

ACADEMIC PORTFOLIO

SIMONE TAIOLI

Personal Data

Date of birth: 27/09/1974
Place of birth: Cesena (Italy)
Citizenship: Italian
Gender: Male
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Current appointment

Senior Research Scientist & Head of the Interdisciplinary Laboratory for Computational Science

European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*),
Fondazione Bruno Kessler, Strada delle Tabarelle, 286 – Trento, Italy

Education and previous academic appointments

Higher education

Oct 2009 – Apr 2013: 2nd PhD in Physics (**Doctor Eropaeus**), University of Trento, Trento (IT).

- Second PhD in theoretical condensed matter physics. Final mark: **excellent**.
- Final dissertation: “*From materials science to astrophysics with electronic structure calculations*”.
- Advisor: Prof. Siddharth Saxena (University of Cambridge, UK), Co-advisors: Dr. Stefano Simonucci (University of Camerino, Italy), Dr. Maurizio Dapor (ECT* & University of Trento, Italy).

Jan 2001 – May 2004: 1st PhD in Nuclear Science and Technology, University of Bologna (IT) and Scuola Normale Superiore, Pisa (IT)

- **By competition scoring first.**
- Final dissertation: “*Inner shell photoionization and non-radiative decay processes in molecules: theory and calculations*”.
- Advisor: Dr. Stefano Simonucci (University of Camerino, Italy), Co-advisors: Prof. Renato Colle (Scuola Normale Superiore & University of Bologna, Italy) & Prof. Jorge Fernandez (University of Bologna, Italy)

Oct 1994 – Dec 2000: Undergraduate student in Nuclear Science and technology, University of Bologna, Bologna (IT).

- Course Duration: 5 years + M.Sc. in Plasma and Reactor Physics: first-class (**summa cum laude - 100/100 e lode**).
- Final dissertation: “*Quantum mechanical calculation of Auger spectra of silicon clusters.*”.
- Advisor: Prof. Renato Colle (Scuola Normale Superiore & University of Bologna, Italy),
Co-advisor: Dr. Stefano Simonucci (University of Camerino, Italy).

Previous employment

Oct 2022 – Oct 2023 Associate Professor at Gdańsk University of Technology – Gdańsk, Poland

Sept 2020 – Feb 2022 Professor at Peter the Great St. Petersburg Polytechnic University – St. Petersburg, Russia (from 1st Sept 2022 appointed to Full Professor, part-time, I resigned and halted all formal commitments)

Oct 2015 – Dec 2017 Adjunct Professor at the Institute of Particle and Nuclear Physics, Charles University –Prague (CZ)

May 2010 – Dec 2014 Tenured position – Solid State and Materials Science **group leader** at the Interdisciplinary Laboratory for Computational Science, Center for Materials and Microsystems, Bruno Kessler Foundation & University of Trento – Trento (IT)

May 2008 – May 2010 Tenure-track position at the Center for Materials and Microsystems, Bruno Kessler Foundation – Trento (IT)
Light-matter interaction for the interpretation of electron spectra.

Oct 2007 – Apr 2008 Post-doctoral Research fellow at the Electronic Engineering Department, The University of Sheffield – Sheffield (UK)
Excitonic effects in carbon-based nanostructures.

Oct 2005 – Sept 2007 Post-doctoral Research fellow at the Earth Sciences Department, University College London – London (UK)
DFT and QMC modelling of transition metals

Jan 2004 – Sept 2005 Post-doctoral Research fellow at the Physics & Astronomy Department, University College London – London (UK)
Time-dependent wave-packet propagation in electron-molecule scattering

Military service

August 2000 – July 2001 Compulsory military service.

Academic Habilitations to teach at Italian and European Universities

- National Scientific Habilitation to Full Professor (prima fascia) in **Theoretical Condensed Matter Physics (SSD 02/B2)**, Italy
- Qualification aux fonctions de Professeur des universités - **Milieux denses et matériaux**, France.

- National Scientific Habilitation to Associate Professor in **Theoretical Condensed Matter Physics (SSD 02/B2)**, Italy
- National Scientific Habilitation to Associate Professor in **Models and Methods for the Chemical Sciences (SSD 03/A2)**, Italy
- Qualification aux fonctions de maître de conférences - **Milieux denses et matériaux**, France.

