

# Martí Duocastella

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## Education

- 2007- 2010 **PhD in Physics**, Department of Applied Physics and Optics, University of Barcelona, Spain.  
Title of the thesis: "Study of the laser forward transfer for the preparation of miniaturized biosensors". Advisor: Prof. Pere Serra
- 2005-2007 **MS in Engineering Physics**, University of Barcelona, Spain.
- 2000-2005 **BS in Physics**, University of Barcelona, Spain.

## Professional Experience

- 2019-present **Serra Hunter fellow**, University of Barcelona, Spain
- 2014-2019 **Researcher**, Nanophysics, Istituto Italiano di Tecnologia, Genoa, Italy
- 2012-2013 **Vice-president of Research and Development**, TAG Optics Inc., Princeton, USA
- 2010-2013 **Postdoctoral Research Associate**, Department of Mechanical and Aerospace Engineering, Princeton University, USA.

## Fellowships and Awards

- 2019 TechnioSpring Marie Curie Fellowship (renounce)
- 2013 R&D 100 Award
- 2013 Laser Focus World-OSA Technology Innovation Award
- 2013 SPIE PRISM Award for Photonics Innovation in the category of Optics and Optical Components
- 2012 Siemens' Technology To Business center's national business and innovation competition
- 2006-2009 Formacion Personal Investigador/Spanish Ministry of Education/Spain
- 2006 Best Master Student Award, MS in Engineering Physics, Department of Applied Physics and Optics, University of Barcelona
- 2006 Outstanding Student Paper Award.The 4th International Congress on Laser Advanced Materials Processing (LAMP) 2006, Kyoto, Japan
- 2005-2009 PhD Research Grant "Formación de personal investigador", Spanish Government
- June-Dec. 2004 Undergraduate Research Grant "Becas colaboración en departamentos", Spanish Government

## Teaching Experience

- 2019-present **Lecturer**, Courses: "Physics II", 6 ECTs (B.S. Chemistry); "Nanofabrication and nanoprocessing in clean room environment", 3 ECTs (Master in Nanotechnology); Electromagnetism, 9 ECTs (B.E. Electronic Engineering), University of Barcelona, Spain
- May 2017 **Guest Professor**, Course: "Introduction to optical microscopy", 2 ECTs, BOKU - Univ. of Nat. Resources and Life Sciences, Vienna, Austria

- 2014-2019 **Lecturer**, PhD Course: "Laser-matter interactions, from fundamentals to Applications", 4 ECTS, University of Genoa, Genoa, Italy
- 2009-2010 **Lecturer**, "Laboratory of Electromagnetism", 6 ECTS, University of Barcelona, Spain; "Laboratory of Electricity and Optics", 3 ECTS University of Barcelona, Spain
- 2008-2009 **Teaching Assistant**, "Laboratory of Physics", 1.5 ECTS, University of Barcelona, Spain
- 2007-2008 **Teaching Assistant**, "Laboratory of Electricity and Optics", 3 ECTS, University of Barcelona, Spain

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## Supervised thesis

- 2014-2018 Simonluca Piazza, "Advanced optical systems for fabrication and imaging"  
**Winner of the 3<sup>rd</sup> best poster award of the Bioimaging Conference 2015** that took place in Genoa, Italy
- 2013-2017 Giuseppe Sancataldo, "Fast and deep imaging of 3D biological systems"  
**Winner of the "Antonio Borsellino Award"** from SIBPA (Italian Society of Applied and Fundamental Biophysics) for the best PhD thesis on a biophysical topic

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## Supervision of postdoctoral, master and undergraduate researchers

### 2 postdoctoral researchers

- 2014-2019 Dr. Salvatore Surdo. Topic: laser manufacturing
- 2015-2017 Dr. Tiziana Ravazenga. "Topic: optical methods for fast 3D particle tracking"
- 2015 **1 Hosted international researcher** Camilo Florian-Baron, from Universitat de Barcelona. Topic: additive laser manufacturing
- 2010 – 2013 **1 undergraduate student** (Theresa d'Addio-Rossi). Topic: design of the TAG lens  
 (at Princeton) **3 Master students** (Crispin Amiri Naini, Ulf Quentin and Benjamin Gröschel). Topic: optimization of the TAG lens for laser manufacturing

