ENRICO LATTUADA

RESEARCHER

PERSONAL

Date of birth:	28 April 1990
Place of birth:	Milan, Italy
Nationality:	Italian
Driving license:	Italian B

CONTACTS

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PROFESSIONAL AND RESEARCH INTERESTS

- Optical methods and their application to soft matter
- High performance computing with CUDA, C++, and Python
- Sedimentation and fluid dynamics
- Structure, dynamics, self-assembly, and phase-separation in complex fluids
- Research and Development, Physics and Chemistry laboratory

SOFT SKILLS

- Decision-making and problem-solving
- Project management
- Quick learner (and willing to learn)
- Data analysis
- Communication
- Work in teams
- Creativity

LANGUAGES

Italian — native

English — professional knowledge
B2 level - FCE, grade B

German — basic knowledge
A1 level - Sprachenzentrum, University of Vienna (AT)

WORK EXPERIENCE

Mar 2022 – present — **Lise Meitner Post-doctoral Research Fellow**
Faculty of Physics, University of Vienna, Vienna (AT) – Prof. Roberto Cerbino group
Project: Die Nichtgleichgewichtsphysik der kolloidalen Sedimentation
Keywords: sedimentation; non-equilibrium fluctuations; colloidal suspensions; Differential Dynamic Microscopy
Experimental: Study of non-equilibrium fluctuation in sedimenting colloidal suspensions using Differential Dynamic Microscopy with brightfield and confocal microscopy.
Management: Set up a new laboratory (optics, microscopy, chemistry).
Programming: Main developer of fastddm, a Python package wrapping C++/CUDA code, which allows the analysis of Differential Dynamic Microscopy experiments in seconds or minutes on CPU or GPU, compared to the several hours required by existing codes that perform similar tasks.

2016 – present — **Research co-Supervisor**
Co-supervision of ›20 international university students (graduate and post-graduate) from Polytechnic of Milan, La Sapienza University of Rome, University of Vienna, University of Milan, Massachusetts Institute of Technology (MIT), University of Guanajuato, Institute of Science and Technology (IST) Austria.

Dec 2018 – Feb 2022 — **Post-doctoral Research Fellow**
Department of Physics, La Sapienza University of Rome, Rome (IT) – Prof. Francesco Sciortino group
Feb 2021 – Feb 2022 — **Project: Gel di equilibrio di DNA**
Keywords: DNA nanostars; patchy particles; equilibrium gels; light scattering; Photon Correlation Imaging
Experimental: Study of spatially resolved local dynamics of DNA nanostars equilibrium colloidal gels using Photon Correlation Imaging.
Simulation: Coarse-grained molecular dynamics simulations of DNA nanostars using open-source software oxDNA.

Dec 2018 – Jan 2021 — Project: DNA-gel
Keywords: DNA nanostars; patchy particles; equilibrium gels; light scattering; Photon Correlation Imaging
Experimental: Design and assembly of a Photon Correlation Imaging (PCI) setup for spatially resolved blended imaging/scattering experiments. Feasibility study for the use of DNA nanostars gels for biomedical purposes, in collaboration with a biomedical group of CNR/La Sapienza Università di Roma/Sant'Andrea Hospital, Rome (IT).
Simulation: Coarse-grained molecular dynamics simulations of DNA nanostars using open-source software oxDNA.
Programming: Development of PCI analysis code in Python/C++/CUDA.

