Giulia Rossi

Ricercatrice a tempo determinato

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Istruzione e formazione

2007
Dottorato in Fisica
Università di Genova - Genova - IT

2006
Master in Science Communication
Scuola Superiore di Studi Avanzati - Trieste - IT

2003
Laurea in Fisica
Università di Genova - Genova - IT

Esperienza accademica

2016 - IN CORSO
Ricercatore a tempo determinato (RTD-B)
Università di Genova - Genova - IT

2013 - 2016
Ricercatore a tempo determinato (RTD-A)
Università di Genova - Genova - IT

2011 - 2013
FP7 Marie Curie IEF post-doctoral fellow
INSERM - Paris - FR

2008 - 2011
Post-doctoral fellow
Aalto University - Helsinki - FI

2007 - 2008
Post-doctoral fellow
Università di Genova - Genova - IT

Esperienza professionale

2007 - 2008

Editor of scientific project proposals partnership selection and management

D'Appolonia Spa - Genova - IT

Competenze linguistiche

Italian	**English**	**French**
Madrelingua	Esperto	Buono

Attività didattica

Since 2015 (60h/year) Full course: “Fisica Generale” Unige, Engineering School, Italy
Since 2016 (30h/year) Course: “Laboratorio di calcolo (C++)”, DIFI
2014 – 2016 (20h/year) Teaching assistant, course “Fisica Generale”, School of Medical and Pharmaceutical Sciences, Unige
2014/2015 (40h/year) Teaching assistant,course “Fisica Generale” Engineering School, Unige
2014/2015 (30h/year) Course “Thermodynamics”, DIFI
Since 2016 (4h/year) seminars, course “Materia Soffice”, Master/PhD in Physics, DIFI
2014 – 2016 (2h/year) seminar, course “Nanotecnologie”, Master/PhD in Physics, DIFI

Attività didattica e di ricerca nell'alta formazione

Supervisione di dottorandi, specializzandi, assegnisti

2016-present 4 PhDs (F. Simonelli, S. Salassi, D. Rapetti, A. L. de Marco) and 7 master students (F.Simonelli, S. Salassi, A. Torchi, E. Lavagna, D. Rapetti, D. Bonventre, D. Ciardo)
2013-2015, DIFI co-supervision of 1 PhD (E. Panizon), DIFI
2011-2013, co-sup of 1 PhD student (J. Barnoud), INSERM
2008-2011, co-sup of 1 PhD student (P. Kanerva) and 2 master students (J. Jalkanen and A. Kutvonen), Aalto University
2007-2008, co-sup of 1 master student (G. Schiappelli), DIFI

Partecipazione al collegio dei docenti nell'ambito di dottorati di ricerca accreditati dal Ministero

2017 - in corso
Membro del collegio dei docenti del Corso di dottorato in Fisica (2017-18) e in Fisica e Nanoscienze (2018-2019)

Interessi di ricerca

Interessi di ricerca

Mi occupo di fisica della materia, studio con strumenti teorici e computazionali il comportamento della materia dura e soffice, organica e inorganica, biologica e di sintesi.

Interazioni tra nanoparticelle sintetiche e membrane cellulari.

I materiali di sintesi alla nanoscala giocano un ruolo tecnologico sempre più importante. Eppure, la loro produzione e il loro uso non è esente da rischi per la salute. Uno dei processi biologici più rilevanti per la tossicità dei nanomateriali è la loro interazione con le membrane cellulari. Le membrane cellulari sono la barriera fisica che separa le nostre cellule dal mondo esterno, e l'alterazione delle proprietà della membrana cellulare possono mettere a rischio la salute della cellula. Il nostro gruppo di ricerca studia, attraverso simulazioni di Dinamica Molecolare a livello atomistico e coarse-grained, l'interazione tra nanomateriali di sintesi, quali plastiche o nanoparticelle metalliche, e membrane cellulari.

È in questo ambito che nel quinquennio 2016-2021 porterò avanti il progetto **ERC Starting Grant (677513) BioMNP** - *Understanding the interaction between metal nanoparticles and biological membranes.*

Nanoleghe metalliche.

Le nanoleghe sono particelle di dimensione nanometrica composte da due o più specie metalliche. Le loro proprietà, in particolare ottiche e catalitiche, le rendono interessanti per una varietà di applicazioni: per esempio, lo sviluppo di catalizzatori più efficienti o quello di rivestimenti capaci di assorbire il calore e lasciar passare la luce. Le proprietà delle nanoleghe sono in gran parte determinate dalla loro struttura e dall'ordinamento chimico dei loro componenti. Il nostro gruppo studia con strumenti computazionali la struttura e il comportamento delle nanoleghe al variare di condizioni quali la temperatura, la pressione, il tipo di supporto sul quale sono depositate.

