Allegato B – senza dati personali

Decreto Rettore Università di Roma "Sapienza" n. 2623/2020 del 27.10.2020

PAOLO POSTORINO
Curriculum Vitae

Roma, 10 novembre 2020

Part I – General Information

Full Name	Paolo Postorino
E-mail	paolo.postorino@uniroma1.it
Spoken Languages	Italian, English

Part II – Education

Type	Year	Institution	Notes (Degree, Experience,…)
University graduation	1989	Università di Roma "La Sapienza"	Laurea in Fisica
Pre-doctorate training	1989/90	Rutherford Appleton Laboratory, UK	Visiting scientist at the Spallation Neutron Source ISIS
PhD	1990/93	Joint Ph.D. School Università di Perugia e L'Aquila	Ph.D. Fellowship in "Condensed Matter Physics"
Licensure 01	2000	Università degli Studi della Calabria	Idoneità nazionale Professore Associato – Settore B01B: FISICA
Licensure 02	2013	Ministry of Education, University and Research, Italy	Abilitazione Scientifica Nazionale Professore di I Fascia - SC 02/B1 Fisica sperimentale della materia
Licensure 03	2020	Ministry of Education, University and Research, Italy	Abilitazione Scientifica Nazionale Professore di I Fascia - SC 02/B1 Fisica sperimentale della materia

Part III – Appointments
IIIA – Academic Appointments

Start	End	Institution	Position
1993	2002	University of Roma "Sapienza" - Department of Physics – Faculty of Engineering	University Researcher (Gruppo Discipline n. 87 – Struttura della Materia)
2002	2010	University of Roma "Sapienza" - Department of Physics – Faculty of Engineering	Associate Professor in Experimental Physics (SSD FIS/01)
2010	today	University of Roma "Sapienza" – Department of Physics – Faculty of Science	Associate Professor in Experimental Physics (SSD FIS/01 – SC 02/B1)

IIIB – Other Appointments

Start	End	Institution	Position
1987	1988	Compulsory military service under the Italian armed forces	

Part IV – Teaching experience

I have been invited to give lectures and advanced courses to PhD students and to students of national and international specialized Schools, mostly on the use of optical spectroscopy techniques and high pressures methods, among which:

Year	Institution	Lecture/Course
1996	Università di Camerino International School *Structural Techniques for Advanced Radiation Sources*	Lectures on *Neutron diffraction techniques*
2003	ICTP, Trieste Summer School on *Manganites at high-pressure*	Lectures on *High Pressures Techniques in Optical Spectroscopies*
2009	Palinuro *School of Superconductors and Functional Oxides*	Lectures on Optical spectroscopy in strongly correlated electron systems
2009	Porto Conte Ricerche, Alghero Advanced course on *Tecniche Strumentali applicate alle Biotecnologie*	*La spettroscopia Raman: uno strumento semplice ed efficace per applicazioni multi-disciplinari*
2011	ICTP, Trieste *Joint ICTP-SISSA Colloquium on Condensed Matter*	*Tuning lattice distortion by pressure: the insulator to metal transition and the onset of phase-separated states*
2013	Institute for Plasma Research & Department of Science and Technology, Ahmedabad (India) *School on Advanced Characterization methods for nanophase materials*	Lectures on *Optical Spectroscopy at High Pressure*
2005-19	"Sapienza" Ph.D. School of Physics	Lectures on *Raman Spectroscopy*
2018	Michigan University (by CEA)	Lectures on *Principles of Engineering Materials*
2019	Michigan University (by CEA)	Lectures on *Principles of Engineering Materials*
2020	Perugia University Ph.D. in Physics	Lectures on *Raman Spectroscopy in low-dimensional systems*

I have been a member of many committees for the selection of researchers and post-doc fellows for university and national research institutions. I am a regular member of the final examination committees of Ph.D. Thesis in several Italian (Perugia, Salerno, Roma Tre, Camerino, Firenze, Aquila) and international Universities (Technische Universitat Munchen, Indian Institute of Technology Kharagpur, Sorbonne Université, Basel University), and I have been a member (and President in 2017) of the evaluation and selection committee for the admission to the Ph.D. in Physics of the University of Rome "Sapienza". Since 2004 I have been a member of the board of diverse Ph.D Schools, specifically:

2004-11	"Sapienza" - Ph.D. School of Material Science	Member of the board (Collegio dei Docenti) of the Ph.D. School

2012–today	"Sapienza" Ph.D. School of *Mathematical Models for Engineering, Electromagnetics and Nanosciences*	Member of the board (Collegio dei Docenti) of the Ph.D. School

Since 1993, as a staff member of the University of Roma "Sapienza", I have been regularly teaching several courses to student classes of both the Engineering and the Science Faculty of the University of Roma "Sapienza". These are Fisica I (Mechanics and Thermodynamics), Fisica II (Electromagnetism), Esperimentazione Fisica (Physics Laboratory), Fisica III (Modern Physics), Struttura della Materia con Elementi di Meccanica Quantistica (Structure of matter with basics of quantum mechanics) and Struttura della Materia (Structure of Matter). My typical teaching assignment has been **120 hours (12 CFU) per academic year** with an average number of students greater than **100 per year**.

