

CURRICULUM VITAE ET STUDIORUM

Paolo Emilio Santangelo

Dipartimento di Scienze e Metodi dell'Ingegneria
Università degli Studi di Modena e Reggio Emilia

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Education

Università degli Studi di Modena e Reggio Emilia, Italy

Doctorate (It.: *Dottorato di ricerca*) 2009

Design of High-Performance Materials, within the program in "High Mechanics and Automotive Design & Technology"

Research Areas: spray characterization, dropwise cooling, heat transfer under evaporative conditions, experimental techniques

Advisor: Prof. Paolo Tartarini; Co-Advisor: Prof. Giovanni S. Barozzi

Laurea degree (M.Sc.) 2005

Mechanical Engineering, full marks and honors (final: 110/110 *summa cum laude*)

Research Area: fuel cells

Advisor: Prof. Paolo Tartarini; Co-Advisors: Prof. Giuseppe Cantore, Prof. Alberto Muscio

Experience

Università degli Studi di Modena e Reggio Emilia, Italy

November 2022 – present

Associate Professor (It.: *Professore associato*) – Dipartimento di Scienze e Metodi dell'Ingegneria

Responsibilities: research, teaching and mentoring, proposal writing

Research Areas: dropwise cooling, fire suppression, flow/flame interaction, fuel cells, experimental techniques

Università degli Studi di Modena e Reggio Emilia, Italy

November 2019 – November 2022

Assistant Professor (It.: *Ricercatore universitario a tempo determinato ai sensi dell'art. 24, comma 2, lett.*

b) della Legge n. 240/2010) – tenure-track, Dipartimento di Scienze e Metodi dell'Ingegneria

Responsibilities: research, teaching and mentoring, proposal writing

Research Areas: dropwise cooling, fire suppression, flow/flame interaction, fuel cells, experimental techniques

Università degli Studi di Modena e Reggio Emilia, Italy

April 2018 – November 2019

Assistant Professor (It.: *Ricercatore universitario a tempo determinato ai sensi dell'art. 24, comma 2, lett.*

a) della Legge n. 240/2010) – fixed term, Dipartimento di Ingegneria "Enzo Ferrari"

Responsibilities: research, teaching and mentoring, proposal writing

Research Areas: dropwise cooling, fire suppression, flow/flame interaction, fuel cells, experimental techniques

University of Maryland, USA

July 2013 – July 2019

Overseas (courtesy) Appointment, Department of Fire Protection Engineering

Responsibilities: research, distance mentoring

Research Areas: flow/flame interaction, fire suppression, fire-induced flows

Università degli Studi di Modena e Reggio Emilia, Italy June 2013 – April 2018

Research Scholar, Dipartimento di Ingegneria “Enzo Ferrari”
Responsibilities: research, proposal writing
Research Areas: spray characterization, fire suppression, dropwise cooling, experimental techniques
Host: Prof. Paolo Tartarini

Università degli Studi di Modena e Reggio Emilia, Italy September 2016 – September 2017

Research Associate, Dipartimento di Ingegneria “Enzo Ferrari”
Responsibilities: research, mentoring, proposal writing
Research Areas: dropwise cooling, fuel-cell science and technology, experimental techniques
Supervisor: Prof. Paolo Tartarini

Università degli Studi di Modena e Reggio Emilia, Italy August 2015

Research contract, Dipartimento di Ingegneria “Enzo Ferrari”
Responsibilities: research
Research Areas: spray cooling of heated surfaces
Supervisors: Prof. Mauro A. Corticelli, Prof. Paolo Tartarini

University of Maryland, USA February 2011 – June 2013

Research Associate (Post-Doc), Department of Fire Protection Engineering
Responsibilities: research, mentoring, proposal writing, general supervision of the activities in FireTEC (Fire Testing and Evaluation Center)
Research Areas: spray characterization, flow/flame interaction, fire suppression, fire-induced flows, flammability, thermal degradation, experimental techniques
Supervisor: Prof. André W. Marshall

Delta Q Consultants, Inc., USA March 2011 – October 2012

Post-Doctoral Consultant (concurrent appointment with University of Maryland)
Responsibilities: consultancy, testing, proposal writing
Subjects of Interest: flammability of solid materials, thermal degradation, cone calorimetry

Università degli Studi di Modena e Reggio Emilia, Italy February 2009 – January 2011

Post-Doctoral Researcher (It.: *Assegno di Ricerca*), Dipartimento di Ingegneria Meccanica e Civile
Responsibilities: research, mentoring, proposal writing
Research Areas: spray characterization, flow/flame interaction, fire suppression, dropwise cooling, experimental techniques
Supervisor: Prof. Paolo Tartarini

University of Maryland, USA January 2007 – June 2008

Short-Term Scholar and Trainee, Department of Fire Protection Engineering
Research Areas: spray characterization, experimental techniques
Supervisor: Prof. André W. Marshall

Università degli Studi di Modena e Reggio Emilia, Italy September 2005 – May 2006

Graduate Research Fellow, Dipartimento di Ingegneria Meccanica e Civile
Research Areas: dropwise cooling, condensation, fuel cells
Supervisor: Prof. Paolo Tartarini

Special skills

Spray and flow diagnostics

Particle Image Velocimetry (PIV); Malvern Spraytec; Laser-Induced Fluorescence (LIF); Bi-directional probes for gas-velocity measurements; Hot-wire anemometry

Thermal measurements and flammability standards

Infrared thermography; Cone calorimetry; LIFT (Lateral Ignition and Flame spread Test)

Languages

Italian: mother tongue

English: excellent both written and oral; Preliminary English Test (PET) and First Certificate in English (FCE), *Cambridge Centre of English*

German: fluent both written and oral; high-school classes

French: limited

Research

Interests

Experiments in thermo-fluid dynamics, fire and energetics represent the core of research interests and conducted activity. Notably, laser-based techniques and infrared thermography have been employed to investigate subjects in fluid mechanics, fire and heat transfer. Cone calorimetry and STA (Simultaneous Thermal Analysis) have also been used to analyze flammability and thermal degradation of solid materials. Some physical and computational modeling has also been developed as based on the obtained experimental results. The research activity encompasses the following areas:

