TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

DIPARTIMENTO DI FISICA

Luca Biferale (he/his/him)
Born August 12, 1965, in Imperia (Italy)
Married, two children (born 1996 and 2000)
web: http://biferale.web.roma2.infn.it/
Researcher unique identifier: ResearcherID: L-4535-2013

EDUCATION

Mar. 1993 PhD. Univ. of Rome Sapienza. Title: Anomalous scaling laws in fully developed turbulence.
Mar. 1989 Master in Physics, Univ. of Rome Tor Vergata.

CURRENT POSITION: **Full Professor** (since 2014) of Theoretical Physics, Mathematical and Numerical Modelling, Dept. Physics, University of Rome Tor Vergata, Italy.

OTHER POSITIONS

05/2020-04/2022	Scientific Expert, **Italian Embassy in Paris**, France
01/2019 & 01/2020	Visiting Professor at **SUSTech** (Shenzhen, China)
03/2016	Visiting Professor at **Johns Hopkins University** (Baltimore, USA)
2011	Visiting Professor at **Technische University Eindhoven** (The Netherlands)
06/2011 & 07/2012	Visiting Professor at **Observatory of Nice** (France)
07/2008	Visiting Scientist at **University of Chicago** (USA)
06/2006-07/2006	Visiting Professor at **Johns Hopkins University** (Baltimore, USA)
01/2005-03/2014	Associate Professor, Dept. Physics, **University of Rome** Tor Vergata (Italy)
01/1995-12/2004	Researcher, Dept. of Physics, **University of Rome** Tor Vergata (Italy)
02/1993-12/1994	Marie Curie and H. Poincare Post-doc fellow, **Observatory of Nice** (France)
06/1989-12/1989	Fellow **European Centre Scientific & Engineering Computing**, IBM (Italy)

FELLOWSHIPS/HONOURS/AWARDS/MAIN GRANTS

2022-present	Member of **ITATEC** – Accademia di Ingegneria e Tecnologia
2021-2026	**European Research Council** Advanced Grant 'Smart-TURB', PE8
2014-2019	**European Research Council** Advanced Grant 'NewTURB', PE8
2015	**Outstanding Referee** Physical Review Journals
2010	**Elected Fellow**. **EUROMECH** Society, division of *Fluid Dynamics*
2008	**Elected Fellow**. **APS**, division of *Statistical and Nonlinear Physics*
1986/87/88/89	Distinguished undergraduate student. Awarded by **Acc. Nazionale dei Lincei** (Italy)

GRADUATE STUDENTS AND POSTDOC [only those hired by me]

Ph.D (Total 21) ongoing: C. Calascibetta, D. Capocci, F. Fossella, A. Freitas
Post-doc (Total 20): I. Daumont, B. Devenish, A.S. Lanotte, G. Manzi, E. Foard, G. Sahoo, F. Bonaccorso, S.K. Malapaka, K. Gustafsson, M. Linkmann, M. Buzzicotti, M. De Pietro, P. Clark di Leoni, Q. Ni, R. Scatamacchia, I. Mazzitelli, R. Heinonen, T. Li, L. Piro. F. Guglietta.

SCIENTIFIC ACTIVITY (key words): Complex fluids. Turbulence. Multifractals. Machine-Learning. Reinforcement Learning. Microfluidics and Biofluidic. Lattice Boltzmann equations, Dynamical Systems. Information Theory. Stochastic Processes. Renormalization Group. Monte Carlo methods.

Key numbers (scientific impact, Google Scholar)
Number of published papers: 280+ (1 PhysComm, 2 PhysRep; 1 ARFM; 2 PRX; 29 PRL; 57 PRE+PRFuids)
Hirsch-index (H): 55
m-index (H/# years after PhD): **1.80**
i10-index (# publications with more than 10 citations): **170+**
Citations (total): 11000+; Citations (2022): 1010

Prof. Luca Biferale
Dept. Physics, University of Rome Tor Vergata
Via della Ricerca Scientifica, 1 – 00133 Roma
http://biferale.web.roma2.infn.it/

biferale@roma2.infn.it
biferale@gmail.com

Ph. +39 0672594595
Cel. +39 3496494879

TEACHING EXPERIENCE

Undergraduate. Dept. Physics (DP) and Faculty Mech. Engineering (ME) U. Rome Tor Vergata: Mathematical Methods for Physics (DP); Dynamical Systems (DP); Turbulence and Complex Fluids (ME), Quantum Mechanics (DP), Statistical Mechanics (DP), Computational Physics (DP).
Postgraduate. Faculty of Engineering, U. Rome La Sapienza: Turbulence (short course, 2000); Royal Institute of Technology Stockholm (SE): Lagrangian and Eulerian Turbulence (short course, 2012); Dept. Physics University Hong Kong (CN): Modern problems in turbulence (short course, 2003); SUSTech (CN): Statistical Turbulence (short course, 2019 & 2020)

MEMBER STEERING/ORGANISING COMMITTEES [most recent only]

