

Debora Monego

Max Planck Institute for Polymer Research
Ackermannweg 10, 55128 Mainz, Germany
E: monegod@mpip-mainz-mpg.de

CURRENT POSITION

MSCA Postdoctoral Fellow,
Max Planck Institute for Polymer Research, Mainz, Germany 2024–Present
Advisor: Prof. Dr. Frauke Gräter
– My current research focuses on the investigation of mechanochemical properties of collagen using a combination of classical mechanics and bioinformatics techniques (projectcolmec.eu).

EDUCATION

Ph.D. in Chemistry, University of Sydney, Sydney, Australia 2016–2020
– Dissertation: *Effect of Surface Ligands on Colloidal Stability, Shape and Sedimentation of Apolar Nanoparticles*
Advisor: Dr. Asaph Widmer-Cooper
M.Sc. in Chemistry, Federal University of Santa Maria, Santa Maria, Brazil 2014–2016
– Dissertation: *The Free Radical Scavenging Activity of Neurosporene: A Theoretical Study*
Advisor: Prof. Paulo Cícero do Nascimento
B.Sc. in Physics, Federal University of Santa Maria, Santa Maria, Brazil 2009–2016
– Dissertation: *Study of the alignment of TiO₂ Nanorods with Applications in Liquid Crystal Devices*
Advisors: Prof. Luiz Fernando Schelp and Prof. Mary O'Neill (University of Hull)
B.Sc. in Chemistry, Federal University of Santa Maria, Santa Maria, Brazil 2008–2012

ACADEMIC EXPERIENCE

Postdoctoral Researcher, HITS, Heidelberg, Germany 2023–2024
Research visit, University of Harvard Medical School, Boston, United States Sep–Nov 2023
– Used bioinformatics and evolutionary models to analyze the evolutionary patterns of collagen sequences and identify the specific mutations that correlate with disease manifestations observed in clinical settings. Ongoing collaboration with Prof. Debora Marks.
Postdoctoral Research Fellow and Lecturer in Chemistry,
Columbia University, New York, United States 2020–2022
– Studied the dynamics of cells in biological tissues with the goal of explaining the sorting and migration of cancer cells. Ongoing collaboration with Prof. Laura Kaufman's and Prof. David Reichman's groups.
– Education research: co-developed interactive simulation tool and POGIL-based activity to teach statistics to first year students. Currently evaluating the effectiveness of this approach in promoting student learning in comparison to more traditional approaches (e.g., lecturing).
Graduate Research Assistant, University of Sydney, Sydney, Australia 2016–2020
– Used molecular dynamics simulations to study the structure and interaction between nanoparticles, as well as their stability to aggregation in solution in collaboration with different experimental groups.

- Collaboration with Theoretical Physics Group,**
Federal University of Santa Maria, Santa Maria, Brazil 2014–2016
- Worked on various projects (also outside my thesis work) using quantum mechanics simulations and spectroscopic methods to evaluate the antioxidant activity of carotenoid compounds.
- Summer Project,** University of Hull, Hull, United Kingdom 2013–2014
- Investigated the phase separation of nematic liquid crystalline semiconductors in organic photovoltaics.

