

PAOLO BROTTO

PERSONAL DATA

Date of birth ~~1988/12/02~~
Residence ~~via XX/XX/XX/XX/01613 Genoa (Italy)~~
Nationality Italian
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LANGUAGES

Italian (native language)
English (fluent)
French (good)

EDUCATIONAL

2010/03/04 PhD in Materials Science and Technology
2006/10/04 Master Degree in Physics (101/110)

Skills and expertise

Scientific

The scientific skills related to my current activity within the spin-off PM_TEN reflect those acquired over years of research collaboration with the Physics Department of the Genoa University (in the Superconductivity Group at the very beginning of my career then in the Environmental Physics Group).

- Algorithm development for the description of physical systems
- Use and implementation of numerical models and study of optimization techniques of pre- and post-processing procedures aimed to the construction of a complete modelling chain for the description of the atmospheric system
- Statistical models for the analysis of observed data and source-oriented techniques implemented in chemical transport models (variational methodologies and reactive tracers analysis tools) aimed at the identification of source-process-target mechanisms.
- Development of theoretical models to describe the physical properties of crystals and crystalline-structured materials, group theories
- Statistical mechanics and quantum field theory, solid state physics, conventional and unconventional superconductivity

Technical

- Software programming and numerical codes development for the implementation of mathematical models and algorithms (C/C++, Fortran, Linux shell scripting).
- Use of pre- post-processing software for data managing, analysis and mapping, GIS software (MapInfo, Surfer).
- Mathematical analysis codes (e.g. Mathematica, Maple, Mathcad)

Administration/management

I was the main promoter of the technology transfer operation that led to the establishment of the university spin-off PM_TEN and I am CEO of the company since the beginning. Thus I could gain experience even in the field of corporate management, in particular:

- administrative and financial management of the company.
- Marketing and public relationships.
- Project management.

I am Vice-President of the TICASS Consortium, head of the Liguria Regional Center for Research in Energy Environment and Sustainable Development.

Teaching/Communication

I participated to several national and international conferences, technical and public meetings.

I also contributed to several educational frameworks, in particular:

- Teaching contract in the Second Level University Master in "Pollution, Environment, Health"
- Adjunct professor for the course on "Atmospheric Physics and Pollutant Dispersion" at the Genoa University (Physics Dept)
- Teaching contract in the Second Level University Master in "System Engineering for Maritime Technologies – Fortemare" II Ed
- Lecturer for the course of "Theory and Models of Superconductivity"

Work experiences

2012 – now (employee from September 2016): PM_TEN Srl

At the end of 2011 I started working on a project idea aimed to the technology transfer and to establish a connection between the academic research and the business market. Thus in July 2012 I was one of the founding members of the **Spin-Off Company of the Genoa University PM_TEN srl** (Physical Methods and Technologies for Environmental Needs). The company works in field of environmental sciences and offers high-level services to the community through the use of state-of-the-art instruments and methodologies for the environmental analysis, also contributing to the scientific research improvement providing the university and the public institutional world with a powerful and accredited partnership for strategic and scientific research projects.

Within the company I am in charge of **numerical modelling activities**, including the development of simulation tools and its application to atmospheric studies for the assessment of air quality and the evaluation of emission sources impact.

Right before the company foundation I participated in the FiXo project of Genoa University, and I could attend a training course on basic financial and administrative aspects of company management. I am **CEO** of the spin-off company since its foundation and I take care of **financial and administrative issues**.

Since September 6th 2016 I am employee with the placement of first level Italian CCNL terziario/commercio at spin-off company PM_Ten srl. I am responsible of research and development activities, which are now focused on:

- the **development of mathematical numerical models** within uncommon frameworks;

- the realization of **education and dissemination projects** aimed at encouraging the population **active engagement** and the adoption of **resilient approaches** to face air quality issues.

Project collaborations

- POR-FESR SINDBAD (Leisure and Boating Safety Navigation) funded in 2018 within regional call POR LIGURIA 2014-2020 in European FESR framework – Axis 1 "Research and Innovation (OT1)" Action 1.2.4 Project for the development of an advanced operational service to support navigation in a specific area. I am in charge of coordinating the meteorological simulations team.
- POR-FESR MEMORIA Project (Misure E MOdelli: una Rete Integrata per la qualità dell'Aria), funded in 2016). Project for the development of an innovative approach that integrates numerical models and low-cost atmospheric pollution sensor networks for the assessment of air quality. I am the head of PM_TEN activities, in charge of the development of mathematical model for the integration of observed and simulation data.
- EUROCHAMP2020, H2020-INFRAIA call for proposal, whose activities started in January 2017. Project aiming at integrating the most advanced European atmospheric simulation chambers into a world-class infrastructure for research and innovation. I participated in the proposal writing as the responsible for Bio/aero contamination task within the action "Evolution of atmospheric simulation infrastructure to enable the study of impact of air quality on health and on cultural heritage". I introduced PM_TEN as associated partner in the project.