Research activity

Research Interests

- **Development and application of state-of-the-art many-body techniques**, from mean-field (Hartree-Fock and Density Functional Theory also Time-dependent) to methods beyond mean-field, such as configuration interaction (CI), many-body perturbation theory (GW), Multi-configurational self-consistent approaches (MP2, MCSCF, RASPT2), and Path-Integral Monte Carlo (PIMC).
- **Development and application of theoretical spectroscopy methods** to study resonance-affected photo-excitation events in materials at different scales of aggregation in their interaction with external fields. I am a main developer and maintainer of the SURPRISES code, which is an *ab-initio* code suite to simulate electron excitation and decay spectra (XPS, Auger, ARPES, EELS, NEXAFS) of atoms, molecules and solids.
- **Physics of cancer** Monte Carlo modelling of hadron and proton therapy experiments via *ab-initio* and Monte Carlo methods.
- **Combined Monte Carlo and *ab-initio* modeling** of charge transport, secondary emission spectra and yields of solids.
- **Photochemistry and photophysics**: study of light-harvesting systems, such as multi-chromophoric Pigment Protein Complexes, bacteriochlorophyll, carotene, with both multi-reference methods typically used in quantum chemistry to interpret two-dimensional and pump-probe non-linear spectroscopies.
- **Development of novel methods to study β -decay in stellar nucleosynthesis** of evolved stars and in Big-Bang nucleosynthesis. We have implemented from scratch a relativistic approach to scattering theory, based on the Dirac-Hartree-Fock approximation, to interpret the β -decay spectra of heavy nuclei, such as lanthanides (used to develop scintillators for atomic and nuclear physics experiments) and actinides.
- **Materials modelling under extreme conditions of temperature and pressure**, applied particularly to planetary and mineral sciences.
- **Artificial Intelligence for Quantum Systems**: development of Deep Learning solutions for the investigation of quantum states.
- **Modeling of carbon-based nanostructures**, such carbon nanotubes, fullerenes, graphene, graphene foams, nanotubes bundles and of functional, memristive and bio-inspired materials.
- **Ultra-cold Fermi gases at unitarity** and BCS superconductivity.
- **Study of Metal-Organic frameworks (MOF) and Zeolitic Imidazolate framework (ZIF)** for gas separation and storage.
- **Computational modeling of crystal growth.**

Conference organization

5th Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications (IRRMA-V) – 09-14/06/2002, Bologna (IT)

New Frontiers in Multiscale Modelling of Advanced Materials – 17-20/06/2014, European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*), Trento (IT)

Graduate and undergraduate teaching

- *Density functional approaches to the many-body problem*, 3rd year degree in Physics at Gdańsk University of Technology (March - May 2023)
- *Dielectric-response models within an ab-initio framework*, Summer school to PhD students in Physics at Gdańsk University of Technology (July 2023)
- *Scattering of waves and particles*, Summer school to PhD students in Physics at Gdańsk University of Technology (August 2022)
- *Scattering theory*, Winter school to PhD students in Physics at Gdańsk University of Technology (December 2021)
- *Advanced Problems in Condensed Matter Physics*, 5th year master degree in Physics, Peter the Great St.Petersburg Polytechnic University, Russia (Sept – Dec 2021)
- *Scattering theory*, PhD in Physics and Engineering at the the Gdańsk University of Technology (June 2021)
- *Advanced Problems in Condensed Matter Physics*, 3rd year undergraduate degree in Physics, Peter the Great St.Petersburg Polytechnic University, Russia (Sept – Dec 2020)
- *Scattering theory with applications to Condensed Matter and Nuclear Physics*, 4th and 5th year physics students, Charles University in Prague (Feb – June 2016)
- *Computational Materials Science*, PhD in Materials Engineering at the University of Trento (March – April 2014)

Advisory and co-advisory role for undergraduate and graduate students

I am currently **supervising two PhD students:**

- **Francesco Carnovale** at the Physics Department, University of Trento with Prof. G. Lattanzi on *4D Microscopy of biological materials by short pulse terahertz sources (MIMOSA)*

from 01/11/2022 - to date.

- **Giovanni Novi Inverardi** at the Physics Department, University of Trento with Prof. G. Lattanzi on *4D Microscopy of biological materials by short pulse terahertz sources (MIMOSA)*

from 01/11/2022 - to date.

Outcomes

1. **“Role of defects in atom probe analysis of sol-gel silica”**
Gustav Eriksson & Matteo De Tullio & Francesco Carnovale & Giovanni Novi Inverardi & Tommaso Morresi & Jonathan Houard & Marc Ropitiaux & Ivan Blum & Emmanuel Cadel & Gianluca Lattanzi & Mattias Thuvander & Martin Andersson & Mats Hulander & **Taioli S.** & Angela Vella.
ACS Omega, in press (2025)
2. **“Evaporation of cations from non-conductive nano-samples using single-cycle THz pulses: an experimental and theoretical study”**
M De Tullio & G Novi Inverardi & J Houard & M Ropitiaux & I Blum & F Carnovale & Gianluca Lattanzi & **Simone Taioli** & G Eriksson & M Hulander & M Andersson & A Vella & T Morresi
Physical Review B 111 (4) (2025)
3. **“Adsorption of Silica Oligomers on Biomolecules: Structural and Dynamical Insights for Atom Probe Tomography via classic Molecular Dynamics Simulations”**
GN Inverardi & L Petrolli & F Carnovale & A Bartocci & **S Taioli** & G Lattanzi
Computational and Structural Biotechnology Journal 27, 2537 (2025)
4. **“Atom probe tomography: Computational challenges and perspective”**
G Lattanzi & **S Taioli** & GN Inverardi & F Carnovale
Biophysical Journal 123 (3), 424a (2024)
5. **“Silica in silico: A molecular dynamics characterization of the early stages of protein embedding for atom probe tomography”**
GN Inverardi & F Carnovale & L Petrolli & **S Taioli** & G Lattanzi
Biophysica 3 (2), 276-287 (2023)

I co-supervised three PhD students:

- **Piero Luchi** at the Physics Department, University of Trento together with Prof. F. Pederiva on *Machine Learning techniques FOR Quantum Gate Engineering (ML Q-FORGE)* from 01/11/2019 - 12/05/2023. Final mark: Excellent
- **Alessandro Piccoli** at the Physics Department, University of Trento together with Prof. A. Miotello on *Quantum sensing with laser-synthesized nano-diamond NV color centers (NADIA)* from 01/11/2020 - 30/04/2024. Final mark: Excellent
- **Francesca Triggiani** at the Physics Department, University of Camerino together with Prof. S. Simonucci on *Quantum many-body approaches to scattering of waves and particles* from 01/11/2021 - 28/07/2025.

