# Tiziana Mancini

## ABOUT ME

I am a 3rd year PhD student in Physics at University of Rome, La Sapienza.
My research activities mainly focus on IR and THz spectroscopy, with particular interest in biophysics and environmental issues.

## WORK EXPERIENCE

01/01/2022 – 31/12/2024 Rome, Italy

### PHD STUDENT IN PHYSICS AT SAPIENZA UNIVERSITY OF ROME SAPIENZA TERAHERTZ

My research field is Infrared (IR) and Terahertz (THz) spectroscopy and their possible applications for detection and analysis in biological and environmental fields.
In particular, actually I am focusing on biophysics issues, to deepen knowledge about structure and functionalities of biological macromolecules and I am also working on potential applications of IR and THz spectroscopy for air pollution monitoring, starting from the development of innovative specific sensors chemically functionalized, up to pollutants and pathogen detection and spectroscopic analysis.

**Thesis:** Development of an optical biosensor device based on IR spectroscopy for VOCs and airborne pathogen detection

01/05/2023 – 31/07/2023 Graz, Austria

### VISITING PHD STUDENT AT UNIVERSITY OF TECHNOLOGY TU GRAZ INSTITUTE OF PHYSICAL AND THEORETICAL CHEMISTRY

The aim of the collaboration has been the development of a functionalized sensor platform for pathogen concentration. I work on Metal-Organic Framework (MOF) biocomposites, and, in particular, on the synthesis of MOF@Antibody films on a inert substrate in order to obtain a functionalized surface.

Supervisors: Prof. Paolo Falcaro and Dr. Francesco Carraro

01/12/2022 – 28/02/2023 Rome, Italy

### TUTOR FOR UNIVERSITY COURSE SAPIENZA UNIVERSITY OF ROME

Tutor activity for first year university students (40 hours of lectures) at Faculty of Mathematics, Physics and Natural Sciences.

Foundations of mathematics - theory and exercises

## EDUCATION

01/10/2019 – 26/10/2021

### Master Degree in Condensed Matter Physics at University of Rome La Sapienza

**Institutiton:** University of Rome La Sapienza
**Final grade:** 110/110 cum laude
**Thesis:** Photophysical properties changes of phthalocyanine
**Supervisors:** Prof. Eugenio Del Re, Prof. Luca Tortora and Dr. Mauro Missori
**Skills and topics:** Nonlinear and quantum optics, Physics laboratory I, Condensed matter physics, English language, Photonics, Many body physics, Solid state physics, Physics laboratory II, Relativistic quantum mechanics, Medical applications of physics, Molecular biology, Chimica del restauro e della conservazione, Spectroscopy methods and nanophotonics

24/09/2016 – 01/10/2019

### Bachelor Degree in Physics at University of Rome La Sapienza

**Institutiton:** University of Rome La Sapienza
**Final grade:** 110/110 cum laude

**Thesis:** Polarization of Cosmic Microwave Background
**Supervisor:** Prof. Francesco Piacentini

2011 – 2016
### Diploma of Scientific Secondary School

**Institution:** Liceo Scientifico "Enrico Fermi" of Gaeta
**Final Grade:** 100/100 cum laude

## EDUCATION AND TRAINING

09/09/2024 – 13/09/2024 Catanzaro, Italy
### 5TH EUROMBR EUROPEAN SUMMER SCHOOL ON MICROFLUIDICS

About microfluidic systems and bioreactors functioning, their principles, construction basis and their application for biosensors, diffusion studies, cell studies and organ-on-chip experiments. Both theoretical and practical experimental lectures have been attended.

05/2024 – 06/2024 Roma, Italy
### BIOSENSORS AND GREEN IMMOBILIZATION TECHNIQUES CNR Istituto di Fisica della Materia - Rome Technopole

About biosensors, their constitution and functioning and the different chemical and physical principles underlying them. The different functionalization/immobilization techniques have been deepened with a particular focus on the green and sustainable aspect.

