

Debora Berti

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Short Summary

Debora is Full Professor of Physical Chemistry at the Department of Chemistry of the University of Florence and has been a member of the Italian Consortium for Colloid and Surface Science (CSGI) since its foundation.

She teaches Physical Chemistry (BSc Chemistry), Physical Chemistry of Nanosystems (MSc in Chemical Sciences), and Soft Matter Materials (English MSc in Advanced Molecular Sciences).

Debora's scientific background is Physical Chemistry of Soft Matter. Her research topics include hybrid nano and microparticle/lipid assemblies for responsive drug delivery and encapsulation of benefit agents, the interaction of nanostructured assemblies with model biomimetic membranes and interfaces, design, and application of nanostructured fluids for the conservation of cultural heritage.

Debora Berti has a well-established track record of her work, with more than 160 authored or co-authored research papers and several chapters contributed to specialized books.

She is co-Editor of the Journal of Colloid and Interface Science and Advances in Colloid and Interface Science (Elsevier), a member of the Ownership Board of the journal Physical Chemistry Chemical Physics (Royal Society of Chemistry), member of the Review Panel of the Partnership for Soft Condensed Matter (PSCM, ILL-ESRF), member of the Soft Matter committee of the scientific panel of Helmholtz Zentrum -Berlin and member of the Elettra Proposal Review Panel for the SAXS beamline- Trieste, Member of the Scientific Advisory Board of Swedish Drug Delivery Center (SweDeliver)

She was the President of the European Colloid and Interface Society (2013-2015).

She edited the book "Colloidal Foundations of Nanoscience," published by Elsevier in 2014.

AFFILIATIONS

Member of the Italian Chemical Society (Physical Chemistry Division); Vice President of the Regional Board of the Italian Chemical Society (2016-)

Member of the American Chemical Society

Member of the Italian Society for Neutron Scattering and member of its executive board (2016-present)

Member of the European Neutron Society Association

Member of the European Colloid and Interface Society

Member of CSGI (Italian Center for Colloids and Nanoscience) since its foundation in 1993

AWARDS AND PRIZES

1999: "Young Scientists Award" from European Neutron Scattering Association

STUDENT MENTORING & SUPERVISING

Debora has mentored and supervised the work of many undergraduate and graduate students and post-docs. Her role in fostering career development in the academy and private sector has been particularly successful with young women scientists. Among her female students of her who have undertaken successful careers: Paola Luciani; Full Professor for Pharmaceutical Technology; University of Bern, Switzerland; Francesca Baldelli Bombelli, Associate Professor of Chemistry, Politecnico di Milano, Italy; Lucia Franchi; Strategic Account Director at Novozymes, Copenhagen, Denmark; Arianna Bartolini, Patent Attorney, Hoffmann Eitle Patent- und Rechtsanwälte PartmbB, Germany; Silvia Ferrati, Associate Scientist Translational Aeglea BioTherapeutics, Austin, TX USA; Francesca Betti, R&D Manager at CabroSpA, Italy; Silvia Sostegni, QC Supervisor Eli Lilly and Company, Italy and many others

MAIN PARTICIPATIONS TO FUNDED RESEARCH PROJECTS from 2010

2009-2011: Vice-coordinator of "Functional Self-Assembled Nanosystems" PRIN 2008, (20087K9)
2013-2017: EU-IAPP DNA-TRAP (FP7 2013-2017) (48 months, team leader CSGI unit, leader Work Package 3)
2014-2015: ECRF; Interaction of Engineered Nanoparticles with model lipid bilayer (18 months; PI)
2013-2016: PRIN 2010-2011 Soft Matter Nanostrutturata: dall'indagine chimico-fisica allo sviluppo di applicazioni innovative (36 months, national coordinator)
2017-2019: ECRF "Nanoparticles interacting with organized Soft Matter" (18 months, PI)
2018-2021: Contact Coordinator of the "FET-OpenEVFoundry" for the CSGI unit (project coordinator)
2020-2021 PI of "Engineering Hybrid Soft Matter Assemblies" (ECRF)
2020-2024 Contact Coordinator of the "FET-Proactive Biogenic Organotropic Wetsuits" for the CSGI unit
2022-2025 National Center for RNA technologies (PI for the Department of Chemistry)
2023-2025

