

ANGELA CAPOCEFALO

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Employment

- March 202 – present **Fixed term Researcher (RTDa)**
Department of Physical and Chemical Sciences, University of L'Aquila, L'Aquila
- Nov. 2020 – Feb. 2023 **Post-Doctoral fellowship**
Istituto dei Sistemi Complessi, Consiglio Nazionale delle Ricerche (ISC-CNR), Rome
- Nov. 2019 – Nov. 2020 **Post-Doctoral fellowship**
Istituto di Nanotecnologia, Consiglio Nazionale delle Ricerche (NANOTEC-CNR), Rome

Education

- Nov. 2016 – Nov. 2019 **PhD in Mathematical Models for Engineering, Electromagnetics and Nanosciences (XXXII cycle)**
curriculum: Material Science (SSD FIS/03, FIS/07)
Physics Department, Sapienza University of Rome
Thesis: "*Hybrid plasmonic nanoparticle assemblies with tunable properties for biophysical applications*"
Supervisors: Prof. Paolo Postorino, Dr. Fabio Domenici
- Sept. 2014 - July 2016 **M.Sc. in Physics**
Physics Department, Sapienza University of Rome
Supervisor: Prof. Federico Bordi
- Oct. 2010 - March 2014 **B.Sc. in Physics**
Physics Department, Sapienza University of Rome
Supervisor: Prof. Federico Bordi.

International research experiences

Visiting

- March - Sept. 2018 **Friedrich Schiller Universität, Jena**
Institut für Physikalische Chemie, Friedrich Schiller Universität and Leibniz Institute of Photonic Technology (IPHT), Jena, Germany

Measurement sessions at large scale facilities

- February 2021 **Small Angle X-Ray Scattering, SWING beamline, SOLEIL Synchrotron, France.**
- July 2019 **Small Angle Neutron Scattering, V16 SANS instrument, HZB, Germany**
- June 2019 **Synchrotron Radiation FTIR, SMIS beamline, SOLEIL Synchrotron, France**
- September 2018 **Small Angle X-Ray Scattering, SWING beamline, SOLEIL Synchrotron, France**
- February 2018 **Small Angle Neutron Scattering, V16 SANS instrument, HZB, Germany**
- January 2018 **Synchrotron Radiation FTIR, SMIS beamline, SOLEIL Synchrotron, France**

Publications

- [†] **A. Capocéfalo**, S. Gentilini, L. Barolo, P. Baiocco, C. Conti, N. Ghofraniha; *Biosensing with free space Whispering Gallery Mode microlasers*; *Photonics Research* 11 (5), 732-741, (2023) doi: 10.1364/PRJ.477139.
- L. Tavagnacco, E. Chiessi, L. Severini, S. Franco, E. Buratti, **A. Capocéfalo**, F. Brasili, A. Mosca Conte, M. Missori, R. Angelini, S. Sennato, C. Mazzuca, E. Zaccarelli; *Molecular origin of the two-step mechanism of gellan aggregation*; *Science Advances* 9 (10), eadg4392, (2023), doi: 10.1126/sciadv.adg4392.
- G. Nisini, A. Scroccarello, F. Ripanti, C. Fasolato, F. Cappelluti, **A. Capocéfalo**, F. Della Pelle, D. Compegnone, P. Postorino; *Nanoscale SERS investigation of a polyphenol-based plasmonic nanovector*; *Nanomaterials* 13 (3), (2023) doi: 10.3390/nano13030377.