SELECTED HONORS AND AWARDS

- Marie Skłodowska-Curie Actions Postdoctoral Fellowship** 2024
- Isabel Rojas Travel Award,** HITS. Awarded for a research visit to the Blavatnik Institute at Harvard Medical School, US (3000 EUR) 2023
- Innovative Course Design + SOLER Grant,** Columbia University (5000 USD) 2022
- A&S Equity and Diversity Activities Grant,** Columbia University (2000 USD) 2022
- ACIS Best Thesis Award for 2021,** Australian Colloid and Interface Society 2022
- Columbia Science Fellowship,** Columbia University 2020–2022
- Columbia Science Fellowship Research Grant,** Columbia University (12000 USD) 2020
- Awarded Humboldt Research Fellowship Programme for Postdoctoral Researchers,** Heidelberg Institute for Theoretical Studies (declined) 2020
- Le Fèvre Student Lecture Award,** University of Sydney. Awarded to three outstanding PhD students in the final year of their studies 2019
- RJW Le Fèvre Research Travelling Scholarship,** University of Sydney (3000 AUD) 2019
- RACI Travel Bursary,** Royal Australian Chemical Institute 2019
- First place in the Annual Publications Prize,** ARC Centre of Excellence in Exciton Science Workshop 2018
- Overseas Travel Fellowship,** Australian Nanotechnology Network. Awarded for a research visit to INM Leibniz Institute for New Materials, Germany (3000 AUD) 2018
- Postgraduate Supplementary Scholarship,** University of Sydney Nano Institute. Awarded to postgraduate candidates in recognition of excellent work in the fields of nanoscale science and technology 2018–2020
- University of Sydney Postgraduate Research Scholarship** 2016–2020
- Master's Scholarship,** CAPES 2014–2016
- Science Without Borders Scholarship,** CNPq. Awarded to study Physics at the University of Hull, UK 2013–2014
- Asociación de Universidades Grupo Montevideo Scholarship,** AUGM. Awarded to study at the Universidad Nacional del Litoral, Argentina 2010

TEACHING EXPERIENCE

- Lecturer in Chemistry,** Columbia University, New York, United States 2020–2022
- Frontiers of Science (SCNCCC1100): Core Curriculum science course, required for first year students at Columbia College
 - Developed content for modules in Neuroscience, Physics, Biophysical Chemistry, and Earth Science and taught two weekly seminars (22 students each)
 - Wrote and graded homework and exams
 - Contributed to curriculum development
 - Designed material and quiz questions, and contributed to curriculum development of an online version of the course (MOOC at EdX)

- Columbia University Science Honors Program instructor**,
Columbia University, New York, United States 2021–2022
- Co-created and taught 10-week course titled “Volcanoes” for 10th-12th grade students
- Postgraduate Teaching Fellow**, University of Sydney, Sydney, Australia 2019–2020
- Fundamentals of Chemistry 1B (CHEM1012)
 - Chemistry 1A (CHEM1111)
 - Chemistry 1B (CHEM1112), Advanced (CHEM1912), Special Studies Program (CHEM1992)
- Demonstrator for Chemistry Labs**, University of Sydney, Australia 2019–2020
- Experimental Chemistry 1A (CHEM1111)
- Tutor for Disabilities Services Office**, University of Sydney, Sydney, Australia 2018–2019
- Forensic and Environmental Chemistry (CHEM2404)
 - Chemical Structure and Stability (CHEM2402)
 - Proteins in Cells (BCMB2002)
 - Immunology (IMM2011)

PUBLICATIONS | *equal contribution | [Google Scholar Profile](#)

