

LUCA RIDOLFI – Curriculum Vitae

born on 08/12/1963

Professor of Hydraulics and Fluid Mechanics

Dept. Environmental, Land, and Infrastructure Engineering - Politecnico di Torino (Italy)

Education and Academic Record: *Master Degree* in Water Engineering, Politecnico di Torino (1988), *Assistant Professor* of Hydraulics, Politecnico di Torino (1989-1998); *Visiting Professor*, Dept. Civil and Environmental Engineering, Texas A&M University-USA (1997); *Associate Professor* of Hydraulics, Politecnico di Torino (1998-2001); *Visiting Professor*, Dept. Civil and Environmental Engineering, Princeton University-USA (1998-1999); *Full Professor* of Hydraulics and Fluid Mechanics, Politecnico di Torino (2001-present); *Visiting Professor*, Dept. Environmental Sciences, University of Virginia-USA (2005).

Teaching Activity: Teaching portfolio includes master-degree courses in *Hydraulics*, *Fluid Mechanics*, *Environmental Fluid Mechanics*, *Hydrology*, *Water Resources Planning and Management*, *Hydraulic Measures*, *Irrigation techniques*.

Moreover, I teach PhD courses about *Transport Processes in Fluids* and *Cardiovascular Fluid Mechanics*.

Advising Activity: I have advised 32 PhD students and more than 150 Master Thesis at Politecnico di Torino. Moreover, I have co-advised PhD students at the University of Genoa, University of Padua, University of Trento, and Politecnico di Milano.

Referee Activity: I have served as reviewer for a number of reputable peer-reviewed journals including: *Water Resources Research*, *Advances in Water Resources*, *Journal of Hydrology*, *Nonlinear Processes in Geophysics*, *Journal of Fluid Mechanics*, *Physics Review Letters*, *Journal of Geophysical Research*, *Physics of Fluids*, *Geophysical Research Letters*, *Proceedings of the Royal Society A*, *Physical Review E*, *Journal of Theoretical Biology*, *Europhysics Letters*, *Environmental Research Letters*.

Academic Assignments: *Head*, Department of Water, Transport and Infrastructure Engineering, Politecnico di Torino, 2004-2011. *Coordinator*, Doctorate in Water Engineering, Politecnico di Torino, 2000-2007. *Coordinator*, Doctorate in Environmental Engineering, Politecnico di Torino, 2012-2014, *Coordinator*, Doctorate in Civil and Environmental Engineering, Politecnico di Torino, 2014-present. *Board member*, Doctorate School, Politecnico di Torino (2000-present). *Board Member*, Committee for the Strategic Plan of Politecnico di Torino (2015-2016). *Board Member*, Biomedical Inter-Departmental Center, Politecnico di Torino (2017-present). *President*, National Committee for the Scientific Assessment of the Associate and Full Professors in Fluid Mechanics, Hydrology, and Water Engineering (2013-16). *Board Member*, Italian Water Engineering Group (2006-2008).

Service Activities: *Member*, Committee for the Dam Planning in the Northwest Italy (2004-present). *Member*, Committee for the Small-Hydropower Development in the Alpine Region, (2008-present). *Didactic Coordinator*, Hydroaid: International School "Water for Development", organized by the Italian Ministry of Foreign Affairs, Turin, Italy (2002-2004). *Scientific Advisor*, Flood Forecasting Piedmont Region, Italy (1998-2004). *Scientific Advisor*, Hydraulic behavior of water distribution networks and urban drainage systems, SMAT (Water Utility Company of Turin) (2009-present). *Scientific Advisor*, Alpine Stream Research Center (ALPSTREAM), Parco del Monviso (2018-present). *Scientific Advisor*, PoliToBIOMed Lab, Inter-departmental Research Centre in Biomedical Engineering at Politecnico di Torino (2018-present).

Research Record

My scientific activity has been – and still is – inspired by the awareness that natural phenomena are always complex and only a study from multiple viewpoints can lead to a substantial step forward in their understanding. I have found that the development of new knowledge greatly benefits from the cooperation and discussion with scientists from different research fields. This approach has driven my research towards new scientific areas, giving me the opportunity to learn and (sometimes) make some contributions.

I have authored or co-authored more than 270 articles, including 220 papers published on ISI peer-reviewed journals. The corresponding scientific productivity bibliometric indices are (Scopus, on 02/11/2020): citations= 8800, H-index=49.

I have also co-authored two books:

- Bellomo N., Lods B., Revelli R., Ridolfi R. (2008) *Generalized Collocation Methods*, Birkhauser, Boston;
- Ridolfi L., D'Odorico P., Laio F. (2011) *Noise-induced phenomena in Environmental Sciences*, Cambridge Univ. Press, New York;

and two invited book chapters:

- Laio F, Ridolfi L (2013) Dynamical systems driven by dichotomous noise, In *Bounded noise in Physics, Biology, and Engineering*, D'Onofrio A, Ed., Birkhauser, Boston.
- Camporeale C, Perona P, Ridolfi L (2019) Hydrological and geomorphological significance of riparian vegetation in dryland, In *Dryland ecohydrology* D'Odorico P, Porporato A, Eds., Springer.

Main scientific interests and specific topics dealt with

Fluid Mechanics: wall turbulence, canopy turbulence, complex network-based analysis of turbulent flows, heterogeneous porous media, well hydraulics, open channel flows, sediment transport, climate teleconnections.

