

BIOGRAPHICAL SKETCH

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NAME: Candeo, Alessia

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Senior Assistant Professor – RTDB

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
Politecnico di Milano, Milano, Milano	BS	02/2010	Engineering Physics
Politecnico di Milano, Milano, Milano	MS	12/2012	Engineering Physics
Politecnico di Milano, Milano, Milano	PHD	12/2015	Physics
IESL FORTH, Hersonissos	Other training	2013	COST Action TD 1003 Bioinspired Nanotechnologies 2nd Summer School Photonics meets Biology SPIRIT Summer School Multimodal
Max Planck Institute for Experimental Medicine, Gottingen	Other training	2014	Molecular Imaging: from high resolution in vitro towards in vivo imaging
Royal Society, London	Other training	2014	Laserlab Europe Foresight Workshop Lasers for Life
European Molecular Biology Organization	Other training	2016	Practical Course 3D developmental imaging
STFC SHE Training, STFC Rutherford Appleton Laboratory, Harwell Campus, Didcot	Other training	2018	Control of Substances Hazardous to Health (COSHH) Assessor Course
NEUBIAS	Other training	2018	NEUBIAS 3rd Training School for Facility Staff on Bioimage Analysis
STFC SHE Training, STFC Rutherford Appleton Laboratory, Harwell Campus, Didcot	Other training	2019	Laser Safety Officer Course
Politecnico di Milano, Milano, Milano	Other training	2020	Practical methods for innovative teaching
European Innovation Council	Other training	2022	EIC Women Leadership Programme (WLP)
Museo della Scienza e della Tecnica, Milano, Milano	Other training	2022	MEKE (Museum Engagement for Knowledge Exchange) Public Engagement training

A. Personal Statement

I am currently Senior Assistant Professor at the Department of Physics at Politecnico di Milano, Italy. I am a Physics Engineer by training and hold a Ph.D. in Physics. My primary research interests center around the field of photonics, where I specialized in the creation of novel optical setups and the construction of data processing pipelines. My work predominantly revolves around advancing imaging technologies, including but not limited to light-sheet fluorescence microscopes, integrating imaging with time-resolved and spectroscopic methods.

1. Candeo A, Nogueira de Faria B, Erreni M, Valentini G, Bassi A, de Paula A, Cerullo G, Manzoni C. A hyperspectral microscope based on an ultrastable common-path interferometer. *APL Photonics*. 2019 December 01; 4(12). Available from: <https://doi.org/10.1063/1.5129860>
2. Sargenti A, Candeo A, Farruggia G, D'Andrea C, Cappadone C, Malucelli E, Valentini G, Taroni P, Iotti S. Fluorescence lifetime imaging of intracellular magnesium content in live cells. *Analyst*. 2019 Mar 21;144(6):1876-1880. PubMed PMID: 30810548.
3. Omori N, Candeo A, Mosca S, Lezcano-Gonzalez I, Robinson IK, Li L, Greenaway AG, Collier P, Beale AM. Multimodal Imaging of Autofluorescent Sites Reveals Varied Chemical Speciation in SSZ-13 Crystals. *Angew Chem Int Ed Engl*. 2021 Mar 1;60(10):5125-5131. PubMed PMID: 33332715.
4. Ghirardello M, Candeo A, Ardini B, Valentini G, Manzoni C, Calligaro T, Pichon L, Bai X, Lenz R, Alberti R, Gironda M, Comelli D. Time-resolved photoluminescence imaging for the mapping of weakly luminescent pigments in paintings. *The European Physical Journal Plus*. 2023 October 10; 138(906). Available from: <https://doi.org/10.1140/epjp/s13360-023-04485-1>

