

FRANCESCO MANTEGAZZA
Curriculum Vitae

Francesco Mantegazza

Full Professor of Applied Physics (FIS/07, 02/D1)
Department of Medicine and Surgery
Università di Milano – Bicocca
Edificio U28, Via Raoul Follereau 3
20584 Vedano al Lambro (MB)
Italy

Place and date and of birth:

Milano (Italy) April 29th, 1964.

Education (degrees, Universities, dates):

Laurea in Physics, Università di Milano, 1989.
PhD in Physics, Università di Milano, 1992.

Career/Employment (Universities, positions, dates):

Università di Milano, Researcher, 1993- 1999.
Università di Milano-Bicocca, Researcher, 1999-2004.
Università di Milano-Bicocca, Associate Professor, 2004-2022.
Università di Milano-Bicocca, Full Professor, 2022-present

Teaching activity:

Professor of Medical Physics and Biophysics for the Medicine and Surgery and for the Dentistry Courses, and of Methods for NanoBiotechnology for the Biotechnology course and president of the examination commissions.
F.M. supervised several master degree and PhD theses in Physics of the University of Milan and of Milano-Bicocca.

Past research interests:

Optical properties of complex fluids.
Electrokinetic phenomena of charged nanoparticles.
Colloidal suspensions and polyelectrolytes.
Ligand-receptor interactions.
Mixed systems of nanoparticles-liquid crystals.
Persistence length of polyelectrolytes in solution.
Renewable energy from electrokinetic effects.
Efficiency improvement of artificial respiration systems.

Current research interests:

Physico-chemical characterization of nanoparticles.
Development of single-molecule manipulation and imaging techniques.
Nanomanipulation by using Optical Tweezers (OT), Magnetic Tweezers (MT) and Atomic Force Microscopy (AFM).
Aggregation and characterization of amyloid fibrils.
Nanomechanics of single molecule of DNA and proteins.
Nanoparticles and Nanomedicine.
Single-molecule studies of DNA supercoils, transitions, and superstructures.
Nucleoid associated proteins and bacterial DNA packaging.

Intrinsic disordered protein unfolding.
Nanomechanics of single cells and tissue.

Research activity:

F.M. is author of more than 100 publications with international reviews, 4 international patents, several proceedings and communications to national and international conferences or congresses. Total number of citations about 2500 and h-index of 29.

F.M. has been coordinator or has participated to several research projects funded by national or international boards.

F.M. scientific research activity is devoted to the experimental study of the nanomechanical properties of single molecules and single cells or tissues. The objective is providing quantitative information about complex and unknown relevant biophysical issues, such as DNA compaction inside nucleus, surface elasticity of cancer or healthy cells or tissues, DNA superstructures, and conformation of intrinsically disordered proteins.

The techniques employed in the Lab are Magnetic Tweezers (MT) and Atomic Force Microscopy (AFM).

MT is a single molecule technique, which allows exerting forces and torques on a single biomolecule. As an example, MT allows obtaining, in the different conditions, the force and the torque necessary to promote the nanomechanical denaturation of DNA or the force required to unfold a single protein.

On the other hand, AFM allows acquiring topographical 3D images of the samples under investigation with nanometric resolution. In addition, AFM force spectroscopy can characterize the membrane stiffness, related for example to the neoplasticity of the cells, or study the protein structure, by applying forces to polyproteins in order to unfold them.