05/02/2024 – 09/02/2024 Venice, Italy
### XXVIII SCHOOL OF PURE AND APPLIED BIOPHYSICS SIBPA - Società Italiana di Biofisica Pura e Applicata

About main research lines of italian biophysical school. A particular focus is established on molecular interaction study and on the application of the most innovative biophysical techniques

05/09/2022 – 09/09/2022 Florence, Italy
### BIOPHOTONICS AND ARTIFICIAL INTELLIGENCE SCHOOL Siof - Società Italiana di Ottica e Fotonica

From the basis of Artificial Intelligence functioning to its wide and promising application in biophysical and biophotonics research.

10/07/2022 – 15/07/2022 Varenna, Italy
### MULTIMODAL AND NANOSCALE OPTICAL MICROSCOPY SIF - Società Italiana di Fisica

About the microscopy, from the origin to the most innovative recent technological advancement.

06/06/2022 – 10/06/2022 Ischia, Italy
### IV SCUOLA NAZIONALE DI BIOSENSORI OTTICI E BIOFOTONICA Siof - Società Italiana di Ottica e Fotonica

About biosensors, how they are built and how they work. About the different possibile approaches and the most appealing recent advacement, with a particular focus on optical biosensors.

28/06/2022 – 30/06/2022 Naples, Italy
### THE EVOLUTION OF ENZYMES AND METABOLIC PATHWAYS: ANALYSIS, UNDERSTANDING AND IMPLICATIONS FOR BIOTECHNOLOGY Stazione Zoologica Anton Dohrn

About enzymes and methabolic pathway. A special focus is provided on practical sessions of the school, showing the techniques and computational tools for protein study.

**SAFETY TRAINING COURSES** AIFOS - Base course (4 h) / INFORMA - Specific Risks Course - Medium Risk (8 h)

**ENGLISH STUDY TRIPS** New York (2012) - Boston (2012) - London (2013) - Dublin (2014)

## LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

| | UNDERSTANDING | | SPEAKING | | WRITING |
|---|---|---|---|---|---|
| | Listening | Reading | Spoken production | Spoken interaction | |
| **ENGLISH** | C1 | C1 | C1 | C1 | C1 |
| **FRENCH** | B1 | B1 | B1 | B1 | B1 |

*Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user*

## DIGITAL SKILLS

Matlab & Matlab Simulink | C Language | Opus | LaTex | OriginLab | Microsoft Office | Protein visualization | Orange Data Mining | Protein Data Bank | Define Secondary Structure of Proteins | Estensivo uso dei database molecolari RCSB PDB, UniProt, Alphafold.

## PUBLICATIONS

### Search for structural differences in spike glycoprotein variants of SARS-CoV-2: Infrared Spectroscopy, Circular Dichroism and Computational Analysis

[2024]
Research paper
**Mancini T***., Luchetti N., Macis S., Minicozzi V., Mosetti R., Nucara A., Lupi S. and D'Arco A.* (Submitted paper)

### Ultrahigh-sensitive and real-time detection in atmosphere of environmental BTXs relevant for occupational safety via Infrared spectroscopy coupled with Machine Learning technique

[2024]
Research Paper
**T. Mancini***,‡, F. Radica, L. Mosesso ‡, M.C. Paolozzi‡, S. Macis, A. Marcelli, S. Tamascelli, G. Tranfo, G. Della Ventura, S. Lupi and A. D'Arco*. (Submitted paper).

### Infrared Spectroscopy of SARS-CoV-2 Viral Protein: from Receptor Binding Domain to Spike Protein

[2024]
Research paper
**T. Mancini**, S. Macis, R. Mosetti, N. Luchetti, V. Minicozzi, A. Notargiacomo, M. Pea, A. Marcelli, G. Della Ventura, S. Lupi and A. D'Arco. Infrared Spectroscopy of SARS-CoV-2 Viral Protein: from Receptor Binding Domain to Spike Protein. *Advanced Science,* **2024**, 2400823.