I supervised two PhD students:

- **Francesco Segatta** at the Chemistry Department, University of Bologna together with Prof. M. Garavelli on *Computational Based Design of Bio-Inspired Electrochromic Molecules for Colour Tunable Electronic Ink* from 01/10/2014 to 17/04/2017. Final mark: Excellent cum laude

Outcomes

1. **“A quantum chemical interpretation of 2DES spectra of Light-Harvesting complexes”**
Segatta F. & Cupellini L. & Jurinovich S. & Mukamel S. & Dapor M. & **Taioli S.** & Garavelli M. & Mennucci B.
J. Am. Chem. Soc. 139 (22), 7558 (2017)
2. **“UV-light induced vibrational coherences, the key to understand Kasha rule violation in trans-azobenzene”**
Borrego-Varillas R. & Nenov A. & Oriana A. & Omachi J. & Ganzer L. & Manzoni C. & Segatta F. & Conti I. & Segarra-Marti J. & Dapor M. & **Taioli S.** & Mukamel S. & Garavelli M. & Cerullo G.
J. Chem. Phys. Lett. 9, 1534 (2018)
3. **“Ultrafast Carotenoid to Retinal Energy Transfer in Xanthorhodopsin Revealed by the Combination of Transient Absorption and Two Dimensional Electronic Spectroscopy”**
Segatta F. & Gdor I. & Julien R hault J. & **Taioli S.** & Friedman N. & Sheves M. & Rivalta I. & Ruhman S. & Cerullo G. & Marco Garavelli M.
Chemistry - A European Journal 24, 12084 (2018)

- **Tommaso Morresi** at the Faculty of Mechanical, Civil and Environmental Engineering, University of Trento on *Computer simulations of the electronic structure and topological properties of graphene and other 2D materials* from 01/11/2015 to 29/05/2019. Final mark: Excellent

Outcomes

1. **“Exploring event horizons and Hawking radiation through deformed graphene membranes”**
Morresi T. & Simonucci S. & Binosi D. & R. Piergallini & Roche S. & Pugno N. & **Taioli S.**
2D Materials 7, 041006 (2020)
2. **“Structural, Electronic and Mechanical properties of all-sp² graphene allotropes with density lower than graphene”**
Morresi T. & Pedrielli A. & Pugno N. & Gabbrielli R. & a Beccara S. & **Taioli S.**
Carbon 159, 512 (2020)
3. **“Anisotropic approach for simulating electron transport in layered materials: computational and experimental study of Highly Oriented Pyrolytic Graphite”**
Azzolini M. & Morresi T. & Stehling N. & Rodenburg C. & Pugno N. & **Taioli S.** & Dapor M.
J. Phys. Chem. C 122 (18), 10159 (2018)
4. **“A Novel Combined Experimental and Multiscale Theoretical Approach to Unravel the Structure of SiC/SiO_x Core/shell Nanowires For Their Optimal Design”**
Morresi T. & Timpel M. & Pedrielli A. & Garberoglio G. & Pasquali L. & Tatti R. & Pugno N. & M.V. Nardi & **Taioli S.**
Nanoscale 10, 13449 (2018)
5. **“Relativistic theory and ab-initio simulations of electroweak decay spectra in medium-heavy nuclei and of atomic and molecular electronic structure”**
Morresi T. & **Taioli S.** & Simonucci S.
INVITED PAPER: Advanced Theory and Simulations Adv. Theory Simul. 1, 1870030 (2018) - JOURNAL COVER

6. **“Monte Carlo simulations of measured electron energy-loss spectra of diamond and graphite: Role of dielectric-response models”**
Azzolini M. & Morresi T. & Garberoglio G. & Calliari L. & Pugno N. & **Taioli S.** & Dapor M. Carbon 118, 299 (2017)

I also closely, even though not officially, supervised further three PhD students:

- **Martina Azzolini** at the Faculty of Mechanical, Civil and Environmental Engineering, University of Trento on *Monte Carlo simulations of energy loss and secondary electron spectra of solid targets* from 01/11/2015 to 30/04/2019. Final mark: Excellent

Outcomes

1. **“Computational tools for calculating REEL spectra in solids: a comparison between Monte Carlo method and the numerical solution of the Ambartsumian-Chandrasekhar equations”**
Azzolini M. & Ridzel O.Y. & Kaplya P. & Afanas’ev V. & Pugno N. & **Taioli S.** & Dapor M. Computational Materials Science 173, 109420 (2020)
2. **“Secondary electron emission and yield spectra of metals from Monte Carlo simulations and experiments”**
Azzolini M. & Angelucci M. & Cimino R. & Larciprete R. & Pugno N. & **Taioli S.** & Dapor M. J. Phys.: Condens. Matter 31, 055901 (2019)
3. **“Anisotropic approach for simulating electron transport in layered materials: computational and experimental study of Highly Oriented Pyrolytic Graphite”**
Azzolini M. & Morresi T. & Stehling N. & Rodenburg C. & Pugno N. & **Taioli S.** & Dapor M. J. Phys. Chem. C 122 (18), 10159 (2018)
4. **“Monte Carlo simulations of measured electron energy-loss spectra of diamond and graphite: Role of dielectric-response models”**
Azzolini M. & Morresi T. & Garberoglio G. & Calliari L. & Pugno N. & **Taioli S.** & Dapor M. Carbon 118, 299 (2017)