1. Characterization of water-mist sprays [T2,J3,J4,J7,P3,P6,P7,P8,P10,P18]
2. Spray/flame interaction and fire suppression [J4,J5,J8,J10,J11,J21,P14,P17,P20,P25,P26,JP2]
3. Dropwise cooling of heated solid surfaces [J13,P1,P2,P4,P9,P11,P12, P13,P15,P16,P23,P24,JP1]
4. Flammability, thermophysical properties and thermal degradation of solid materials [P19]
5. Fire-induced flows [J9]
6. Acoustic performance of nozzles used in gas-based fire protection systems [J22]
7. Combined Heat & Power (CHP) by fuel cells for stationary applications and fuel-cell efficiency [T1,J1,J2,J14,P5]
8. Advanced and innovative techniques for layer deposition onto fuel-cell substrates [J15,J17,J18,J19,J23,P27,P29,P30]
9. Application of infrared thermography to overland-flow dispersion models [J6,P21,P22]
10. Application of infrared thermography to detection of defects in metal-matrix composites [J12]
11. Thermal measurements in medical devices and strategies for pain management [J16,P28]
12. Nitrogen cooling in aluminum-alloy extrusion process [J20,J26,P31,P37]
13. Ventilation systems and heat pumps for Nearly Zero Energy Buildings [J27,P32,P33,P35,P36,JP3,JP5]
14. Nanofluids as an advanced cooling technology [J24,P34,JP4]
15. Hydrogen production from chemical reactions involving aluminum and water [J25]
16. Passive radiative cooling [JP6].

Contributions¹

a) Journals

[J27] R. Sedoni, M. Romani, P.E. Santangelo, A hybrid model for the assessment of indoor environmental quality in buildings: An insight into mold growth, *Energy Reports*, vol. 13, pp. 4114-4125, 2025.

doi.org/10.1016/j.egyr.2025.03.037

[J26] R. Pelaccia, M. Negozio, P.E. Santangelo, A simple approach to transient-state modeling of nitrogen cooling in the extrusion of light-alloy complex profiles, *Journal of Manufacturing Science and Engineering – Transactions of the ASME*, vol. 147 (2), article no. 021007 (12 pages), 2025.

doi.org/10.1115/1.4066665

¹ Corresponding author underlined.

- [J25] V. Testa, M. Gerardi, L. Zannini, M. Romagnoli, P.E. Santangelo, Hydrogen production from aluminum reaction with NaOH/H₂O solution: Experiments and insight into reaction kinetics, *International Journal of Hydrogen Energy*, vol. 83, pp. 589-603, 2024.
doi.org/10.1016/j.ijhydene.2024.08.152
- [J24] A. d'Adamo, M. Diana, G. Corda, A. Cucurachi, M. Cannio, A. Pellacani, M. Romagnoli, E. Stalio, P.E. Santangelo, Experimental assessment and predictive model of the performance of Ti-based nanofluids, *International Journal of Heat and Mass Transfer*, vol. 216, article no. 124600 (14 pages), 2023.
doi.org/10.1016/j.ijheatmasstransfer.2023.124600
- [J23] R. Pedicini, M. Romagnoli, P.E. Santangelo, A critical review of Polymer Electrolyte Membrane Fuel Cell systems for automotive applications: Components, materials, and comparative assessment, *Energies*, vol. 16 (7), article no. 3111 (28 pages), 2023.
doi.org/10.3390/en16073111
- [J22] M. Strianese, N. Torricelli, L. Tarozzi, P.E. Santangelo, Experimental assessment of the acoustic performance of nozzles designed for clean agent fire suppression, *Applied Sciences*, vol. 13 (1), article no. 186 (21 pages), 2023.
doi.org/10.3390/app13010186
- [J21] P.E. Santangelo, L. Tarozzi, P. Tartarini, Full-scale experiments of water-mist systems for control and suppression of sauna fires, *Fire*, vol. 5 (6), article no. 214 (17 pages), 2022.
doi.org/10.3390/fire5060214
- [J20] R. Pelaccia, P.E. Santangelo, A Homogeneous Flow Model for nitrogen cooling in the aluminum-alloy extrusion process, *International Journal of Heat and Mass Transfer*, vol. 195, article no. 123202 (14 pages), 2022.
doi.org/10.1016/j.ijheatmasstransfer.2022.123202
- [J19] A. Willert, F.Z. Tabary, T. Zubkova, P.E. Santangelo, M. Romagnoli, R.R. Baumann, Multilayer additive manufacturing of catalyst-coated membranes for polymer electrolyte membrane fuel cells by inkjet printing, *International Journal of Hydrogen Energy*, vol. 47 (48), pp. 20973-20986, 2022.
dx.doi.org/10.1016/j.ijhydene.2022.04.197
- [J18] P.E. Santangelo, M. Romagnoli, M. Puglia, An experimental approach to evaluate drying kinetics and foam formation in inks for inkjet printing of fuel-cell layers, *Experimental Thermal and Fluid Science*, vol. 135, article no. 110631 (11 pages), 2022.
doi.org/10.1016/j.expthermflusci.2022.110631
- [J17] M. Cannio, S. Righi, P.E. Santangelo, M. Romagnoli, R. Pedicini, A. Carbone, I. Gatto, Smart catalyst deposition by 3D printing for Polymer Electrolyte Membrane Fuel Cell manufacturing, *Renewable Energy*, vol. 163, pp. 414-422, 2021.
doi.org/10.1016/j.renene.2020.08.064
- [J16] P.E. Santangelo, G. Santunione, A. Muscio, Experimental methodology for quantitative assessment of heat-wrap thermal transient behavior, *Medical Engineering & Physics*, vol. 69, pp. 72-84, 2019.
doi.org/10.1016/j.medengphy.2019.05.003
- [J15] P.E. Santangelo, M. Cannio, M. Romagnoli, Review of catalyst-deposition techniques for PEMFC electrodes, *Tecnica Italiana – Italian Journal of Engineering Science*, vol. 63 (1), pp. 65-72, 2019.
doi.org/10.18280/ti-ijes.630109
- [J14] P.E. Santangelo, P. Tartarini, Effects of load variation and purge cycles on the efficiency of Polymer Electrolyte Membrane Fuel Cells for stationary applications, *Journal of Renewable and Sustainable Energy*, vol. 10 (1), article no. 014301 (19 pages), 2018.
doi.org/10.1063/1.5000936
- [J13] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Experimental and numerical analysis of thermal interaction between two droplets in spray cooling of heated surfaces, *Heat Transfer Engineering*, vol. 39 (3), pp. 217-228, 2018.
dx.doi.org/10.1080/01457632.2017.1295737