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## Patents

- 2018 C.B. Arnold, C. Theriault, **M. Duocastella**, *Microscope with tunable acoustic gradient index of refraction lens enabling multiple focal plan imaging*, Patent 9,946,081
- 2017 **M. Duocastella**, G. Sancataldo, A. Diaspro, *Metodo e apparato per il tracciamento ottico di oggetti emettitori*, Patent application IT 102017000006925
- 2015 C.B. Arnold, C. Theriault, **M. Duocastella**, *Microscope with tunable acoustic gradient index of refraction lens enabling multiple focal plan imaging*, Patent 9,213,175
- 2009 P. Serra, **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, *Apparatus and method for direct laser printing*, Patent WO2011009973 A2

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## Participation in projects

### As Principal Investigator (PI)

- 2015 'Verso una nuova biologia con un microscopio 3D a milioni di fotogrammi al secondo', from Compagnia di San Paolo, ROL 24704. Award amount 153 k€
- 2015 'Sistema ultra-veloce per il tracciamento 3d di oggetti nanometrici', from Compagnia di San Paolo, ID 2015.AAI4112.U4919. Award amount 186 k€
- 2013 'Ultra-high speed z-scanning for laser manufacturing', from the National Science Foundation; SBIR Phase I, federal award ID 1315667. Award amount \$148,480

### As collaborator

- 2007-2010 'Procesos de escritura directa con láser para su aplicación a microsistemas de análisis total', from the Spanish Ministry of Education and Science (MEC); reference concession MAT2007-62357. Principal researcher: Pere Serra Coromina
- 2004-2007 'Desarrollo de técnicas de escritura directa con láser para aplicaciones biomédicas', from the Spanish Ministry Industry, Commerce and Tourism (MCYT); reference concession MAT2004-03741. Principal researcher: José Luis Morenza

### Project collaborations with enterprises

#### As collaborator

- 2016-2017 Development of fast 3D optical microscopes: Nikon Instruments
- 2007-2008 Development of a prototype to fabricate microarrays through the technique Bio Laser Induced Forward Transfer (BioLIFT). Company: Nuevas Tecnologías Espaciales, SA (project No. 3-1172/06/NL/IA funded by the ESA)

### Research stays abroad

- May-July 2009 Naval Research Lab (NRL), Washington DC, USA, "*Laser-induced forward transfer for microelectronic application*"
- June-Sept. 2008 Institut National de la Santé et de la Recherche Médicale (INSERM), Bordeaux, France, "*Laser-induced forward transfer of living cells*"

### Publications

#### Peer-reviewed Journal articles (\* denotes corresponding author)

51. S.Y. Kang, M. Duocastella, C.B. Arnold, *Variable optical elements for fast focus control*, Nat. Photonics. **14**, 533 (2020)
50. M. Duocastella\*, S. Surdo, A. Zunino, A. Diaspro, P. Saggau, *Acousto-optic systems for advanced microscopy*, J. Phys. Photon. (accepted)
49. S. Surdo, A. Diaspro, M. Duocastella\*, *Printability conditions for an all-solid-state laser transfer*, Appl. Surf. Sci. **506**, 144969 (2020)
48. A. Le Gratiet, M. d'Amora, M. Duocastella, R. Marongiu, A. Bendandi, S. Giordani, P. Bianchini, A. Diaspro, *Zebrafish structural development in Mueller-matrix scanning microscopy*, Sci. Reports **9**, 19974 (2019)
47. A. Zunino, S. Surdo\*, M. Duocastella\*, *Dynamic multi-focus laser writing with acousto-optofluidics*, Adv. Mater. Technol. **4**, 1900623 (2019)
46. S. Surdo, M. Duocastella\*, *Fast acoustic light sculpting for on-demand maskless lithography*, Adv. Sci. **6**, 1900304 (2019)
45. S. Surdo, A. Diaspro, M. Duocastella\*, *Geometry-controllable micro-optics with laser catapulting*, Opt. Matt. Express **9**, 2892 (2019)
44. V. Lusi, T.L. Moore, F. Laurino, A. Coclite, R. Perreira, I. Rizzuti, R. Palomba, P. Zunino, M. Duocastella, S. Mizrahy, D. Peer, P. Decuzzi, *A Tissue Chamber Chip for Assessing Nanoparticle Mobility in the Extravascular Space*, Biomed. Microdevices **21**, 41 (2019)
43. P. Cataldi, J.A. Heredia-Guerrero, S. Guzman-Puyol, L. Ceseracciu, L. La Notte, A. Reale, J. Ren, Y. Zhang, L. Liu, M. Miscuglio, P. Savi, S. Piazza, M. Duocastella, G. Perotto, A.