- **Dr. Andrea Pedrielli** at ECT* and at the Faculty of Mechanical and Environmental Engineering, University of Trento on from 01/11/2014 to 30/04/2018. Final mark: Excellent

Outcomes

1. **“Electronic excitation spectra of cerium oxides: from ab initio dielectric response functions to Monte Carlo electron transport simulations”**
Pedrielli A. & De Vera P. & Trevisanutto P. & Pugno N. & Abril I. & Garcia-Molina R. & **Taioli S.** Dapor M. Physical Chemistry Chemical Physics 23, 19173 (2021)
2. **“Designing graphene-based nanofoams with nonlinear auxetic and anisotropic mechanical properties under tension or compression”**
Pedrielli A. & **Taioli S.** & Garberoglio G. & Pugno N. Carbon 111, 796 (2017)
3. **“Gas Adsorption and Dynamics in Pillared Graphene Frameworks”**
Pedrielli A. & **Taioli S.** & Garberoglio G. & Pugno N. Micropor. Mesopor. Mater. 257C, 222 (2018)

4. **“The Mechanical and Thermal Properties of Graphene Random nanofoams via Molecular Dynamics Simulations”**
Pedrielli A. & **Taioli S.** & Garberoglio G. & Pugno N.
Carbon 132, 766 (2018)
5. **“A Novel Combined Experimental and Multiscale Theoretical Approach to Unravel the Structure of SiC/SiO_x Core/shell Nanowires For Their Optimal Design”**
Morresi T. & Timpel M. & Pedrielli A. & Garberoglio G. & Pasquali L. & Tatti R. & Pugno N. & M.V. Nardi & **Taioli S.**
Nanoscale 10, 13449 (2018)

- **Anna Battisti** at the Faculty of Physics, University of Trento on *Computer Simulation of Biological Systems* from 01/11/2010 to 12/03/2013

Outcomes

1. **“Zeolitic Imidazolate Frameworks for separation of binary mixtures of CO₂, CH₄, N₂, and H₂ separation: a computer simulation investigation”**
Garberoglio G. & Battisti A. & **Taioli S.**
Microporous and Mesoporous Materials 143:46 (2011)

I am supervising or I supervised seven postdoctoral researchers:

- **Tommaso Morresi** at ECT*, Trento on *Advanced Coatings for Enhanced Corrosion Resistance of Steel in Liquid Metal Energy Systems* from 19/05/2025 - 18/10/2025
- **Tommaso Morresi** at ECT*, Trento on *Microscopy of biological materials by short pulse terahertz sources* from 01/07/2022 - 31/12/2024
- **Achille Fiore** at ECT*, Trento on *Microscopic calculations of nuclear structure and nucleosynthesis of heavy element during R process* from 01/04/2022 - 31/03/2023
- **Paolo Emilio Trevisanutto** at ECT*, Trento on *Artificial Intelligence for Quantum Systems* from 01/05/2019 - 31/08/2021
- **Samuel Giuliani** at ECT*, Trento on *Microscopic calculations of nuclear structure and nucleosynthesis of heavy element during r-process* from 01/12/2020 - 31/12/2021
- **Andrea Pedrielli** at ECT* and at the Faculty of Mechanical Engineering, University of Trento on *Ab-initio simulations of the electronic, mechanical, and adsorption properties of materials* from 30/04/2018 - 31/09/2021
- **Pablo de Vera Gomiz** Marie Curie Fellow at ECT* on *Nanoparticle a Comprehensive Mechanistic description (NanoEnHanCeMent)* from 01/10/2020 - 31/09/2021
- **Alessio Paris** at at the European Centre for Theoretical Studies in Nuclear Physics and Related Areas n *Ab-initio simulations of the electronic properties of memristive materials* from 01/01/2016 to 31/12/2017

Furthermore, I supervised two master student dissertations:

- Andrea Merlo (“Path integral Monte Carlo investigations of Li nucleosynthesis in evolved stars”)
- Stefano Nasca (“Graphene growth and functionalization: theory and calculations”)

General scientific and academic activities

Assessment Committee Expert

Member of the steering committee of the 2022 postdoctoral calls at ECT*, 2022

Member of the steering committee of Francesca Triggiani's PhD at the University of Camerino, 2025

Member of the steering committee of Abbas Kosari Mehr's PhD at Politecnico di Milano, 2025

Editorial role

Associate Editor: Frontiers in Materials – Editorial Board of the Computational Materials Science section

I acted as **Topic Editor** for the research topic issue “Methodological and Computational Developments for Modeling the Transport of Particles within Materials” which has appeared in Frontiers in Materials.

I acted as **Topic Editor** for the special issue “New Frontiers in Multiscale Modelling of Advanced Materials” appeared in Frontiers in Materials.

Also, I was **Guest Editor** for the 2014 Spring Meeting Proceedings of The Materials Research Society (MRS) and its publishing partner, Cambridge University Press.