Progetti di ricerca

2016 - IN CORSO

ERC Starting Grant BioMNP - Understanding the interaction between metal nanoparticles and cell membranes

EU - ERC H2020 - IT

1130000 Euro - Responsabile scientifico

Metal nanoparticles (MNP) play more and more important roles in pharmaceutical and medical technology as diagnostic or therapeutic devices. Metal NPs can nowadays be engineered in a multitude of shapes, sizes and compositions. Despite such technological advances, there is still poor understanding of the molecular processes that drive the interactions of metal NPs with cells. Cell membranes are the first barrier encountered by NPs entering living organisms. The understanding and control of the interaction of MNPs with biological membranes is thus of paramount importance to understand the molecular basis of NP's biological effects. BioMNP aims at rationalizing the complex interplay of NP size, functionalization and aggregation state during the interaction with model biomembranes. The project will rely on cutting-edge simulation techniques and facilities, and develop new molecular models to address NP-membrane interactions on a large range of length and time scales.

2011 - 2013

Marie Curie IEF fellowship - Computational study of the interaction between inhaled carbon nanoparticles and lung membranes

EU - FP7 - FR

180000 Euro - Responsabile scientifico

The past decades have seen hundreds of new applications of nanomaterials developed and patented. The high expectations of nanotechnology are illustrated by the rapidly growing research and development actions funded by the public and private sectors. Yet, benefits alone are not sufficient to promote global investments in nanotechnology: safety is a primary concern. Inhalation of particles with a diameter of a few nanometers may happen to all of us, when stuck in a traffic jam in our city. Specialized workers may be exposed, as well, when involved in the production or dispersion of nanoparticles and nanofibers, or when cutting or re- processing a nanocomposite material. Carbon nanomaterials are one of the major byproducts of combustion processes and one of the most promising materials for applications at the nanoscale.

During inhalation, the first barrier which carbon nanoparticles bump into is the lung membrane, which coats the inner surface of alveoli. Lung membranes are our first line of defense against foreign substances attempting to enter our organism via air and they are crucial for breathing, regulating gas exchange at the water-air interface of the alveoli. Understanding the mechanisms of nanoparticle interaction with lung membranes is a fundamental step for the assessment of NPs hazardousness. PLUM pursues this objective by studying this interaction at molecular level, addressing at the same time physical and biological effects. PLUM considers both carbon nanoparticles (CNPs) and nanotubes (CNTs), and investigates their influence on the membrane properties and the mechanism of permeation through lung membranes. These effects are studied as a function of physical (size, shape) and chemical (coating, functionalization) properties.

2013 - 2016

Marie Curie Career Integration Grant - Nanoplast

FP7 EU - IT

75000 Euro - Responsabile scientifico

Every year, millions of tons of plastic litter are reversed into the oceans, washed up on the shores or piled in landfills. There, plastics are degraded down to the micro and nano scale, and enter the food chain. Plastic particles can be vectors of toxic substances, but the effects of micro and nanoplastics themselves on living organisms is still largely unknown. Nanoplast addresses a fundamental step of this interaction: the interaction of nanoplastics with model biological membranes. Nanoplast is a

computational study of the interaction between polymers of everyday use and model lipid membranes. The project main goal is to identify possible physical mechanisms of damage to the cell membrane induced by the interaction with plastic nanofragments.
Membranes can be altered in many ways: mechanical (membrane rigidity), dynamical (lipid and peptide diffusion) and structural (lipid order, area per lipid, membrane thickness). Even more interestingly, our preliminary results show that hydrophobic polymers such as polystyrene can influence the lateral organization of heterogeneous lipid membranes into ordered (rafts) and disordered domains. These changes are relevant as they can affect the functionality of membrane proteins and other constituents, therefore altering the overall cell functioning.
Nanoplast studies the polymers most commonly found in the marine environment (polypropylene, polyethylene, polyethylene terephthalate, polystyrene...) and model membranes of various compositions. Both the polymers and the membranes are modeled at a coarse-grained level, relying on the support of detailed all-atom models whenever necessary.

Characterizing the interaction of plastic nanoparticles with cell membranes is the first step towards understanding the physical and chemical basis for their toxicity in all living organisms – bacteria, plants and animals. Since plastics are nowadays ubiquitous, the project can have a great impact, on the scientific community worldwide and on the society in general.

Attività editoriale

Activity as a referee
G. Rossi is a referee for ACS Nano, Macromolecules, RSCAdvances, The Journal of Physical Chemistry and the Journal of Physical Chemistry Letters, Nanoscale, Langmuir, The Journal of Applied Physics, The Biophysical Journal, The Journal of Chemical Physics, APX, The Journal of Computational Chemistry, The Journal of Polymer Science, RSC Advances
Activity as project evaluator
G. Rossi is a reviewer for the Academy of Finland and for the Romanian Executive Agency for Research, Development and Innovation