

Cristina Cantarutti

Present occupation

Jan 2022-present **Ricercatore a tempo determinato tipo A** in Fisica Applicata PHYS-06
University of Udine (Italy)

Past experience

Sept 2021-Jan 2022 **Post-doc** in the Biophysics group of the University of Udine (Italy)

Sept 2020 – Sept 2021 **Post-doc** in the Biophysics group of the University of Udine (Italy)

Apr 2019 – Dec 2019 **CNRS post-doc** at the Institut de Chimie de Nice of the University of Nice (France) in the Equipe Matériaux et Polymères Eco-compatibles (European project KaRMA2020).

Jan 2018 – Jan 2019 **Post-doc** in the Biophysics group of the University of Udine (Italy)

Career breaks

Aug 2018 – Apr 2019 Maternity leave

Jun 2023 – Nov 2023 Maternity leave

Academic education

Nov 2014 – Oct 2017 **PhD in Biomedical Sciences and Biotechnology** in the **Biophysics group** of the University of Udine (Italy). Supervisor: Prof. G. Esposito; co-supervisor: Prof. A. Corazza. Project: characterization of protein molecular interactions with synthesized nanoparticles, molecular chaperones, supramolecular systems and small peptides.

PhD thesis “Challenging protein-nanoparticle interactions. Results with gold nanoparticle and β 2-microglobulin system”. Thesis defence: 02/03/2018.

- Jul 2014 **Master degree in Organic and Biomolecular Chemistry** at the University of Trieste (Italy).
Final grade: 110/110 with honours.
- Jul 2012 **Bachelor degree in Chemistry** at the University of Trieste (Italy).
Final grade: 110/110 with honours.

Research experience abroad during PhD

Two months at the New York University of Abu Dhabi (UAE) as visiting PhD student.

Publications

- 1) Corazza A, **Cantarutti C**, Mimmi MC, Verona G, mangione P, Giorgetti S, Bellotti V (**2024**) NMR reveals structural and dynamics changes of transthyretin that were hidden in X-ray studies. *Amyloid*. 31: S184, Meeting abstract 449
- 2) Corazza A, Mimmi MC, **Cantarutti C**, Verona G, mangione P, Giorgetti S, Bellotti V (**2024**) NMR study of transthyretin binding by monovalent and bivalent stabilizers in human serum. *Amyloid*. 31: S184, Meeting abstract 451.
- 3) Kumar M, **Cantarutti C**, Thorn D C, Bellotti V, Esposito G, Wilson M R, Ecroyd H and Carver J A (**2023**) The extracellular chaperone clusterin prevents primary and secondary nucleation of an amyloidogenic variant of β 2-microglobulin. *Australian Journal of Chemistry*, 76: 696-708.
- 4) **Cantarutti C**, Mimmi MC, Verona G, Mandaliti W, Taylor GW, Mangione P, Giorgetti S, Bellotti V, Corazza A. (**2022**) Calcium binds to transthyretin with low affinity. *Biomolecules*. 12: 1066
- 5) Moretti M,* Marzi I,* **Cantarutti C**, Vivoli Vega M, Mandaliti W, Mimmi MC, Bemporad F, Corazza A, Chiti F. (**2022**) Conversion of the native N-terminal domain of TDP-43 into a monomeric alternative fold with lower aggregation propensity. *Molecules*, 27: 4309.
*equal contribution
- 6) **Cantarutti C**,* Hunashal Y,* La Rosa C, Condorelli M, Giorgetti S, Bellotti V, Fogolari F and Gennaro E (**2022**) The corona of protein–gold nanoparticle systems: the role of ionic strength. *Phys Chem Chem Phys*, 24: 1630-1637.
*equal contribution
- 7) **Cantarutti C***, Vargas MC, Dongmo Fomthum C, Dumoulin M, La Manna S, Marasco D, Santambrogio C, Grandori R, Scoles G, Soler MA, Corazza A and Fortuna S* (**2021**) Insights on peptides topology in the computational design of protein ligands: the example of lysozyme binding peptides. *Phys Chem Chem Phys*, 23: 23158-23172.
*corresponding authors