2010 – September 2016: post-doc researcher at Genoa University

From May 2010 to September 5th 2016 I've been a post-doc at the **Environmental Sciences Group of the Physics Department** of Genoa University. My research activity was focused on the **atmospheric dispersion modelling** and I was in charge of the development and implementation of numerical simulation codes for the description of aerosol interactions and pollutant dispersion in atmosphere. I collaborated with the main local authorities (Liguria Region, Province of Genoa and Genoa Municipality) to the development of the modelling chains now in use for the air quality assessment and forecasting over the local regional and urban area. In the last year I started working on the **biological component of atmospheric aerosol (bioaerosol)** and I collaborated with the Microbiology Department of Genoa University for the development of an innovative approach to bioaerosol study using atmospheric chambers facilities. I was involved in the **development of an atmospheric chamber** at the Physics Department of Genoa University and INFN (National Institute of Nuclear Physics). This is a still on-going activity that is expected to provide a high level state-of-the-art instrument, unique in the Italian scientific framework, intended to become a facility for both the national and international scientific community.

Project collaborations

I collaborated in several projects focused on air quality assessment and the development of integrated approaches and modelling tools for the impact evaluation of the main pollution sources.

- DEPOTMASS (DEtermining Particulate Organic and Total Mass in Aerosol Streaker Samples), funded by the National Scientific Commission of the National Institute for Nuclear Physics (INFN). Partners: Florence, Genoa and Milan Sections as well as National Laboratories of Legnaro (2015-2017). I participated in the proposal writing and I'm involved in the activities related to the use of an atmospheric simulation chamber for the production of artificial aerosol samples. (INFN – Genoa section co-proponent)

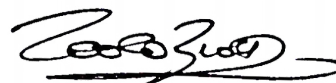
- MED-Integrated Maritime Approach CAIMANs (2014-2015). The project is the natural follow-up of previous MED-APICE project. In the first phase of the project the air quality impact of touristic maritime traffic is evaluated through high resolution atmospheric dispersion modelling, then in the last phases of the project data will be collected by Mediterranean port cities in order to identify critical end points and possible common strategies for air quality mitigation. I participated in the proposal writing and I was in charge of the emission calculations and air quality simulations (model development and scenario analysis, population exposure assessment). (Unige co-proponent)
- MED-APICE (2010-2013). The project involved five Mediterranean port cities (Barcelona, Marseille, Genoa, Venice and Thessaloniki) and was aimed to the evaluation of harbour impact on urban air quality and to the assessment of mitigation actions and possible common strategies for pollution reduction. For the Genoa area we built up a team composed by the Province of Genoa as institutional partner and our research group as scientific partner and project leader. I was in charge of the air quality simulations activities (model development, implementation for scenario analysis and source apportionment) (Unige co-proponent)
- ALCOTRA-AERA (2011-2013). I collaborated to the development and the implementation the regional scale modelling chain for the air quality forecast and evaluation that is now owned by Liguria Region. I was in charge of the development of pollutant atmospheric diffusion numerical simulations. (Unige collaborating with Liguria Region, leader)
- MANIA (2012-2014): project funded by the Italian National Institute for Nuclear Physics (INFN) for the development of nuclear analysis techniques for air quality assessment (INFN – Genoa section co-proponent)
- MITA (2010-2011): local project in collaboration with Genoa Municipality and Local Environmental Protection Agency of Liguria Region; I collaborated to the development of a local scale modelling chain for the assessment of urban traffic impact on Genoa air quality. I developed the air quality section of the integrated simulation tool and I performed the simulations and data analysis. (Unige collaborating with Genoa Municipality, leader)

January 2007 – December 2009: PhD in Materials Science and technologies at Genoa University

In January 2007 I granted a **scholarship by the Genoa University** to attend the PhD course in Materials Sciences and Technologies and I worked at the **Physics Department** within the **Superconductivity group** on theoretical models for the description of the **physical properties of multiband superconductive materials** and in particular of Magnesium diboride. I contributed to the Superconductivity course of Physics master degree providing **frontal lectures on the theory of superconductivity**.