Since 1994 I have been, and I am, **the supervisor of 55 Master Degree** and a of a large number of bachelor degree students (14 since 2018). Since 1999, I have been the supervisor of **19 Ph.D. students** at the University of Roma "Sapienza", 1 of whom in co-tutoring with Prof. G. Abstreiter of Technischen Universität München, 1 with Prof. F. Bruni of the Roma Tre University, and 2 with Prof. C. Petrillo of Perugia University. Many Most of the students who graduated or got a Ph.D. under my supervision are now working (have worked) in international research institutions and Universities, e.g. ETH-Zurich, Soleil-Paris, CSEC-Edinborough, TUM-Munich, TUE-Eindhoven, APS-Argonne (Illinois-US), ESRF-France, ALBA-Spain, Stanford University (California-US), AMOLF-Amsterdam, Basel University (Switzerland), Harvard University (Boston-Massachusetts-US), Fermilab Chicago (Ilinois-US). One of the present collaborators of my research group (Dr. A. Ciccola) is a founder of a Sapienza start-up (D-ART Srl).

I have also contributed to the Italian version of the book *Sears and Zemansky's University Physics* by H.D. Young and H.A. Freedman.

The details of the courses that I have been giving along the years, all given at "Sapienza", are listed in reverse chronological order in the following table:

Year	**Institution**	**Lecture/Course**
2020/21	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Fisica	Struttura della Materia – 6 CFU
	LM Fisica	Spectroscopy Methods and Nanophotonics – 4 CFU
2019/20	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Fisica	Struttura della Materia – 6 CFU
2018/19	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Fisica	Struttura della Materia – 6 CFU
2017/18	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Fisica	Struttura della Materia – 6 CFU
2016/17	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LM Fisica	Laboratorio di Fisica 12 CFU
2015/16	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 9 CFU
2014/15	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU

	LT Ingegneria Ambiente e Territorio	Fisica I – 9 CFU
2013/14	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 9 CFU
2012/13	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 9 CFU
2011/12	LM Ingegneria delle Nanotecnologie	Struttura della Materia con Elementi di Meccanica Quantistica – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 9 CFU
2010/11	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2009/10	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2008/09	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2007/08	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2006/07	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2005/06	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2004/05	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2003/04	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2002/03	LM Ingegneria Ambiente e Territorio	Fisica III – 6 CFU
	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2001/02	LT Ingegneria Ambiente e Territorio	Fisica I – 6 CFU
2000/01	Corso di Laurea Ingegneria Edile e Architettura	Fisica Generale Corso in affidamento
1999/2000	Corso di Diploma Universitario Ingegneria Ambiente e Risorse	Fisica Generale II Corso in affidamento
1998/99	Corso di Laurea in Fisica	Esperimentazione di Fisica I Corso in affidamento
1997/98	Corso di Laurea in Fisica	Esperimentazione di Fisica II Corso in affidamento

Service activities to the Department and the University

1) Representative (elected) of the Researchers of the SSD B03X – Struttura della Materia – Faculty of Engineering (2000/02)
2) Member (elected) of the Executive Board of the Physics Department (2015/17)
3) Member (elected) of the Executive Board of the Science Faculty (Facoltà di Scienze Fisiche Matematiche e Naturali) (2016/18)
4) Member of the Executive Board (Comitato Direttivo) of the Research Center on the Application of Nanotechnologies to Engineering (Centro di Ricerca per le Nanotecnologie Applicate all'Ingegneria – CNIS) (since 2015)
5) Delegate to represent the Physics Department in the Working Group of the Technological District for Culturale Heritage and Humanities (Distretto Tecnologico per i Beni Culturali – Dtc Lazio), established and financed by Regione Lazio (since 2017)

6) Member of the Education and Teaching Committee (Commissione Didattica) of the Physics Department
7) Member of the Committee for Educational Guidance in Physics of Matter for students (Commissione per i percorsi formativi degli studenti – Curriculum *Fisica della Materia*)
8) Delegate of the Physics Department Director to Safety & Security of the Fermi Building (Physics Dept.)
9) Delegate to represent the Physics Department in the TICHE - Technological Innovation in Cultural Heritage Foundation (Fondazione TICHE)
10) Member of the University Tender Committee in charge of the evaluation procedure for *Fornitura di un Sistema multifunzionale in ultra-alto vuoto con spettroscopia di fotoemissione XPS per il laboratorio di spettromicroscopia integrata dell'Amaldi Research Center* (2019).
11) Appointed tutor for training early career researchers and professors within the programme QuID-Sapienza (Qualità e Innovazione della Didattica - Sapienza).

Part V - Society memberships, Awards and Honors

Year	**Title**
2002-05	Member of the International Scientific Committee of the EHPRG
2009-12	Member of the International Scientific Committee of the EHPRG
2014-17	Member of the International Scientific Committee of the EHPRG
2009-12	Member of the International Evaluation Committee – Panel 4: Magnetic Excitations - of the ILL (Institut Laue Langevin, Grenoble, FR)
2012–today	Reviewer selected by ANVUR (National Agency for the Evaluation of the Research and University system) for Evaluation of the Quality of Research (VQR) over the periods 2004-2010 and 2011–2014, and for SIR project.
2015	Reviewer for the Programme of Excellence - Ile de France - DIM OxyMORE - Matériaux oxydes
2015	Award by Sapienza "Riconoscimento di eccellente insegnamento universitario", top 5% faculty members.
2015-today	Member of the Board of CNIS (Centro di ricerca per le Nanotecnologie applicate all'Ingegneria Sapienza)
2016-19	Member of the Editorial Advisory Board of the journal *Novel Superconducting Materials*
2017-today	Member of the Editorial Board of the *Journal of Physics: Condensed Matter*
2019	Member of the Working Group in charge of producing the *Three-Years Strategy Plan* of the *National Technological Cluster for Cultural Heritage*, selected and appointed by the Executive Board of the TICHE Foundation
2019-2020	Member of the Scientific Committee of the XXVII International Conference on Raman Spectroscopy – ICORS (postponed due to Covid-19 emergency)
2020	Member of the Editorial Board of *Materials* - An open access Journal from MDPI

I am also a member of programme and organizing committees for several national and international conferences on condensed matter under high pressure, and a reviewer for many international journals. I am a regular referee for Phys. Rev. Lett., Phys. Rev. B, J. Appl. Phys., Appl. Phys. Lett., J. Chem. Phys., Dalton Transaction, J. Raman Spectroscopy, Nano Letters, Scientific Reports, J. Phys. Chem. B and C.