**Link** 10.1002/advs.202400823

### Nanofibrous Conductive Sensor for Limonene: One-Step Synthesis via Electrospinning and Molecular Imprinting

[2024]
Research paper
A. Macagnano, F. N. Molinari, P. Papa, **T. Mancini**, S. Lupi, A. D'Arco, A. R. Taddei, S. Serrecchia and F. De Cesare. Nanomaterials **2024,** 14(13), 1123.

**Link** https://doi.org/10.3390/nano14131123

### Secondary Structures of MERS-CoV, SARS-CoV, and SARS-CoV-2 Spike Proteins Revealed by Infrared Vibrational Spectroscopy

[2023]
Research paper
D'Arco, A.; Di Fabrizio, M.; **Mancini, T.**; Mosetti, R.; Macis, S.; Tranfo, G.; Della Ventura, G.; Marcelli, A.; Petrarca, M.; Lupi, S. Secondary Structures of MERS-CoV, SARS-CoV, and SARS-CoV-2 Spike Proteins Revealed by Infrared Vibrational Spectroscopy. *Int. J. Mol. Sci.* **2023**, 24, 9550.

**Link** https://doi.org/10.3390/ijms24119550

### New Frontier in Terahertz Technologies for Virus Sensing

[2023]
Review
**Mancini, T.**; Marcelli, A.; Lupi, S.; D'Arco, A. New Frontier in Terahertz Technologies for Virus Sensing. *Electronics* **2023**, *12*, 135.

**Link** https://doi.org/10.3390/electronics12010135

## Infrared characterization of spike protein of MERS-CoV, SARS-CoV, SARS-CoV-2 and its variants: first steps toward an optical biosensing device

[2023]
Conference paper
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M., Lupi S. Infrared characterization of spike protein of MERS-CoV, SARS-CoV, SARS-CoV-2 and its variants: first steps toward an optical biosensing device.
Proceedings Volume 12572, Optical Sensors 2023; 125720D (2023)
Event: SPIE Optics + Optoelectronics, 2023, Prague, Czech Republic

**Link** https://doi.org/10.1117/12.2665812

## High Sensitivity Monitoring of VOCs in Air through FTIR Spectroscopy Using a Multipass Gas Cell Setup

[2022]
Research paper
A. D'Arco, **T. Mancini**, M.C. Paolozzi, S. Macis, L. Mosesso, A. Marcelli, M. Petrarca, F. Radica, G. Tranfo, S. Lupi, et al., High sensitivity monitoring of VOCs in air through FTIR spectroscopy using a multipass gas cell setup. *Sensors* **2022**, 22, 5624,

**Link** https://doi.org/10.3390/s22155624

## Terahertz Spectroscopic Analysis in Protein Dynamics: Current Status

[2022]
Review
**Mancini, T.**; Mosetti, R.; Marcelli, A.; Petrarca, M.; Lupi, S.; D'Arco, A. Terahertz Spectroscopic Analysis in Protein Dynamics: Current Status. *Radiation* **2022**, 2, 100-123.

**Link** https://doi.org/10.3390/radiation2010008

## Synthesis of WO3 nanopowder using a green surfactant for efficient gas sensing applications

[2023]
Research paper
Pakdel, H., Galstyan, V., D'Arco, A., **Mancini, T.**, Lupi, S., Moumen, A., Borsi, M., Comini, E.
Synthesis of WO3 nanopowder using a green surfactant for efficient gas sensing applications. *Ceramics International*, **2023,** 49(18), 30501

**Link** https://doi.org/10.1016/j.ceramint.2023.06.314

## UV Light Stereoselective Limonene Sensor Using Electrospun PVP Composite Nanofibers

[2024]
Conference paper
A. Macagnano, F. N. Molinari, **T. Mancini**, S. Lupi and F. De Cesare. UV Light Stereoselective Limonene Sensor Using Electrospun PVP Composite Nanofibers. *Proceedings* **2024**, 97, 131.

