

Giovanni Di Muccio

EDUCATION

Ph.D. in Industrial Engineering, *with honors*

University of Rome Tor Vergata, Italy

Thesis: Computational Modeling of Nanopore Based-Devices for Protein Sensing and Sequencing.

2017–2021

Ms.C. Nanotechnology Engineering, *with honors*

Sapienza University of Rome, Italy

Thesis: Acoustically Induced Bjerknes Forces on Encapsulated Gas Microbubbles.

2014–2017

B.Sc. Chemical Engineering,

Sapienza University of Rome, Italy

Thesis: Laminar Flows in Triangular Cross-Section Ducts for Microfluidic Applications.

2009–2013

RESEARCH EXPERIENCE AND MAIN COLLABORATIONS

University of Rome Tor Vergata

Postdoctoral Researcher

Rome, Italy

Nov. 2021, May 2022

- Computational analysis of transport mechanism for ions across a cell membrane and role in the cardiovascular system.

University of Rome Tor Vergata

Ph.D. Student, advisor Prof. M. Chinappi, co-adv. B. Morozzo della Rocca.

Rome, Italy

2017–2021

University of Groningen

Remote collaboration, Maglia Lab, Prof. G. Maglia.

Groningen, Netherlands

2021, ongoing

- Computational modeling and Molecular Dynamics simulations of “large” biological nanopores and small globular proteins: structure prediction, capture rates and pore hindrance estimation.
- Electrohydrodynamics characterization of WT and mutated nanopores: electrostatic, ionic selectivity and electroosmotic flow engineering.

Université d'Évry/Collège de France

Visiting Research, Lambe Lab/Solid State Chemistry and Energy, Profs. J. Pelta and J.M. Tarascon.

Paris, France

Winter 2019

- Development of an experimental nanopore sensing setup for electrochemical applications.
- Modeling and characterization of cyclodextrins and polysulfurs molecular interactions.
- Molecular Dynamics simulations of an α -Hemolysin nanopore at high pH: ionic selectivity and electroosmotic flow estimation.

Ioan Cuza University

Remote collaboration, Prof. T. Luchian's group.

Iași, Romania

Summer 2018

- Molecular Dynamics simulations of small dipolar peptides through an α -Hemolysin nanopore: peptide structure, ionic currents and pore hindrance correlations analysis.

CLNS@SAPIENZA, IIT/Sapienza University of Rome

Microfluidic Group, Master Thesis, advisor C.M. Casciola, co-adv Prof. M. Chinappi.

Rome, Italy

Dec-2016, Jul-2017

- Development of an experimental setup of a microfluidic environment mimicking the Blood-Brain Barrier impairment, for Ultrasounds Microbubbles Targeted Drug-Delivery Studies.
 - * Experimental: cultivating and seeding endothelial cells in a microfluidic device.
 - * Computational: Acoustic propagation modeling of the microfluidic device (COMSOL Multiphysics)
- Acoustofluidic theoretical modeling and experiments of encapsulated-gas microbubbles in confined environment.
 - * Experimental: Micro-PIV particle tracking (microbubbles under ultrasounds in confined environment).
 - * Computational: implementation of modified Rayleigh-Plesset differential equation (radius dynamics of an excited microbubbles) into a particle Euler-Lagrange model, for simulating the collective motion of hundreds of microbubbles (FORTRAN, MATLAB).

TEACHING AND TUTORING ACTIVITIES

- **Tutoring and Orientation Activities** at University of Rome Tor Vergata 2019-2021
Matematica di Base e Orientamento, Undergraduate Level, Macroarea di Ingegneria (POT-ING)
- **Supervising Master, PhD and Visiting students,** 2020
teaching Molecular Dynamics simulations, Linux and HPC resources usage and managment.
Chemical Nano-Engineering & Industrial Engineering at University of Rome Tor Vergata
- **Tutor** for private lessons 2013-Present
Physics, Chemistry/Biochemistry, Calculus I, Informatic/Coding