- Athanassiou, I.S. Bayer, *Sustainable Electronics Based on Crop Plant Extracts and Graphene: A "Bioadvantaged" Approach*, Adv. Sust. Sys. **2**, 1800069 (2018)
42. S. Surdo, R. Carzino, A. Diaspro, **M. Duocastella\***, *Single-Shot Laser Additive Manufacturing of High Fill-Factor Microlens Arrays*. Adv. Opt. Mater. **6**, 1701190 (2018)
41. S. Piazza, P. Bianchini, C. Sheppard, A. Diaspro, F. De Angelis **M. Duocastella\***, *Enhanced volumetric imaging in two-photon microscopy via acoustic lens beam shaping*. J. Biophotonics **11**, e201700050 (2018)
40. **M. Duocastella\***, G. Sancataldo, P. Saggau, P. Ramoino, P. Bianchini, A. Diaspro, *Fast inertia-free light sheet microscope*. ACS Photonics **4**, 1797(2017)
39. M.P. Arciniegas, A. Castelli, S. Piazza, S. Dogan, L. Ceseracciu, R. Krahne, **M. Duocastella**, L. Manna, *Laser-Induced Localized Growth of Methylammonium Lead Halide Perovskite Nano and Microcrystals on Substrates*. Adv. Function. Mater. **27**, 1701613 (2017)
38. **M. Duocastella**, G. Vicidomini, K. Korobchevskaya, K. Pydzińska, M. Ziólek, A. Diaspro, G. de Miguel, *Improving the Spatial Resolution in Direct Laser Writing Lithography by Using a Reversible Cationic Photoinitiator*. J. Phys. Chem. C **121**, 16970 (2017)
37. **M. Duocastella\***, F. Tantussi, A. Haddadpour, R. Proietti Zaccaria, A. Jacassi, G. Veronis, A. Diaspro, F. De Angelis, *Combination of scanning probe technology with photonic nanojets*. Sci. Reports **7**, 3474 (2017)
36. S. Surdo, A. Diaspro, **M. Duocastella\***, *Micromixing with spark generated cavitation bubbles*, Microfluid. Nanofluidics **21**, 82 (2017)
35. G. Sancataldo, L. Scipioni, T. Ravasenga, L. Lanzano, A. Diaspro, A. Barberis, **M. Duocastella\***, *3D multiple-particle tracking with nanometric precision over tunable axial ranges*, Optica **4**, 367 (2017)
34. S. Surdo, A. Diaspro, **M. Duocastella\***, *Microlens fabrication by replica molding of frozen laser-printed droplets*, Appl. Surf. Sci. **418**, 554 (2017)
33. **M. Duocastella**, C.B. Arnold, J. Puchalla, *Selectable light-sheet uniformity using tuned axial scanning*, Microsc. Res. Tech. **80**, 250 (2017)
32. M. Elmeranta, G. Vicidomini, **M. Duocastella**, A. Diaspro, and G. de Miguel, *Characterization of nanostructures fabricated with two-beam DLW lithography using STED microscopy*, Opt. Matt. Express **6**, 3169 (2016)
31. C. Florian, S. Piazza, A. Diaspro, P. Serra, **M. Duocastella\***, *Direct laser printing of tailored polymeric microlenses*, ACS Appl. Matt. Interfaces **8**, 17028 (2016)
30. **M. Duocastella\***, C. Theriault, C.B. Arnold, *Three-dimensional particle tracking via tunable color-encoded multiplexing*, Opt. Lett. **41**, 863 (2016)
29. S. Tozza, R. Mecca, **M. Duocastella**, A. Del Bue, *Direct Differential Photometric Stereo Shape Recovery of Diffuse and Specular Surfaces*, J. Math. Imaging Vis. **56**, 57 (2016)
28. S. Surdo, S. Piazza, L. Ceseracciu, A. Diaspro, **M. Duocastella\***, *Towards nanopatterning by femtosecond laser ablation of pre-stretched elastomers*, Appl. Surf. Sci. **374**, 151 (2016)
27. **M. Duocastella\***, C. Florian, P. Serra, A. Diaspro, *Sub-wavelength Laser Nanopatterning using Droplet Lenses*, Sci. Reports **5**, 16199 (2015)
26. G. de Miguel, G. Vicidomini, **M. Duocastella**, A. Diaspro, *Selective fluorescence functionalization of dye-doped polymerized structures fabricated by direct laser writing (DLW) lithography*, Nanoscale **7**, 20164 (2015)
25. G. de Miguel, **M. Duocastella**, G. Vicidomini, A. Diaspro,  *$\lambda/20$  axial control in 2.5 D polymerized structures fabricated with DLW lithography*, Opt. Express **23**, 24850 (2015)