During my career I have participated to over 100 international conferences and workshops as an invited speaker or giving contributed presentations. I have also been member of Scientific Committees of some International Conferences and Workshops on high pressure applications and techniques. A very short list of some **invited talks/plenary lectures** given to international conferences since 2000 is here reported.

Year	Title
2001	Pressure-induced transformation in fluid iodine - NATO ADVANCED RESEARCH WORKSHOP "New kinds of phase transitions: Transformations in disordered substances" Volga river, Russia 24-28 May 2001
2004	Competitive effects on the high-pressure phase diagram of manganites – "XI High-Pressure Physics of Semiconductor", Berkeley, California 2-5 August 2004
2011	Tuning lattice distortion by pressure: the insulator to metal transition and the onset of phase-separated states ICTP, Trieste Joint ICTP-SISSA Colloquium on Condensed Matter 9 March 2011
2016	"Structural, electronic and optical properties of Iodine and Bromine organometal perovskites under pressure", E-MRS (European Materials Research Society), Warsaw, September 2016
2016	"High pressure experiments at synchrotron: new challenges and opportunities", Annual Meeting of the Italian Society of Synchrotron Light, Bari, September 2016
2018	"Pressure induced order-disorder transitions in Hybrid Perovskites", Eighteenth International Conference on High Pressure Semiconductor Physics (HPSP18) Barcelona, 23-27 July 2018

Part VI - Funding Information [grants as PI-principal investigator or I-investigator]

Year	Title	Program	Grant value
1989–1990	*Development of the inverse geometry neutron spectrometer eVS installed at the pulsed neutron source ISIS (UK)*	Funded by European Commission	
1993–1994	*Spectroscopy in systems under high pressure*	CNR Special Project	
1994–1996	*Insulator to Metal Transitions and Structural Transitions in molecular Systems under High Pressure*	CNR Special Project	
1998–1999	*Insulator to Metal Transition in Simple Molecular Fluids*	Project PAISS funded by INFM	≈ 30.000 € for the Work Package, received as Unit Responsible
2002–2004	*Study of epitaxial and isotropic strain effects on the metallization process in manganites through Raman, infrared, and X-ray spectroscopies*	PRIN 2002: Effetto dello strain sulla transizione metallo isolante e sulla fase metallica di FILM sottili ed eterostrutture di manganiti. Funded by MIUR.	90.000 € for the Work Package, received as Unit Responsible
2004-2006	*Study of the charge-localization extent induced by isotropic and epitaxial strain in manganese perovskites by means of optical spectroscopies and structural diffraction techniques*.	PRIN 2004: Perovskiti funzionali: sintesi, proprieta' magnetiche e di trasporto elettronico e ionico. Funded by MIUR	60.000 € for the Work Package, received as Unit Responsible
2005–2008	*PRESS MAG-O*	Project funded by INFN and selected as one of the Highlights 2006 of the INFN - Research Group V	120.000 € for the whole project
2009-2011	*Chemical Control and Doping Effects in Pnictide High-temperature Superconductors*	Funded by Fondazione CARIPLO	60.000 € for the Work Package, received as Unit

			Responsible
2011-2012	*Protic Ionic Liquids: structural and spectroscopic study by means of experimental and computational techniques*	Project ATENEO financed by the University of Roma *Sapienza*	85.000 € for the whole project
2013-2015	*Integrating photons and Neutrons at ESS*	Funded by Elettra-Sincrotrone Trieste on a competitive call for PIK (Project In-Kind) projects for the European Spallation Source ESS	25.000 € for the Work Package, received as Unit Responsible
2014-2016	*The Carbon Age of Superconductivity: Organic Superconductors and their Synthesis, Characterization and Theoretical Modelling*	Funded by Fondazione CARIPLO	70.000 € for the Work Package, received as Unit Responsible
2015-2016	*Underwater Tracking System*	Funded by INFN	150.000 € for the whole project
2018-today	*Time-resolved Raman spectroscopy and time-resolved absorption & reflectivity, coupled to spin and time-resolved ARPES at NFFA-SPRINT & Elettra-Fermi for out-of-equilibrium studies of condensed matter*	Funded by NFFA-SPRINT (CNR & EU Funding)	150.000 € for the technical Work Package (man-power not-included), to be received as WP-Responsible
2017	*Procurement contract for spectroscopic imaging of industrial paint.*	Dip. di Ingegneria Industriale, Informazione, Economia – Univ. L'Aquila	9000 €
2018	*Procurement contract for the execution of Raman measurements*	Funded by Fater S.p.A.	4000 €
2020-	*Tiny big science*	Funded by Sapienza under the Call "Bando di Ateneo per iniziative di Terza Missione"	5.000 € for the project, received as Responsible

I am the coordinator of the FET (Future and Emerging Technologies) project ***FingerSERSing*** submitted to the call H2020-FETOPEN-2018-2019-2020-01 for EC funding. The project has been evaluated 4.6/5 but not funded because of limited allocated budget.
An adapted version of this project has been submitted to the call Progetti 2020-Collaborativi of Sapienza for supporting projects of high quality recognised at international level. The project has been audited on 15.10.2020 and the outcome of the evaluation is expected by the end of November.

