

# FABIO GUGLIETTA - CURRICULUM VITAE

(Updated on July 2024)

## PERSONAL DATA

Given and family name: Fabio Guglietta  
Date and place of birth: 8 June 1994, Rome (Italy)  
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## PROFESSIONAL EXPERIENCE

2023–today | **Researcher (RTDa)** (Tor Vergata University of Rome, Dept. of Physics, Italy)  
2021–2023 | **Postdoctoral researcher** (Helmholtz Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Forschungszentrum Jülich, Germany)  
2018–today | **Associate member of INFN** (Istituto Nazionale Fisica Nucleare, Italy)  
2018–2021 | **Graduate Research Fellow** (The Cyprus Institute, Cyprus)

## TEACHING EXPERIENCE

2024 | **Lectures Series on Kinetic Theory and Applications to Fluid Mechanics (Ph.D. Course)**  
Tor Vergata University of Rome (Italy)  
2023–2024 | **Statistical Mechanics I (Bachelor Course)**  
Tor Vergata University of Rome (Italy)  
2022–2023 | **Scientific Computing in Engineering II (Master Course)**, *teaching assistant*  
Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)  
2017–2019 | **Classical Electrodynamics (Bachelor Course)**, *teaching assistant*  
Tor Vergata University of Rome (Italy)

## SCIENTIFIC EDUCATION

03/2022 | **Joint PhD** (Marie Skłodowska-Curie fellowship)  
*Topic:* theoretical and computational physics  
*Institutions:* Tor Vergata University of Rome, The Cyprus Institute, RWTH Aachen University  
*Thesis title:* Mesoscale investigations on the effects of membrane viscosity on transient red blood cell dynamics  
*Supervisors:* Prof. Mauro Sbragaglia, Prof. Giannis Koutsou, Prof. Marek Behr  
11/2018–11/2021 | European Joint Doctorate in theoretical and computational physics  
03/2021–05/2021 | **Secondment at NVIDIA** (Jülich Applications Lab)  
*Topic:* implementation of Eulerian simulations of blood dynamics on GPUs  
*Supervisor:* Jiri Kraus.  
07/2018 | **Master's degree**  
*Topic:* theoretical physics  
*Institution:* Tor Vergata University of Rome  
*Grade:* 110/110 (cum laude)  
*Thesis title:* Probabilistic cellular automata in statistical mechanics on GPU computing platforms  
10/2016–07/2018 | Studies of theoretical physics at Tor Vergata University of Rome  
2018 | **Visiting Student** (Cranfield University)  
2016–2017 | **Stage** (Research activity in Theoretical Physics)  
*Topic:* Irreversible dynamics on one dimensional Ising-type spin system  
*Institution:* Tor Vergata University of Rome  
10/2016 | **Bachelor's degree**

## PUBLICATIONS

Corresponding author is indicated with \*.

9. D. Taglienti, **F. Guglietta\*** and M. Sbragaglia (2024). Droplet dynamics in homogeneous isotropic turbulence with the immersed boundary-lattice Boltzmann method. *Physical Review E*, 110, 015302.
8. D. Simeoni\*, G. Parise, **F. Guglietta**, A. R. Rossi, J. Rosenzweig, A. Cianchi, M. Sbragaglia (2024). Lattice Boltzmann method for warm fluid simulations of plasma wakefield acceleration. *Physics of Plasmas*, 31(1), 013904.
7. **F. Guglietta\***, F. Pelusi, M. Sega, O. Aouane and J. Harting (2023). Suspensions of viscoelastic capsules: Effect of membrane viscosity on transient dynamics. *Journal of Fluid Mechanics*, 971, A13.
6. F. Pelusi\*, **F. Guglietta**, M. Sega, O. Aouane, J. Harting (2023). A sharp interface approach for wetting dynamics of coated droplets and soft particles. *Physics of Fluids*, 35(8): 082126.
5. D. Taglienti\*, **F. Guglietta** and M. Sbragaglia (2023). Reduced model for droplet dynamics in shear flows at finite capillary numbers. *Physical Review Fluids*, 8(1), 013603.
4. G. Parise\*, A. Cianchi, A. Del Dotto, **F. Guglietta**, A. R. Rossi and M. Sbragaglia (2022). Lattice Boltzmann simulations of plasma wakefield acceleration. *Physics of Plasmas*, 29(4), 043903.
3. **F. Guglietta\***, M. Behr, L. Biferale, G. Falcucci and M. Sbragaglia (2021). Lattice Boltzmann simulations on the tumbling to tank-treading transition: effects of membrane viscosity. *Philosophical Transactions of the Royal Society A*, 379(2208), 20200395.
2. **F. Guglietta\***, M. Behr, G. Falcucci and M. Sbragaglia (2021). Loading and relaxation dynamics of a red blood cell. *Soft Matter*, 17(24), 5978-5990. ISO 690
1. **F. Guglietta\***, M. Behr, L. Biferale, G. Falcucci and M. Sbragaglia (2020). On the effects of membrane viscosity on transient red blood cell dynamics. *Soft Matter*, 16(26), 6191-6205.

## RESEARCH INTEREST

My research interest mainly concerns the study of the dynamics of viscoelastic *capsules* and *droplets* immersed in Newtonian *fluids*. I developed a code to numerically investigate such systems by using algorithms based on the hybrid *immersed boundary - lattice Boltzmann (IBLB) method* to simulate the fluid and to handle the fluid-structure interaction. I also parallelised this code both on CPUs (by using *MPI*) and on GPUs (by using *CUDA* language). I have also worked on numerical lattice Boltzmann (LB) simulations to reproduce *plasma wakefield acceleration* experiments: we mainly studied the diffusion effects introduced by the LB method which have not been considered so far with other standard numerical solvers employed in the plasma acceleration community. Recently, I have also taken part in a project to investigate the *hydrodynamic properties of some ancient naval rams* that were used during the first Punic war (3rd century BC): since both Roman and Punic naval rams have been found on the seabed, my task is to provide a hydrodynamic characterisation of them to understand which of these two types is more suitable for navigation.