- 8) Prakasam T, Hunashal Y, **Cantarutti C**, Giorgetti S, Faravelli G, Mondani V, Sharma S.K., Jagannathan R, Palmisano G, Bellotti V, Fogolari F, Olsen J-C, Trabolsi A and Esposito G (2021) Topologically non-trivial metal-organic assemblies inhibit amyloidogenesis. *Cell Reports Physical Science*, 2: 100477-100498.

- 9) Hunashal Y, **Cantarutti C**, Giorgetti S, Marchese L, Fogolari F and Esposito G (2020) Insights into a Protein-Nanoparticle System by Paramagnetic Perturbation NMR Spectroscopy. *Molecules*, 25(21): 5187-5201.

- 10) **Cantarutti C**, Dinu R and Mija A (2020) Polyhydroxybutyrate bioresins with high thermal stability by crosslinking with resorcinol diglycidyl ether. *Biomacromolecules*, 21(8): 3447–3458.

- 11) Dinu R, **Cantarutti C** and Mija A (2020) Design of sustainable materials by crosslinking a bio-based epoxide with keratin and with lignin. *ACS Sustainable Chem. Eng*, 8(17): 6844-6852.

- 12) Hunashal Y, **Cantarutti C**, Giorgetti S, Marchese L, Molinari H, Niccolai N, Fogolari F and Esposito G (2020) Exploring exchange processes in proteins by paramagnetic perturbation of NMR spectra. *Phys Chem Chem Phys*, 22: 6247-6259.

- 13) **Cantarutti C**, Dinu R. and Mija A (2019) Biorefinery Byproducts and Epoxy Biorenewable Monomers: A Structural Elucidation of Humins and Triglycidyl Ether of Phloroglucinol Cross-Linking. *Biomacromolecules*, 21(2): 517-533.
Supplementary cover published

- 14) **Cantarutti C**, Fogolari F, Hunashal Y, Ferrara V, Caragnano A, et al. (2019) Assessing the Effect of Preservation in Heart Transplant Protocol: Cold Ischemia Versus Normothermic Perfusion. *Biomark Applic*, 3:139-149.

- 15) S. Sponga, V. Ferrara, A.P. Beltrami, A. Bonetti, **Cantarutti C**, A. Caragnano, F. Ortolani, A. Lechiancole, R. Esposito, C. Di Nora, V. Tursi, C. Nalli, U. Livi (2019) Ex-vivo Perfusion on Marginal Donors in Heart Transplantation: Clinical Results and Pathological Findings. *J Heart Lung Transplant*, 38(4):S42-S43

- 16) **Cantarutti C.**, Raj G., Fogolari F., Giorgetti S., Corazza A., Bellotti V., Naumov P. and Esposito G. (2018) Interference of citrate-stabilized gold nanoparticles on β 2-microglobulin oligomeric association. *Chem Commun*, 54: 5422-5425.

- 17) **Cantarutti C.**, Bertocin P., Giorgetti S., Bellotti V., Fogolari F. and Esposito G. (2018) The interaction of β 2-microglobulin with gold nanoparticles: impact of coating, charge and size. *J Mater Chem B*, 6: 5964-5974.

- 18) Brancolini G., Maschio M. C., **Cantarutti C.**, Corazza A., Fogolari F., Bellotti V., Corni S., Esposito G. (2018), Citrate stabilized Gold Nanoparticles interfere with Amyloid Fibril formation: D76N and Δ N6 β 2microglobulin variants. *Nanoscale*, 10: 4793-4806.

- 19) Sponga S., Ferrara V., Beltrami A., Bonetti A., **Cantarutti C.**, Caragnano A., Esposito G., Lechiancole A., Guzzi G., Meneguzzi M., Nalon S., Ortolani F., Piani D., Livi U. (2018) Oc55 Outcome of Heart Transplantation with Marginal Donors: Cold Storage Vs Normothermic Perfusion. *J Cardiovasc Med*, 19: e27.