Since 1990, as PI of research activities requiring beam time for specialized measurements at the major international large scale facilities (ELETTRA, ESRF, ILL, LLB, ISIS, SOLEIL, ALBA, APS), I have received funding to support the execution of the experiments on excellence-based approval by international evaluation panels.

Part VII – Research Activities

Since 2000, I am the Group Leader of the HPS (High Pressure Spectroscopy) group at the Physics Department of University of Roma "Sapienza", which, at present, consists of 2 Associate Professors, 2 Ph.D., 1 Post-doc, and 1 Master degree student and several undergraduate students.

SYNOPSIS

My research activity is in the field of experimental condensed matter physics. Since the beginning and up to now, I have been more specifically focused on the investigation of condensed matter under extreme

temperature and pressure conditions by means of diffraction techniques (neutrons and x-rays) and optical spectroscopy (Raman and Infrared).
My research activity always developed within international collaborations and I carry out my experiments at the major neutron and synchrotron radiation facilities, as well as at my optical spectroscopy laboratories at the Physics Dept. of Rome University *Sapienza*. I have always been working in collaborating groups: at the beginning of my activity when, as a Ph.D. student, I joined the group of Disordered and Liquid Systems based at the University of Rome *Sapienza* and at the University of L'Aquila, and over **the last 20 years as a research group leader** at the Physics Dept. *Sapienza* University.
Indeed, **starting from 1999, I was the responsible of a research line** funded by INFM within the Liquids and Disordered Systems division and I organized my own research group and laboratory of high pressure spectroscopy (HPS Group@Sapienza, see https://gruppohps.wordpress.com). In the following years, I got financed under several national research grants (see funding lists) for the implementation of the lab and for Ph.D and Post-doc fellowships.
The first laboratory I set up is now fully equipped to design, prepare and carry out Raman and Infrared experiments on microscopic samples under variable temperatures (from 5 K up to 1000 K) and high pressures (up to 50 GPa). A sample preparation lab is also available as a support facility to prepare experiments that are, then, carried out at national and international facilities. In 2014, a new state-of the-art MicroRaman spectrometer was added to the lab, making also the Terahertz frequency range accessible to the experiments.
A second laboratory of the HPS group was created and, thanks to a first grant of 53.000 Euros gained under a "Sapienza" University call (Grandi Attrezzature 2013), and a second grant of 30.000 Euros ("Sapienza" University Call – Medie e Grandi Attrezzature 2018), and to a close collaboration with Prof. F. Bordi and Prof. F. Sciortino, I equipped it with a new apparatus based on a tunable wavelength lasers for LTS (Laser Transmission Spectroscopy). LTS is a new method alternative to Dynamic Light Scattering for full characterization of nanoparticles in colloids. More recently, a second optical table has been equipped for applications of the tunable laser to photoluminescence studies on samples at ambient and high pressure. Exploiting the pulsed characteristics of the laser (10 ns pulse duration), we started a research activity on time-dependent Raman and photoluminescence response in biomaterials that typically show slow dynamics related to functionality. Recently, the lab. received a beta-version of a new MicroRaman spectrometer from HORIBA to carry out, under non-disclosure agreement, extensive testing of the instrument.
In 2018, I started a collaboration with the group NFFA-SPRINT based in Trieste (IOM-CNR & Elettra Sincrotrone) aiming at designing and building an optical system for time-resolved Raman measurements with options for time-resolved photoluminescence & reflectivity measurements. The plan is to install the instrument at SPRINT/Elettra and operate it in coupled mode with the spin and time-resolved ARPES. The project focuses on the study of out-of-equilibrium and fast dynamics of low-dimensional and highly-correlated electron systems. At present, the opto-mechanical components of the instrument have been mounted and tested in my labs. and will be transferred for the final assembling and operation at Trieste labs. by the end of the year.
Under the financing of the Department of Physics as one of the Excellence Departments in Italy, I am involved in the spectroscopic characterization of the VIRGO mirrors and, within the Amaldi Research Center, I am engaged in the activities XPS and Raman of the infrastructure *Integrated System of Spectro-Microscopies*.

During the years of leading the HPS group, apart from an Associate Professor (P. Dore) and a University Researcher, now retired, I attracted **19 Ph.D. students** and **7 Post-Docs** (A. Congeduti, F. Bordignon, D. Di Castro, B. Joseph, S. Mangialardo, F. Capitani, F. Ripanti, A. Ciccola), equivalent to about **3.5 person per year** working in my group over 20 years of activity of the HPS group. During these years, **more than 50 graduate students** carried out their Master Thesis work at the HPS laboratory. A number of national/international collaborations are active and particularly close and fruitful are those with my former students who are nowadays working abroad in well recognized and highly qualified research institutions of France, Switzerland, Germany, The Netherlands, UK, and US. Over the period 2003 - 2010, my laboratory was part of the Research and Development Center CRS-Coherentia of the INFM-CNR.

