

Curriculum vitae

Education:

- Ph.D in Physics, Torino University (1983-1987)

Positions:

- 1985-2000 I.N.F.N. researcher
- 2000-2005 Associate professor, department of physics of the Torino University
- 2006 - Full professor, department of physics of the Torino University

Research Areas:

- Physics:
 - Statistical Mechanics,
 - Phase Transitions and Critical Phenomena
 - Lattice Gauge Theories
 - Random Matrix Theories
 - Montecarlo simulations of Complex Systems
- Biology:
 - Systems Biology,
 - Gene regulation,
 - Bioinformatics

Scientific Profile

My research interests are of interdisciplinary nature. I started as a particle physicist, working on the field theoretical description of Quantum Chromodynamics (QCD). In this context I was one of the first to use and develop numerical montecarlo methods for the study of effective string models in lattice QCD. Then I moved to statistical mechanics and to the study of complex and/or critical systems. In the last 20 years I started also to work in molecular biology (with a particular attention to gene regulation) with bioinformatic tools. In this last part of my scientific career I tried to apply in a biological context the techniques and ideas which I had developed in previous years as a physicist. In particular the use of simulation tools to address biological problems and the use of advanced methods in network theory to identify the relevant degrees of freedom of complex systems.

In this framework , with a few collaborators from the biology department of the Turin University I managed to create a PhD program named “Complex Systems for Quantitative Biomedicine”

<https://phd-csqb.campusnet.unito.it/do/home.pl>

with the aim to combine together wet biology expertise and theoretical tools to address complex biological problems.

I published more than 200 papers on peer reviewed ISI journals on topics ranging from Quantum Field Theory to Computational Biology, with a total number of more than 5000 citations and an h index of 45 according to google scholar:

<https://scholar.google.it/citations?user=j6FcjtwAAAAJ&hl=it>

further information on my scientific activity can be found in my Orcid page:

<https://orcid.org/0000-0001-5488-142X>

I serve as referee for several journals both

in high energy theoretical physics:

JHEP, JSTAT, Nuclear Physics B, Phys. Rev. Letters, Phys. Rev. D ...

and in computational Biology:

PloS Comp. Biol., PloS ONE, BMC Bioinformatics, BMC Genomics...

Teaching

- Course on "Statistical Field Theory", within the Master in "Physics of fundamental Interactions" of the Torino University
- Course on "Complex Systems for Biology" within the Master in "Physics of complex systems" of the Torino University
- Course on "Systems Biology" within the Master in "Molecular Cell Biology" of the Torino University
- Course on "Computational Neuroscience" within the Master in "Biotechnology for Neuroscience" of the Torino University

In the last ten years I was the advisor of more than 20 PhD student, part of them from the PhD program in theoretical physics and part from the PhD program in complex systems for life sciences. Most of them have now post-doc positions in top ranking universities in Europe and U.S.

Funding: research grants of the last years

- 2005-2009 FIRB (Fondi Interministeriali per la Ricerca di Base) project: "Molecular recognition in protein-ligand, protein-protein and protein-surface interactions: development of integrated experimental and computational approaches to the study of systems of pharmaceutical interest." Total funding for the project: 2.100.000 euro out of which the amount of resources for my group was of 214.000 euro
- 2006-2009 CIPE (Comitato Interministeriale per la Programmazione Economica) project: (P.I. of the whole project) "Statistical Mechanics and network theory for cellular systems" Total funding for the project: 90.000 euro out of which the amount of resources for my group was of 30.000 euro
- 2012-2015 FSP grant GeneRNet (P.I. of the whole project) "Computational and experimental approaches to identify and model biologically relevant Gene Regulatory Networks" Total funding for the project: 325.000 euro
- 2017-2020 CRT grant (P.I. of the whole project) "Network Theory for Gene Regulation" Funding: 40.000 euro