- First Bilateral Workshop **Smart-TURB/Smart-HEART**, Farnetta, Italy 2023
- Workshop on **Challenges and Benchmarks for quantitative AI in Complex Fluids and Complex Flows**, Centro Enrico Fermi, Rome, Italy 2022
- HPC applications to Turbulence and Complex Flows (**EJD-Stimulate School**). Rome, Italy 2020
- **HPC-LEAP** Conference. Cambridge, UK 2018
- **FSIM-2017**: Fluid and structures: interactions and modeling (COST meeting). Naples, Italy 2017
- HPC applications to Turbulence and Complex Flows (**EJD-HPCLEAP School**). Rome, Italy 2016
- **FlowMat 2015** Flowing Matter Across Scales (ERC & COST meeting). Rome, Italy 2015
- Workshop on **Instantons and Extreme Events in Turbulence** (IMPA). Rio de Janeiro, Brazil 2015
- **9th European Fluid Mechanics Conference** (EFMC9). Rome, Italy 2012
- Program on **New Directions in Turbulence**. Kavli Institute of Theoretical Physics (KITPC), Beijing, China 2012
- **Breakup of small aggregates in turbulence** (COST meeting). Rome, Italy 2011
- **Numerical issues in Lagrangian and Eulerian Turbulence** (COST meeting). Rome, Italy 2010
- **Discrete Simulations of Fluid Dynamics** 19th, DSFD2010 Conference. Rome, Italy 2010

INSTITUTIONAL RESPONSIBILITIES

2023	Committee Fluid Dynamics Prize, APS-DFD
2021-present	Institutional Relations Manager **ERCinItaly**
2023-2027	Supervisory Board, **European Joint Doctorate AQTIVATE** - Advanced computing, Quantum algorithms and data-driven Approaches for science, Technology and Engineering
2020-2021	Chairman elected, and Chairman Nominating Committee APS Division Fluid Mechanics
2018-2022	Supervisory Board, **European Joint Doctorate STIMULATE** - Simulation in Multiscale physical and biological systems
2014-2019	Supervisory Board, **European Joint Doctorate** HPC-LEAP
2014-2018	Managing Committee, **COST Action** *Flowing Matter* ESF
2017	Access Committee, **PRACE** (Partnership Advancing Computing in Europe).
2017	Scientific Board, **European Open Science Cloud for Research Pilot Projects** (EOSC).
2015-2018	**Executive Committee**. Dept. Physics University of *Tor Vergata*, Rome (Italy)
2014-2021	EUROMECH Fluid Mechanics Prize and Fellow Committee
2013-2019	Director, **CAST** (Inter-department Centre for Applications of Calculus to Science and Technology), Univ. *Tor Vergata,* Rome (Italy)
2013-2017	Physical Science Working Group **(European Space Agency)**
2013-2017	Steering Committee, **European High Performance Infrastructure in Turbulence**. EU
2012-2017	Scientific Committee, High Performance Computing Centre **CINECA**, Bologna (Italy)
2013-present	**Doctoral Studies Committee**, Dept. Physics Univ. *Tor Vergata*, Rome (Italy)
2008-2013	Financial Rapporteur & Managing Committee, **COST Action** *Particles in Turbulence*. ESF
2007-2009	Coordinator **ERASMUS** Project, Dept. Physics Univ. *Tor Vergata,* Rome (Italy)
2004-2009	**Euromech** board, **European Turbulence Conference**
2006-2016	National Coordinator, **Scientific Initiatives** *Particles and Fields in Turbulence* INFN (Italy)

Prof. Luca Biferale
Dept. Physics, University of Rome Tor Vergata
Via della Ricerca Scientifica, 1 – 00133 Roma
http://biferale.web.roma2.infn.it/

biferale@roma2.infn.it
biferale@gmail.com

Ph. +39 0672594595
Cel. +39 3496494879

MEMBERSHIPS OF SCIENTIFIC SOCIETIES/INSTITUTIONS [only those still active]
INFN (National Institute of Nuclear Physics)**; EUROMECH** (European Mechanics Society); **APS** (American Physical Society); **CECAM** (Centre Européen de Calcul Atomique et Moléculaire), **ELLIS** (European Laboratory for Learning and Intelligent Systems)

EDITORIAL AND REVIEWING ACTIVITIES

2020-present Editorial Board, **Physical Review E**
2007-2013 Divisional Associate Editor, **Physical Review Letters** (Fluid Mechanics)
2004-2018 Associate Editor, **Journal of Turbulence**
2011-present Editorial Board, **European Journal of Physics E** (EPJE)
2018-2019 Editorial Board, **Entropy**
2007-2011 Editorial Board, **European Journal of Physics B** (EPJB)

Evaluator for (only major): Italian Ministry of Research (**MUR**), European Science Foundation (**ESF**), European Research Council (**ERC**), **US-Israel** binational science foundation. Italian Supercomputing Resources Allocations (**ISCRA**); Partnership for advanced computing in Europe (**PRACE**). **Italian-French** University. **ETH** Zurich. **Agence Nationale** de la **Recherche** (France). European Cooperation in Science and Technology (**COST**).