- [J12] P.E. Santangelo, G. Allesina, G. Bolelli, L. Lusvarghi, V. Matikainen, P. Vuoristo, Infrared thermography as a Non-Destructive Testing solution for thermal spray metal coatings, *Journal of Thermal Spray Technology*, vol. 26 (8), pp. 1982-1993, 2017.
[dx.doi.org/10.1007/s11666-017-0642-6](https://doi.org/10.1007/s11666-017-0642-6)
 - [J11] P.E. Santangelo, L. Tarozzi, P. Tartarini, Full-scale experiments of fire control and suppression in enclosed car parks: A comparison between sprinkler and water-mist systems, *Fire Technology*, vol. 52 (5), pp. 1369-1407, 2016.
[dx.doi.org/10.1007/s10694-016-0569-3](https://doi.org/10.1007/s10694-016-0569-3)
 - [J10] P.E. Santangelo, B.C. Jacobs, N. Ren, J.A. Sheffel, M.L. Corn, A.W. Marshall, Suppression effectiveness of water-mist sprays on accelerated wood-crib fires, *Fire Safety Journal*, vol. 70, pp. 98-111, 2014.
[dx.doi.org/10.1016/j.firesaf.2014.08.012](https://doi.org/10.1016/j.firesaf.2014.08.012)
 - [J9] S.P. Jankiewicz, C.C. Siang, X. Yao, P.E. Santangelo, A.W. Marshall, R.J. Roby, Analyzing fire-induced dispersion and detector response in complex enclosures using salt-water modeling, *Fire Safety Journal*, vol. 65, pp. 19-29, 2014.
[dx.doi.org/10.1016/j.firesaf.2014.02.002](https://doi.org/10.1016/j.firesaf.2014.02.002)
 - [J8] P.E. Santangelo, P. Tartarini, Full-scale experiments of fire suppression in high-hazard storages: A temperature-based analysis of water-mist systems, *Applied Thermal Engineering*, vol. 45-46, pp. 99-107, 2012.
[dx.doi.org/10.1016/j.applthermaleng.2012.04.011](https://doi.org/10.1016/j.applthermaleng.2012.04.011)
 - [J7] P.E. Santangelo, Experiments and modeling of discharge characteristics in water-mist sprays generated by pressure-swirl atomizers, *Journal of Thermal Science*, vol. 21 (6), pp. 539-548, 2012.
[dx.doi.org/10.1007/s11630-012-0579-5](https://doi.org/10.1007/s11630-012-0579-5)
 - [J6] S. Orlandini, G. Moretti, M.A. Corticelli, P.E. Santangelo, A. Capra, R. Rivola, J.D. Albertson, Evaluation of flow direction methods against field observations of overland flow dispersion, *Water Resources Research*, vol. 48 (10), article no. W10523 (13 pages), 2012.
[dx.doi.org/10.1029/2012WR012067](https://doi.org/10.1029/2012WR012067)
 - [J5] P.E. Santangelo, P. Tartarini, Full scale experiments on water-mist fire-suppression systems in High-Hazard Storages (HHS) – A temperature-based comparison between sole water and water/additive flow, *Impiantistica Italiana*, vol. XXIV (6), pp. 65-74, 2011.
 - [J4] P.E. Santangelo, P. Tartarini, Fire control and suppression by water-mist systems, *The Open Thermodynamics Journal*, vol. 4, pp. 167-184, 2010.
[dx.doi.org/10.2174/1874396X01004010167](https://doi.org/10.2174/1874396X01004010167)
 - [J3] P.E. Santangelo, Characterization of high-pressure water-mist sprays: Experimental analysis of atomization and dispersion, *Experimental Thermal and Fluid Science*, vol. 34 (8), pp. 1353-1366, 2010.
[dx.doi.org/10.1016/j.expthermflusci.2010.06.008](https://doi.org/10.1016/j.expthermflusci.2010.06.008)
 - [J2] L. Venturelli, P.E. Santangelo, P. Tartarini, Fuel cell systems and traditional technologies. Part II: Experimental study on dynamic behavior of PEMFC in stationary power generation, *Applied Thermal Engineering*, vol. 29 (17-18), pp. 3469-3475, 2009.
[dx.doi.org/10.1016/j.applthermaleng.2009.05.023](https://doi.org/10.1016/j.applthermaleng.2009.05.023)
 - [J1] P.E. Santangelo, P. Tartarini, Fuel cell systems and traditional technologies. Part I: Experimental CHP approach, *Applied Thermal Engineering*, vol. 27 (8-9), pp. 1278-1284, 2007.
[dx.doi.org/10.1016/j.applthermaleng.2006.11.002](https://doi.org/10.1016/j.applthermaleng.2006.11.002)
- b) In preparation/Submitted
- [JP6] G. Sciurti, P. Magazzeni, P.E. Santangelo, A. Muscio, Performance comparison of selective and broadband emitters in passive radiative cooling, submitted.
 - [JP5] R. Sedoni, P.E. Santangelo, D. Angeli, An accurate low-order model of a fin-and-tube heat exchanger for the dynamic simulation of heat pumps, revised version submitted.

- [JP4] V. Testa, P.E. Santangelo, A. d'Adamo, M. Romagnoli, Optimization of thermophysical properties of SiO₂- and TiO₂-based nanofluids for cooling Proton Exchange Membrane Fuel Cell systems, submitted.
- [JP3] R. Sedoni, M. Romani, W. Monteleone, F. Ochs, D. Angeli, P.E. Santangelo, Comprehensive modelling and experimental analysis of exhaust air heat pumps for residential applications under cooling operation, revision requested.
- [JP2] P.E. Santangelo, J.A. Sheffel, M.L. Corn, A.W. Marshall, Suppression effectiveness of large droplets on accelerated wood-crib fires.
- [JP1] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Experiments and modeling of dropwise cooling in single-phase evaporation: Single- and multi-droplet configurations.