Because of my recognised experience in the high pressure field, I have been elected as one of the members of the International Scientific Committee of the European High Pressure Research Group for several three-years terms (2002-05, 2008-2011, and 2014-2017) and I am among the Italian reference researchers in the field. Since 2005, I am one of the organizers of the workshop of the Italian High Pressure scientific community.
To carry out my research activity over the years, I obtained funding to cover capital, operation and people costs (Ph.D. and post-doc fellowships) from public (INFM, CNR, INFN, MIUR) and private (Fondazione CARIPLO) organizations, as well as from my University through the funding scheme "Progetti di Ateneo". The expenses of the experimental projects involving measurements at the national and international facilities (ELETTRA, ESRF, ILL, LLB, ISIS, SOLEIL, ALBA, APS) have been covered by the facilities, since the proposals had been selected and approved by the international peer review committees appointed by the facilities.

SHORT HISTORY

- My research activity started as a Ph.D. student when I joined the group of Disordered and Liquid Systems based at the Universities of Rome Sapienza and L'Aquila, contributing to the study of hydrogen-bonded systems, in particular water under extreme pressure-temperature conditions.
- In the following years, I extended my research interests to high pressure/high temperature molecular systems and, in particular, to pressure-induced insulator to metal transitions in liquid and solid halogens.
- From 2000 on, I started what became my primary research line, namely the study of strongly correlated electron systems including colossal magneto-resistance systems, superconductors, transition metal oxides and in general functional oxides, by optical spectroscopy and diffraction techniques. Also for this research activity I often exploited high pressure (0 - 50 GPa) methods. Indeed, the possibility of compressing the lattice in a clear and controlled way allows to exploit the volume as a thermodynamic variable. Such an unusual extra degree of freedom provides a simple means to decouple the effects of the microscopic interactions simultaneously at work in highly correlated systems. The interpretation of the experimental results is often rather cumbersome because the Hamiltonian contains interaction terms over the same energy scale, which are related to the different coupling mechanisms. Therefore, during the last years a close collaboration with the theoretical group of condensed matter in our department and at the SISSA School in Trieste was established.
- Thanks to the experience reached over the years, I launched a new research line focused at exploiting optical methods for more technological and practical applications. Together with several collaborators, I am involved in spectroscopic investigations of cultural heritage artworks as well as systems for bio-medical applications and materials of biophysical relevance. The latter research activity has been growing over the last few years and several master and Ph.D. students are now working on this thematic. In particular, we have published several papers exploiting the high potential of conventional Raman spectroscopy and of the recent Surface Enhanced Raman Spectroscopy (SERS) in the field of biophysics research. A number of collaborations have been developed with groups from our Department and the Department of Chemistry but also with external institutions (Istituto Superiore di Sanità, Italian Institute of Technology).

Keywords	Brief Description
1. HYDROGEN BONDED SYSTEMS	
Keywords - High pressure - Neutron scattering - Water	**1a. Water under extreme thermodynamic conditions** The research started during my staying at ISIS Spallation Neutron Source (UK) and continued for several years. Among a number of experiments carried out on hydrogen bonded systems, using different neutron spectrometers available at ISIS, those on supercritical water were particularly remarkable. Indeed, a neutron-diffraction study, we published in ***Nature*** **in 1993**, showed for the first time a de-structuring of water that, above the critical point, behaves like a simple liquid. The whole of the results so obtained stimulated many theoretical works, and these results still represent a benchmark for the literature, even recent, on liquid H_2O. (Collaboration with A. Soper, ISIS UK)
Keywords - Hydrogen bond - Optical properties - Green Chemistry	**1b. Hydrogen bond in ionic liquids** Quite recently, in collaboration with the Dept. of Chemistry of *Sapienza*, I started the investigation of the microscopic behavior of ionic-liquids and their interactions with biological macromolecules. In particular, we demonstrated that a combined theoretical (*ab initio*) and experimental spectroscopic approach is successful for a deeper understanding of the hydrogen bond network that underlies the local structure of these highly interacting systems, which we found to actually survive also in their liquid phase. Several papers have appeared on these systems in the last 5-6 years and I am the corresponding author of the monography: ***Raman Spectroscopy in Ionic liquids Under Variable Thermodynamic and Environmental Conditions*** published in the book **The structure of Ionic Liquids** edited by Springer.
2. CONDUCTIVITY AND STRUCTURAL TRANSITIONS, PRESSURE EFFECTS	
My research in this field was largely devoted to the study of pressure driven Insulator to Metal Transition (IMT) in simple molecular systems (solid and liquid halogens) and in strongly correlated electron systems such as colossal magneto-resistance (CMR) materials and transition metal oxides. I employed structural (x-ray diffraction, EXAFS) and optical spectroscopy (Raman and IR) techniques jointly with high-pressure methods (diamond anvil cells, Paris-Edinburgh large-volume cells). Particularly remarkable are my studies on Iodine, CMR Manganites, MgB_2, Vanadium Oxides and charge density waves in Tellurides.	
Keywords - High pressure - Insulator-to-metal transition - Optical spectroscopy - Molecular systems	**2.a Molecular systems** My study of the IMT in I_2, considered a classical counterpart of H_2, was carried out by coupling several experimental techniques (Infrared, Visible, and UV absorption spectroscopy, Raman, EXAFS) and developing specific high-temperature high-pressure experimental apparatus for each technique. The results in I_2 (liquid, solid and in solution) show the importance of the thermally-induced disorder in causing early metallization in the liquid. A general model for metallic liquid halogens was proposed by us, based on the occurrence of instantaneous percolative paths among interacting molecules. The analysis of the IMT transitions in simple liquid systems such as Cs, Rb, Hg, and H2, led us to the idea of a sort of universal liquid at least in proximity of the IMT. (Main collaborations with the High Pressure group at the ESRF and the group of J.P. Itie LURE, FR).
Keywords - Insulator-to-metal transition - Strongly correlated electron systems - High pressure	**2.b Strongly correlated electron systems** The main idea behind my work on CMR manganites, which I started about 10 years ago, consisted in using hydrostatic and “chemical” pressure for tuning the Jahn-Teller distortion that affects the MnO6 octahedra and, consequently, the electron-phonon coupling. This strategy allowed to decouple the effects of the different microscopic interactions acting simultaneously, and thus to identify