4. †***A. Capoccefalo**, T. Bizien, S. Sennato, N. Ghofraniha, F. Bordi, F. Brasili; *Responsivity of fractal nanoparticle assemblies to multiple stimuli: structural insights on the modulation of the optical properties*; *Nanomaterials* 12 (9), (2022) doi:10.3390/nano12091529.
5. E. Truzzi, **A. Capoccefalo**, F. Meneghetti, E. Maretti, M. Mori, V. Iannuccelli, F. Domenici, C. Castellano, E. Leo; *Design and physicochemical characterization of novel hybrid SLN-liposome nanocarriers for the smart co-delivery of two antitubercular drugs*; *Journal of Drug Delivery Science and Technology* 70, 103206 (2022), doi: 10.1016/j.jddst.2022.103206.
6. D. Palmieri, F. Brasili, **A. Capoccefalo**, T. Bizien, I. Angelini, L. Oddo, Y. Toumia, G. Paradossi, F. Domenici; *Improved hybrid-shelled perfluorocarbon microdroplets as ultrasound- and laser-activated phase-change platform*; *Colloids and Surfaces A: Physicochemical and Engineering Aspects* 641, (2022) doi:10.1016/j.colsurfa.2022.128522.
7. †* **A. Capoccefalo**, E. Quintiero, C. Conti, N. Ghofraniha, I. Viola; *Droplet lasers for smart photonic labels*, *ACS Applied Materials & Interfaces* 13 (43), 51485-51494 (2021), doi: 10.1021/acsami.1c14972.
8. † **A. Capoccefalo**, T. Deckert-Gaudig, F. Brasili, P. Postorino, V. Deckert; *Unveiling the interaction of protein fibrils with gold nanoparticles by plasmon enhanced nano-spectroscopy*, *Nanoscale* 13 (34), 14469-14479, (2021) doi: 10.1039/D1NR03190B.
9. †* **A. Capoccefalo**, E. Quintiero, M. Bianco, A. Zizzari, S. Gentilini, C. Conti, V. Arima, I. Viola, N. Ghofraniha; *Random laser spectral fingerprinting of lithographed microstructures*; *Advanced Materials Technologies*, 2001037, (2021) doi: 10.1002/admt.202001037.
10. D. Caprara, F. Ripanti, **A. Capoccefalo**, M. Ceccarini, C. Petrillo, P. Postorino; *Exploiting SERS sensitivity to monitor DNA aggregation properties*; *International Journal of Biological Macromolecules* 170, 88-93, (2021) doi: 10.1016/j.ijbiomac.2020.12.039.
11. * M. Bonomo, L. Gontrani, **A. Capoccefalo**, A. Sarra, A. Nucara, M. Carbone, P. Postorino, D. Dini; *A combined electrochemical, infrared and EDXD tool to disclose Deep Eutectic Solvents formation when one precursor is liquid: Glyceline as case study*; *Journal of Molecular Liquids* 319, 114 292, (2020) doi:10.1016/j.molliq.2020.114292.
12. † F. Brasili, **A. Capoccefalo**, D. Palmieri, F. Capitani, E. Chiessi, G. Paradossi, F. Bordi, F. Domenici; *Assembling patchy plasmonic nanoparticles with aggregation-dependent antibacterial activity*; *Journal of Colloid and Interface Science* 580, 419-428, (2020). doi:10.1016/j.jcis.2020.07.006.
13. D. Caprara, F. Ripanti, **A. Capoccefalo**, A. Sarra, F. Brasili, C. Petrillo, C. Fasolato, P. Postorino; *DNA-functionalized gold nanoparticle assemblies for Surface Enhanced Raman Scattering*, *Colloids and Surfaces A: Physicochemical and Engineering Aspects* 589, 124399, (2020). doi:10.1016/j.colsurfa.2019.124399.
14. F. Domenici, **A. Capoccefalo**, F. Brasili, A. Bedini, C. Giliberti, R. Palomba, I. Silvestri, S. Scarpa, S. Morrone, G. Paradossi, M. Frogley, G. Cinque; *Ultrasound delivery of Surface Enhanced InfraRed Absorption active gold-nanoprobes into fibroblast cells: a biological study via Synchrotron-based InfraRed microanalysis at single cell level*, *Scientific Reports* 9 (1), 1-13 (2019). doi: 10.1038/s41598-019-48292-0.
15. C. Fasolato, S. Giantulli, **A. Capoccefalo**, Y. Toumia, D. Notariello, F. Mazzarda, I. Silvestri, P. Postorino, F. Domenici; *Antifolate SERS-active nanovectors: quantitative drug nanostructuring and selective cell targeting for effective theranostics*, *Nanoscale* 11 (32), 15224-15233, (2019). doi: 10.1039/C9NR01075K.
16. † **A. Capoccefalo**, D. Mammucari, F. Brasili, C. Fasolato, F. Bordi, P. Postorino, F. Domenici; *Exploring the Potentiality of a SERS-Active pH Nano-Biosensor*, *Frontiers in Chemistry* 7:413, (2019). doi: 10.3389/fchem.2019.00413.
17. E. Truzzi, F. Meneghetti, M. Mori, L. Costantino, V. Iannuccelli, E. Maretti, F. Domenici, C. Castellano, S. Rogers, **A. Capoccefalo**, E. Leo; *Drugs/lamellae interface influences the inner structure of double-loaded liposomes for inhaled anti-TB therapy: An in-depth small-angle neutron scattering investigation*, *Journal of Colloid and Interface Science* 541, 399-406 (2019). doi: 10.1016/j.jcis.2019.01.094.