B. Positions, Scientific Appointments and Honors

Positions and Scientific Appointments

2022 -	Senior Assistant Professor – RTDB, Politecnico di Milano, Milano, MI
2020 -	Visiting Researcher , UK Research and Innovation (UKRI) Rutherford Appleton Laboratory, Central Laser Facility, Didcot
2020 - 2022	Junior Assistant Professor – RTDA, Politecnico di Milano, Milano, MI
2018 - 2020	Staff Microscopy Link Scientist , Science & Technology Facilities Council, later UKRI, Rutherford Appleton Laboratory, Central Laser Facility, Didcot
2018 - 2020	Visiting Researcher, Oxford Brookes University, Oxford
2017 - 2017	Visiting Scientist , Science & Technology Facilities Council, Rutherford Appleton Laboratory, Central Laser Facility, Didcot
2017 - 2017	Postdoctoral Researcher, Politecnico di Milano, Milano, MI
2017 - 2017	Co.Co.Co consulting position, Politecnico di Milano, Milano, MI
2016 - 2016	Postdoctoral Researcher , Politecnico di Milano, Milano, MI
2015 - 2015	Visiting Student, Biology Department, IBENS École Normale Supérieure, Paris
2013 - 2015	Ph.D. in Physics , Politecnico di Milano, Milano, MI
2011 - 2012	Master Thesis , Politecnico di Milano, Milano, MI

Honors

2024 - 2027	Elected Vice-President of the International Commission for Optics (ICO) Bureau and assigned the role of Chair of the Committee for the Regional Development of Optics , International Commission for Optics
2024	Part of the Facility Access Panel , Central Laser Facility
2024	Review Editor, <i>Frontiers in Plant Science</i> and <i>Frontiers in Chemistry</i>
2023	Premio Switch to Product, Politecnico di Milano, Polihub, Deloitte

C. Contribution to Science

1. Since 2013, I have contributed to the development of one of the first light sheet fluorescence microscopy (LSFM) laboratories in Italy, based at Politecnico di Milano. Our lab was among the early adopters and developers of this technique, applying it to a diverse range of innovative biological systems. My work has supported studies in plant root signaling (Candeo, *Plant Cell Physiol.*, 2017), cardiovascular disease and neuroscience in zebrafish (Romano, *PLoS Comput. Biol.*, 2017; Carra, *Int. J. Mol. Sci.*, 2022), tissue regeneration in Hydra (Iachetta, *Int. J. Dev. Biol.*, 2018), and intestinal

dysfunction in murine models (Candeo, J. Biomed. Opt., 2016). In addition to supporting applications, I have also contributed to the technical advancement of LSFM, developing novel modalities that include the use of alternative light sources (Calisesi, Biomed. Opt. Express, 2019) and customized illumination strategies (Pozzi, J. Biomed. Opt., 2024).