c) Proceedings

- [P37] M. Grespan, R. Pelaccia, P.E. Santangelo, Numerical modeling of nitrogen-cooled extrusion dies: A 3D-1D methodology for porthole dies, *18th International Heat Transfer Conference (IHTC-18)*, 2-7 August 2026, Rio de Janeiro, Brazil, paper IHTC18-0204.
- [P36] R. Sedoni, M. Romani, P.E. Santangelo, A physical model for the assessment of indoor environmental quality in buildings, *19th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES)*, 8-12 September 2024, Rome, Italy, paper SDEWES2024.0505.
- [P35] R. Sedoni, P.E. Santangelo, D. Angeli, M. Romani, L. Fioravanti, An analytical model of evaporator performance under frosting conditions for lumped-parameter simulations of heat pumps, *41st UIT International Heat Transfer Conference*, 19-21 June 2024, Naples, Italy, *Journal of Physics: Conference Series*, vol. 2940, article no. 012015 (8 pages), 2025.
[dx.doi.org/10.1088/1742-6596/2940/1/012015](https://doi.org/10.1088/1742-6596/2940/1/012015)
- [P34] V. Testa, M. Romagnoli, M. Cannio, A. d'Adamo, P.E. Santangelo, Enhancement of thermophysical properties and assessment of heat transfer by Ti- and Si-based nanofluids for fuel-cell cooling, *European Fuel Cells and Hydrogen Piero Lunghi Conference*, 13-15 September 2023, Capri, Italy, paper ID 91114.
- [P33] R. Sedoni, G. Cannistraci, P.E. Santangelo, D. Angeli, M. Romani, L. Fioravanti, A lumped-parameter model of a smart ventilation unit for Nearly Zero Energy Buildings, *78° Congresso Nazionale ATI*, 14-15 September 2023, Carpi, Italy, *Journal of Physics: Conference Series*, vol. 2648, article no. 012041 (12 pages), 2023.
[dx.doi.org/10.1088/1742-6596/2648/1/012041](https://doi.org/10.1088/1742-6596/2648/1/012041)
- [P32] R. Sedoni, G. Cannistraci, P.E. Santangelo, D. Angeli, M. Romani, L. Fioravanti, Comprehensive modeling of ventilation systems for Nearly Zero Energy Buildings, *40th UIT International Heat Transfer Conference*, 26-28 June 2023, Assisi, Italy, *Journal of Physics: Conference Series*, vol. 2685, article no. 012045 (8 pages), 2024.
[dx.doi.org/10.1088/1742-6596/2685/1/012045](https://doi.org/10.1088/1742-6596/2685/1/012045)
- [P31] P.E. Santangelo, R. Pelaccia, G. Rinaldi, B. Reggiani, L. Orazi, Advanced simulation of nitrogen cooling in extrusion of light alloys, *17th International Heat Transfer Conference (IHTC-17)*, 14-18 August 2023, Cape Town, South Africa, paper ID 703.
[dx.doi.org/10.1615/IHTC17.480-30](https://doi.org/10.1615/IHTC17.480-30)
- [P30] M. Romagnoli, P.E. Santangelo, MAMA-MEA, Mass Manufacture of MEAs Using High Speed Deposition Processes, *8th European Fuel Cell Piero Lunghi Conference and Exhibition (EFC19)*, 9-11 December 2019, Naples, Italy, paper EFC19076, pp. 125-126.
- [P29] M. Cannio, P.E. Santangelo, M. Romagnoli, R. Pedicini, I. Gatto, Smart catalyst deposition by 3D printing for low temperature fuel cells, *Italian National Conference on the Physics of Matter (FisMat 2019)*, 30 September - 4 October 2019, Catania, Italy, abstract 052, pp. 58-59.
- [P28] P.E. Santangelo, G. Santunione, A. Muscio, Evaluation of heat-wrap thermal transient behavior: The development of an experimental test procedure, *XXIV Convegno A.I.P.T.*, 21 September 2018, Padua, Italy.

- [P27] P.E. Santangelo, M. Cannio, M. Romagnoli, Review of catalyst-deposition techniques for PEMFC electrodes, *The 3rd AIGE/IIETA International Conference and 12th AIGE 2018 Conference (AIGE – IIETA 2018)*, 14-16 June 2018, Reggio Calabria – Messina, Italy, paper 119.
- [P26] P.E. Santangelo, L. Tarozzi, M. Bettati, P. Tartarini, Water-mist systems for fire-protection of saunas, *17th International Water Mist Conference*, 25-26 October 2017, Rome, Italy, abstract available on-line ([pdf](#)).
- [P25] P.E. Santangelo, L. Tarozzi, P. Tartarini, Control and suppression of sauna fires by water-mist systems, *2nd International Fire Safety Symposium - IFireSS 2017*, 7-9 June 2017, Naples, Italy, paper ID155, pp. 861-868.
- [P24] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Experimental and numerical analysis of thermal interaction between two droplets in spray cooling of heated surfaces, *ASME-ATI-UIT 2015 Conference on Thermal Energy Systems: Production, Storage, Utilization and the Environment*, 17-20 May 2015, Naples, Italy, paper 231.
- [P23] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Spray cooling by gently-deposited droplets: Experiments and modeling of heat-transfer mechanisms, *15th International Heat Transfer Conference (IHTC-15)*, 10-15 August 2014, Kyoto, Japan, paper IHTC15-8367.
[dx.doi.org/10.1615/IHTC15.evp.008367](https://doi.org/10.1615/IHTC15.evp.008367)
- [P22] S. Orlandini, G. Moretti, M.A. Corticelli, P.E. Santangelo, A. Capra, R. Rivola, J.D. Albertson, Evaluation of flow direction methods against field observations of overland flow dispersion, *American Geophysical Union Fall Meeting 2012*, 3-7 December 2012, San Francisco, CA, USA, Abstract H31G-1207, published in *Eos – Electronic Supplement*.
- [P21] S. Orlandini, G. Moretti, M.A. Corticelli, P.E. Santangelo, A. Capra, R. Rivola, J.D. Albertson, Evaluation of flow direction methods against field observations of overland flow dispersion, *XXXIII Convegno di Idraulica e Costruzioni Idrauliche*, 10-15 September 2012, Brescia, Italy, paper 1238, available on-line ([pdf](#)).
- [P20] P.E. Santangelo, B.C. Jacobs, N. Ren, J.A. Sheffel, M.L. Corn, A.W. Marshall, Suppression effectiveness of water sprays on accelerated wood-crib fires, *Suppression, Detection and Signaling Research and Applications (SUPDET 2012)*, 5-8 March 2012, Phoenix, AZ, USA, available on-line ([pdf](#)).
- [P19] P.E. Santangelo, N.L. Ryder, A.W. Marshall, C.F. Schemel, Flammability of solid materials: An experimental calorimetric approach, *ASME 2011 International Mechanical Engineering Congress & Exposition (IMECE 2011)*, 11-17 November 2011, Denver, CO, USA, paper IMECE2011-63870, vol. 1, pp. 945-950.
[dx.doi.org/10.1115/IMECE2011-63870](https://doi.org/10.1115/IMECE2011-63870)
- [P18] P.E. Santangelo, P. Tartarini, P. Valdiserri, Experimental parametric analysis of water-mist sprays: An investigation on coalescence and initial dispersion, *ASME 2011 International Mechanical Engineering Congress & Exposition (IMECE 2011)*, 11-17 November 2011, Denver, CO, USA, paper IMECE2011-63846, vol. 6, pp. 1167-1174.
[dx.doi.org/10.1115/IMECE2011-63846](https://doi.org/10.1115/IMECE2011-63846)
- [P17] P.E. Santangelo, P. Tartarini, Full-scale experiments on water-mist fire-suppression systems in High-Hazard Storages (HHS): A temperature-based comparison between sole water and water/additive flow, *12th International Conference “Multiphase Flow in Industrial Plants” (MFIP12)*, 21-23 September 2011, Ischia, Italy, on USB flash drive, paper V.4.
- [P16] P.E. Santangelo, P. Tartarini, Dropwise cooling in single-phase evaporation: Infrared experiments on single- and multi-droplet configurations, *24th European Conference on Liquid Atomization and Spray Systems - ILASS 2011*, 5-7 September 2011, Estoril, Portugal, on CD-ROM, “Surface Cooling” section.
- [P15] P.E. Santangelo, P. Tartarini, Infrared experiments of dropwise cooling: Single- and multi-droplet configurations in single-phase evaporation, *29th UIT National Heat Transfer Conference*, 20-22 June 2011, Turin, Italy, pp. 161-166.
- [P14] P.E. Santangelo, P. Tartarini, B. Pulvirenti, P. Valdiserri, A.W. Marshall, Fire suppression by water-mist sprays: Experimental and numerical analysis, *14th International Heat*

