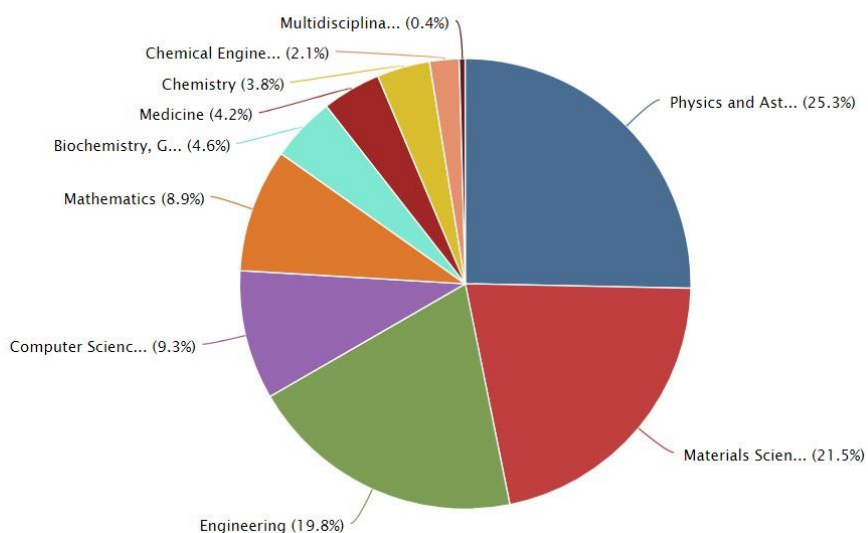
Since 2013 I am member in Boards for CNR contests, in particular for the competition announcements:

- ASS/INO/008/2013/NA
- ASS/INO/018/2013/NA
- ASS/INO/011/2014/NA
- *Incarico di collaborazione codice 2014/1946*

**Publications distribution****Publications by Journal:**

Light: Science and Applications – NPG (IF 14.1): 1  
Nature Communications (IF 11.9): 1  
Proceedings of the National Academy of Science of the United States of America (PNAS, IF 9.6): 1  
Advanced Functional Materials (IF 15.6): 1  
ACS Applied Materials & Interfaces (IF 8.5): 1  
Lab on a Chip (IF 6.9): 4  
Analytical Chemistry (ACS) (IF 6.4): 1  
Materials and Design (Elsevier) (IF 5.8): 1  
Proceedings of the IEEE (I.F. 5.6): 1  
RSC Advances (Royal Society of Chemistry, IF 3.8): 1  
Cytometry part A (Wiley Online Library, IF 3.2): 2  
Journal of Biophotonics (IF 3.9): 1  
Methods (IF 3.8): 1  
Applied Physics Letters (IF 3.1): 1  
Optics Express (IF 3.1): 1  
Optics Letters (IF 3.0): 2

## Documents by subject area



**H-index: 19 (Scopus).**

### ANNEXES (upon request)

- Awards certificates
- Official verdicts by the ASN 2017 Board
- Copies of degrees and qualifications
- Reference Letters