## COMPUTER SKILLS

<b>Operating systems</b>	Linux, macOS and Microsoft Windows ( <i>expert user</i> ).
<b>Programming languages</b>	Fortran, C, awk, Python ( <i>expert user</i> ); Julia ( <i>user</i> ).
<b>Parallel computing</b>	MPI, OpenMP, CUDA C, CUDA Fortran ( <i>expert user</i> ).
<b>Open source libraries</b>	LAPACK, BLAS ( <i>user</i> ).
<b>Visualisation software</b>	gnuplot, paraview ( <i>expert user</i> ).
<b>Packages</b>	Office, LibreOffice, L <sup>A</sup> T <sub>E</sub> X( <i>expert user</i> ).

## AWARDS, FUNDING & FELLOWSHIP

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- 2022 | - GCS grant, from Jülich Supercomputing Centre (JSC), Forschungszentrum Jülich, Germany  
Title: An extended immersed boundary lattice Boltzmann method for wetting dynamics of Ga<sub>2</sub>O<sub>3</sub> droplets and dynamics of viscoelastic dense suspensions (POLPS) - Awarded 30M core-hours.
- 2019 | - Funding from Tor Vergata University of Rome for “Detailed Simulation of Red blood Cell Dynamics accounting for membrane viscoelastic properties” (SorCeReS, CUP No. E84I9002470005),  
“Beyond Borders 2019” call (PI: Prof. G. Falcucci).
- 2018 | - Fellow of the “Simulation in Multiscale physical and biological systems” (STIMULATE)  
European joint doctorate under the European Union’s Horizon 2020 research  
and innovation programme, grant agreement No. 765048.

## CONTRIBUTED PRESENTATIONS, POSTERS & SCHOOLS

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- 2024 | - Discrete Simulations in Fluid Dynamics (DSFD) 2024, Zurich, Switzerland (Talk)  
- Helmholtz Institute Erlangen-Nürnberg for Renewable Energy (IEK-11) (**Invited Talk**)  
- Computational and Mathematical Biomedical Engineering (CMBE24), Arlington, USA (Talk)  
- Società Italiana di Fisica Statistica - Young Seminars (SIFS), online (**Invited talk**)
- 2023 | - APS 76th Annual Meeting of the Division of Fluid Dynamics, Washington, USA (Talk)  
- Dynamics of Capsules, Vesicles and Cells in Flow (DynaCaps) 2023, Compiègne, France (Talk)  
- International Conference of Rheology (ICR) 2023, Athens, Greece (Talk)  
- A day on Statistical Physics for Machine Learning, Rome, Italy (School)
- 2022 | - Discrete Simulations in Fluid Dynamics (DSFD) 2022, Suzhou, China (Talk)  
- DPG Meeting of the Condensed Matter Section, Regensburg, Germany (Talk)  
- 14th European Fluid Mechanics Conference (EFMC), Athens, Greece (Talk)
- 2021 | - Discrete Simulations in Fluid Dynamics (DSFD) 2021, Viterbo, Italy (Talk)  
- Conference on Multiscale Physical and Biological Systems 2021, Paphos, Cyprus (Talk)
- 2020 | - Discrete Simulations in Fluid Dynamics (DSFD) 2020, Viterbo, Italy (Talk)  
- Machine and Reinforcement Learning, Rare Events and Tensor Networks, Rome, Italy (School)  
- Fields and Particles in Turbulence, Rome, Italy (Talk)
- 2019 | - APS: Discrete Fluid Dynamics (DFD) 2019, Seattle, USA (Talk)  
- Discrete Simulations in Fluid Dynamics (DSFD) 2019, Bangalore, India (Talk)  
- Multiscale, multilevel algorithms and uncertainty quantification, Wuppertal, Germany (School)  
- Mathematical Modeling and Numerical Analysis for Exascale, Berlin, Germany (School)  
- School on Computational Modelling, Geilo, Norway (School)  
- School on Fundamentals of Data Science, Ferrara, Italy (School)  
- Young Researcher Meeting (YRM) 2019, Rome, Italy (Poster)
- 2018 | - Workshop in High performance computing and simulation, Jülich, Germany (School)

## ORGANISATION OF CONFERENCES/WORKSHOPS/SCHOOLS

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- 2024 | - Modeling and applications of bioparticle transport in blood flow simulations  
at the microscale (at CMBE24), Arlington, USA (Symposium)
- 2020 | - Machine and Reinforcement Learning, Rare Events and Tensor Networks, Rome, Italy (School)

## STUDENTS SUPERVISION

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- 2021 | - Diego Taglienti: Master Thesis in Physics, University of Rome “Tor Vergata”.  
- Gianmarco Parise: Master Thesis in Physics, University of Rome “Tor Vergata”.
- 2019 | - Diego Taglienti: Bachelor Thesis in Physics, University of Rome “Tor Vergata”.

## PEER REVIEW

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Scientific Reports - *Nature*, Communications Physics - *Nature*, European Physical Journal E, Soft Matter - *The Royal Society of Chemistry*, Microfluidics and Nanofluidics, International Journal of Multiphase Flow, Journal of Computational Science, International Journal of Modern Physics C, Computers & Mathematics with Applications, Mathematics and Computers in Simulations, Computer Methods in Applied Mechanics and Engineering.