SCIENTIFIC TRACK AND RESEARCH INTERESTS

The research interests of DB focus on the Physical Chemistry of Soft Matter, with particular attention to complex fluids with biological relevance. This field of research is becoming more and more central in modern chemical sciences, biophysics, and biotechnology

Over these last years, Debora' interests shifted to self-assembled bilayer systems. Together with her group, she investigates synthetic biomimetic systems to understand and model the interactions of engineered nanomaterials with biological interfaces, to unveil some of the physical determinants that steer the behavior at the nano-bio-interface.

In addition, natural physical principles can inspire the design of novel hybrid systems, including synthetic and biological components that can be used in the biomedical field, e.g. for drug delivery.

She is currently investigating the colloidal properties of extracellular vesicles and in particular, their interaction with engineered nanoparticles to design and construct smart constructs with superior targeting properties.

Throughout her career, Debora has applied radiation scattering methods, such as small angle scattering and reflectivity, to characterize the structural details of self-assemblies with biological relevance.

PUBLICATION DATA AND BIBLIOMETRIC INDEXES

Debora Berti is the author or co-author of more than 180 peer-reviewed publications (h-index=39 -Scopus, February 2024) and two patents.

The updated publication list is accessible online: <http://www.researcherid.com/rid/G-6525-2011>

MAJOR SCIENTIFIC CONTRIBUTIONS (with collaborators and coworkers)

-First Experimental Evidence of Molecular recognition contributions in the complexation of nucleic acids operated by negatively charged nucleolipid micellar assemblies, *Angew. Chem. Int. Ed.*, 2007, 46, 3070*

-First evidence Complexation of single-stranded nucleic acids into nucleolipid lamellar phases, *J. Am. Chem. Soc.*, 2007, 129, 11664*

-Design, preparation and physico-chemical investigation of phospholipid membranes decorated by cholesterol-based oligonucleotides as soft hybrid nanostructures, *J. Phys.Chem. B*, 2008, 112, 35, 10942*

Insights into the receptor-independent modulation of reconstituted Gi protein in liposomes, *Mol. Biosyst.*, 2009, 5, 301, journal cover*

-Visualization of magnetically triggered Release from Giant Unilamellar Vesicles: decorated with magnetic nanoparticles, *J. Phys. Chem. Letters*, 2011, 2, 713

-Understanding the mechanistic aspects of the interaction of inorganic nanoparticles with nanostructured lipid assemblies, *Nanoscale*, 2014, 6, 6452*

-First insights into Interaction of lipoplexes with model membranes, *Soft Matter*, 2014,10, 39, Cover Feature, January Hot Paper *

-First insights into the role of the bacterial lipid cardiolipin in the action of novel antimicrobial nanoplexes in model bacterial membranes, *Scientific Reports*, 2017, 7, 41242*

-First evidence of the thermotropic and magnetotropic phase behaviour of lipid liquid crystals containing magnetic nanoparticles, *Nanoscale*, 2018,10, 3480*, selected to be a part of a themed collection International Year of the Periodic Table: As attractive as magnets – applications for magnetic materials.