† first author paper. *corresponding author paper.

Participation to conferences and workshops

Oral presentations

- "Interaction of amyloid fibrils with plasmonic nanoparticles: a nanoscale investigation towards the development of novel therapeutic strategies", BIOPHYSICS@ROME, April 19-20, 2023, Rome, Italy.
- "Assembly of patchy colloids towards the development of functional nanomaterials", invited talk, NANOINNOVATION 2022 - YoungInnovation event, September 19-23, Rome, Italy.
- "Surface Enhanced Raman Spectroscopy for cancer cell screening", invited talk; THURSDAY MORNING SCIENCE, June 18, 2020, University of L'Aquila, Italy.
- "Bio-plasmonic functional aggregates of protein decorated gold nanoparticles", PLASMONICA 2018, July 4-6, 2018, Florence, Italy.

Posters

- "Real-time light transmission spectroscopy (rt-LTS): quantitative investigation of colloidal aggregation dynamics", R. Pallucchi, **A. Capoccefalo**, G. Peruzzi, P. Postorino, B. Ruzicka, C. Fasolato, INTERCHALL2023, April 17-21, 2023, Rome, Italy.

- "Physicochemical characterization of SLN/Liposomes hybrid nanoparticles for the co-delivery of two anti-tubercular drugs: focus on SANS analysis", E. Truzzi, F. Meneghetti, M. Mori, E. Maretti, V. Iannuccelli, F. Domenici, C. Castellano, [A. Capocéfalo](#) and Eliana Leo, NANOINNOVATION 2020, September 15-18, 2020, Rome.
- "Monitoring the DNA melting profile by using Surface-Enhanced Raman Spectroscopy", D. Caprara, F. Ripanti, [A. Capocéfalo](#) and P. Postorino, RAMANFEST 2019, June 24-25, 2019, Oxford, UK.
- "Surface-Enhanced Raman Scattering of DNA-Nanoparticle assemblies", D. Caprara, F. Ripanti, [A. Capocéfalo](#), A. Sarra, C. Fasolato, F. Sciortino, and P. Postorino, ITALIAN SOFT DAYS 2018, September 13-14, 2018, Padova.
- "SERS active pH-nanosensor with tunable properties", [A. Capocéfalo](#), D. Mammucari, F. Brasili, C. Fasolato, P. Postorino and F. Domenici, 26TH INTERNATIONAL CONFERENCE ON RAMAN SPECTROSCOPY ICORS 2018, August 26-31, 2018, Jeju Island, Korea.
- "SERS active pH-nanosensor", [A. Capocéfalo](#), D. Mammucari, F. Brasili, C. Fasolato, P. Postorino and F. Domenici, PLASMONICA 2018, July 4-6, 2018, Florence, Italy.
- "Surface-Enhanced Raman Scattering of DNA-Nanoparticle assemblies", D. Caprara, F. Ripanti, [A. Capocéfalo](#), C. Fasolato and P. Postorino, PLASMONICA 2018, July 4-6, 2018, Florence, Italy.
- "Synchrotron Radiation SEIRA signalling of a gold nanoprobe in sonicated cells", F. Brasili, [A. Capocéfalo](#), A. Bedini and F. Domenici; PLASMONICA 2018, July 4-6, 2018, Florence, Italy.
- "Small-angle neutron scattering characterization of liposomes for anti-tuberculosis inhaled therapy", E. Truzzi, [A. Capocéfalo](#), C. Castellano, F. Domenici, F. Meneghetti, E. Maretti, L. Costantino, V. Iannuccelli and E. Leo; NANOMEDICINE ROME 2018, June 18-20, 2018, Rome, Italy.
- "Surface-Enhanced Raman Scattering of DNA-Nanoparticle assemblies", D. Caprara, F. Ripanti, [A. Capocéfalo](#), A. Sarra, C. Fasolato, F. Sciortino and P. Postorino, DESIGNER SOFT MATTER 2018, June 6-8, 2018, Singapore.