Jun – Oct 2015 — **Junior Research Intern**
Dept. of Chem., Mat. Sci. and Chem. Eng., Polytechnic of Milan, Milan (IT) – Prof. Roberto Piazza group

EDUCATION

Nov 2015 – Ott 2018 — **Ph.D. in Industrial Chemistry and Chemical Engineering**
Dept. of Chem., Mat. Sci. and Chem. Eng., Polytechnic of Milan, Milan (IT) – Prof. Roberto Piazza group
Thesis: Experimental study of the sedimentation of complex colloidal suspensions
Keywords: sedimentation; colloidal suspensions; gels; centrifugation; optical correlation techniques; velocimetry
Grade: with honors
Experimental: First experimental evidence of promoted sedimentation in systems of particles with strong mutual attractive interactions. Investigation of the settling velocity of binary colloidal suspensions, with focus on the Generalized Archimedes' principle applied to the dynamics, using standard (PIV, tracking) and advanced (Ghost Particle Velocimetry) velocimetry techniques. Compressive rheology study of depletion gels.
Programming: Development of code for experimental setup control (LabVIEW) and measurement analysis (MATLAB).

Oct 2012 – Apr 2015 — **Master of Science in Nuclear Engineering**
Polytechnic of Milan, Milan (IT) – Prof. Roberto Piazza group
Thesis: Experimental study of the sedimentation of complex colloidal suspensions
Track: Nuclear Systems Physics
Grade: 110 with honors

Sep 2009 – Sep 2012 — **Bachelor of Science in Energy Engineering**
Polytechnic of Milan, Milan (IT)
Track: Nuclear Engineering
Grade: 103/110

BIO

I am a Lise Meitner postdoc research fellow working in the Group of Roberto Cerbino at the Faculty of Physics of the University of Vienna. My research interests include the investigation of the structure and dynamics of complex colloidal suspensions using optical techniques and the development of high-performance codes for experiments analysis (using Python and C++/CUDA).

My doctoral work focused on the experimental study of the (natural and forced) sedimentation of particle suspensions and colloidal gels. My investigation of the settling velocity in colloidal suspensions provided the first experimental proof of the promoted sedimentation in suspensions with strong attractive interactions. The results obtained also helped to interpret in a new light the behavior of protein suspensions and the analysis of analytical ultracentrifugation data. As a side project, I also investigated the thermophoresis of amphiphilic block copolymers around the micellization temperature.

During my first postdoc, in Rome, I investigated the peculiar dynamic properties of equilibrium gels made of DNA nanostars – particles having multiple arms departing from a common central junction –, which are able to interact through sticky tips on the arms. The results I obtained proved that equilibrium gels are in fact homogeneous in space, contrarily to standard gels, which form heterogeneous networks.

My current project deals with the experimental study of the concentration and velocity fluctuations in settling and sedimented colloidal suspensions using advanced optical techniques (including Differential Dynamic Microscopy).

I am a highly motivated researcher who is always enthusiastic about contributing to research and development projects. I am eager to collaborate with interdisciplinary teams and am dedicated to continuous learning and improvement, actively striving to expand my knowledge and acquire new tools and skills to deliver high-quality work and make a positive impact.

CERTIFICATIONS AND TRAINING

ONLINE

Introduction to version control with Git	Microsoft Learn, 7 May 2023
GitHub fundamentals - Administration basics and product features	Microsoft Learn, 11 May 2023
3D Printing and Modeling for Beginners (MK3S+)	Prusa Academy, 6 Nov 2022
Fit4Funding – Your training on EU funding	Austrian FFG, Vienna (AT), 1 Jun 2022

SUMMER SCHOOLS

Machine Learning for Materials Hard and Soft	Erwin Schrödinger Institute, Vienna (AT), 11-22 Jul 2022
15th Bombannes Summer School on Scattering Applied to Soft Condensed Matter	Carcans-Maubuisson (FR), 20-28 Jun 2022
1st Summer School on Complex Fluid Flows in Microfluidics	University of Porto, Porto (PT), 10-14 Jul 2017