-Design of microemulsions confined in hydrogels for efficient removal of adhesive tapes from paper artworks, *Proc. Natl. Acad. Sci. USA*, 2018, 115, 5932

-DB was selected as leader in the field to write her personal perspectives about "Nanoparticles and organized lipid assemblies: from interaction to design of hybrid soft devices" on the occasion of Soft Matter's 15 th Anniversary (*Soft Matter*, 2019,15, 8951)*

-First evidence of the application of plasmonic properties of AuNps to assess the stiffness of membrane-enclosed nanosized vesicles. (*Nanoscale Horizons* 2021, Cover feature, listed among the 20 most popular articles of 2021, see <https://pubs.rsc.org/en/Journals/ArticleCollectionLanding?themelD=CE9175AF-C50E-4C15-824D-D9A90E79645C>)*

-First evidence of engineered NPs decorating or bridging soft free-standing interfaces, depending on their stiffness (*J. Phys. Chem. C* 2022, 126, 9, 4483–4494) *

* first or senior author

Representative publications from the last 10 years:

1) Cardellini, J., Ridolfi, A., Donati, M., Giampietro, V., Severi, M., Brucale, M., Valle, F., Bergese, P., Montis, C., Caselli, L., Berti, D. Probing the coverage of nanoparticles by biomimetic membranes through nanoplasmonics (2023) *Journal of Colloid and Interface Science*, 640, pp. 100-109. DOI: 10.1016/j.jcis.2023.02.073

- 2) Caselli, L., Ridolfi, A., Cardellini, J., Sharpnack, L., Paolini, L., Brucale, M., Valle, F., Montis, C., Bergese, P., Berti, D. A plasmon-based nanoruler to probe the mechanical properties of synthetic and biogenic nanosized lipid vesicles (2021) *Nanoscale Horizons*, 6 (7), pp. 543-550.
- 3) Häffner, S.M., Parra-Ortiz, E., Browning, K.L., Jørgensen, E., Skoda, M.W.A., Montis, C., Li, X., Berti, D., Zhao, D., Malmsten, M. Membrane Interactions of Virus-like Mesoporous Silica Nanoparticles (2021) *ACS Nano*, 15 (4), pp. 6787-6800
- 4) Pfeiffer, T., De Nicola, A., Montis, C., Carlà, F., Van Der Vegt, N.F.A., Berti, D., Milano, G. Nanoparticles at Biomimetic Interfaces: Combined Experimental and Simulation Study on Charged Gold Nanoparticles/Lipid Bilayer Interfaces (2019) *Journal of Physical Chemistry Letters*, 10 (2), pp. 129-137.
- 5) Mendoza, M., Caselli, L., Salvatore, A., Montis, C., Berti, D. Nanoparticles and organized lipid assemblies: From interaction to design of hybrid soft devices (2019) *Soft Matter*, 15 (44), pp. 8951-8970.

- 6) Montis, C., Generini, V., Boccalini, G., Bergese, P., Bani, D., Berti, D. Model lipid bilayers mimic non-specific interactions of gold nanoparticles with macrophage plasma membranes (2018) *Journal of Colloid and Interface Science*, 516, pp. 284-294
- 7) Fogli, S., Montis, C., Paccosi, S., Silvano, A., Michelucci, E., Berti, D., Bosi, A., Parenti, A., Romagnoli, P. Inorganic nanoparticles as potential regulators of immune response in dendritic cells (2017) *Nanomedicine*, 12 (14), pp. 1647-1660.
- 8) Salvatore, A., Montis, C., Berti, D., Baglioni, P. Multifunctional Magnetoliposomes for Sequential Controlled Release (2016) *ACS Nano*, 10 (8), pp. 7749-7760.
- 9) Montis, C., Castroflorio, B., Mendoza, M., Salvatore, A., Berti, D., Baglioni, P. Magnetocubosomes for the delivery and controlled release of therapeutics (2015) *Journal of Colloid and Interface Science*, 449, pp. 317-326.
- 10) Montis, C., Maiolo, D., Alessandri, I., Bergese, P., Berti, D. Interaction of nanoparticles with lipid membranes: A multiscale perspective (2014) *Nanoscale*, 6 (12), pp. 6452-6457.