	the mechanisms driving the CMR and the IMT transitions and their close coupling with the PM/FM magnetic transition. My studies on $La_{1-x}Ca_xMnO_3$ CMR manganites enabled to obtain the first extended experimental P-T phase diagram of a manganite, and a microscopic theoretical model to reproduce it by introducing a strongly P-dependent antiferromagnetic interaction. High pressure studies carried out on the parent $LaMnO_3$ and Ga/Mn substituted compounds confirmed the above scenario and revealed the onset of a magnetic/structural phase separation scenario at high-P and low-T, as well as an IMT transition above 32 GPa in a weakly Jahn-Teller distorted $LaMnO_3$. (Main collaborations with D.D. Sarma, IIS India, and Stanford University US). The results obtained were reported in many papers including 4 articles in *Phys. Rev. Lett.*, and one in *PNAS*.
	Later on, I extended the leading idea of the pressure modulation of a symmetry breaking interaction, such as the Jahn-Teller (local distortion), to other interactions (lattice extended) and accordingly suited systems. Namely, the studies carried out on Peierls distorted VO_2 led us to the identification of a new metallic monoclinic phase achieved under pressure (above 10 GPa), which definitely clarifies the major role of the electron-electron vs the electron-phonon coupling in driving the IMT in these systems. Particularly interesting are also the studies on the effects of the lattice compression on the incommensurate modulation of the electron density in di- and tri-tellurides, where we found that the charge density wave state is suppressed under pressure. (Main collaborations with L. Degiorgi ETH Zurich, I.R. Fisher Stanford University, US, Infrared Beamline at ELETTRA).
Keywords - HTc superconductors - Chemical vs hydrostatic pressure - Raman spectra	**2.c Superconducting systems**
	A peculiar class of highly correlated electron systems is that of high temperature superconductors, among which a most approachable one is MgB_2 whose rather simplicity allows for a deeper insight into fundamental physical properties. Therefore, I started my work on superconductors with MgB_2 as a first sample, and extended it to iron based systems and, recently, to doped polycyclic aromatic hydrocarbons. The research strategy was the investigation of the phonon spectrum by Raman and infrared spectroscopy usually in combination with a theoretical analysis, with the aim of identifying the key coupling drivers for the onset of the superconductive phase. A high appreciation by the scientific community was received for the papers on doped MgB_2, (two of them received about 120 citations) where a novel interpretation of the Raman spectra was proposed. I have also obtained new experimental results about the pressure effects on the superconducting temperature and on lattice structure and dynamics of prototypical iron-based superconductors, in collaboration with M. Hanfland of the ESRF (FR) and L. Malavasi Pavia Univ. (published on *J. Am. Chem. Soc.* in 2009)

Keywords - Low-dimensional systems - Semiconducting nanowires - Optical properties - High pressure	**2.d Low dimensional systems**
	A common indication emerging from the results of the above studies is the special relevance of the intrinsic dimensionality of the systems. In particular, structural transitions induced by strict confinement can be used to tune relevant electronic properties of systems. Following this idea and fully exploiting the potential of the spectroscopic techniques coupled to high pressure methods, I started a collaboration with G. Abstreiter (TUM –Munchen) and E. Bakkers (TUE-Eindhoven) on nano-sized materials like Ga-As nanowires. In the last few years, relevant papers have been published in ACS Nano and Nano Letters. In the last few years we have applied our spectroscopic techniques to investigate the possibility of using bundle of ordered carbon nanotubes as a base for directional detectors for wimps (Weakly Interacting Massive Particle) in collaboration with A. Polosa and C. Mariani of our Dept. Several papers have been published (Carbon, J. Phys. Chem). Exploiting my previous experience, my present research nowadays focuses on the single/few layers TMD (Transition Metal Dichalcogenides) which, notably, are among the most interesting graphene-like materials as well as on 2D heterostructures in collaboration with D. Di Castro of Tor Vergata University, I. Zardo of Basel University, L. Malavasi of Pavia University.
3. APPLIED SPECTROSCOPIC METHODS	
Taking full advantage of the deep knowledge and experience I matured in the field of optical spectroscopy, and thanks to the increased number of young researchers in my group, I launched several research activities where we began to apply experimental methods to the study of more technological and practical subjects.	
Keywords - Raman spectroscopy - Imaging	**3.a Cultural Heritage**
	Cultural heritage research offers valuable contributions to heritage conservation and study through multidisciplinary projects, which, in our case, brought to significant improvements in diagnostics and in the identification of the causes/effects of alterations. In particular, we carried out systematic spectroscopic studies on polychromes by fully exploiting the high spatial resolution of our microRaman spectrometer. Our results enabled to unveil some aspects of the Etruscan painting techniques as well as to understand the alteration phenomena affecting medieval artworks or of the modern street art. This is a multi-disciplinary research activity carried out within a collaboration with the Istituto del Restauro di Roma, Roma Tre University (M.A. Ricci). Taking full advantage from these collaborations, two monographies on two books and more than 10 papers have been published over the last few years.
Keywords - Plasmonic nanoparticles -SERS substrates - SERS imaging - Cellular diagnostics	**3.b Biological and Biomedical applications**
	The exploitation of spectroscopic techniques to address research topics of biomedical interest has been pursued during the last years, and some experimental projects were launched in collaboration with groups from the Istituto Superiore di Sanità and Roma Tor Vergata and CNR.
	Recently I shifted my research interests more towards biophysical topics. In particular, we investigated the aggregation processes in protein misfolding, the main ossidative processes in DNA, and we addressed the possibility of developing high sensitivity - high selectivity biosensors. Our specific ability in this field is that of combining conventional Raman spectroscopy and SERS (Surface Enhanced Raman Spectroscopy) exploiting new tools, such as hydrostatic pressure (up to 1.5 GPa) and chemical treatments with ionic-liquids, to drive and control the microscopic processes at work in an assembly of large biomolecules. Our first papers in this field appeared in 2012 (Soft Matter and