I hereby declare that all the above mentioned information given by me is true and correct to the best of my knowledge and belief.

Genoa, 24th October 2019



Publications list

Papers and books contributions

- Ottaviani E, Gjerci N, Novellino A, D'Angelo P, Brotto P, De Leo F, Ferrari F, Besio G, Mazzino A, Figari M, Zaccone R, Mantovani C, Magaldi M (2019). *SINDBAD: a new operational service for a safer leisure and boating navigation*. METROSea Proceedings, p. 140 ISBN: 978-92-990084-2-3 (short paper).
- Massabò D, Danelli SG, Brotto P, Comite A, Costa C, Di Cesare A, Doussin JF, Ferraro F, Formenti P, Gatta E, Negretti L, Oliva M, Parodi F, Vezzulli L, Prati P (2018). *ChAMBRé: a new atmospheric simulation Chamber for Aerosol Modelling and Bio-aerosol Research..* ATMOSPHERIC MEASUREMENT TECHNIQUES, vol. 11, p. 5885-5900, ISSN: 1867-1381, doi: 10.5194/amt-11-5885-2018 (paper).
- Bove MC, Brotto P, Calzolari G, Cassola F, Cavalli F, Fermo P, Hjorth J, Massabò D, Nava S, Piazzalunga A, Schembari C, Prati P (2015) *PM10 source apportionment applying PMF and chemical tracer analysis to ship-borne measurements in the western Mediterranean*, Atmospheric Environment, doi: 10.1016/j.atmosenv.2015.11.009 (paper)
- Brotto P, Repetto B, Formenti P, Pangui E, Livet A, Boussherrine N, Martini I, Varnier O, Doussin JF, Prati P (2015) *Use of an atmospheric simulation chamber for bioaerosol investigation: a feasibility study*, Aerobiologia, doi:0.1007/s10453-015-9378-2 (paper)
- Massabò D, Caponi L, Bernardoni V, Bove MC, Brotto P, Calzolari G, Cassola F, Chiari M, Fedi ME, Fermo P, Giannoni M, Lucarelli F, Nava S, Piazzalunga A, Valli G, Vecchi R, Prati P (2015) *Multi-wavelength optical determination of black and brown carbon in atmospheric aerosols*, Atmospheric Environment, doi:10.1016/j.atmosenv.2015.02.058 (paper)
- Salameh D, Detournay A, Pey J, Pérez N, Liguori F, Saraga D, Bove MC, Brotto P, Cassola F, Massabò D, Latella A, Pillon S, Formenton G, Patti S, Armengaud A, Piga D, Jaffrezo JL, Bartzis J, Tollis E, Prati P, Querol X, Wortham A, Marchand N (2014) *PM2.5 chemical composition in five European Mediterranean cities: A 1-year study*, Atmospheric Research, doi: 10.1016/j.atmosres.2014.012.001 (paper)
- Bove MC, Brotto P, Cassola F, Cuccia E, Massabò D, Mazzino A, Piazzalunga A, Prati P (2014) *An integrated PM2.5 source apportionment study: Positive Matrix Factorization VS the chemical transport model CAMx*, Atmospheric Environment, doi: 10.1016/j.atmosenv.2014.05.039 (paper)
- Liguori F, Latella A, Pillon S, Elvini E, Patti S, Prati P, Bove MC, Brotto P, Cassola F, Cuccia E, Marchand N, Detournay A, Salameh D, Armengaud A, Piga D, Pey J, Perez N, Querol X, Poupkou A, Melas D, Bartzis G.J., Filiou K, Saraga D, Tolis El, Quaglia T, Zannetti MT, Parra M, Fernández F, Perez C, Repa E (2013). *Reducing atmospheric pollution in the Mediterranean port cities – The results of APICE project*, published in February 2013, ed. Liguori F and Zannetti MT ISBN 978-88-7504-166-3 (book)
- Brotto P, Pallecchi I, Putti M, Galleani d'Agliano E (2010). *Interband and intraband effects in the upper critical field of disordered MgB₂*. Phys Rev. B, Condensed matter and materials physics, vol. 82, ISSN: 1098-0121, doi: 10.1103/PhysRevB.82.134512 (paper)
- Pallecchi I, Brotto P, Ferdeghini C, Putti M, Palenzona A, Manfrinetti P, Lehmann AG, Orecchini A, Petrillo C, Sacchetti F, Affronte M, Allodi G, De Renzi R, Serventi S, Andreone A, Lamura G, Daghero D, Gonnelli