Reviewer's experience

I regularly **review** papers for several international high-impact journals in physics, chemistry and materials science, such as Physical Review Letters, Nature Communications, Science Advances, NanoLetters, Nanoscale, Communications Materials, Nanoscale Advances, ACS Materials and Interfaces, Industrial & Engineering Chemistry Research, Journal of Alloys and Compounds, Frontiers in Materials, Journal of Materials Chemistry A, Nuclear Instruments and Methods in Physics Research Section B, Frontiers in Materials, Reviews in Physics, Advances in Chemistry, Physical Review B, Scientific Reports, Physical Chemistry Chemical Physics, Chemical Science, The Journal of Physical Chemistry, The Journal of Physical Chemistry Letters, Physica E: Low-Dimensional Systems and Nanostructures, Physica B: Condensed Matter, Molecules, Journal of Molecular Modelling, Coordination Chemistry Reviews, Soft Computing, Journal of Hydrogen Energy, Journal of Physics B: Condensed Matter, Europhysics Letters,

Recent Personal Research Grants and Project Funding

Apr 2025 – Oct 2025 : €70,000

Advanced Coatings for Enhanced Corrosion Resistance of Steel in Liquid Metal Energy Systems

PRINCIPAL INVESTIGATOR - granted by Bruno Kessler Foundation

Sep 2022 – Oct 2026 : €2,896,705

4D Microscopy of biological materials by short pulse terahertz sources (MIMOSA)

PRINCIPAL INVESTIGATOR - granted by the European Community - PATHFINDER - OPEN

Sept 2020 – Dec 2026 PANDORA: €3,500,000

Plasma for Astrophysics, Nuclear Decays Observation and Radiation for Archaeometry

PROJECT LOCAL LEADER - granted by INFN

Nov 2020 – Oct 2022 : €50,000

Microscopic calculations of nuclear structure and nucleosynthesis of heavy element during r-process

PRINCIPAL INVESTIGATOR - granted by the Caritro Foundation

Nov 2020 – Oct 2022 NanoEnHanCeMent: €171,473.28

Nanoparticle Enhanced Hadron-therapy: a Comprehensive Mechanistic description project

CO-PRINCIPAL INVESTIGATOR (PI: Pablo de Vera) H2020-MSCA-IF-2018 - granted by EU (contract n. 840752)

Nov 2020 – Oct 2023 QUICHE: €66,000

QUantum SensIng TeChnology for Fundamental PPhysics Experiments

CO-PRINCIPAL INVESTIGATOR - granted by the Q@TN consortium

Nov 2020 – Oct 2023 NADIA: €66,000

Quantum sensing with laser-synthesized nano-diamond NV color centers

CO-PRINCIPAL INVESTIGATOR - granted by the Q@TN consortium

Nov 2019 – Oct 2022 ML Q-FORGE: €66,000

Machine Learning techniques FOR Quantum Gate Engineering

CO-PRINCIPAL INVESTIGATOR - granted by the Q@TN consortium

Nov 2019 – Oct 2021 NANOCATER: €66,000

High-Z ceramic oxide nanosystems for mediated proton cancer therapy

CO-PRINCIPAL INVESTIGATOR - granted by the Caritro Foundation

July 2018 – Aug 2021 ARTIQS: €240,000

ARTificial Intelligence for Quantum Systems

CO-PRINCIPAL INVESTIGATOR - granted by the Q@TN consortium

Nov 2016 – Dec 2020 NEMESYS: €300,000

Non equilibrium dynamics models and excited state properties of low-dimensional systems

CO-PRINCIPAL INVESTIGATOR - granted by National Institute of Nuclear Physics (INFN)

Mar 2013 – Oct 2016 MADELENA: €1,500,000

Developing and studying Novel Intelligent NanoMaterials and Devices towards Adaptive Electronics and Neuroscience Applications

CO-PRINCIPAL INVESTIGATOR - granted by Autonomous province of Trento on a competitive basis

Dec 2010 – Dec 2015 The annual budget of the research group I led (2 post-docs, 4 staff and 3 PhD student) was around €500,000, based on both institutional support, public grants and industry income (almost 40 %).

Mar 2014 – Aug 2014 : visiting scientist, Ecole Normale Supérieure de Lyon €8,000

Outgoing researcher grant: Bio-inspired electrochromic ink

PRINCIPAL INVESTIGATOR - granted by Autonomous province of Trento on a competitive basis

Mar 2013 – Feb 2014 SuperCar: €30,000

Carbon-based nanomaterials and graphene growth on metallic substrates by supersonic fullerene epitaxy

PRINCIPAL INVESTIGATOR - granted by Autonomous province of Trento on a competitive basis

Apr 2012 – July 2012 INTELBIOMAT visiting scientist, Pierre and Marie Curie University, Paris (FR): € 5,100

Interdisciplinary Approaches to Functional Electronic and Biological Materials

PRINCIPAL INVESTIGATOR - granted by the European Science Foundation

Jan 2011 – Dec 2013 NATO Collaborative Linkage Grant: € 20,000

Exchange Grants on electron energy loss techniques in collaboration with Kurchatov Institute, Moscow (RU)

CO-PRINCIPAL INVESTIGATOR - granted by NATO

Mar 2011 – Feb 2013 MISTICO: € 120,000

New Technologies and Microsystems for solar energy cogeneration solutions

CO-PRINCIPAL INVESTIGATOR - granted by the Caritro Foundation

Jan 2010 – Dec 2010 *A comparative study of the electronic properties of graphene and hexagonal boron nitride monolayers on metal surfaces*