- a. Calisesi G, Castriotta M, Candeo A, Pistocchi A, D'Andrea C, Valentini G, Farina A, Bassi A. Spatially modulated illumination allows for light sheet fluorescence microscopy with an incoherent source and compressive sensing. *Biomed Opt Express*. 2019 Nov 1;10(11):5776-5788. PubMed Central PMCID: PMC6865118.
 - b. Candeo A, Doccula FG, Valentini G, Bassi A, Costa A. Light Sheet Fluorescence Microscopy Quantifies Calcium Oscillations in Root Hairs of *Arabidopsis thaliana*. *Plant Cell Physiol*. 2017 Jul 1;58(7):1161-1172. PubMed Central PMCID: PMC6383626.
 - c. Romano SA, Pérez-Schuster V, Jouary A, Boulanger-Weill J, Candeo A, Pietri T, Sumbre G. An integrated calcium imaging processing toolbox for the analysis of neuronal population dynamics. *PLoS Comput Biol*. 2017 Jun;13(6):e1005526. PubMed Central PMCID: PMC5479595.
 - d. Candeo A, Sana I, Ferrari E, Maiuri L, D'Andrea C, Valentini G, Bassi A. Virtual unfolding of light sheet fluorescence microscopy dataset for quantitative analysis of the mouse intestine. *J Biomed Opt*. 2016 May 31;21(5):56001. PubMed PMID: 27135065.
2. From the beginning of my research career, I have focused on the development and application of light sheet fluorescence microscopy (LSFM), particularly for plant biology. I contributed to the establishment of LSFM as an innovative tool for studying dynamic processes in plant tissues, with a specific emphasis on calcium signaling in the root apparatus. My contributions include designing and building the experimental LSFM system, developing a customized data analysis pipeline, and initiating international collaborations focused on root biology. These efforts enabled high-resolution, real-time imaging of calcium dynamics in plant roots, facilitating insights that were previously inaccessible with conventional techniques. I also took care of establishing international collaborations on plant root related projects. This work has resulted in several high-impact publications with international partners who have relied on our system and analytical capabilities.
- a. Alfieri A, Doccula FG, Pederzoli R, Grenzi M, Bonza MC, Luoni L, Candeo A, Romano Armada N, Barbiroli A, Valentini G, Schneider TR, Bassi A, Bolognesi M, Nardini M, Costa A. The structural bases for agonist diversity in an *Arabidopsis thaliana* glutamate receptor-like channel. *Proc Natl Acad Sci U S A*. 2020 Jan 7;117(1):752-760. PubMed Central PMCID: PMC6955363.
 - b. De Col V, Fuchs P, Nietzel T, Elsässer M, Voon CP, Candeo A, Seeliger I, Fricker MD, Grefen C, Møller IM, Bassi A, Lim BL, Zancani M, Meyer AJ, Costa A, Wagner S, Schwarzländer M. ATP sensing in living plant cells reveals tissue gradients and stress dynamics of energy physiology. *Elife*. 2017 Jul 18;6 PubMed Central PMCID: PMC5515573.
 - c. Candeo A, Doccula FG, Valentini G, Bassi A, Costa A. Light Sheet Fluorescence Microscopy Quantifies Calcium Oscillations in Root Hairs of *Arabidopsis thaliana*. *Plant Cell Physiol*. 2017 Jul 1;58(7):1161-1172. PubMed Central PMCID: PMC6383626.
 - d. Costa A, Candeo A, Fieramonti L, Valentini G, Bassi A. Calcium dynamics in root cells of *Arabidopsis thaliana* visualized with selective plane illumination microscopy. *PLoS One*. 2013;8(10):e75646. PubMed Central PMCID: PMC3797704.
3. I developed an innovative hyperspectral microscope based on a common-path interferometer, capable of both reflectance and fluorescence imaging (Candeo, APL Photonics, 2019). This system was subsequently upgraded to enable hyperspectral Raman imaging (Ardini, Optica, 2023), expanding its capabilities for label-free chemical characterization. Building on this platform, I contributed to the design of a portable hyperspectral camera for non-invasive, in situ analysis across a wide range of sample types. I further adapted the system to support multimodal imaging across scales, from macro to micro, and across large fields of view (Ardini, JPhys Photonics, 2024). These imaging technologies were applied particularly to the field of cultural heritage, including the analysis of historical paintings, dyed textiles, and biofilm growth on statues. My work contributed to advanced diagnostic tools for conservation science and material characterization (Candeo, Eur. Phys. J. Plus,

2022; Li, Anal. Chem., 2024).