- 20) **Cantarutti C**, Raimondi S, Brancolini G, Corazza A, Giorgetti S, Ballico M, Zanini S, Palmisano G, Bertoncin P, Marchese L, Mangione P, Bellotti V, Corni S, Fogolari F, Esposito G (2017), Citrate-stabilized Gold Nanoparticles hinder fibrillogenesis of a pathologic variant of β 2-microglobulin. *Nanoscale*, 9: 3941-3951.
- 21) **Cantarutti C.**, Bertoncin P., Corazza A., Giorgetti S., Mangione P. P., Bellotti V., Fogolari F. and Esposito G. (2017), Short-chain alkanethiol coating for small-size gold nanoparticles supporting protein stability. *Magnetochemistry*, 3: 40-51.
- 22) Soler MA, Rodriguez A, Russo A, Adedeji AF, Dongmo Fomthui CJ, **Cantarutti C**, Ambrosetti E, Casalis L, Corazza A, Scoles G, Marasco D, Laio A, Fortuna, S (2017), Computational design of cyclic peptides for the customized oriented immobilization of globular proteins., *Phys Chem Chem Phys*, 19: 2740-2748.
- 23) Şologan M, **Cantarutti C**, Bidoggia S, Polizzi S, Pengo P, Pasquato L (2016), Routes to the preparation of mixed monolayers of fluorinated and hydrogenated alkanethiolates grafted on the surface of gold nanoparticles. *Faraday Discuss.*, 191: 527–543.
- 24) Bosi S, Fabbro A, **Cantarutti C**, Mihajlovic M, Ballerini L, Maurizio P (2016), Carbon based substrates for interfacing neurons: Comparing pristine with functionalized carbon nanotubes effects on cultured neuronal networks. *Carbon*, 97: 87-91.

Submitted Manuscript: Design and mechanistic analysis of a potent bivalent inhibitor of transthyretin amyloid fibrillogenesis. P. Patrizia Mangione,* Guglielmo Verona,* **Cristina Cantarutti**, Paola Nocerino, Maria Chiara Mimmi, Christopher J. Swain, Diana Canetti, Sofia Giorgetti, Iain Uings, Julian D. Gillmore, Graham W. Taylor, Mark B. Pepys, Vittorio Bellotti, Alessandra Corazza
*equal contribution

Membership

- GIDRM - Italian Group of Discussion concerning Magnetic Resonance
- INBB – National Institute of Biostructures and Biosystems (Interuniversity Consortium)

National Scientific Qualification

29/09/2023-29/09/2034 **National Scientific qualification** as associate professor in the Italian higher education system, in the call 2021/2023 (Ministerial Decree n. 553/2021 and 589/2021) for the disciplinary field of 02/D1 - Applied physics, physics teaching and history of physics. SSD FIS/07

Awards and grants

Pfizer Research Grant Junior Investigator Global ATTR Amyloidosis Research (**role: PI**) – December 2022 - December 2025, amount: 150k \$

Attendance grant for Italian-French International Conference on Magnetic Resonance – 27-30 September 2022, Milan IT

Young Researchers Fellowship for International Workshop on Advanced Isotopic Labelling Methods – 13-16 September 2022, Grenoble FR

Editorial activity

Invited Guest Editor for *Molecules*, Special Issue “NMR in Biochemical Research: From Small Molecules to Macromolecular Complexes” Section: “Physical Chemistry”

Reviewer for *RSC Advances*, *International Journal of Molecular Sciences*, *Molecules*, *International Journal of Biological Macromolecules*, *Life*, *Communications Chemistry*.