Beam time at BESSY synchrotron radiation facility, Berlin (DE)

CO-PRINCIPAL INVESTIGATOR - granted by BESSY consortium

June 2010 – June 2011 Grant for computational time, 2,000,000 Au on Cray XT4: £ 3,000

A comparative study of the electronic properties of graphene and hexagonal boron nitride monolayers on metal surfaces

PRINCIPAL INVESTIGATOR - granted by EPSRC (UK)

June 2010 – Dec 2010 Marie Curie Outgoing Researcher (FP7 People): € 30,000 *Epitaxial growth of graphene and SiC layers on inorganic surfaces: a joint theoretical and experimental approach.*

PRINCIPAL INVESTIGATOR - granted by the European Commission

Feb 2009 – Feb 2010 ETH consulting service agreement: € 54,000

Simulation and modeling of low energy electron beams

CO-PRINCIPAL INVESTIGATOR - granted by ETH, Zurich

Feb 2007 – Dec 2007 Royal society International Joint Projects.

Melting curve of transition metals from first principles £ 5,000

CO-PRINCIPAL INVESTIGATOR - granted by the Royal Society

Jan 2006 UCL Graduate School Award for Staff: £ 5,000

Wavepacket treatment of dissociative attachment of water

PRINCIPAL INVESTIGATOR - granted by University College London graduate school

Visiting positions

Visiting professor - University of Murcia - 2 months (2021-2022)

Visiting professor - Gdańsk University of Technology - 1 month (2021-2022)

Research Fellow at the Institute of Advanced Studies - University of Bologna - 12 months (2012-2015)

Visiting scientist - Ecole Normale Supérieure de Lyon - 6 months (2014)

Visiting scientist - University Pierre and Marie Curie - 6 months (2013)

Visiting scientist & Honorary Research Fellow - University College London - 10 months (2010)

Invited talks

INVITED Talk: **Adventures in the wavepacket land: DEA of water** – *International Symposium on Electron-Molecule Collisions and Swarms (EMS2005)* – 27-30/07/2005, Campinas (Brasil)

- Talk: **Mixed ab initio quantum mechanical and Monte Carlo calculations of secondary emission from SiO₂ and carbon-based nanoclusters** – *Linking nuclei, molecules, and condensed matter: computational quantum many-body approaches* – 06-10/07/2009, ECT*, Trento (IT)
- INVITED KEYNOTE and Session Chairman: **The Growth of Carbon-Based Materials by Supersonic Beam Epitaxy: Experiments, Theory and Calculations** – *Materials Research Society Meeting* – 21-24/04/2014, San Francisco (USA)
- INVITED Talk: **Theoretical Estimates of Stellar e-captures from First-Principles Simulations** – *Russbach School on Nuclear Astrophysics* – 08-14/03/2015, Russbach am Pass Gschütt, Austria
- INVITED Talk: **Electron-matter interaction as a tool for materials analysis: theory and experiment** – *Third joint CNR-FBK-UNITN Workshop* – 16/06/2015, University of Trento (IT)
- INVITED PLENARY lecture: *From materials science to astrophysics with multichannel scattering theory* – **Nanoscience & Nanotechnology 2015** – 28/09/2015-02/10/2015, INFN Frascati (Rome, IT)
- INVITED talk: **Graphene trumpets, foams, pillared networks, carbon materials growth, and all that from first-principles** – *EMN Meeting on Computation and Theory* – 10-14/10/2016, Las Vegas (USA)
- INVITED Talk: **Synthesis of carbon-based materials by SuMBE: theory and experiment** – *1st Synthetic methods across the flagship* – 6-10/02/2017, Puerto de la Cruz (Tenerife, SP)
- INVITED Talk: **A first-principle approach to scattering in many-body systems** – *14th International Conference of Computational Methods in Sciences and Engineering (ICCMSE 2018)* – 14-18/03/2018, Thessaloniki (Greece)
- INVITED Talk: **The physics and chemistry of carbon** – *International Workshop on Nanocarbon Photonics and Optoelectronics (NPO2018)* – 6-10/08/2018, Savonlinna (FI)
- INVITED Talk: **Enabling materials by dimensionality: from 0D to 3D carbon-based nanostructures** – *15th International Conference of Computational Methods in Sciences and Engineering (ICCMSE 2019)* – 01-05/05/2019, Rhodes (Greece)
- INVITED Talk: **Relativistic Theory and Ab Initio Simulations of Electroweak Decay Spectra in Medium-Heavy Nuclei** – *Precise beta decay calculations for searches for new physics* – 8-12/04/2019, ECT*, Trento (Italy)
- INVITED Talk: **Relativistic Approaches to β -decays in stellar plasmas** – *PANDORA: Measuring β -decays in plasmas* – 30-31/10/2019, Perugia (Italy)
- INVITED Talk: **Exploring Event Horizons and Hawking Radiation through Deformed Graphene Membranes** – *Global Summit and Expo on Graphene and 2D Materials (2DMAT2021)* – 23-25/08/2021, Paris (France)
- INVITED PLENARY lecture: *17th International Conference of Computational Methods in Sciences and Engineering (ICCMSE 2021)* – 04-07/09/2021, Heraklion, Crete (Greece)
- INVITED Talk and Session Chairman: **Simulation of low energy electron transport in condensed matter for technological and medical applications** – *Dynamics of Systems on the Nanoscale (DySoN-ISACC 2021)* – 18-22/10/2021, Santa Margherita Ligure (Italy)
- INVITED Talk: **The half-life for the radioactive ^{134}Cs and ^{135}Cs in astrophysical scenarios** – *2nd PANDORA Progress Meeting* – 16-17/12/2021, Catania (Italy)