FUNDING [only most important > 20 Keuro, as PI or local PI]

2023-2026	PRIN2022	107 Keuro
2022-2026	FARE (Smart-HEART, MUR)	384 Keuro
2022-2026	MSCA-EU European Joint Doctorate (AQTIVATE, H2020)	260 Keuro
2021-2026	ERC AdG (Smart-TURB, H2020)	2248 Keuro
2018-2022	MSCA-EU European Joint Doctorate (Stimulate, H2020)	515 Keuro
2014-2019	MSCA-EU European Joint Doctorate (HPC-LEAP, H2020)	515 Keuro
2014-2019	ERC AdG (NewTURB, FP7)	1986 Keuro
2013-2017	European High Performance Infrastructure in Turbulence (EuHIT, FP7)	320 Keuro
2006-2016	National Coordinator Iniziativa Specifica (FieldTURB-INFN)	~100 Keuro
2006	Advanced Project "Non-Newtonian Fluids" (CNISM)	~50 Keuro
2000-2004	Training and Research Network (Nonideal Turbulence, FP5)	~200 Keuro

HIGH PERFORMANCE COMPUTING (HPC) [Only major grants]: ***Fractal Turbulence*** (22MH, PRACE 2012). ***Monte-Carlo methods for instantons in Turbulence*** (13MH INFN 2012). ***Multiphase systems in porous media*** (10MH PRACE 2013). ***Turbulence under Rotation*** (55MH PRACE 2014). ***Homogeneous and Anisotropic Turbulence*** (27MH PRACE 2015). ***Superfluid Turbulence under counter-flows*** (22MH PRACE 2016). ***Instantons and Intermittency in Hydrodynamic Turbulence: A Lattice Monte Carlo Approach*** (18MH PRACE 2017). **Inverse and direct cascades in rotating turbulent flows** (60MH PRACE 2018). **Smart-TURB: data assimilation of Eulerian and Lagrangian Turbulent Flows by Machine Learning**. (6MH EuroHPC 2022)

EDITOR SPECIAL ISSUES *Discrete simulation of fluid dynamics: applications* Phil. Trans. Royal Soc. A **369**, 2384 (2011) and Phil. Trans. Royal Soc. A **369**, 2152 (2011). *Fluids and Structures, multiscale coupling and modeling.* Eur. Phys. J. E. **42**, 3 (2018). *Multi-scale phenomena in Complex Flows and flowing Matter*, Eur. Phys. J. E **39**, 56 (2016).

Prof. Luca Biferale
Dept. Physics, University of Rome Tor Vergata
Via della Ricerca Scientifica, 1 – 00133 Roma
http://biferale.web.roma2.infn.it/

biferale@roma2.infn.it
biferale@gmail.com

Ph. +39 0672594595
Cel. +39 3496494879

INVITED: COLLOQUIUM (C), **PLENARY** (P), **LECTURES** (L) [**most significant only, >100 in total, see web page]**:

-Data-driven and Equations-Informed tools for modeling turbulent flows. StatPhys 2023 Tokyo, Japan 2023 (P).
-ML tools for PDEs and PDEs tools for ML. Ellis-ESA Workshop 'Quantum Algorithms and Machine Learning for huge Data-Analysis, Simulations and Potential Earth Observation Applications', online 2021 (L).
-Equations-Informed and Data-Driven Tools for Data Assimilation and Data Classification of Turbulent Flows, Discrete Simulations Fluid Dynamics International Conference, Viterbo, Italy, 2020 (P).
-Nudging, Hybrid Monte Carlo, Smart particles: new tools for old problems. Workshop on *Perspectives in Turbulence* Texas A&M, USA 2018 (L).
-Cascades in turbulent flows. COST Conference. *Flowing Matter* Lisbon, Portugal 2018 (P).
-Flow navigation by smart particles via Reinforcement Learning. *Physics-Informed Machine-Learning* Conference, Santa Fe, USA 2018 (L).
-Lagrangian power statistics and irreversibility in turbulence. *Geometrical and Statistical Fluid Mechanics* Simons Centre Workshop, Stony Brook, USA 2017 (L).
-Anomalous scaling in turbulence with direct and/or inverse energy cascades. *Turbulent Dissipation Mixing and Predictability* Workshop IPAM Los Angeles, USA 2017 (L).
-Convection in complex flows and boundary conditions. *International Conference on Rayleigh Bénard convection*, Gottingen, the Netherlands 2015 (L).
-Panta rei. *Multiscale Institute Colloquium*, Eindhoven, The Netherlands, 2015 (C).
-Droplets and Bubbles in Turbulence. *Discrete Simulations of Fluid Dynamics* International Conference, Fargo, USA 2011 (P).
-Caustics & Intermittency in inertial particles velocities in turbulence. *International Symposium on Turbulence*, Beijing, China 2009 (L).

Prof. Luca Biferale
Dept. Physics, University of Rome Tor Vergata
Via della Ricerca Scientifica, 1 – 00133 Roma
http://biferale.web.roma2.infn.it/

biferale@roma2.infn.it
biferale@gmail.com

Ph. +39 0672594595
Cel. +39 3496494879