- Transfer Conference (IHTC-14)*, 8-13 August 2010, Washington, DC, USA, paper IHTC14-22634, vol. 5, pp. 571-580.
[dx.doi.org/10.1115/IHTC14-22634](https://doi.org/10.1115/IHTC14-22634)
- [P13] P. Tartarini, M.A. Corticelli, P.E. Santangelo, Experimental and numerical analysis of droplet cooling, *14th International Heat Transfer Conference (IHTC-14)*, 8-13 August 2010, Washington, DC, USA, paper IHTC14-22217, vol. 6, pp. 677-685.
[dx.doi.org/10.1115/IHTC14-22217](https://doi.org/10.1115/IHTC14-22217)
- [P12] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Thermal interaction between two droplets in single-phase evaporation, *28th UIT National Heat Transfer Conference*, 21-23 June 2010, Brescia, Italy, pp. 187-192.
- [P11] P.E. Santangelo, M.A. Corticelli, P. Tartarini, Evaporative cooling of heated solid surfaces: Two-droplet thermal interaction, *DIPSI Workshop "Droplet Impact Phenomena & Spray Investigations"*, 28 May 2010, Bergamo, Italy, pp. 35-42, on CD-ROM.
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- [P9] P. Tartarini, M.A. Corticelli, P.E. Santangelo, Droplet cooling of heated surfaces: Experimental and numerical analysis, *11th Triennial International Conference on Liquid Atomization and Spray Systems - ICLASS 2009*, 26-30 July 2009, Vail, CO, USA, on CD-ROM, paper ICLASS09-074.
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- [P7] P.E. Santangelo, P. Valdiserri, P. Tartarini, Drop-size and initial-velocity measurements in water-mist sprays, *27th UIT National Heat Transfer Conference*, 22-24 June 2009, Reggio Emilia, Italy, pp. 131-136.
- [P6] P.E. Santangelo, N. Ren, P. Tartarini, A.W. Marshall, Spray characterization of high pressure water mist injectors: Experimental and theoretical analysis, *22nd European Conference on Liquid Atomization and Spray Systems - ILASS 2008*, 8-10 September 2008, Como, Italy, on CD-ROM, paper ILASS08-10-5.
- [P5] L. Venturelli, P.E. Santangelo, P. Tartarini, Experimental analysis of stationary power generation by PEMFC, *26th UIT National Heat Transfer Conference*, 23-25 June 2008, Palermo, Italy, pp. 603-608.
- [P4] M.A. Corticelli, P.E. Santangelo, P. Tartarini, Dropwise cooling: A numerical simulation code and its validation by infrared thermography tests, *26th UIT National Heat Transfer Conference*, 23-25 June 2008, Palermo, Italy, pp. 329-334.
- [P3] P.E. Santangelo, N. Ren, P. Tartarini, A.W. Marshall, Discharge and dispersion analysis of water mist sprays, *25th UIT National Heat Transfer Conference*, 18-20 June 2007, Trieste, Italy, pp. 123-127.
- [P2] P. Tartarini, P.E. Santangelo, L. Tarozi, Droplets wall interaction: Measurement of the interface temperature through infrared-transparent media, *DITICE Workshop "Drop/wall interaction: Industrial applications, Experiments and Modeling"*, 18-19 May 2006, Bergamo, Italy, on CD-ROM.
- [P1] P.E. Santangelo, L. Tarozi, P. Tartarini, Multi-droplet cooling: Experimental tests on infrared-transparent media, *24th UIT National Heat Transfer Conference*, 21-23 June 2006, Naples, Italy, pp. 419-424.

d) Theses

- [T2] P.E. Santangelo, Characterization of water-mist sprays: Experimental and theoretical analysis of atomization and dispersion, Doctoral Thesis, Università degli Studi di Modena e Reggio Emilia, Modena, Italy, 2009.