24. **M. Duocastella\***, G. Vicidomini, A. Diaspro, *Simultaneous multiplane confocal microscopy using acoustic tunable lenses*, Opt. Express **22**, 19293 (2014)
23. H. Kim, **M. Duocastella**, K. M. Charipar, R. C. Y. Auyeung, A. Piqué, *Laser printing of conformal and multi-level 3D interconnects*, Appl. Phys. A. **113**, 5 (2013)
22. **M. Duocastella**, C.B. Arnold, *Enhanced depth of field laser processing using an ultra-high speed axial scanner*, Appl. Phys. Lett. **102**, 061113 (2013)
21. **M. Duocastella**, C.B. Arnold, *Transient response in ultra-high speed liquid lenses*, Journal of Physics D: Applied Physics **46**, 075102 (2013)
20. **M. Duocastella**, B. Sun, C.B. Arnold, *Simultaneous imaging of multiple focal planes for 3-D microscopy using ultra-high-speed adaptive optics*, J. Biomed. Opt. **17**, 050505 (2012)
19. **M. Duocastella**, C.B. Arnold, *Bessel and annular beams for materials processing*, Laser Photonics Rev. **6**, 607 (2012)
18. **M. Duocastella**, A. Patrascioiu, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *On the correlation between droplet volume and irradiation conditions in the laser forward transfer of liquids*, Appl. Phys. A **109**, 5 (2012)
17. **M. Duocastella**, H. Kim, P. Serra, A. Piqué, *Optimization of laser printing of nanoparticle suspensions for microelectronic applications*, Appl. Phys. A **106**, 471 (2012)
16. Patrascioiu, **M. Duocastella**, V. Dinca, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *Liquids microprinting through a novel film-free femtosecond laser based technique*, Appl. Surf. Sci. **257**, 5190 (2011)
15. **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *Droplet printing through bubble contact in the laser forward transfer of liquids*, Appl. Surf. Sci. **257**, 2825 (2011)
14. **M. Duocastella**, A. Patrascioiu, V. Dinca, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *Study of liquid deposition during laser printing of liquids*, Appl. Surf. Sci. **257**, 5255 (2011)
13. **M. Duocastella**, A. Patrascioiu, J. M. Fernández-Pradas, J. L. Morenza, P. Serra, *Film-free laser forward printing of transparent and weakly absorbing liquids*, Opt. Express **18**, 21815 (2010)
12. **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *Sessile droplet formation in the laser-induced forward transfer of liquids: a time-resolved imaging study*, Thin Solid Films **518**, 5321 (2010)
11. **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, D. Zafra, P. Serra, *Novel laser printing technique for miniaturized biosensors preparation*, Sens. Actuators B **145**, 596 (2010)
10. Guillotin, A. Souquet, S. Catros, **M. Duocastella**, B. Pippenger, S. Bellance, R. Bareille, M. Rémy, J. Amédée, F. Guillemot, *Rapid prototyping of engineered tissue with high cell density and microscale organization : an application of Laser Assisted Bioprinting (LAB)*, Biomaterials **31**, 7250 (2010)
9. **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, P. Serra, *Time resolved imaging of the laser forward transfer of liquids*, J. Appl. Phys. **106**, 084907 (2009)
8. P. Serra, **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, *Liquids microprinting through laser-induced forward transfer*, Appl. Surf. Sci. **255**, 534 (2009)
7. **M. Duocastella**, J.M. Fernández-Pradas, P. Serra, J.L. Morenza, *Printing biological solutions through laser-induced forward transfer*, Appl. Phys. A **93**, 941 (2008)
6. **M. Duocastella**, J.M. Fernández-Pradas, P. Serra, J.L. Morenza, *Jet formation in the laser forward transfer of liquids*, Appl. Phys. A **93**, 453 (2008)
5. J.M. Martín-Durán, **M. Duocastella**, P. Serra, R. Romero, *A new method to deliver exogenous material into developing planarian embryos*, J. Exp. Zool. (Mol. Dev. Evol.) **310B**, 668 (2008)