	RCS Advances) and a number of others followed. In the strong effort devoted to develop innovative biosensing devices, a paramount role is played by SERS. In collaboration with the Biophysics Group of F. Bordi of our Dept. we have approached the problem from the basic aspects of designing and realizing proper metallic nanostructures through the self-assemby of metallic nanoparticles. In collaboration with the theoretical group of F. Sciortino of our Dept. we also successfully exploited controlled assembling of DNA functionalized nanoparticles. Our SERS measurement thus confirmed theoretical predictions and paved the way to novel plasmonic nanodevices. Our experience and the exploitation of these SERS results allowed us to propose in different papers a new strategy for the targeting of cancer cells. Relevant papers on these aspects appears on Nanoscale, APL, Colloids and Surfaces, Frontiers in Chemistry.

Part VIII – Summary of Scientific Achievements

The results of my research activity have been presented to more than 150 international conferences and workshops (both invited and contributed). I am co-author of about **190 publications (WoS/Scopus)** on peer reviewed journals, which received about **3640 citations (WoS/Scopus)** for a **total IF of 628 (impact factor relative to the publication year)** and an **IF per paper of 3.53** (only 178 have an IF) and a H-index **HF=33 (WoS/Scopus)**. The 3 most cited articles received 234, 156, 127 citations.

Over the period **2005-2020**, I have published **148 papers (WoS/Scopus)** on peer reviewed journals, which received about **2505 citations (WoS/Scopus)** for a **total IF of 520 (impact factor relative to the publication year)** and an **IF per paper of 3.69** (only 141 have an IF) and a H-index **HF=29 (WoS/Scopus)**.

Using Google Scholar, my total bibliometrics score results to be about 250 papers, 4560 citations, and HF=36.

Product type	Number	Data Base	Start	End
Papers [international]	190	WoS/Scopus	1989	2020
Books [scientific]	3	ISBN		
Books [teaching]	1	ISBN		

Total scientific production

Total Impact factor	628	WoS/Scopus
Average Impact factor per product	3.53	WoS/Scopus
Total Citations	3640	WoS/Scopus
Average Citations per product	19.16	WoS/Scopus
Hirsch (H) index	33	WoS/Scopus
Normalized H index(*)	1.03 = 33/32 [32 resulting from (2020-1989)+1, 1989 being the year of the first publication]	WoS/Scopus

Scientific production last 15 years (2005-2020)

Total Impact factor (**)	520	WoS/Scopus
Average Impact factor per product	3.69	WoS/Scopus
Total Citations	2505	WoS/Scopus
Average Citations per Product	16.93	WoS/Scopus
Hirsch (H) index	29	WoS/Scopus
Normalized H index per year	1.93 = 29/15	WoS/Scopus

(*) H index divided by the academic seniority.
(**) For the IF of the papers published in 2020 I have used the one of 2019

Part IX– Selected Publications

List of the publications selected for the evaluation. The IF of each paper is referred to the publication year.

1. *The Interatomic structure of water at supercritical temperatures*
   Postorino, P.; Tromp, R.H.; Ricci, M.A.; Soper, A.K.; Neilson, G.W.
   NATURE (1993) Vol. 366, 668-670
   IF=22.326 Total Citations: 234 (WoS/Scopus); 308 (Scholar)

2. *Water above its boiling-point: Study of the temperature and density dependence of the partial pair correlation functions. I. Neutron diffraction experiment*
   Postorino, P.; Ricci, M.A.; Soper, A.K.
   JOURNAL OF CHEMICAL PHYSICS (1994) Vol. 101, 4123-4132
   IF=3.635 Total Citations: 97 (WoS/Scopus); 113 (Scholar)

3. *Anomalous high pressure dependence of the Jahn-Teller phonon in $La_{0.75}Ca_{0.25}MnO_3$*
   Congeduti, A.; Postorino, P.; Caramagno, E.; Nardone, M.; Kumar, A.; Sarma, D.D.
   PHYSICAL REVIEW LETTERS (2001) Vol. 86 , 1251-1254
   IF=6.668 Total Citations: 86 (WoS/Scopus); 101 (Scholar)

4. *Effect of the Al content on the optical phonon spectrum in $Mg_{1-x}Al_xB_2$*
   Postorino, P.; Congeduti, A.; Dore, P.; Nucara, A.; Bianconi, A.; Di Castro, D.; De Negri, S.; Saccone, A.
   PHYSICAL REVIEW B (2002) Vol. 65, 020507
   IF=3.327 Total Citations: 97 (WoS/Scopus); 110 (Scholar)