Bio-fluid mechanics: fluid mechanics of the arterial tree, impact of atrial fibrillation on the systemic and cerebral fluid mechanics, multiscale (0D-1D) numerical modelling of arterial hemodynamics, complex network-based analysis of hemodynamics signals (NIRS, heart arrhythmias and cerebral flow patterns), hemodynamics and microgravity, bacterial biofilm dynamics in porous media.

Stochastic processes: dichotomous noise- and shot noise-driven processes, mean first passage times in stochastic processes, noise-induced phase transitions, noise-induced spatial pattern formation in water-dependent ecosystems, noise-induced (and -sustained) biodiversity, species competition/cooperation under random forcing.

Mathematical methods: spectral methods for highly non-linear partial differential equations, Taylor-Galerkin methods for non-linear waves, parabolic inverse problems with unknown source, reconstruction of differential models from time series, modal and non-modal stability analysis.

Hydrology: Flood forecasting, chaos theory and water cycle at the watershed scale, multivariate non-linear flow prediction, non-linear time series analysis, snow hydrology.

Eco-hydrology: coupling between water cycle and plant biosphere, stochastic soil water balance, vegetation water stress under random water availability, water-controlled soil emissions of biogenic gases, hydrologic controls on plant root distribution, plant water uptake strategies to cope water stress, impact of climate change on plant ecosystems, spatial vegetation patterns.

Quantitative geomorphology: meandering river geomorphology, impact of damming in river geomorphology, integral-differential modelling of river morphodynamics, dune/antidune dynamics modelling, ice/snow morphodynamics, karst morphodynamics.

River bio-geography: riparian plant ecosystems, impact of stream-driven stochasticity on riparian vegetation dynamics, coupling between river morphodynamics and riparian vegetation patterning.

Hyporheic corridor: transport processes and chemical zonation in fluvial corridors, hyporheic flows during flood events, meander-driven hyporheic flows, impact of stage stochasticity on hyporheic corridor, effect of basin landscape on hyporheic complexity, biofilm dynamics in fluvial sediments.

Water distribution networks: complex network-based metrics for the planning and management of water distribution networks, novel metrics for network segmentation, management of mountain aqueducts.

Virtual water trade: impact of virtual water trade on the societal resilience to water crisis, world virtual water trade dynamics, complex network approach to water-food nexus, trade community detection, novel metrics for environmental impacts of water withdrawals, geopolitics implications of water globalization.

Economic complexity: complex network approach to economic complexity metrics, novel multidimensional metrics.

Major international collaborations in Hydraulics and Fluid Mechanics

Amilcare Porporato (Princeton Univ.), Paolo D'Odorico (University of California, Berkeley), Ignacio Rodriguez-Iturbe (Texas A&M Univ.), Aaron Packman (Northwestern Univ.), Paolo Perona (Univ. of Edinburgh), Günter Langergraber (Boku Univ.), Hans Kuerten (Univ. of Eindhoven), Pietro Salizzoni (École Centrale de Lyon).

Major interdisciplinary collaborations

Stochastic processes

David Cox (Magdalen College, Univ. of Oxford)

Bio-fluid mechanics

Fiorenzo Gaita, Matteo Anselmino, Andrea Saglietto (Dept. Cardiology, Univ. Hospital “Molinette”, Turin)

Franco Veglio and Alberto Milan (Dept. Internal Medicine, University Hospital “Molinette”, Turin)

David Steinman (Biomed. Simulation Lab., Univ. of Toronto)

Eco-Hydrology/Eco-Hydraulics

Pierluigi Viaroli (Dept Chemical, Life, Env. Sustan. Sciences, University of Parma)

Stefano Fenoglio, Francesca Bona (Dept. Environ. Life Sciences, University of Torino)

Maria Cristina Bruno (Department of Sustainable Agro-ecosyst. and Bioresources, Fondazione Edmund Mach)

Complex systems

Guido Chiarotti (SISSA, Trieste)

National and international acknowledgments

“*Arturo Parisatti*” *International Prize* (1996), awarded by the “Istituto Veneto di Scienze, Lettere ed Arti”, Venice (Italy), for the paper “Nonlinear analysis of river flow time sequences” by Amilcare Porporato and Luca Ridolfi.

Visiting Professor at Texas A&M University (1997), Princeton University (1998-1999), and University of Virginia (2005)

Three-year *Distinguished Chair in Hydrology and Hydraulic Engineering*, Fulbright (2010-12).

Person in charge for collaborations École Centrale de Lyon-Politecnico di Torino

Special Funding by ISI Foundation (Institute for Scientific Interchange - Complexity)

Member of Editorial Board of Springer-POLITO Series

Member of Scientific Committee of International and National Congresses: WDSA 2014 (Water Distribution System Analysis, Bari), National Hydraulics and Water Engineering Congresses (e.g., Ancona, 2018;) Bologna, HIC 2018 (International Hydroinformatics Conference, Palermo, 2018)

Member, Academy of Sciences of Turin (founded by Lagrange in 1757)

Publications

Please, see the following website

https://iris.polito.it/cris/rp/rp04769?sort_byall=2&orderall=DESC&open=all#.X6AvCxZ7mpo