4. **M. Duocastella\***, M. Colina, J.M. Fernández-Pradas, P. Serra, and J.L. Morenza, *Study of the laser-induced forward transfer of liquids for laser bioprinting*, Appl. Surf. Sci. **253**, 7855 (2007)
3. **M. Duocastella**, J.M. Fernández-Pradas, P. Serra, J.L. Morenza, *Laser-induced forward transfer of liquids for miniaturized biosensors preparation*, J. Laser Micro. Nanoen. **3**, 1 (2007)
2. P. Serra, J.M. Fernández-Pradas, M. Colina, **M. Duocastella**, J. Domínguez, J.L. Morenza. *Laser induced forward transfer: a direct writing technique for biosensors preparation*, J. Laser Micro. Nanoen. **1**, 236-242 (2006)
1. M.Colina, **M.Duocastella**, J.M. Fernández-Pradas, P.Serra, and J.L. Morenza, *Laser-induced forward transfer of liquids: study of the droplet ejection process*, J. Appl. Phys. **99**, 74 (2006)

### Conference proceedings

7. S. Surdo, MA Geven, R Donno, A Diaspro, N Tirelli, **M Duocastella**, *Cavitation-assisted micromixing for polymeric nanoparticle generation*, Proceedings 2(13), 942 (2018)
6. A. Diaspro, L. Lanzanò, P. Bianchini, G. Vicidomini, **M. Duocastella**, F. Cella Zancacchi, C. JR Sheppard, *The Extra microscope*, Biophys. J. **112**, 583a (2017)
5. S. Piazza, P. Bianchini, C. Sheppard, A. Diaspro, **M. Duocastella\***, *Fast Volumetric Imaging in Two-Photon Microscopy and Enhanced Background Rejection using an Acoustic Lens*, Biophys. J. **110**, 162a (2016)
4. G. Sancataldo, P. Bianchini, P. Saggau, P. Ramoino, A. Diaspro, **M. Duocastella\***, *A Novel Fast Volumetric Light Sheet Microscopy*, Biophys. J. **110**, 648a (2016)
3. C.J.R. Sheppard, M. Castello, G. Vicidomini, **M. Duocastella**, A. Diaspro, *Microscopy using source and detector arrays*, Proc. SPIE 971302 (2016)
2. **M. Duocastella\***, G. Vicidomini, A. Diaspro, *Simultaneous multiplane imaging for 3D confocal microscopy using high-speed z-scanning multiplexing*, Proc. SPIE 93300Q (2015)
1. J.M. Fernández-Pradas, **M. Duocastella**, P. Serra, J.L. Morenza, *Production of miniaturized biosensors through laser-induced forward transfer*, Proc. SPIE 659, 2 65920R (2007)