RS, Tortello M (2009). *Investigation of Li-doped MgB₂* RID F-9182-2011. SUST, vol. 22, ISSN: 0953-2048, doi: 10.1088/0953-2048/22/9/095014 (paper)

- Brotto P, Tropeano M, Ferdeghini C, Manfrinetti P, Palenzona A, Galleani d'Agliano E, Putti M (2008). *Experimental confirmation of the low B isotope coefficient of MgB₂*. Phys Rev. B, Condensed matter and materials physics, vol. 78, ISSN: 1098-0121, doi: 10.1103/PhysRevB.78.092502 (paper) -
- Putti M, Brotto P, Monni M, d'Agliano EG, Sanna A, Massidda S (2007). *Intraband vs. interband scattering rate effects in neutron irradiated MgB₂* Europhys. Lett., vol. 77, ISSN: 0295-5075, doi: 10.1209/0295-5075/77/57005 (paper) - IF (2007): 2.22 - Citations: 21.

Invited talks

- Brotto P (2018) *Modellistica ambientale per lo studio di impatto e la valutazione di scenario – EMODnet Day Italia - Dati marini al servizio di industria e settore pubblico per uno sviluppo sostenibile* held in Trieste 8th June 2018 (invited talk)
- Brotto P, Bove MC, Cassola F, Cuccia E, Massabò D, Mazzino A, Beggiato M, Badalato L and Prati P (2014). *Sviluppo e applicazioni di una catena modellistica per la qualità dell'aria in Liguria - Source apportionment e confronto fra modelli a recettore e modelli chimici di trasporto –PM2014 - 6th National Conference on Atmospheric Particulate Matter to be held in Genoa (Italy), 20-23 May 2014 (Invited talk)*
- Brotto P, Tropeano M, Ferdeghini C, Manfrinetti P, Palenzona A, Galleani d'Agliano E and Putti M (2008). *Role of disorder in two gap MgB₂* – Abstract at Workshop “Low dimension dynamical phenomena” within “International School of Solid State Physics” held at Ettore Majorana Scientific Centre in Erice (Italy) in July 2008 (invited talk)

Oral presentations

- Brotto P (2019) *Modellistica ambientale: meteo, mare, studio di impatto e valutazione di scenario – Festival del Mare* held in Genoa Old Harbour Area 16-18 May 2019 (oral presentation)
- Brotto P, Bove MC, Cassola F, Massabò D, Mazzino A and Prati P (2017) *L'impatto del traffico marittimo sulla qualità dell'aria urbana: da APICE a CAIMANs* - Workshop "La riduzione delle emissioni in ambito costiero e portuale" held at Polo Universitario "Marconi" La Spezia 22 Novembre 2017 (oral presentation)
- Brotto P, Caponi L, Brugnatti L, Tarchino F and Frassetto S (2017) *The POR-FESR MEMORIA project: an integrated models-sensors approach for the air quality assessment*, URBANCEQ-2017 International Conference on Urban Comfort and Environmental Quality held in Genoa (Italy) 28-29 September 2017 (oral presentation)
- Brotto P, Gatta E, Bove MC, Massabò D, Mazzino A, Parodi F, Prati P (2016) *ChAMBRé: lo sviluppo di una camera atmosferica per lo studio del bioaerosol*, PM2016 – 7th National Conference on atmospheric particulate matter held in Rome (Italy) 18-20 May 2016 (oral presentation)