5. *Pressure tuning of electron-phonon coupling: The insulator to metal transition in manganites*
   Postorino, P.; Congeduti, A; Dore, P; Sacchetti, A.; Gorelli, F.; Ulivi, L.; Kumar, A.; Sarma, D.D.
   PHYSICAL REVIEW LETTERS (2003) Vol. 91, 175501
   IF=7.035 Total Citations 64 (WoS/Scopus); 75 (Scholar)

6. *Evidence of a pressure-induced metallization process in monoclinic VO_2*
   Arcangeletti, E.; Baldassarre, L.; Di Castro, D.; Lupi, S.; Malavasi, L.; Marini, C.; Perucchi, A.; Postorino, P.
   PHYSICAL REVIEW LETTERS (2007) Vol. 98, 196406
   IF=6.944 Total Citations 156 (WoS/Scopus); 222 (Scholar)

7. *Pressure dependence of the charge-density-wave gap in rare-earth tritellurides*
   Sacchetti, A.; Arcangeletti, E.; Perucchi, A.; Baldassarre, L.; Postorino, P.; Lupi, S.; Ru, N.; Fisher, I.R.; Degiorgi, L.
   PHYSICAL REVIEW LETTERS (2007) Vol. 98, 026401
   IF=6.944 Total Citations 47 (WoS/Scopus); 70 (Scholar)

8. *Optical properties of $V_{1-x}Cr_xO_2$ compounds under high pressure*
   Marini, C.; Arcangeletti, E.; Di Castro, D.; Baldassarre, L.; Perucchi, A.; Lupi, S.; Malavasi, L.; Boeri, L.; Pomjakushina, E.; Conder, K.; Postorino, P.
   PHYSICAL REVIEW B (2008) Vol. 77, 235111
   IF=3.322 Total Citations 127 (WoS/Scopus); 156 (Scholar)

9. *Persistence of Jahn-Teller distortion up to the insulator to metal transition in $LaMnO_3$*
Baldini, M.; Struzhkin, V.V.; Goncharov, A.F.; Postorino, P.; Mao, W.L.
PHYSICAL REVIEW LETTERS (2011) Vol. 106, 66402
IF=7.370 Total Citations 59 (WoS/Scopus), 72 (Scholar)

10. *Pressure tuning of the optical properties of GaAs nanowires*
Zardo, I.; Yazji, S.; Marini, C.; Uccelli, E.; Fontcuberta I Morral, A.; Abstreiter, G.; Postorino, P.
ACS NANO (2012) Vol. 6, 3284
IF=12.062 Total Citations 36 (WoS/Scopus), 39 (Scholar)

11. *Unravelling the structure of protic ionic liquids with theoretical and experimental methods: ethyl-, propyl- and butylammonium nitrate explored by Raman spectroscopy and DFT calculations*
Bodo, E.; Mangialardo, S.; Ramondo, F.; Ceccacci, F.; Postorino, P.
JOURNAL OF PHYSICAL CHEMISTRY B (2012) Vol. 116, 13878
IF=3.607 Total Citations 57 (WoS/Scopus), 66 (Scholar)

12. *Origin of colossal magnetoresistance in $LaMnO_3$ manganite*
Baldini, M.; Muramatsu, T.; Sherafati, M.; Mao, H.K.; Malavasi, L.; Postorino, P.; Satpathy, S.; Struzhkin, V.V.
PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA (2015) Vol. 112, 10869
IF=9.423 Total Citations 33 (WoS/Scopus), 40 (Scholar)

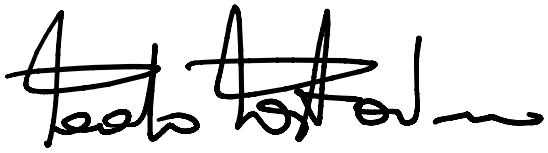
13. *Hexagonal silicon realized*
Hauge, H.I.T.; Verheijen, M.A.; Conesa-Boj, S.; Etzelstorfer, T.; Watzinger, M.; Kriegner, D.; Zardo, I.; Fasolato, C.; Capitani, F.; Postorino, P.; Kolling, S.; Li, A.; Assali, S.; Stangl, J.; Bakkers, E.P.A.M.
NANO LETTERS (2015) Vol.15, 5855
IF=13.779 Total Citations 85 (WoS/Scopus), 114 (Scholar)

14. *Folate-based single cell screening using surface enhanced Raman microimaging*
Fasolato, C.; Giantulli, S.; Silvestri, I.; Mazzarda, F.; Toumia, Y.; Ripanti, F.; Mura, F.; Luongo, F.; Costantini, F.; Bordi, F.; Postorino, P.; Domenici, F.
NANOSCALE (2016) Vol. 8, 17304
IF=7.367 Total Citations 24 (WoS/Scopus), 30 (Scholar)

15. *Pressure-induced effects in organic-inorganic hybrid perovskites*
Postorino, P.; Malavasi, L.
THE JOURNAL OF PHYSICAL CHEMISTRY LETTERS (2017) Vol. 8, 2613
IF=8.709 Total Citations 47 (WoS/Scopus), 56 (Scholar)

16. *Raman spectroscopy of graphene under ultrafast laser excitation*
Ferrante, C.; Virga, A.; Benfatto, L.; Martinati, M.; De Fazio, D.; Sassi, U.; Fasolato, C.; Ott, A.K.; Postorino, P.; Yoon, D.; Cerullo, G.; Mauri, F.; Ferrari A.C.; Scopigno, T.
NATURE COMMUNICATIONS (2018) Vol.9, 308
IF=11.878 Total Citations 33 (WoS/Scopus), 46 (Scholar)

Roma, 10 novembre 2020



Paolo Postorino