### Book chapters

3. S. Surdo, A. Diaspro, **M. Duocastella\***, "Film-free laser-induced forward transfer (FF-LIFT)". In *Laser printing of functional materials*, edited by P. Serra, A. Pique, Wiley (2018)
2. P. Serra, **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, "Laser-induced forward transfer: a laser-based technique for biomolecules printing". In *Cell and organ printing*, edited by B.R. Ringeisen, B.J. Spargo, P. Wu, Springer Verlag (2010), Berlin, Germany
1. P. Serra, **M. Duocastella**, J.M. Fernández-Pradas, J.L. Morenza, "Laser-induced forward transfer: a versatile technique for microprinting". In *Advances in laser materials processing technology, research and applications*, edited by J. Lawrence, J. Pou, D.K. Low, E. Toyserkani, CRCPress & Woodhead Publishing Ltd. (2009), Cambridge, UK

### Invited articles in popular scientific magazines

2. S. Piazza, G. Sancataldo, **M. Duocastella\***, "Toward millisecond volumetric microscopy". *Imaging&Microscopy* (2018)
1. S. Piazza, **M. Duocastella\***, "Faster and deeper imaging with acoustic liquid lenses". *Biophotonics.World* (2018) <https://www.biophotonics.world/magazine/article/370/faster-and-deeper-imaging-with-acoustic-liquid-lenses>



## Plenary/Keynote Talks

- June 2019 14<sup>th</sup> School on Acousto-Optics and Applications, Torun, Poland  
*"Toward ultrafast volumetric microscopy with acoustic liquid lenses"*
- March 2018 Focus on Microscopy, Singapore, Singapore  
*"Toward millisecond volumetric microscopy"*

## Invited Talks

- June 2020 The 21st International Symposium on Laser Precision Microfabrication (LPM), Dresden, Germany (moved to online conference)  
*"Ultrasonic laser shaping for advanced patterning"*
- Sep. 2019 SPIE security+defense, Strasbourg, France  
*"On demand micro-optics using single shot laser additive manufacturing"*
- July 2019 Rudolf-Virchow-Zentrum, Universität Würzburg, Würzburg, Germany  
*"Faster volumetric microscopy with acoustic liquid lenses"*
- May 2019 University of Barcelona, Barcelona, Spain  
*"Acoustic light focusing for fast 3D microscopy"*
- Feb. 2019 International Symposium on SSS Laser Processing (3S-LP), Yokohama, Japan  
*"Fast Sub-Wavelength Laser Nanopatterning using Engineered Materials and Acoustically-Shaped Light"*
- Feb. 2019 SPIE Photonics West, San Francisco, USA  
*"Acoustic z-focus control for high-speed volumetric optical microscopy"*
- Dec. 2018 The arctic university of Norway, Tromsø, Norway  
*"Faster axial focusing for high-speed 3D microscopy"*
- Jan. 2018 SPIE Photonics West, San Francisco, USA  
*"Laser additive manufacturing for enhanced performance of optoelectronic devices"*
- Sept. 2017 Conference on Laser Ablation (COLA), Marseille, France  
*"Laser direct write of tailored microlenses and microlens arrays"*
- June 2017 The 18th International Symposium on Laser Precision Microfabrication (LPM), Toyama, Japan  
*"Laser direct printing of micro-optical elements"*
- Sept. 2016 University of Natural Resources and Life Sciences, Vienna, Austria  
*"Toward real-time volumetric imaging and tracking of biological systems"*
- May 2016 EMRS 2016 Spring Meeting, Lille, France  
*"Laser optofluidics for micro and nanofabrication"*
- April 2016 International School of Biophysics Antonio Borsellino, Erice, Italy  
*"Non-fluorescence based super-resolution microscopy"*  
*"Methods for fast volumetric imaging"*
- June 2015 X International Workshop on Adaptive Optics for Industry and Medicine (AOIM), Pavia, Italy  
*"Sound driven optofluidic lenses for high-speed focusing"*
- Feb. 2015 Naval Research Laboratory (NRL), Washington DC, USA  
*"Multiplane imaging and enhanced laser processing using acousto-optic tunable lenses"*
- Oct. 2014 University of Barcelona, Barcelona, Spain  
*"Ultra-high speed adaptive optics for simultaneous multiplane imaging and enhanced laser processing"*
- March 2014 School of Photonics 2014, Cortona, Italy  
*"Shaping light in microscopy: adaptive optical methods for enhanced imaging"*
- Nov. 2012 LP3, CNRS, Marseille, France  
*"Laser-based methods for microfabrication and imaging"*