1. [D. Monego*](#), [S. Dutta*](#), D. Grossman, M. Krapez, P. Bauer, J. Margaritat, B. Mahler, A. Widmer-Cooper, and B. Abécassis “Ligand-Induced Incompatible Curvatures Control Ultrathin Nanoplatelet Polymorphism and Chirality”, *PNAS*, **2024**, 121 (9) e2316299121.
2. B. Rennekamp, C. Karfusehr, M. Kurth, A. Ünal, [D. Monego](#), K. Riedmiller, G. Gryn’ova, D. M Hudson, F. Gräter “Collagen breaks at weak sacrificial bonds taming its mechanoradicals”, *Nature Communications*, **2023**, 14, 2075.
3. [D. Monego](#), T. Kister, N. Kirkwood, D. D. Jimenez, P. Mulvaney, T. Kraus, A. Widmer-Cooper “When like destabilizes like: Inverted solvent effects in apolar nanoparticle dispersions”, *ACS Nano*, **2020**, 14, 5278–5287.
4. [D. Monego*](#), T. Kister*, N. Kirkwood, P. Mulvaney, A. Widmer-Cooper, T. Kraus “Colloidal Stability of Apolar Nanoparticles: Role of Ligand Length”, *Langmuir*, **2018**, 34, 12982-12989.
5. T. Kister, [D. Monego](#), P. Mulvaney, A. Widmer-Cooper, T. Kraus “Colloidal stability of apolar nanoparticles: The role of particle size and ligand shell structure”, *ACS Nano*, **2018**, 12, 5969-5977.
6. V. Dal Prá, J. F. Soares, [D. Monego](#), R. G. Vendruscolo, D. M. G. Freire, M. Alexandri, A. Koutinas, R. Wagner, M. A. Mazutti, M. B. Da Rosa “Comparison of Different Compressed Fluids for Residual Oil Extraction from Palm Kernel Cake”, *Waste and Biomass Valorization*, **2018**, 9, 265-271.
7. [D. Monego](#), M. B. da Rosa, P. C. do Nascimento “Applications of computational chemistry to the study of the antiradical activity of carotenoids: A review”, *Food Chemistry*, **2017**, 217, 37-44.
8. F. B. Pires, C. B. Dolwitsch, V. dal Pra, H. Faccin, [D. Monego](#), L. M. de Carvalho, C. Viana, O. Lameira, F. O. Lima, L. Bressan, M. B. da Rosa “Qualitative and quantitative analysis of the phenolic content of *Connarus* var. *angustifolius*, *Cecropia obtusa*, *Cecropia palmata* and *Mansoa alliacea* based on HPLC-DAD and UHPLC-ESI-MS/MS”, *Revista Brasileira de Farmacognosia*, **2017**, 27, 426-433.
9. F. B. Pires, C. B. Dolwitsch, V. dal Pra, [D. Monego](#), V. M. Schneider, R. R. F Loose, M. E. P. Schmidt, L. Bressan, M. A. Mazutti, M. B. da Rosa “An Overview about the chemical composition and Biological Activity of Medicinal species found in the Brazilian Amazon”, *Journal of Applied Pharmaceutical Science*, **2016**, 6, 233-238.
10. V. Dal Prá, J. F. Soares, [D. Monego](#), R. G. Vendruscolo, D. M. G. Freire, M. Alexandri, A. Koutinas, R. Wagner, M. A. Mazutti, M. B. Da Rosa “Extraction of bioactive compounds from palm (*Elaeis guineensis*) pressed fiber using different compressed fluids”, *The Journal of Supercritical Fluids*,

2016, 112, 51-56.

SEMINAR TALKS | ~ presented virtually, ** invited

1. ***Physics of Cancer*, September, 2024, Leipzig, Germany, “How collagen translates mechanical forces to oxidative stress”
2. ***IUTAM: Theoretical and numerical developments in cellular mechanobiology*, June, 2024, Sevilla, Spain, “Exploring the Evolutionary Mechanisms of Collagen as a Protein Material”
3. ***MRS Spring Meeting*, April, 2024, Seattle, United States, “Empowering Diversity: Inclusive Strategies in STEM Education”
4. *Single Molecule Biophysics Meeting*, January, 2024, Les Houches, France, “How collagen turns mechanical into oxidative stress: Insights from coevolution”
5. *ACS Fall Meeting*, August, 2023, San Francisco, United States, “Sacrificial bonds deter oxidative stress from mechanoradicals in collagen”
6. *ACS Fall Meeting*, August, 2023, San Francisco, United States, “Frontiers of Science Inclusivity Discussions: Moving toward inclusive STEM classrooms by including students’ voices”
7. *Hünfeld Workshop*, April, 2023, Hünfeld, Germany, “Size-dependent Sedimentation of Nanocrystals: The Role of the Ligand Shell Structure”
8. *Columbia Science Spotlight Lecture Series*, April, 2022, New York, United States, “How tiny is the future? Harnessing the Nanoscale”
9. *Columbia Science Spotlight Lecture Series*, March, 2021, New York, United States, “Zooming in: using computer simulations to understand nanoparticles”
10. *Statistical Mechanics of Soft Matter*, December, 2019, Adelaide, Australia, “Size-dependent sedimentation of nanocrystals: the role the ligand shell structure”
11. ***Le Févre Student Lectureships*, September, 2019, Sydney, Australia, “Ligand-mediated interactions between nanoparticles”
12. *9th Australian Colloid and Interface Symposium*, February, 2019, Hobart, Australia, “Colloidal stability of apolar nanoparticles: effect of ligand and solvent structure”
13. *Quantum and Computational Chemistry Student Conference*, December, 2018, Australian National University’s Kioloa campus, “Understanding nanoparticles”
14. *Statistical Mechanics of Soft Matter*, December, 2018, Auckland, New Zealand, “Ligand-Mediated Interaction Between Nanoparticles”
15. *Australian Symposium on Computationally Enhanced Materials Design*, July, 2018, Sydney, Australia, “Ligand-Mediated Interaction Between Nanoparticles”
16. *Chemistry Postgraduate Symposium*, September, 2017, University of Sydney, Sydney, Australia, “Ligand-Mediated Interaction Between Nanoparticles”