Job-related skills

- **Calibration and acquisition** of NMR experiments, knowledge of **Bruker pulse programming**;
- use of **scientific data analysis softwares** (Origin, R, xmgrace, ImageJ), NMR processing and analysis softwares (Topspin, Sparky, NMRPipe, Mestrenova, Dynamics Center), chemical structure drawing programs (Chem Draw and Chem Draw 3D) and molecular graphics softwares (Pymol);
- use of **linux** environment and basic **bash scripting**;
- use of softwares to perform and analyse **MD simulations** (NAMD and VMD) and to perform **molecular docking** (AutoDock);
- knowledge of main **spectroscopic techniques** (NMR, UV-Vis, fluorescence, DLS, IR), microscopies (TEM, AFM), other characterization techniques like thermogravimetric analysis and mass spectrometry, QCMD and basic purification techniques (extraction and chromatography);
- organic and nanomaterial **synthesis and characterization**;
- **laboratory management** and attested **safety laboratory practice**;
- manipulation of **cryogenic** fluids;
- **communication skills** (oral and poster contributions, paper writing).

Schools, trainings and congresses

Feb 2025 Protein misfolding and aggregation in disease. (Mantova, Italy)
Poster presentation: NMR study of transthyretin-stabilizers interaction directly in human serum.

- Sept 2024 The Leuven Protein Aggregation Meeting (2nd edition) (Leuven, Belgium)
Poster presentation: NMR reveals structural and dynamics changes of transthyretin that were hidden in X-ray studies
- May 2023 NMR symposium at ISTA (Austria)
Poster presentation: Transthyretin variants: same structure, different behaviour
- Mar 2023 XXI Telethon convention (Riva del Garda, Italy)
Poster presentation: Transthyretin variants: same structure, different behaviour
- Sept 2022 Italian-French International Conference on Magnetic Resonance (Milan, Italy)
Poster presentation: The amyloidogenic protein transthyretin reveals a complex dynamic landscape on multiple timescales
- Sept 2022 Advanced Isotopic Labelling Methods for Integrated Structural Biology (Grenoble, France)
- Nov 2021 Dissemination event on the project Alt Frialty Udine “Le giovani ricercatrici e i giovani ricercatori UNIUD raccontano l'invecchiamento”
Oral presentation: Nuovi farmaci per il trattamento dell'amiloidosi sistemica associata all'invecchiamento.
- May 2021 WebPro – Proteins on the Web 2021 organized by Società Italiana di Biochimica (Gruppo Proteine)
Poster presentation: Hydrogen-deuterium exchange reveals increased conformational fluctuations in the amyloidogenic V122I variant than in wild-type transthyretin
- Feb 2021 – Mar 2021 Bio-NMR training by Dr. Helena Kovacs from Bruker (theory and practice). Topics : triple resonance, side chain experiments, fast methods, relaxation and power handling, X-detected experiments and screening and binding.
- Mar 2021 LINXS Amyloid Workshop - Heart and Mind: linking in vitro science to the clinical context
- Dec 2019 Towards a cure for amyloid diseases: a successful example of precision and translational medicine. Pavia (Italy)
Oral presentation as Invited Speaker Molecular knots: a possible approach to interfere with β 2m fibrillogenesis.
- Nov 2017 Advances in NMR and MS Based Metabolomics GIDRM congress. Padova
Poster contribution: Cristina Cantarutti, Veronica Ferrara, Antonio Beltrami, Ugolino Livi, Sandro Sponga, Gennaro Esposito.
 NMR metabolomics of blood samples from heart transplanted patients related to different organ conservation systems.
- Sept 2017 GIDRM XLVI National Congress on Magnetic Resonance. Salerno
Poster contribution: Cantarutti C, Wilson M.R., Carver J.A., G. Esposito G.
 Hydrodynamics of β 2-microglobulin in presence of two molecular chaperones by NMR