- INVITED Talk: **Radioactive decay in evolved stars: the case of ^{134}Cs and ^{135}Cs – 13th Torino Workshop on AGB stars & the 3rd Perugia Workshop on Nuclear Astrophysics** – 19-24/06/2022, Perugia (Italy)
- INVITED Talk: **Relative Role of Physical Mechanisms on Complex Biodamage Induced by Carbon Irradiation** – *From Hadrons to therapy: fundamental physics driving new medical advances* – 05-09/09/2022, Trento (Italy)
- INVITED Talk: **Electronic excitation spectra and yield: from ab initio dielectric response functions to charge transport Monte Carlo simulations** – (*CMD30-FisMat2023*) – 04-08/09/2023, Milan
- INVITED Talk: **Electron collisions: From materials science to astrophysics** – *4th DEA Club Meeting* – 19-21/06/2024, Potsdam
- INVITED Talk: **Towards realistic secondary electron simulation** – *FIT4NANO* – 27-28/06/2024, Vienna
- INVITED Talk: **The influence of electronic correlation on weak decays of light and heavy nuclei in astrophysical scenarios** – *KRINA2025* – 17-21/02/2025, Trento (Italy)
- INVITED Talk: **Advancements in secondary and backscattered electron energy spectra and yields analysis: From theory to applications** – *FisMat2025* – 07-11/07/2025, Venice
- INVITED Plenary Talk: **Predict, Probe, Reconstruct — Electron Correlation Across Scales: Beams, Bands, and Galactic Chemical Evolution** – *Nanoscience Days 2025* – 07-08/10/2025, Jyväskylä
- INVITED SEMINARS: I delivered about 15 invited guest seminars at several chemistry, physics and materials engineering departments in Italy and Europe, including Charles University in Prague, EPFL in Lausanne, University of Trento, Ecole Normale Supérieure de Lyon, University of Bologna, University of Padua, University of Alicante, University of Murcia, The Polytechnic University of Milan.

Contributed talks

- Talk: **Exploring the wavepacket land: Dissociative Electron Attachment calculations** – *Winter School on Theoretical Methods for Electron and Positron Induced Chemistry* – 14-18/02/2005, J. Heyrovsky Institute of Physical Chemistry, Prague (CZ)
- Talk: **Scattering approach to the calculation of Auger spectra in nanostructures** – *13th European Conference on Applications of Surface and Interface Analysis* – 18-23/10/2009, Antalya, Turkey
- Talk: **SURPRISES: when ab initio meets statistics in extended systems** – *International Workshop on Quantum Monte Carlo in the Apuan Alps VI* – 24-31/07/2010, The Apuan Alps Centre for Physics, Vallico Sotto (IT)
- Talk: **Is contact potential the hallmark of the fermion-fermion interaction?** – *Sixteenth Training Course in the Physics of Strongly Correlated Systems* – 03-14/10/2011, International Institute for Advanced Scientific Studies, Vietri sul mare (IT)
- Talk: **Non-adiabatic ab-initio molecular dynamics of Supersonic Beam epitaxy of Silicon Carbide at room temperature** – *9th European Conference of Computational Chemistry* – 01-05/09/2013, Sopron (HU)

- Talk: **Non-adiabatic ab initio molecular dynamics of supersonic beam epitaxy of silicon carbide at room temperature** – *Italian National Conference on Condensed Matter Physics Including Optics, Photonics, Liquids, Soft Matter* – 09-13/09/2013, Milan (IT)
- Talk: **The growth of carbon-based materials by supersonic beam epitaxy: experiments, theory and calculations** – *27th Indian-Summer School on Graphene – the Bridge between Low- and High-Energy Physics* – 14-18/09/2015, Prague (CZ)
- Talk: *Theoretical estimates of stellar e-captures end beta-decay from first-principles simulations* – **28th Indian-Summer School on Ab Initio Methods in Nuclear Physics** – 29/08/2016-02/09/2016, Prague (CZ)
- Talk: **Graphene trumpets, foams, pillared networks, carbon materials growth, and all that from first-principles** – *1st European Conference on Chemistry of Two-Dimensional Materials (Chem2DMat)* – 22-26/08/2017, Strasbourg (FR)
- Talk: **Graphene synthesis, carbon foams, pillared graphene, pseudospheres and all that from first-principles, multiscale simulations and experiments** – *Recent Progress in Graphene and Two-dimensional Materials Research Conference (RPGR2017)* – 19-22/09/2017, Singapore
- Talk: **Relative role of the physical mechanisms on complex biodamage induced by carbon irradiation** – (*CMD30-FisMat2023*) – 04-08/09/2023, Milan
- Talk: **Evaporation of cations from non-conductive nano-samples using single-cycle THz pulses: an experimental and theoretical study** – *International Symposium on Ultrafast Phenomena and THz Waves (ISUPTW)* – 15-18/11/2024, Guangzhou (China)
- Talk: **Ab Initio Simulations of Electroweak Decay Spectra in astrophysical scenarios: the role of the electronic structure** – *s, i & r Element Nucleosynthesis (sirEN) Conference* – 08-13/06/2025, Giulianova