[T1] P.E. Santangelo, Analisi di soluzioni innovative per la produzione combinata di energia elettrica e termica mediante Fuel Cells (in Italian), M.Sc. Thesis, Università degli Studi di Modena e Reggio Emilia, Modena, Italy, 2005.

e) Presentations

07/08/2026	18 th International Heat Transfer Conference (IHTC-18), Rio de Janeiro, Brazil [P37]
10/09/2024	19 th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), Rome, Italy [P36]
29/06/2024	2024 International Conference on Advanced Energy Materials, Devices and Systems (AEMDS 2024), "Advanced methods for functional layer deposition in Polymer Electrolyte Membrane Fuel Cell manufacturing" (invited lecture), Ningbo, China (speech delivered on-line)
16/08/2023	17 th International Heat Transfer Conference (IHTC-17), Cape Town, South Africa [P31]
27/06/2023	40 th UIT International Heat Transfer Conference, Assisi, Italy [P32]
11/04/2019	IWMA Seminar Italy 2019 – <i>Seminario sulla Tecnologia Antincendio Water Mist</i> , Milan, Italy
19/09/2018	Safety Expo 2018, "RTV.6 Autorimesse: Il controllo dell'incendio attraverso i sistemi watermist. Un caso pratico" Seminar (invited), Bergamo, Italy
15/06/2018	The 3 rd AIGE/IIETA International Conference and 12 th AIGE 2018 Conference (AIGE – IIETA 2018), Reggio Calabria – Messina, Italy [P27]
25/10/2017	17 th International Water Mist Conference, Rome, Italy [P26]
09/06/2017	2 nd International Fire Safety Symposium - IFireSS 2017, Naples, Italy [P25]
18/05/2015	ASME-ATI-UIT 2015 Conference on Thermal Energy Systems: Production, Storage, Utilization and the Environment, Naples, Italy [P24]
11/08/2014	15 th International Heat Transfer Conference (IHTC-15), Kyoto, Japan [P23]
08/03/2012	Suppression, Detection and Signaling Research and Applications (SUPDET 2012), Phoenix, AZ, USA [P20]
16/11/2011	ASME 2011 International Mechanical Engineering Congress & Exposition (IMECE 2011), Denver, CO, USA [P18,P19]
03/11/2010	10 th International Water Mist Conference, Prague, Czech Republic
11/08/2010	14 th International Heat Transfer Conference (IHTC-14), Washington, DC, USA [P13,P14]
22/06/2010	28 th UIT National Heat Transfer Conference, Brescia, Italy [P12]
26/02/2010	"Impianti di rivelazione e spegnimento incendi. Progettazione e manutenzione alla luce della nuova normativa tecnica" Conference, Modena, Italy
24/09/2009	9 th International Water Mist Conference, London, UK [P10]
27-30/07/2009	11 th Triennial International Conference on Liquid Atomization and Spray Systems - ICLASS 2009, Vail, CO, USA [P8,P9]
22/06/2009	27 th UIT National Heat Transfer Conference, Reggio Emilia, Italy [P7]
10/09/2008	22 nd European Conference on Liquid Atomization and Spray Systems - ILASS 2008, Como, Italy [P6]
07/07/2006	ATI-UIT Congress "L'idrogeno vettore energetico del futuro", Turin, Italy
23/06/2006	24 th UIT National Heat Transfer Conference, Naples, Italy [P1]

Fellowships, honors and awards

Best Innovation Award

Awarded to the project “Mass Manufacture of MEAs Using High Speed Deposition Processes (MAMA-MEA)” by the Fuel Cells and Hydrogen Joint Undertaking (FCH-JU) during the European Hydrogen Week, on 24th November 2020

National Scientific Qualification (It.: Abilitazione Scientifica Nazionale) as an Associate Professor in Thermal Fluid Sciences and Nuclear Engineering (It.: Fisica Tecnica e Ingegneria Nucleare), Italy

Qualification awarded by the Italian Ministry of Education and Research (MIUR), 8th October 2018, valid through 8th October 2027

Joint funding from Prof. M.A. Corticelli and Prof. P. Tartarini, Università degli Studi di Modena e Reggio Emilia, Italy

Endowed fellowship, Experiments and modeling of dropwise evaporative cooling, August 2015

The Editors of Applied Thermal Engineering, Elsevier, The Netherlands

Certificate of Outstanding Contribution in Reviewing, May 2017

The Editors of Fire Safety Journal, Elsevier, The Netherlands

Certificate of Outstanding Contribution in Reviewing, October 2014

Bettati Antincendio S.r.l. & Cassa di Risparmio di Modena Foundation, Italy

Post-doctoral fellowship, Title: Theoretical and numerical approach to water-mist systems for fire-safety applications, 2009-2011

MIUR (Italian Ministry of Education and Research), Italy

Doctoral scholarship, 2006-2008

Italkero S.r.l. & Regione Emilia-Romagna, Italy

Research fellowship, Experimental facility for stationary CHP based on fuel cells, 2006

ZADI S.p.A. & Regione Emilia-Romagna, Italy

Research fellowship, Analysis of condensation phenomena inside dashboards of motorbikes, 2005

“Ing. Luigi De Januario” Award 2005 (ex aequo)

Best M.Sc. thesis on energy engineering, awarded by ANIMP (Italian Association of Industrial Plant Engineering)

Funding and proposals

University of Maryland, USA

NSF (National Science Foundation) GOALI (Grant Opportunities for Academic Liaison with Industry) proposal *Towards Predicting Fire Suppression Performance – Quantifying Fire-Spray Interaction*, successfully awarded in June 2012 and started in August 2012, in collaboration with FM Global and UTRC (United Technologies Research Center):

- Resources: about 465 k\$ over a three-year span
- PI: Prof. A.W. Marshall (Maryland), co-PI's: Prof. P.B. Sunderland and Prof. A.C. Trouvé (Maryland), Dr. H.-Z. Yu (FM Global), Dr. V. Sankaran (UTRC)
- Educational impact: 3 Ph.D. scholarships
- Responsibilities: writing (the part on water-mist experiments), budgeting, advising (as long as employed at the University of Maryland)

FireTEC, University of Maryland, USA

Research and consulting projects have been performed in partnership with corporations and institutions as UTRC, Xtralis and NIST (National Institute of Standards and Technology); the annual turnover was about 100 k\$ for about 2.5 years

Proposals were prepared to respond to NFPA (National Fire Protection Association) calls on the following projects: *Combustion Air Requirements for Large Input Appliances* (2011); *Safety Challenges of “Green” Buildings* (2012); *Evaluation of Water Additives for Fire Control and Vapor Mitigation* (2012); *Sprinkler Protection for Cloud Ceilings* (2012)

Delta Q Consultants, Inc., USA

Contribution to preparing a proposal submitted to *Alpha Natural Resources*; general subject: thermal degradation and combustion of coal; submitted in late 2012