- Brotto P, Bove MC, Cassola F, Gatta E, Massabò D, Parodi F, Vigo V, Prati P (2016) *ChAMBRé: the development of an atmospheric simulation chamber at Genoa University*, 2016 Air Quality Conference held in Milan (Italy) 15-18 March 2016 (oral presentation)
- Brotto P, Bove MC, Cassola F, Cuccia E, Massabò D, Mazzino A and Prati P (2014) *A synergic approach for PM_{2.5} source apportionment through receptor modelling and chemical transport model simulations* (2014). 2014 Air Quality Conference held in Garmisch-Partenkirchen (Germany) 24-28 March 2014 Book of Abstracts ISBN: 978-1-909291-20-1 (oral presentation)
- Bove MC, Brotto P, Cassola F, Cuccia E, Massabò D, Mazzino A, Piazzalunga A and Prati P (2012). *Impatto delle attività portuali sulla qualità dell'aria della città di Genova: risultati di una campagna di monitoraggio*. In: PM2012 - 5th National Conference on Atmospheric Particulate Matter - Perugia (Italia), 16-18 Maggio 2012 (oral presentation)
- Putti M, Brotto P, Monni M, d'Agliano EG, Sanna A, Massidda S (2007). *MgB₂ – Effetti del disordine – Intraband VS Interband scattering*, Workshop “Multigap Superconductivity : MgB₂ and beyond” held in Porto Venere (Italy) in March 2007 (oral presentation)

Posters

- Brotto P, Cassola F, Mazzino A, Prati P Downscaling mesoscale wind fields through a mass-consistent model to drive dispersion simulations with ADMS (2014). 2014 Air Quality Conference held in Garmisch-Partenkirchen (Germany) 24-28 March 2014 Book of Abstracts ISBN: 978-1-909291-20-1 (poster)
- Bove MC, Brotto P, Cassola F, Cuccia E, Massabò D, Mazzino A and Prati P (2013). *An integrated source apportionment study: Positive Matrix Factorization vs. the Chemical Transport Model CAMx* In: EAC2013 Prague - European Aerosol Conference Digital Handbook. Granada, 2013/09/01-06 (poster)
- Brotto P, Cassola F, Bove MC, Cuccia E, Massabò D, Mazzino A, Giannaros T, Markakis K, Poupkou A, Melas D and Prati P (2012). *Air quality modelling in the Liguria region and in the urban area of Genoa (Italy)*. In: International Workshop on Air Quality Forecasting Research – Geneve (Switzerland) – 12-14 December 2012 (poster)
- Brotto P, Bove MC, Cassola F, Cuccia E, Massabò D, Mazzino A, Piazzalunga A and Prati P (2012). *The impact of harbour activities on the air quality of the city of Genoa: source apportionment and simulation by dispersion models*. In: EAC2012 Granada - European Aerosol Conference Handbook. Granada, 2012/09/02-07 (poster)
- Brotto P, Cassola F, Mazzino A, Giannaros T, Markakis K, Poupkou A, Melas D and Prati P (2012). *Modelling of particulate matter concentration at regional and local scale*. In: EAC2012 Granada - European Aerosol Conference Handbook. Granada, 2012/09/02-07 (poster)
- Brotto P, Cassola F, Mazzino A, Giannaros T, Markakis K, Poupkou A, Melas D and Prati P (2012). *Air quality modelling in the Liguria region and in the urban area of Genoa (Italy)*. In: Book of abstracts 8th

International Conference on Air Quality Science and Application, Athens, Greece, 19/3/2012 - 23/3/2012 - ISBN 978-1-907396-80-9 (poster)

- Bove MC, Brotto P, Cassola F, Cuccia E, Massabò D, Mazzino A and Prati P (2012). *Evaluation of the impact of harbour activities on air quality in the urban area of Genoa (italy)*. In: Book of Abstracts 8th International Conference on Air Quality Science and Application, Athens, Greece, 19/3/2012 - 23/3/2012 – ISBN 978-1-907396-80-9 (poster)
- Brotto P, Cassola F, Mazzino A, Bove MC, Cuccia E, Massabò D and Prati P (2011). *Developing air quality forecast and evaluation in the city of Genoa and in the Liguria region (italy)*. In: Proceedings of the 14th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Kos, Greece, 2/10/2011 – 6/10/2011 ed. John G. Bartzis, Alexandros Syrakos, Spyros Andronopoulos, ISBN: 978-960-89650-6-5 (poster)
- Brotto P, Galleani d'Agliano E and Putti M (2009). *Hc(2) and T(c) behaviour in MgB₂ irradiated samples* in Workshop “Superconductors by the Mediterranean Sea” Alghero, September 2009 (poster)
- Tropeano M, Brotto P, Ferdeghini C, Galleani d'Agliano E, Manfrinetti P, Palenzona A, Martinelli A and Putti M (2008). *T_c Vs Isotopic Mass Vs Residual Resistivity Investigation in Magnesium Diboride* – SATT 14 – Italian National Conference on Superconductivity held in Parma in March 2008 (poster)