**Link** https://doi.org/10.3390/proceedings2024097131

## Cover Story of Nanomaterials MDPI 14(13) 1123

[2024]
COVER STORY of Nanomaterials MDPI, Volume 14, Issue 13 (July-1 2024) – 104 articles

Article: "Nanofibrous Conductive Sensor for Limonene: One-Step Synthesis via Electrospinning andMolecular Imprinting". A. Macagnano, F.N. Molinari, P. Papa, **T. Mancini**, S. Lupi, A. D'Arco, A. R. Taddei, S. Serrecchia and F. De Cesare, *Nanomaterials* **2024**, 14 (13), 1123.

**Link** 10.3390/nano14131123

## CONFERENCES AND WORKSHOPS

16/09/2024 – 18/09/2024

### Workshop Multi-Messenger Monitoring for occupational health & safety - SPS Multi-Year Project NATO Science for Peace and Security programme

ORAL PRESENTATION

- **Mancini T.**, Radica F., Carraro F., Mosesso L., Paolozzi M.C., Macis S., Marcelli A., Tamascelli S., Tranfo G., Della Ventura G., Falcaro P., Lupi S. and D'Arco A. Innovative optical strategies based on IR spectroscopy for a complete, accurate and specific biochemical air-quality monitoring.

28/06/2024

### Rome Techcnopole Spoke 6 - International Young Researcher Workshop

POSTER PRESENTATION
**T. Mancini**, A. D'Arco, R. Mosetti, S. Macis, G. Tranfo, G. Della Ventura, A. Marcelli and S. Lupi. First step toward the development of an optical biosensor based on vibrational spectroscopy for airborne pathogens detection

16/06/2024 – 20/06/2024

### XXVII SIBPA National Congress 2024 - Società Italiana di Biofisica Pura e Applicata - Genova, Italy

POSTER PRESENTATION
**T. Mancini**, A. D'Arco, M. C. Paolozzi, L. Mosesso, R. Mosetti, S. Macis, A. Marcelli, F. Radica, G. Tranfo, G. Della Ventura and S. Lupi.
*High Sensitivity Monitoring of VOCs in Air through FTIR Spectroscopy Using a Multipass Gas Cell Setup and Machine Learning algorithm*

10/06/2024 – 13/06/2024

### 3rd MOSBRI Scientific Conference 2024 (Molecular-Scale Biophysics Research Infrastructure) - Ljubljana, Slovenia

ORAL PRESENTATION
**Mancini T.**, D'Arco A., Mosetti R., Macis S., Della Ventura G., Marcelli A. and Lupi S.
*First step toward the development of an optical biosensor based on vibrational spectroscopy for the detection of airborne pathogens*

10/09/2023 – 13/09/2023

### Eurosensors2023 XXXV conference Lecce, Italy

ORAL PRESENTATION
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M. and Lupi S
*Spike Proteins Spectroscopic Characterization of MERS-CoV, SARS-CoV, SARS-CoV-2 and Its Variants for the Development of an IR Optical Biosensing Platform*

04/09/2023 – 08/09/2023

### CMD30 FisMat 2023 conference Milan, Italy

ORAL PRESENTATION
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M., Luchetti N., Minicozzi V. and Lupi S.
*Infrared spectroscopy investigation of Spike protein from MERS-CoV, SARS-CoV, SARS-CoV-2 and its variats for the development of an optical biosensor*

04/07/2023 – 05/07/2023

### Workshop DEUPAS - "Ultrasensitive monitoring of VOCs and pathogens by spectroscopy - Innovative solutions and sensor systems for air-quality monitoring" - INFN - LNFN, Frascati, Italy

INVITED SPEAKER
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M. and Lupi S.