- "Thermophilic rearrangement of bio-plasmonic aggregates: morphological and plasmonic related evidences", [A. Capocéfalo](#), F. Brasili, P. Postorino, and F. Domenici; PLASMONICA 2017, July 5-7, 2017, Lecce, Italy.
- "Tuning the optical properties of hybrid bio-plasmonic colloids", F. Brasili, [A. Capocéfalo](#), D. Palmieri, E. Chiessi, P. Postorino, G. Paradossi, F. Bordi and F. Domenici; PLASMONICA 2017, July 5-7, 2017, Lecce, Italy.
- "Biomimetic giant vesicles electroformation", [A. Capocéfalo](#), F. Brasili, B. Cerroni, S. Sennato, G. Paradossi, F. Bordi and F. Domenici, Biomaterials for Healthcare: BIOMATERIALS FOR TISSUE AND GENETIC, October 17-20, 2016, Rome, Italy.
- "Aggregation and stability in solution of plasmonic active nano-biocolloids", F. Brasili, D. Palmieri, [A. Capocéfalo](#), S. Sennato, F. Bordi and F. Domenici; 30TH CONFERENCE OF THE EUROPEAN COLLOIDS AND INTERFACE SOCIETY 2016, September 4-6, 2016, Rome, Italy.
- "Biomimetic giant vesicles electroformation: biophysical evidences", [A. Capocéfalo](#), F. Domenici, F. Brasili, S. Sennato, B. Cerroni and F. Bordi, 30TH CONFERENCE OF THE EUROPEAN COLLOIDS AND INTERFACE SOCIETY 2016, September 4-6, 2016, Rome, Italy.

Participation to schools

16 - 25 September 2017	Giornate Didattiche SISN 2017 Pra Catinat (TO), Italy and Institut Laue Langevin, Grenoble, France
1 - 3 September 2016	ECIS Training Course: Colloids and surfaces in Cultural Heritage, Physico-Chemical Methodologies and New Investigative Approach Rome, Italy
30 June - 18 July 2014	Summer School on Atomistic Simulation Techniques Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste, Italy

Grants

2020	Accepted Research proposal - Institut Laue Langevin Proposal DIR-210: "SANS study of the structure of Solid Lipid Nanoparticles embedded inside liposomes designed for the pulmonary delivery of anti-TB drugs."
2019	Accepted Research proposal - SOLEIL Synchrotron Proposal 20191601: "SAXS investigation on the temperature-driven plasmon coupling in gold nanoparticles adsorbed to PNIPAM microgels." Funded research project - "Progetti di Ricerca Medi, anno 2019", Sapienza University of Rome Funding: 37 787€, Coordinator: Prof. Naurang Saini; Project: "Ultrahigh critical current density superconductor: study of structure - function relationship by spectroscopic techniques".
2018	Starting grant - "Progetti per Avvio alla Ricerca, anno 2018", Sapienza University of Rome Funding: 1000 €; Project: "Development of a SERS-active pH nanosensor" Accepted Research proposal - Helmholtz-Zentrum Berlin für Materialien und Energie Proposal 18207680 (as principal investigator): "Interaction of lysozyme with gold nanoparticles: A SANS study." Accepted Research proposals - SOLEIL Synchrotron Proposal 20181452 (as principal investigator): "Interaction of lysozyme with gold nanoparticles: A Surface Enhanced

Infrared Absorption study."