PUBLICATIONS

1. Interpenetrating gels in binary suspensions of DNA nanostars, E. Lattuada, T. Pietrangeli, F. Sciortino, *J. Chem. Phys.* **157**, 135101 (2022). DOI: 10.1063/5.0117047
2. Treatment of kidney clear cell carcinoma, lung adenocarcinoma and glioblastoma cell lines with hydrogels made of DNA nanostars, M. Leo, E. Lattuada, D. Caprara, L. Salvatori, A. Vecchione, F. Sciortino, P. Filetici, A. Stoppacciaro, *Biomater. Sci.* **10**, 1304 (2022). DOI: 10.1039/D1BM01643A
3. Spatially uniform dynamics in equilibrium colloidal gels, E. Lattuada, D. Caprara, R. Piazza, F. Sciortino, *Sci. Adv.* **7**, eabk2360 (2021). DOI: 10.1126/sciadv.abk2360
4. Hyperbranched DNA clusters, E. Lattuada, D. Caprara, V. Lamberti, F. Sciortino, *Nanoscale* **12**, 23003 (2020). DOI: 10.1039/D0NR04840B
5. DNA-GEL, novel nanomaterial for biomedical applications and delivery of bioactive molecules, E. Lattuada, M. Leo, D. Caprara, L. Salvatori, A. Stoppacciaro, F. Sciortino, P. Filetici, *Front. Pharmacol.* **11**, 1345 (2020). DOI: 10.3389/fphar.2020.01345
6. Thermophoresis in self-associating systems: Probing poloxamer micellization by opto-thermal excitation, E. Lattuada, S. Buzzaccaro, R. Piazza, *Soft Matter* **15**, 2140 (2019). Front Cover. DOI: 10.1039/C8SM02386G
7. Compressive yield stress of depletion gels with variable interaction strength, E. Lattuada, *Il Nuovo Cimento C* **42**, 226 (2019). URL: http://eprints.bice.rm.cnr.it/id/eprint/20669
8. Compressive yield stress of depletion gels from stationary centrifugation profiles, E. Lattuada, S. Buzzaccaro, R. Piazza, *J. Phys.: Condens. Matter* **30**, 044005 (2018). DOI: 10.1088/1361-648X/aaa2d1
9. Use of RAFT macro-surfers for the synthesis of transparent aqueous colloids with tunable interactions, U. Capasso Palmiero, A. Agostini, E. Lattuada, S. Gatti, J. Singh, C. T. Canova, S. Buzzaccaro, D. Moscatelli, *Soft Matter* **13**, 6439 (2017). DOI: 10.1039/C7SM01084B
10. Colloidal Swarms Can Settle Faster than Isolated Particles: Enhanced Sedimentation near Phase Separation, E. Lattuada, S. Buzzaccaro, R. Piazza, *Phys. Rev. Lett.* **116**, 038301 (2016). Synopsis. DOI: 10.1103/PhysRevLett.116.038301

FELLOWSHIPS AND AWARDS

Lise Meitner post-doctoral fellowship *FWF (Austrian Science Fund) – 177.980,00€*	2022
Best poster award *Italian Soft Days 3rd edition, Padua (IT)*	2018
Second best communication award *103rd National Congress of the Italian Physical Society, Trento (IT)*	2017
Doctoral scholarship *MIUR (Italian Ministry of Education, University, and Research)*	2015

SKILLS AND COMPETENCES

SCIENTIFIC PROGRAMMING

- **Python, C++, CUDA**
- MATLAB (MathWorks)
- LabVIEW (National Instruments)

CAD AND 3D PRINTING

- **Inventor** and **Fusion 360** (Autodesk)
- Solid Edge (Siemens), SOLIDWORKS (Dassault Systèmes)
- Prusa Slicer

IMAGE ANALYSIS

- Fiji ImageJ

OPERATING SYSTEMS

- Windows, Ubuntu Linux, MacOS

OFFICE SUITES

- **Microsoft Office (Word, Excel, PowerPoint)**, Apple iWork

OTHER TOOLS

- **LaTeX** (markup language)
- **Git** (Version Control System), **GitHub**
- Blender (3D graphics)
- Origin Pro (scientific graphing)

OTHER ACTIVITIES

Reviewer for *Journal of Physics: Condensed Matter*, *Soft Matter*, and *Papers in Physics*.