*Spectroscopic comparative analysis of α, β, Y and o variants of SARS-CoV-2 virus: first step toward an infrared sensor platform*

24/04/2023 – 27/04/2023

### SPIE. Optics + Optoelectronics 2023 Conference. The International Society for Optics and Photonics (SPIE) - Prague, Czech Republic

ORAL PRESENTATION
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M. and Lupi S.
*Infrared characterization of Spike protein of MERS-CoV, SARS-CoV, SARS-CoV-2 and its variants: first steps toward an optical biosensing device*

19/04/2023 – 20/04/2023

### Biophysics@Rome2023 Research on the path and sustainability

POSTER PRESENTATION
**Mancini T.**, D'Arco A., Macis S., Mosetti R., Della Ventura G., Marcelli A., Paolocci C., Chronopoulou L., Comini E., Galstyan V. and Lupi S
*TiO2 nanostructured array for optical ultrasensitive biosensing*

12/09/2022 – 16/09/2022

### 108° SIF National Congress Società Italiana di Fisica - SIF Milan, Italy

ORAL PRESENTATION
**Mancini T.**, Paolozzi M.C., D'Arco A., Macis S., Marcelli A., Radica F., Tranfo G., Lupi S. and Della Ventura G.
*Detection of low VOCs concentration through IR spectroscopy*

20/06/2022 – 23/06/2022

### SYNC - First Symposium for YouNg Chemists: Innovation and Sustainability - Department of Chemistry - La Sapienza University of Rome - Rome, Italy

ORAL PRESENTATION
**Mancini T.**, Paolozzi M.C., D'Arco A., Macis S., Marcelli A., Radica F., Tranfo G., Lupi S. and Della Ventura G.
*Detection of low Volatile Organic Compounds concentrations through IR spectroscopy*

21/04/2022 – 22/04/2022

### BIOAEROSOLS & ATMOSPHERE POLLUTANTS - Innovative solutions and sensor systems for air-quality monitoring - Workshop INFN - LNFN - Frascati, Italy

INVITED SPEAKER
**Mancini T.**, D'Arco A., Di Fabrizio M., Mosetti R., Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca M. and Lupi S.
*RNA characterization of SARS-CoV-2 virus through Infrared micro-spectroscopy*

28/06/2024

### Rome Techcnopole Spoke 6 - International Young Researcher Workshop

Co-author contribution:
- A. D'Arco; L. Mosesso; M.C. Paolozzi; S. Macis; **T. Mancini**; S. Lupi. FT-IR spectroscopy coupled with Machine Learning for highly sensitive detection and discrimination of gaseous Volatile Organic Compounds

19/02/2024 – 20/02/2024

### Teradays 2024

Co-author contribution:
- D'arco A.; Macis S.; **Mancini T.**; Lupi S. Terahertz Technologies as New Frontiers for Pathogenic Microorganism Sensing: Drawbacks, Potentialities and Applications

10/09/2023 – 13/09/2023

### Eurosensors2023 XXXV conference Lecce, Italy

Co-author contribution
- Macagnano A., Molinari F. N., **Mancini T.**, Lupi S., De Cesare F. UV-Light Designed Stereoselective Limonene Sensor Using Electrospun PVP-Composite Nanofibers

04/09/2023 – 08/09/2023

### CMD30 FisMat 2023 conference Milan, Italy

Co-author in contribution:

- D'Arco A., **Mancini T.**, Macis S., Mosetti R., Della Ventura G., Marcelli A., Palocci C., Chronopoulou L., Comini E., Galstyan V., Lupi S. Infrared optical ultrasensitive biosensor based on TiO2 nanostructured array

04/07/2023 – 05/07/2023

### Workshop DEUPAS - "Ultrasensitive monitoring of VOCs and pathogens by spectroscopy - Innovative solutions and sensor systems for air-quality monitoring" - INFN - LNFN, Frascati, Italy

Co-author contribution

- Molinari F.N., De Cesare F., Lupi S., **Mancini T.**, Marelli M., Macagnano A. A novel approach for the fabrication of BVOCs sensors using conductive molecular imprinted nanofibers

04/07/2023 – 05/07/2023

### Workshop DEUPAS - "Ultrasensitive monitoring of VOCs and pathogens by spectroscopy - Innovative solutions and sensor systems for air-quality monitoring" - INFN - LNFN, Frascati, Italy

Co-author in contribution

- Mosetti R.,D'Arco A., Di Fabrizio M., **Mancini T.**, Macis S., Tranfo G., Della Ventura G., Marcelli A., Petrarca A., Lupi S. Towards an ultrasensitive sensoristic platform for airborne pathogens in DEUPAS project: infrared spectroscopic characterization of spike glycoproteins of various β-coronaviruses.