- June 2012 The 13th International Symposium on Laser Precision Microfabrication (LPM), Washington DC, USA  
*"Shaping light for laser processing and imaging using ultrafast adaptive optics"*
- March 2012 Naval Research Laboratory (NRL), Washington DC, USA  
*"Ultra-high-speed liquid lens for shaping light in laser processing and imaging"*
- Jan. 2012 SPIE Photonics West, San Francisco, USA  
*"Using acoustic energy for structuring light fields in laser processing and imaging"*
- Oct. 2009 EPFL, Lausanne, Switzerland  
*"Biosensors preparation with laser printing"*
- July 2008 Centre de Lasers Intenses et Applications (CELIA), Bordeaux, France  
*"Microdroplet printing through laser-induced forward transfer"*

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### Contributed conference presentations

- Febr. 2019 SPIE Photonics West, San Francisco, USA  
 Oral Communication: *"Acousto-optofluidics for high-throughput laser processing"*
- Apr. 2017 Focus on Microscopy, Bordeaux, France  
 Oral Communication: *"Lateral-shift z-encoded multiple-particle tracking over tunable axial ranges"*
- Feb. 2015 SPIE Photonics West, San Francisco, USA  
 Oral Communication: *"Simultaneous multiplane imaging for 3D confocal microscopy using high-speed z-scanning multiplexing"*
- June 2014 The 15<sup>th</sup> International Symposium on Laser Precision Microfabrication (LPM), Vilnius, Lithuania  
 Oral Communication: *"Enhanced resolution laser processing via in-situ fabrication of liquid microlenses"*
- June 2013 CLEO:2013, Laser Science to Photonic Applications, San Jose, USA  
 Oral Communication: *"Free z-focus control laser processing via ultra-high speed axial scanning"*
- May 2012 CLEO:2012, Laser Science to Photonic Applications, San Jose, USA  
 Oral Communication: *"Simultaneous acquisition of multiple focal planes for real time 3-D microscopy using ultra-high speed adaptive optics"*
- Oct. 2011 The 11th International Congress on Laser Ablation (COLA), Cancun, Mexico  
 Poster: *"Characterizing the tunable acoustic gradient lens for non-Gaussian laser processing"*
- May 2011 CLEO:2011, Laser Science to Photonic Applications, Baltimore, USA  
 Oral Communication: *"Study of the transient behavior of a tunable acoustic gradient index lens for laser processing"*
- April 2011 MRS spring meeting, San Francisco, USA  
 Oral Communication: *"Transient behavior of tunable acoustic gradient index lenses for materials processing applications"*
- June 2009 The 5th International Congress on Laser Advanced Materials Processing (LAMP) 2009, Kobe, Japan  
 Oral communication: *"Study of the deposition process in the laser forward transfer of liquids"*
- June 2008 The 9th International Symposium on Laser Precision Microfabrication (LPM), Quebec, Canada  
 Oral communication: *"Microdroplets printing through laser-induced forward transfer"*
- Sept. 2007 The 9th International Congress on Laser Ablation (COLA), Tenerife, Spain  
 Presented poster: *"Printing biological solutions through laser-induced forward transfer"*



May 2006      The 4th International Congress on Laser Advanced Materials Processing (LAMP) 2006, Kyoto, Japan  
 Presented poster: *"Droplet ejection through laser-induced forward transfer for biomolecules microarrays printing"*

## Organization of scientific meetings and program committee memberships

2019-present      Program committee member "High-Speed Biomedical Imaging and Spectroscopy", SPIE Photonics West  
 2019-present      Program committee member International Congress on Applications of Lasers & Electro-Optics, ICALEO  
 2015              Local organizer of the European Conference of Organized Films (ECOF), with 300 attendees, which took place in Genoa, Italy

## Major collaborations

- Peter Saggau, *Acousto-optic devices for fast beam scanning*, Allen Institute for Brain Science, Seattle, USA
- Craig B. Arnold, *Modeling light-matter interactions*, Princeton University, Princeton, USA
- Alberto Diaspro, *Volumetric microscopy*, Istituto Italiano di Tecnologia, Genoa, Italy

## Short bio

My research focuses on novel optical methods for three-dimensional (3D) light engineering, with applications in materials science, sensing, and biology. Key examples of my work in this area include the development of laser catapulting for additive micro-optics manufacturing, acousto-optofluidic systems for focusing and shaping the light at sub-microsecond time scales, and fast inertia-free optical microscopes for unprecedented volumetric imaging speed.