- Jun 2017 GIDRM NMR Day: HR-MAS NMR, metabolomics and multivariate analysis. Milan
- May 2017 PhD Expo. Udine
Poster contribution: Cantarutti C, Raimondi S, Corazza A, Giorgetti S, Esposito G. Citrate-stabilized Gold Nanoparticles hinder fibrillogenesis of a pathologic variant of β 2microglobulin
- Oct 2016 GIDRM Advanced NMR school: product operator formalism, pulse sequences, molecular motions, relaxation, diffusion, hyperpolarization, solid state NMR, MRI. Turin
- Sep 2016 Nanomedicine Congress, Viterbo
Poster contribution: Cantarutti C, Corazza A, Raimondi S, Giorgetti S, Bellotti V, Fogolari F, Esposito G, Effect of citrate stabilized gold nanoparticles on β 2-microglobulin fibrillation process.
- Sep 2016 International Summer School Nanoscience meets Metrology: Synthesis, Characterization, Testing and Applications of Validated Nanoparticles, Turin
Oral contribution: Cantarutti C, Corazza A, Raimondi S, Giorgetti S, Bellotti V, Fogolari F, Esposito G, Citrate gold nanoparticle interaction with β 2microglobulin: nanoparticle-protein adduct formation. (**Awarded between the three best oral presentations**)
- Feb 2016 International Chemistry Conference on Organic and Bioorganic Chemistry, Abu Dhabi
Poster and oral contribution: Cantarutti C, Corazza A, Raimondi S, Giorgetti S, Bellotti V, Fogolari F, Esposito G, Gold nanoparticles and amyloidogenic proteins: exploiting the interaction to avoid fibrillogenesis. (**Awarded as best poster presentation**)
- Sep 2013 Nanomedicine School, Trieste

Mentoring and teaching activities

Mentoring:

- 2025 Co-supervisor of Mattia Salandra Master thesis in Biotechnology (University of Udine)
- 2025 Co-supervisor of Gabriele Dionis Master thesis in Biotechnology (University of Udine)
- 2024-2027 Co-supervisor of Dr. Juan Sebastian Pinzon Ramirez PhD in Molecular Medicine (University of Udine)
- 2023-2025 Supervisor of Dr. Isabella Isabella Ottenio de Lourenco postdoc (University of Udine)
- 2020 Co-supervisor of Giovanni Krump Bachelor Thesis in Biotechnology (University of Udine)

Undergraduate students teaching:

Applied Physics course for Infermieristica (aa 2021-2022, 2022-2023, 2023-2024), Tecniche di radiologia (aa 2021-2022), Tecniche di Laboratorio Biomedico (aa 2021-2022), Fisioterapia (aa 2022-2023, 2023-2024) at the University of Udine.

Physics course for Biotechnology (aa 2022-2023, 2023-2024) at the University of Udine.

Physics preparatory course (OFA) 2024, 2022, 2021, 2020, 2017 at the University of Udine.

PhD students teaching:

March 2024 Guest lecturer in the course “Artificial Intelligence in Systems Biology” of Prof. Tinen Iles for the PhD program in Molecular Medicine of the University of Udine. Lesson: “Introduction to protein systems: the folding problem”.

May 2023 Lessons “Structure and dynamics of IDPs: from average structures to conformational ensembles” and “Sequential NMR assignment of IDPs through 3D experiments: ¹HN and ¹³C detected experiments” in the course “Intrinsically disordered proteins studied by NMR spectroscopy” for Molecular Medicine PhD program.

Dec 2020 Lesson: “Relaxation dispersion experiments to probe μ s-ms conformational exchange” in the course “Relaxation in NMR. From spectroscopic data to protein dynamics information” for Biomedical Sciences PhD program.

High school students teaching:

Feb – May 2021 Physics and Chemistry courses for Health Profession entrance exam. Liceo Uccellis, Udine

Feb – May 2018 Chemistry course for Medicine entrance exam. Unid Formazione, Udine.

Nov – Dec 2017 Science teacher (J. Linussio high school, Codroipo UD)

Languages

Italian: mother tongue. **English:** advanced. **French:** pre-intermediate. **German:** pre-intermediate.

Udine, 06/02/2025