ADDITIONAL SCHOOLS AND TRAININGS

- STIMULATE Workshop: Machine and Reinforcement Learning, Rare Events and Tensor Networks
University of Rome Tor Vergata, 2020
- Introduction to Machine Learning, University of Rome Tor Vergata, 2019
- Introduction to modern FORTRAN, CINECA, Bologna, 2018

TECHNICAL SKILLS

- **Scientific Computation:** NAMD/VMD, COMSOL Multiphysics, Custom Codes
- **Scripting/Programming:** Bash, Python, TCL, FORTRAN, R, MATLAB, C/C++, Wolfram Mathematica, Ruby
- **Office, Graphics and 3D printing:** Microsoft and Open Office, Latex, Inkscape, Blender, ImageJ/Fiji, Gimp

HPC PROJECTS

- CSGGEOF, MARCONI M100 (IsCra C IsC86), **PI** 2021
- Geometrically induced selectivity [...] in uncharged nanopores, CSCS Piz Daint (s1103), **Main Collaborator** 2021
- Effect of mutations [...] in YaxAB nanopore, CSCS Piz Daint (s1026), **Main Collaborator** 2020
- FLOWYAX, CINECA M100 (IsB21), **Collaborator** 2020
- Electroosmotic flow in WT CgsG nanopore, CSCS Piz Daint (s958), **Main Collaborator** 2019
- Electroosmotic flow in conical nanopores, CSCS Piz Daint (s865), **Collaborator** 2018

INTERNATIONAL TALKS

- Transport in Narrow Channels (Invited), Cargse, France, 2022
- ELKIN2022, Tel Aviv, Israel, 2022
- 1st MASBIC-DISVA Symposium, Ancona, Italy, 2021
- FICN2021: Frontiers in ion channels and nanopores, Rome, Italy, 2021
- 2nd Single Molecule Protein Sequencing, Jerusalem, Israel, September 2019
- Single Nanopore for Sensing and Energy, Université de Montpellier, France, July 2019
- Biophysics@Rome, CNR Headquarters, Rome, Italy, May 2019

LANGUAGES

- **Italian:** Mother tongue
- **English:** Proficient in both written and spoken language

PUBLICATIONS

- [1] Geometrically Induced Selectivity and Unidirectional Electroosmosis in Uncharged Nanopores. G. Di Muccio, B. Morozzo della Rocca, ACS NANO, **2022**
- [2] Electroosmosis in nanopores: Computational methods and technological applications A. Gubbiotti, M. Baldelli, G. Di Muccio, P. Margaretti, S. Marbach, M. Chinappi, ADVANCES IN PHYSICS: X, **2022**
- [3] Nanopore-based protein sequencing using biopores: current achievements and open challenges. A. Asandei, G. Di Muccio, I. Schiopu, L. Mereuta, I. S. Dragomir, M. Chinappi, SMALL METHODS, **2020**
- [4] Single-sulfur atom detection of polysulfides with a protein nanopore for improved batteries. F. Btermier, B. Cressiot, G. Di Muccio et al., NATURE COMMUNICATION MATERIALS, **2020**
- [5] Insights into protein sequencing with an -Hemolysin nanopore by atomistic simulations. G. Di Muccio, A.E. Rossini, D. Di Marino, G. Zollo, M. Chinappi, SCIENTIFIC REPORTS, **2019**
- [6] Single-molecule dynamics and discrimination between hydrophilic and hydrophobic amino acids in peptides, through controllable, stepwise translocation across nanopores. A. Asandei, I.S. Dragomir, G. Di Muccio et al., POLYMERS, **2018**

POSTERS

- Nanopore Sequencing, Boston, USA, 2022
- FICN2021, Rome, Italy, 2021
- 12th EBSA/10th ICPB-IUPAB Biophysics Congress, Madrid, Spain, 2019
- Biophysical Society 63rd Annual Meeting, Baltimore, Maryland, USA, 2019
- Nanoinnovation, Rome, Italy, 2018, 2019, 2020
- Nanofluidic in Physics and Biology, Lyon, France, 2018

AWARDS AND HONORS

- FICN2021, Rome, Italy, 2021
Best Poster Award