INVITED PRESENTATIONS TO INTERNATIONAL CONFERENCES AND SEMINARS

More than 100 oral communications as a speaker and more than 25 invited talks at national and international conferences. From 2015, she delivered 5 invited plenary lectures and 8 invited keynote lectures at International Conferences and Workshops and about 10 seminars at other universities or research centres in Italy and abroad (e.g. UK, France, Australia)

SERVICE ACTIVITIES at the UNIVERSITY of Florence

2021- Vice President of the University of Florence

2021-: Member of the Steering Committee of the Department of Chemistry

2000-: Faculty member, University of Florence, Chemistry Department

2018-2021: Coordinator of the "Monitoring centre for Research", University of Florence

2010-2014 and 2021- Member of the PhD Board at the Department of Chemistry, University of Florence

2018- coordinator of the agreement between the University of Florence and the University of Sydney

2018- coordinator of the agreement between the University of Florence and Monash University (Melbourne, Australia).

2018-: coordinator of the agreement between the University of Florence and Hong Kong University

SERVICES and Editorial Responsibilities

2022- Member of the Facility Access Panel 8 (Small Angle Scattering) ISIS Neutron & Muon Source (UKRI)

2022- Co Chair of the 12th International Colloids Conference (Palma de Mallorca; Chair: J. Eastoe; co-Chairs: D. Berti and M. Malmsten)

2021- Co Chair of the 11th International Colloids Conference (Lisbon, Portugal; Chair: J. Eastoe; co-Chairs: D. Berti and M. Malmsten)

2020-now: Member of the Scientific Advisory Board of the Swedish Competence Center SweDeliver (The Swedish Drug Delivery Center)

2019-now: Member of the Editorial Board: JCIS open (Elsevier), Advances in Colloid and Interface Science (Elsevier)

2018-now: Member of the Ownership Board of the journal Physical Chemistry Chemical Physics, (Royal Society of Chemistry)

2018-now: Local coordinator of University of Florence - University of Sydney agreement

2018-now: Local coordinator of the agreement between the University of Florence and Monash University (Melbourne, Australia)

2017-now: Co-Editor of the Journal of Colloid and Interface Science (Elsevier)

2017-now: Member of the Proposal Review Panel for Central European Research Infrastructure Consortium

2015-now: External Grant Reviewer of Swiss National Science Foundation, Israel Science Foundation, Romanian Science Foundation, ERC

2000-now: Reviewer for many ISI journals in the field of colloid science, soft matter, nanotechnology, nanomedicine

2015-2020: Member of the Soft Matter committee of the HZB-Berlin scientific panel

2018: Member of the Review Panel of the Partnership for Soft Condensed Matter, ILL-ESRF, Grenoble

2013-2015: President of the European Colloid and Interface Society

2000-External referee or member for PhD defense committees at several Universities (Roma I, Perugia, Brescia, Padova, Politecnico di Milano, Napoli, Catania, Genova). Abroad, she has been Jury member in Sweden (Uppsala, Gothenburg), France (Strasbourg, Grenoble, Toulouse) and Australia (Newcastle).

OTHER ACTIVITIES

2016 Chair of the Board for the Overbeek Medal of the European Society of Colloid and Interface Science

2015 and 2014 Chair of the Board for ECIS-Solvay Prize

2014- Panel Member for the Small Angle Scattering line of Elettra Sincrotrone Trieste

2013- Member of the Soft Matter Panel (Helmholtz Zentrum Berlin for Materials and Energy)

2005- Member of the International Advisory Board or International Scientific Committee for several conferences: XXVI ECIS Conference 2012, Malmoe/Lund, 3rd International Soft Matter Conference (ISMC) 2013, Rome Italy; 6th International Colloids Conference, 2016, Berlin, Germany; 4th International Soft Matter Conference (ISMC) 2016, Grenoble France and many others.

Transfer of Knowledge and Technology

Academic PI of several industry-related projects. Currently, she is supervising three post-doc students on grants funded by Procter and Gamble (budget 200KEuro/year)