- a. Li Z, Candeo A, Catelli E, Ghirardello M, Oliveri P, Manzoni C, Prati S, Comelli D, Sciutto G. Multimodal HSI Combined with Multiblock Data Fusion: A New Tool for the Study of Time-Dependent Alteration Processes in Dyed Textiles. Anal Chem. 2024 Dec 17;96(50):19939-19946. PubMed Central PMCID: PMC11657530.
 - b. Ardini B, Corti M, Ghirardello M, Di Benedetto A, Berti L, Cattò C, Goidanich S, Sciutto G, Prati S, Valentini G, Manzoni C, Comelli D, Candeo A. Enhancing hyperspectral imaging through macro and multi-modal capabilities. JPhys Photonics. 2024 June 03; 6(3). Available from: <https://iopscience.iop.org/article/10.1088/2515-7647/ad4cc5>
 - c. Candeo A, Ardini B, Ghirardello M, Valentini G, Clivet L, Maury C, Calligaro T, Manzoni C, Comelli D. Performances of a portable Fourier transform hyperspectral imaging camera for rapid investigation of paintings. The European Physical Journal Plus. 2022 March 30; 137(3):409. Available from: <https://doi.org/10.1140/epjp/s13360-022-02598-7> DOI: 10.1140/epjp/s13360-022-02598-7
 - d. Candeo A, Nogueira de Faria B, Erreni M, Valentini G, Bassi A, de Paula A, Cerullo G, Manzoni C. A hyperspectral microscope based on an ultrastable common-path interferometer. APL Photonics. 2019 December 01; 4(12). Available from: <https://doi.org/10.1063/1.5129860>
4. I have contributed to the development of advanced imaging platforms that combine light sheet fluorescence microscopy (LSFM) with microfluidics, enabling applications ranging from 3D bioprinting to imaging flow cytometry. In the context of 3D bioprinting, I developed a method for high-speed imaging of cells during the deposition of bioinks, allowing real-time monitoring of fluidic property variations. This approach opened new possibilities for the precision design of biomaterials used in tissue engineering and led to the filing of a UK patent (UK Patent Application No. 2001372.8). In the field of imaging flow cytometry, I contributed to the development of integrated microfluidic chips with embedded optical waveguides capable of delivering light-sheet and structured illumination. These systems enabled high-throughput super-resolution 3D reconstruction of single-cell samples in flow, offering significant advances for high-throughput cellular analysis. This work has supported the foundation of two major European research projects (MSCA-DN NEXTSCREEN, 2023; EIC TRANSITION Pathfinder NanoSCAN, 2023) and resulted in the filing of a second patent ("Engineered Microscope Slide", Application No. 812024000134077).
- a. Sala F, Paiè P, Candeo A, Ceccarelli F, Osellame R, Bassi A, Bragheri F. Femtosecond laser microfabrication of a fully-integrated optofluidic device for 3D imaging flow cytometry. Sci Rep. 2025 Apr 8;15(1):11950. PubMed Central PMCID: PMC11978988.
 - b. Paiè P, Calisesi G, Candeo A, Comi A, Sala F, Ceccarelli F, De Luigi A, Veglianese P, Muhlberger K, Fokine M, Valentini G, Osellame R, Neil M, Bassi A, Bragheri F. Structured-light-sheet imaging in an integrated optofluidic platform. Lab Chip. 2023 Dec 20;24(1):34-46. PubMed PMID: 37791882.
 - c. Moetazedian A, Candeo A, Liu S, Hughes A, Nasrollahi V, Saadat M, Bassi A, Grover LM, Cox LR, Poologasundarampillai G. Versatile Microfluidics for Biofabrication Platforms Enabled by an Agile and Inexpensive Fabrication Pipeline. Adv Healthc Mater. 2023 Oct;12(26):e2300636. PubMed Central PMCID: PMC11468497.
 - d. Poologasundarampillai G, Haweet A, Jayash S, Morgan G, Moore J, Candeo A. Real-time imaging and analysis of cell-hydrogel interplay within an extrusion-bioprinting capillary. Bioprinting. 2021 August 01; 23:e00144. Available from: <https://www.sciencedirect.com/science/article/pii/S2405886621000178> issn: 2405-8866
5. In my research, I designed and implemented a time-resolved spectroscopy system using a gated camera to study the optical properties of photocatalytic materials. This tool enabled detailed analysis of light-induced processes at high temporal resolution. Building on this foundation, I established a strong international collaboration focused on the characterization of catalytic materials, particularly zeolites, using advanced time-resolved techniques. Notably, this work led to the first application of confocal fluorescence lifetime imaging microscopy (FLIM) to the analysis of individual zeolite crystals

following operando experiments. These methods provide novel insights into the local optical and catalytic properties of materials under realistic working conditions.

- a. Omori N, Candeo A, Mosca S, Lezcano-Gonzalez I, Robinson IK, Li L, Greenaway AG, Collier P, Beale AM. Multimodal Imaging of Autofluorescent Sites Reveals Varied Chemical Speciation in SSZ-13 Crystals. *Angew Chem Int Ed Engl.* 2021 Mar 1;60(10):5125-5131. PubMed PMID: 33332715.
- b. Omori N, Greenaway A, Sarwar M, Collier P, Valentini G, Beale A, Candeo A. Understanding the Dynamics of Fluorescence Emission during Zeolite Detemplation Using Time Resolved Photoluminescence Spectroscopy. *J. Phys. Chem. C.* 2020 January 09; 124(1):531-543. Available from: <https://doi.org/10.1021/acs.jpcc.9b09050> DOI: 10.1021/acs.jpcc.9b09050
- c. Dozzi M, Candeo A, Marra G, D'Andrea C, Valentini G, Selli E. Effects of Photodeposited Gold vs Platinum Nanoparticles on N,F-Doped TiO₂ Photoactivity: A Time-Resolved Photoluminescence Investigation. *J. Phys. Chem. C.* 2018; 122:14326.

Complete List of Published Work in My Bibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/1Lkiz4JBfbAMIK/bibliography/public/>