Proposal 20180833: "Modulation of the interparticle spacing and optical behaviour of lysozyme decorated gold nanoparticle assemblies: a SAXS study."

2017

Funded research project - "PhD mobility grant", Sapienza University of Rome

Funding: 6-months scholarship; Project: "pERSON: Enhanced Raman Spectroscopy for Nanomedicine".

Accepted Research proposal - Helmholtz-Zentrum Berlin für Materialien und Energie

Proposal 17205592: "SANS study of controlled release from SLNs incorporated inside liposomes for a new inhaled anti TB-therapy."

Starting grant - "Progetti per Avvio alla Ricerca, anno 2017", Sapienza University of Rome

Funding: 1000 €; Project: "Probing the synergistic interactions between proteins and gold nanoparticles: a Fundamental study towards a fine control on the plasmonic and functional properties".

Teaching and tutoring activity

Teaching

- Nanophotonics - M.Sc. Degree in Electronic Engineering, University of L'Aquila, 30 hours (3 CFU), a.y. 2022-2023.

Co-Advisor of Master and Bachelor Thesis

- Candidate: R. Pallucchi, M.Sc. Degree in Physics – Sapienza University of Rome, 2023
Title: "Optical transmission spectroscopy for the investigation of the aggregation dynamics of plasmonic colloids".
- Candidate: C. Taverna, M.Sc. Degree in Physics – Sapienza University of Rome, 2022
Title: "Study of the interaction between amyloid fibrils and nanoparticles by Surface Enhanced Raman Spectroscopy".
- Candidate: F. De Santis, B.Sc. Degree in Physics – Sapienza University of Rome, 2022
Title: "Spettroscopia Raman amplificata da superfici: dalla risonanza plasmonica ad un'applicazione biofisica".
- Candidate: D. Mammucari, M.Sc. Degree in Physics – Sapienza University of Rome, 2018
Title: "Sviluppo di un nanosensore SERS attivo pH sensibile".

Seminar activity

- "Real-time light transmission spectroscopy", seminar given to the students of the course of Biophysics Laboratory of the M.Sc. Degree in Physics - Sapienza University of Rome, a.y. 2022-2023, 1 hour.
- "Protein-nanoparticle interaction: study of the complexes by spectroscopic techniques", seminar given to the students of the course of Biophysics Laboratory of the M.Sc. Degree in Physics - Sapienza University of Rome, a.y. 2021-2022, 2 hours.

Supervision of graduate and undergraduate students

Supervision and tutoring of graduate and undergraduate students in laboratory activities for the M.Sc. Degree in Physics.

Referee activity

International Scientific Journals: Nano Letters, Colloids and Surfaces B, Biochemistry and Biophysics Reports, Biosensors, Sensors, Photonics, Life, International Journal of Molecular Sciences, Pharmaceutics, Molecules.

Skills

Experimental techniques

Spectroscopy

Conventional spectroscopies: Raman, Fluorescence, Infrared, UV-Visible.

Advanced nano-spectroscopies: Surface Enhanced Raman Spectroscopy (SERS), Tip Enhanced Raman Spectroscopy (TERS), Surface Enhanced Infrared Spectroscopy (SEIRA).

Light Transmission Spectroscopy.

Dynamic Light Scattering.

Development of advanced setups for optical spectroscopy-based approaches for the study of colloidal samples and photonic materials.

Microscopy

Optical and Fluorescence Microscopy, Atomic Force Microscopy (AFM), nanomechanical AFM mapping.

Small Angle Scattering

Small Angle X-Ray and Neutron Scattering.

Wet lab expertise

proteins, colloids, polymers, liposomes, chemical functionalization of metallic nanoparticles, chemical functionalization of silicon/glass substrates.

Data analysis

MATLAB, Origin, Gnuplot, SasView.

Image analysis tools

MATLAB, Gwyddion.

Languages

Italian (mother tongue), English (fluent), French (intermediate).