Università degli Studi di Modena e Reggio Emilia, Italy

At the European Community level, he was involved in the project *Mass Manufacture of MEAs Using High Speed Deposition Processes* (MAMA-MEA), awarded by the Fuel Cells and Hydrogen Joint Undertaking (FCH-JU) under the Horizon 2020 program. The project started on 1st January 2018 and ended on 30th June 2021; the consortium included seven partners: Technische Universität Chemnitz, Germany (coordinator); Università degli Studi di Modena e Reggio Emilia, Italy; Fraunhofer Gesellschaft zur Förderung der angewandten Forschung EV, Germany; Johnson Matthey Fuel Cells Ltd., UK; System S.p.A. (now System Ceramics), Italy; INEA Informatizacija Energetika Avtomatizacija DOO, Slovenia; Nedstack Fuel Cell Technology BV, The Netherlands; the total funding exceeded 3 M€. Within the project, he covered the following activities:

- Deputy of the local coordinator (Prof. M. Romagnoli)
- Leader of Work Package WP1 *Specification and technology assessment*, as a member of Università degli Studi di Modena e Reggio Emilia
- Member involved in Work Package WP2 *Technology proof of concept* (leader of one task) e WP7 *Dissemination and Exploitation*

Currently, he is also involved as a participant in the *HyMantoValley - Hydrogen Valley Mantova* project, funded within the EU Interregional Innovation Investments (I3) Instrument. The consortium includes: Provincia di Mantova, Italy; A.G.I.R.E. S.r.l. (coordinator), Italy; SAPIO Produzione idrogeno e ossigeno S.r.l., Italy; RenHive S.r.l., Italy; Wolftank Adisa GmbH, Germany; Veneziana di Navigazione e Rimorchio S.r.l., Italy; Future Proof Shipping B.V., The Netherlands; IPE Locomotori 2000 S.r.l., Italy; Sviluppo Tecnologie e Ricerca per l'Edilizia Sismicamente Sicura ed ecoSostenibile, Italy; Università degli Studi del Sannio di Benevento, Italy; Università degli Studi del Molise, Italy; Università degli Studi di Modena e Reggio Emilia, Italy (local coordinator: Prof. M. Romagnoli); Politecnico di Milano, Italy; Fondazione Bruno Kessler, Italy; Consiglio Nazionale delle Ricerche, Italy; EFIP Federazione europea dei porti interni, Italy. The total funding is about 9 M€; the project started on 1st September 2023 and will end on 31st October 2027.

Nationwide (sponsored by the Italian Ministry of Education, Higher Education and Research, MIUR):

- PRIN (*Progetto di Ricerca di Interesse Nazionale*) Project 2005 *Spray cooling of heated surfaces: experiments, numerical simulations, economical analysis and development of innovative systems*
Five units corresponding to Italian universities (Bergamo, Bologna, Politecnico di Milano, Modena, Pisa), coordinator: Prof. G.E. Cossali (Bergamo unit)
Role: member of the Modena unit (PI: Prof. P. Tartarini)
Resources: ~ 100 k€ over a two-year span (Modena unit only)
Responsibilities: conducting research, mentoring, scientific writing, reporting
- PRIN Project 2007 *Experimental and numerical analysis of sprinkler and water-mist systems for fire control, suppression and extinction*
Five units corresponding to Italian universities (Bergamo, Bologna, Modena, Napoli "Federico II", Pisa), coordinator: Prof. G.E. Cossali (Bergamo unit)
Role: member of the Modena unit (PI: Prof. P. Tartarini)
Resources: ~ 100 k€ over a two-year span (Modena unit only)
Responsibilities: proposal writing, budgeting, conducting research, scientific writing, reporting
- *Ecosystem for sustainable transition in Emilia-Romagna* research and innovation program, within the PNRR (*Piano Nazionale di Ripresa e Resilienza*), coordinator: Prof. M. Dell'Amico (Università degli Studi di Modena e Reggio Emilia)
Twentythree units, among which six universities and six research institutions
Role: member of *Spoke 2 - Clean energy production, storage and saving*, led by Prof. M. Romagnoli (Università degli Studi di Modena e Reggio Emilia)
Duration: 1st October 2022 - 28th February 2026
Responsibilities: supervising, mentoring of a member of the technical staff

At local level, promoted by *Regione Emilia-Romagna* and supported by local industries:

- PRRIITT (*Programma Regionale per la Ricerca Industriale, l'Innovazione e il Trasferimento Tecnologico*) Project 2005 *Combined heat and power generation at 0 environmental impact by fuel cells*
Supported by Italkero S.r.l.
Role: research fellow (PI: Prof. P. Tartarini)
Resources: ~ 100 k€ over a 30-month span (overall)
Responsibilities: conducting research, mentoring, scientific writing, reporting
- PRRIITT Project 2005 *Mathematical modeling to simulate water mist against various fire scenarios*
Supported by Bettati Antincendio S.r.l.
Role: collaborator (PI: Prof. P. Tartarini)
Resources: ~ 200 k€ over a 30-month span (overall)
Responsibilities: conducting research, scientific writing, reporting
- PRRIITT Project 2008 *Study and simulation of innovative nano-mist systems for fire protection; advancement of water-mist and nano-mist systems by chemical additives*
Supported by Bettati Antincendio S.r.l.
Role: collaborator and post-doctoral fellow (PI: Prof. P. Tartarini; co-PI: Dr. B. Pulvirenti, Alma Mater Studiorum – Università di Bologna, Italy)
Resources: ~ 300 k€ over a 30-month span (overall)
Responsibilities: proposal writing, budgeting, conducting research, scientific writing, reporting
- Call for proposals by Regione Emilia-Romagna (art. 6, L.R. 14/2014) 2019 *Development of a hydrogen fueling and control system for a fuel-cell vehicle*
Supported by Landi Renzo S.p.A.
Role: leader of the activities related to hydrogen safety (PI: Prof. M. Romagnoli)
Resources: ~ 50 k€ over a 30-month span (out of ~ 500 k€ awarded to the whole Università degli Studi di Modena e Reggio Emilia unit)
Responsibilities: managing all the activities within the referred task (i.e., proposal writing, budgeting, scheduling, overseeing of involved researchers, assessing and ensuring consistency between scopes and results)
- PR FESR 2021-2027 - Priorità 1 - Azione 1.1.2 - D.G.R. 2097/2022 “Bando per progetti di ricerca industriale strategica rivolti agli ambiti prioritari della Strategia di Specializzazione Intelligente 2023-2024” *Hy-ER – Modellazione, simulazione e dimostrazione a banco di sistemi Idrogeno e Fuel-Cells per applicazioni logistiche ed industriali*
Role: participant (PI: Prof. M. Romagnoli)
Duration: 15th February 2024 – 31st July 2026
Responsibilities: overseeing of the activities of Università degli Studi di Modena e Reggio Emilia unit in synergy with the other units, including supervision of temporary research staff recruited to the purpose

In June 2020, he was awarded a FAR (*Fondo di Ateneo per la Ricerca*) Impulso 2020 starting grant (2 k€) by Università degli Studi di Modena e Reggio Emilia, in recognition of his research achievements and publication record. Those funds expired on 30th June 2022.