I received my PhD in Physics from the University of Barcelona under the supervision of Prof. Pere Serra (05/2010). During this time, I studied a laser additive manufacturing technique, named laser-induced forward transfer (LIFT), for fabricating biosensors. My work covered fundamental aspects involving light-matter interaction, fluid mechanics, and technological applications in the fields of biosensing, electronics and tissue engineering. These studies, which were published in over 10 peer-reviewed articles, helped to establish the optimal printing parameter space for LIFT and gain a better understanding of the technique. I won the best student award at an international conference and did two research stays in prestigious centers (2 months at the Naval Research Laboratory, in the USA; 3 months at Institut national de la santé et de la recherche médicale, in Bordeaux). We also invented a new printing method that we successfully patented.

My research took a different orientation when I joined Princeton University as a Postdoctoral Research Associate under the supervision of Prof. Craig B. Arnold (06/2010-09/2013). At that time, I started working on advanced optical systems for laser fabrication and imaging. Besides publishing 10 articles in high-impact factor journals, my main achievement was the development of an innovative ultrasonic liquid lens, called a Tunable Acoustic Gradient (TAG) lens, that uses sound to focus the light at unprecedented speeds. Prof. Arnold created a start-up company, TAG Optics Inc. to commercialize the product. In collaboration with the company, first as an external consultant and later as the Vice-president of Research and Development, we designed a commercial version of the TAG lens. The disruptive nature of the lens and its potential applications were recognized with the most prestigious awards in optics, including the R&D 100 and the PRISM award. Mitutoyo Corporation acquired the company in June 2019. We also filed two patents which were successfully granted and are currently exploited by Mitutoyo. I became a PI of a competitive project funded by the National Science Foundation.

From 10/2013 to 08/2019 I was a researcher at Istituto Italiano di Tecnologia. As the leader of a research group (2 Postdocs, 3 PhD students), we developed several advanced optical methods for imaging, particle tracking, and laser fabrication. Among the most relevant results we obtained are the following: i) combining acoustics and optics for generating light interferences or dynamic multi-focus distributions at sub-millisecond time scales; ii) using micro-optics for enhancing the spatial resolution and focusing capabilities of optical systems; iii) inventing a new additive manufacturing technique named laser catapulting, for generating customized microlenses and high fill-factor microlens arrays in a single laser shot; iv) designing several

microscopy architectures for fast volumetric imaging and 3D particle tracking over an extended axial range. The results of our work were published in more than 25 journals (3 featured in the journal cover), we were granted one patent, and I was the PI of a competitive national project funded by Compagnia San Paolo. In addition, I co-supervised two PhD theses (one of my students received the Antonio Borsellino award for the best thesis in Italy on a topic related to Biophysics). I was an invited speaker in 16 international conferences. I was also the keynote speaker in two international events: Focus on Microscopy (Singapore, 2017), arguably the most important conference in optical microscopy, and the 14th School on Acousto-optics and Applications (Torun, Poland, 2019).

Since September, I am a Serra Hunter fellow in the Department of Applied Physics, at the University of Barcelona. I plan to consolidate my career as a scientist and continue working on advanced optical methods to maximize the spatiotemporal information retrieved from samples, helping to unveil the dynamics of key biological processes such as protein diffusion or neuronal communication.

Overall, I have attracted over 300 k€ in external funding, published 51 peer-reviewed journals (36 of them as first or corresponding author), supervised 2 PhD students, and given 21 invited talks and 2 keynote talks. My h factor is 20, with over 1800 citations (Scopus). I am a regular reviewer for the main journals in the field of mechanical engineering, materials science and optics. I have large experience in technology transfer activities, being the co-inventor of 4 patents and the VP of a startup company. In addition, I have received 5 international awards.