POSTER PRESENTATIONS

1. *35th Molecular Modelling Workshop 2023*, March, 2023, Erlangen, Germany, “Size-dependent sedimentation of nanocrystals: the role of the ligand shell structure”
2. *Liquid Matter Conference*, July, 2021, Virtual, “Colloidal stability of Apolar Nanoparticles”
3. *Chemistry and Physics of Liquids Gordon Research Conference*, August, 2019, Holderness, New Hampshire, United States, “Colloidal stability of Apolar Nanoparticles”
4. *Telluride School on Theoretical Chemistry*, August, 2019, Telluride, Colorado, United States, “Colloidal stability of Apolar Nanoparticles”
5. *Sydney Surfaces And Soft Stuff Meeting*, May, 2019, Sydney, Australia, “Ligand-Mediated Interactions Between Nanoparticles”

6. *Chemistry Postgraduate Symposium*, November, 2018, University of Sydney, Sydney, Australia, “Ligand-Mediated Interactions Between Nanoparticles”
7. *ARC Centre of Excellence in Exciton Science Annual Workshop*, September, 2018, Melbourne, Australia, “Ligand-Mediated Interactions Between Nanoparticles”
8. *16th Conference of the International Association of Colloid and Interface Scientists*, May, 2018, Rotterdam, Netherlands, “Ligand-Mediated Interactions Between Nanoparticles”
9. *International Conference on Nanoscience and Nanotechnology*, February, 2018, Wollongong, Australia, “Ligand-Mediated Interactions Between Nanoparticles”
10. *Statistical Mechanics of Soft Matter*, November, 2017, Sydney, Australia, “Ligand-Mediated Interactions Between Nanoparticles”
11. *IUPAC Meeting*, July, 2017, São Paulo, Brazil, “Ligand-Mediated Interactions Between Nanoparticles”

MENTORSHIP

Columbia University

- Supervising Anish Chandra Nanjappa, Undergraduate Student 2022–Present
- Supervising Seojin You, Undergraduate Student 2022–Present

University of Sydney (while a PhD student in the Widmer-Cooper group)

- Leo Jiang, Undergraduate Student 2019
- Marion Kaprez, Visiting Undergraduate Student 2018
- James Smith, Honours Student 2017
- Thomas Hagan, Undergraduate Student 2017

COMMUNITY INVOLVEMENT AND OUTREACH

Chemistry in Australia Magazine, Co-authored with A. Widmer-Cooper:

- “The dynamic shapeshifting of nanoplatelets” September 2024
- HITS Open Day**, Public talk “Solving Biological Puzzles with Computer Simulations” July 2024
- SciencePub Heidelberg**, Public talk “Proteins under Force” May 2024
- 23rd juFORUM Congress**, Talk “Forceful Interactions: The role of collagen in biological mechanics” April 2024
- Symposium at SMBE23: Science for everybody: education and outreach in molecular biology and evolution**, Co-organizer July 2023
- Coding for Science Workshop, Columbia University**, Content leader and co-organizer November 2022
- Tools for integrating anti-racist/inclusive pedagogy into STEM instruction at Columbia**, Reading and discussion group co-coordinator 2022
- Skype a Scientist**, Volunteer with four K-6 and two K-8 classrooms 2021–present
- Podcast Diffusion Science radio**, Interview about nanoscience 2019
- Famelab Australia**, Semi-finalist 2019

SERVICE

Reviewer for the following journals:

- Soft Matter, Nature Communications, Materials Science, Langmuir, Journal of Physical Chemistry, Columbia Undergraduate Science Journal
- Sydney University Chemical Society**, Treasurer 2018