19/04/2023 – 20/04/2023

### Biophysics@Rome2023 Research on the path to sustainability

Co-author in contribution:

- D'Arco A., **Mancini T.**, Di Fabrizio M., Mosetti R., Della Ventura G., Marcelli A., Petrarca M., Lupi S. Towards a spectroscopic sensoristic platform for airborne pathogens: infrared characterization of spike glycoproteins from MERS-CoV and its variants

12/09/2022 – 16/09/2022

### 108° SIF National Congress Società Italiana di Fisica - SIF Milan, Italy

Co-author in contribution:

- D'Arco A., Di Fabrizio M., **Mancini T.**, Mosetti R., Della Ventura G., Marcelli A., Petrarca M., Lupi S. Infrared spectroscopy characterization of MERS-CoV, SARS-CoV and SARS-CoV-2 spike proteins for sensoristic platform.

20/06/2022 – 23/06/2022

### SYNC - First Symposium for YouNg Chemists: Innovation and Sustainability - Department of Chemistry - La Sapienza University of Rome - Rome, Italy

Co-author in contribution:

- D'Arco A., Di Fabrizio M., **Mancini T.**, Mosetti R., Della Ventura G., Marcelli A., Petrarca M., Lupi S. First step towards the infrared sensoristic platform: spectroscopic characterization of MERS CoV , SARS CoV and SARS CoV 2 spike proteins

## HONORS AND AWARDS

### Best poster XXXVII SIBPA National Congress 2024

[2024]
Concerning the development of a High Sensitivity sensor device for Monitoring VOCs in Air through FTIR Spectroscopy Using a Multipass Gas Cell Setup and Machine Learning algorithm

### Best communications SIF 108° National Congress

[2022]
Concerning the use of IR spectroscopy for ultra sensitive and selective detection of volatile organic compounds (VOCs) in atmosphere. Spectroscopic setup calibration and promising reasults on VOCs monitoring are exposed, overcoming current limitations.

### Investigator for URGENt - UltRasensitive multi-messenGEr bioseNsing for bioaerosol

Progetti di Ricerca (Piccoli, Medi) - Progetti Medi

09/11/2022 – 09/11/2023

### Principal Investigator for Avvio alla Ricerca 2022 project

Title: Ultra-sensitive detection of volatile organic compounds and pathogens in the atmosphere by vibrational spectroscopy
For measurements, analysis and engineering optimization of an IR spectroscopic setup for monitoring pollutants and pathogens in atmosphere.

2023 – 2024

### Principal Investigator for ISCRA C 2024 project

SISMAs - Structural Investigation of SARS-CoV-2 mutants through Molecular dynAmics simulations

2024 – CURRENT

### Member of SIBPA (Italian Society of Pure and Applied Biophysics)

Organization of Young researchers working in Biophysics in Italy

2024 – CURRENT

### Member of Young SIBPA

## LABORATORY SKILLS

### Spectroscopic instruments for condensed matter physics and biophysics

FTIR microspetrometer - Fourier Transform Infrared Spectrometer (NIR - MIR)
ATR-IR Spectrometer - Attenuated Total Reflectance
Circular Dichroism (CD) spectrophotometer
Raman microspectrometer
Spectrofluorimeter
UV-Vis Microscope
Dip coater
Chemical laboratory instruments
Various instrumental skills acquired during training workshops

## REVIEWER

2023

### Reviewer for Trends in Analytical Chemistry

2024

### Reviewer for Food Analytical Methods