- 2022-2025 PRIN (P.I. of the whole project) "Conformal Perturbation Theory: from Effective String Theory applications to Statistical Mechanics realizations." Total Funding: 206.640 euro out of which the amount of funding for my group was 103.320 euro
- 2022-2026 Simons Foundation grant "Confinement and QCD Strings" Total funding 8.000.000 U.S. dollars out of which the amount of funding for my group is 520.000 U.S. dollars

Management and Academic Responsibilities

- During the academic year 2002/2003, in collaborations with a few colleagues from the Torino University and from other scientific institutions I proposed and promoted the institution of the PhD program : "Complex systems for life sciences" of which I was the director in the period 2008-2013.
- During the academic year 2009/2010, in collaborations with other colleagues of the Torino University and of the "Universita' del Piemonte Orientale" I promoted the institution of a two years master entitled: "Physics of Complex Systems" of which I was the director in the period 2009-2013 and 2018-2021
- In the period 2002-2015 I was the national coordinator of the INFN research initiative: "Biological applications of theoretical physics methods." which involves 12 INFN sections and more than 70 researches.
- In the years 2005-2011 I was a permanent member of the Commission on Biological Physics (C6 commission) of the IUPAP (International Union of Pure and applied Physics) organization.
- In the years 2009-2015 I was associate member of the Commission on Statistical Physics (C3 commission) of the IUPAP (International Union of Pure and applied Physics) organization.
- In the years 2012-2024 I was a member of the Scientific Committee of the SSST (Scuola di Studi Superiori dell'Università di Torino)

Invited presentations to peer-reviewed conferences

In the last few years I was invited to give talks or lectures in a few conferences and schools Among the most recent ones :

- **2021**
 - **Lattice 2021**
title of the talk: "On the behaviour of the interquark potential in the vicinity of the deconfinement transition"
<https://indico.cern.ch/event/1006302/>
 - **Confinement 21**
title of the talk: Effective string description of the confining potential in the (2+1) dimensional SU(2) Lattice Gauge Theory.
<https://www.uu.uis.no/vconf21/>

- **2022**

- **KITP conference on "Confinement, Flux Tubes, and Large N"** (KITP, January 2022)
title of the talk: Lattice determination of confining string contributions in the (2+1) dimensional SU(2) LGT
<https://www.kitp.ucsb.edu/activities/fluxtube22>
- **Conference on Gauge Topology, Flux Tubes And Holographic Models** (Trento ECT*, May 2022)
title of the talk: Recent results on the confining string in non-abelian Lattice Gauge Theories
<https://indico.ectstar.eu/event/111/>
- **100 years of the Ising Model** (IHEP, Paris June 2022)
title of the talk: Using the Ising model to explore the confining regime of Lattice Gauge Theories
<https://indico.math.cnrs.fr/event/5466/>
- **Simons Confinement Collaboration Workshop** (Princeton, September 2022)
title of the talk: Recent results on the confining string in non-abelian Lattice Gauge Theories.
<https://pcts.princeton.edu/events/2022/simons-confinement-collaboration-inaugural-workshop>

- **2023**

- **Quark Confinement Workshop** (FTPI, Minneapolis, May, 2023)
title of the talk: On the shape of the confining flux tube in Lattice Gauge Theories
<https://cse.umn.edu/ftpi/events/quark-confinement-workshop-0>
- **NYU Confinement Workshop**
title of the talk: Sampling the Nambu-Goto effective string using Normalizing Flows
<https://cosmo.nyu.edu/eventman/eventpdf/EbK4MX5Gzdm.pdf>

Organization of international conferences

In the last few years I was in the scientific and/or in the organizing committee of various international conferences: Among the most recent ones :

- **2022**

- **SM&FT 2022 The XIX Workshop on Statistical Mechanics and Non Perturbative Quantum Field Theory** Dec. 2022 (Bari, Italy)
<https://agenda.infn.it/event/28754/>

- **2023**

- **BIOPHYS 2023** (September 2023, Rimini)
<https://eventi.unibo.it/biophys2023>

- **2024**

- **Spring School on Confining Strings** (May 2023 Les Diablerets)

- <https://indico.cern.ch/event/1345257/>