Professional Associations

- National Institute for Nuclear Physics – INFN/TIFPA - 2015
- National Research Council - 2021
- National Institute for Astrophysics - 2023
- Accademia Roveretana degli Agiati di Scienze, Lettere ed Arti - 2017
- Professional Order of the Engineers of the Italian Republic, Chartered Engineer - 2001

Spoken Languages

- Italian – Mother tongue
- English – Proficient
- French – Beginner
- Spanish – Beginner
- Hungarian – Beginner

PUBLICATIONS - Simone Taioli

- 1) [Revisiting \$^7\text{Be}\$ Weak and Radiative Transition Rates in Big-Bang Nucleosynthesis: Implications for the Primordial Lithium Problem](#)
Simone Taioli, Francesca Triggiani, and Stefano Simonucci
Astronomy & Astrophysics, submitted (2026)
- 2) [Enhanced Throughput and Near Atomically Resolved 3D Protein Structure using Atom Probe Tomography](#)
Gustav Eriksson, Francesco Carnovale, Giovanni Novi Inverardi, Gianluca Lattanzi, Simone Taioli, Mattias Thuvander, Mats Hulander, Martin Andersson
Advanced Functional Materials, submitted (2025)
- 3) [Plasma Induced Variation of Electron Capture and Bound-State Decays](#)
B Mishra, A Pidotella, Simone Taioli, S Simonucci, D Mascali
Submitted to *Physical Review C*, arXiv preprint arXiv:2407.01787 (2025)
- 4) [XANES absorption spectra of penta-graphene and penta-SiC₂ with different terminations: a computational study](#)
Andrea Pedrielli, Tommaso Morresi and Simone Taioli
Applied Sciences, 15 (17), 9812 (2025)
- 5) [Role of defects in atom probe analysis of sol-gel silica](#)
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ACS Omega, 10 (30), 33741 (2025)
- 6) [Adsorption of Silica Oligomers on Biomolecules: Structural and Dynamical Insights for Atom Probe Tomography via classic Molecular Dynamics Simulations](#)
Giovanni Novi Inverardi, Lorenzo Petrolli, Francesco Carnovale, Simone Taioli, Alessio Bartocci, Gianluca Lattanzi
Computational and Structural Biotechnology Journal 27, 2537 (2025)
- 7) [Evaporation of cations from non-conductive nano-samples using single-cycle THz pulses: an experimental and theoretical study](#)
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- 10) [Self-Locking in Collapsed Carbon Nanotube Stacks via Molecular Dynamics](#)
A Pedrielli, **Simone Taioli**, NM Pugno
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- 11) [Atom probe tomography: Computational challenges and perspectives](#)
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- 12) [Nuclear physics midterm plan at LNS](#)
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- 13) [Editorial: Methodological and Computational Developments for Modeling the Transport of Particles within Materials](#)
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- 14) [Silica In Silico: A Molecular Dynamics Characterization of the Early Stages of Protein Embedding for Atom Probe Tomography](#)
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- 16) [Presolar grain isotopic ratios as constraints to nuclear physics inputs for s-process calculations.](#)
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- 37) [Enabling materials by dimensionality: from 0D to 3D carbon-based nanostructures](#)
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- 38) [VizieR Online Data Catalog: Effects of a revised \$^7\text{Be}\$ e-capture rate](#)
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- 39) [Effects of a revised \$^7\text{Be}\$ e-capture rate on solar neutrino fluxes](#)
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- 40) [Secondary electron emission and yield spectra of metals from Monte Carlo simulations and experiments](#)
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- 41) [Ultrafast Carotenoid to Retinal Energy Transfer in Xanthorhodopsin Revealed by the Combination of Transient Absorption and Two-Dimensional Electronic Spectroscopy](#)
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- 43) [A novel combined experimental and multiscale theoretical approach to unravel the structure of SiC/SiO_x core/shell nanowires for their optimal design](#)
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- 45) [UV-light induced vibrational coherences, the key to understand Kasha rule violation in trans-azobenzene](#)
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- 47) [Mechanical and thermal properties of Graphene Random nanofoams via Molecular Dynamics simulations](#)
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- 48) [2D Material Armors Showing Superior Impact Strength of Few Layers](#)
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- 49) [Spider silk reinforced by graphene or carbon nanotubes](#)
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- 54) [Characterization of Pristine and Functionalized Graphene on Metal Surfaces by Electron Spectroscopy](#)
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- 56) [A bird's eye view on the concept of multichannel scattering with applications to materials science, condensed matter, and nuclear astrophysics](#)
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- 57) [Synthesis of single layer graphene on Cu \(111\) by C 60 supersonic molecular beam epitaxy](#)
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- 58) [Lithium abundances in AGB stars and a new estimate for the 7Be life-time](#)
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- 59) [New Frontiers in Multiscale Modelling of Advanced Materials](#)
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- 60) [The interaction of C60 on Si\(111\) 7 × 7 studied by supersonic molecular beams: interplay between precursor kinetic energy and substrate temperature in surface activated processes](#)
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