He was involved as a participant in the project *NANO4COOL – NANOfluids for COOLing of PEM Fuel Cell Systems*, funded by Università degli Studi di Modena e Reggio Emilia within the FAR (*Fondo di Ateneo per la Ricerca*) Mission Oriented 2021 program. The total funding – awarded in December 2021 – was about 65 k€ and the duration was 18 months; Prof. A. d’Adamo served as the PI, while he led Work Package WP5 *Cooling performance testing*.

In July 2023, he was awarded a FAR (*Fondo di Ateneo per la Ricerca*) – Piano di Sviluppo Dipartimentale (departmental development program) grant (about 6 k€) by the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, to expand the capabilities of his laboratory.

In addition to those projects, he was involved in an applied-research collaboration with Regione Emilia-Romagna and ZADI S.p.A. for the analysis of condensation phenomena inside dashboards of

motorbikes, through which he enjoyed a research fellowship in 2005. During his term, he mentored an undergraduate student, conducted research and prepared the final report.

From December 2015 through September 2016, he was involved in a consultancy/research activity sponsored by Bettati Antincendio S.r.l. and Camera di Commercio di Reggio Emilia on characterizing an innovative inert-gas fire-suppression system that optimizes the agent discharge.

From November 2017 through November 2019, he was involved in a project supported by Bayer S.p.A. on the quantitative comparison between various heat-wrap types over their thermal transient behavior. This project fell under the umbrella of thermotherapy methods; a novel approach to evaluate wrap/body interface temperature was developed and validated. Finally, the experimental campaign included testing of hundreds of heat-wrap samples.

From November 2020 through July 2021, he led a scientific and technical consulting activity to address thermal-management problems in an industrial ice-cream machine model by Motor Power Company S.r.l.; funding was issued through Fondazione REI - Reggio Emilia Innovazione.

From October 2023 through May 2025, he led a project funded (12 k€) by Diva International S.r.l. along with Prof. A. Muscio; this research focused on the comparative assessment of heat-wrap performance and the evaluation of permeability of their top layer.

From June through November 2025, he led a project funded (15 k€) by RSEngineering S.r.l. along with Prof. D. Angeli; this research focused on the development of a system that combines building information, HVAC (Heating, Ventilation and Air Conditioning) system modeling and control strategies for energy management in buildings.

From November through December 2025, he led a project funded (32 k€) by a top pharmaceutical company along with Prof. A. Muscio; a second contract (35 k€) started in March 2026 as a follow-up to the previous one. This research is focused on advanced heat-flux and temperature measurements in biomedical devices.

Collaborations

a) Academia and research institutions

- Department of Fire Protection Engineering, University of Maryland, USA (Prof. S.I. Stoliarov)
- United Technologies Research Center (UTRC), USA (Dr. M.L. Corn)
- Department of Civil and Environmental Engineering, Cornell University, USA (Prof. J.D. Albertson)
- Department of Materials Science, Tampere University of Technology, Finland (Prof. P. Vuoristo)
- Technische Universität Chemnitz, Germany (Prof. R.R. Baumann)
- Fraunhofer Gesellschaft zur Förderung der angewandten Forschung EV, Germany (Dr. A. Willert)
- Unit of Energy Efficient Building, Universität Innsbruck, Austria (Prof. F. Ochs)
- Dipartimento di Ingegneria "Enzo Ferrari", Università degli Studi di Modena e Reggio Emilia, Italy (Prof. A. Capra, Prof. L. Lusvarghi, Prof. S. Orlandini, Prof. P. Tartarini)
- Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy (Prof. L. Orazi, Dr. R. Pelaccia, Prof. B. Reggiani)
- Dipartimento di Ingegneria Energetica, Nucleare e del Controllo Ambientale, Alma Mater Studiorum - Università di Bologna, Italy (Prof. B. Pulvirenti, Prof. P. Valdiserri)
- Dipartimento di Ingegneria e Architettura, Università degli Studi di Trieste, Italy (Prof. M. Piller)

b) Industry and agencies

- Bayer S.p.A., Italy
- Bettati Antincendio S.r.l., Italy
- CEN/CENELEC and JRC (Joint Research Centre), European Commission
- Combustion Science & Engineering Inc., USA
- Italkero S.r.l., Italy
- Johnson Matthey, UK
- Landi Renzo S.p.A., Italy

- Regione Emilia-Romagna, Italy
- System Ceramics S.p.A., Italy
- ZADI S.p.A., Italy
- Zehnder Group Competence Center Campogalliano, Italy

Teaching and mentoring

University of Maryland, USA

A revision was conducted on some chapters of the Ph.D. thesis *Advances in Characterizing Fire Sprinkler Sprays*, by N. Ren, advised by Prof. A.W. Marshall (November 2010). Supervising activity was carried out on the M.Sc. scholarly paper *Suppression Effectiveness of Water Sprays on Accelerated Wood Crib Fires*, by B.C. Jacobs, advised by Prof. A.W. Marshall (May 2011) and on the M.Sc. thesis *Detailed Measurement of Fire-Induced Mixing Phenomena*, by T.G. Layton, advised by Prof. A.W. Marshall (May 2014). Supervision was also performed on the Ph.D. work by S. Kahrmann on smoke motion through double-skin façades; the student was affiliated with the University of Edinburgh, UK and co-advised by Prof. A.W. Marshall and Prof. J.L. Torero from University of Queensland, Australia (April 2016).

A team of ten undergraduate students was supervised on various projects under the realm of FireTEC activity (fire flammability, smoke detection and wood-crib fire suppression). Three exchange students from *Hochschule Mannheim*, Germany, were supervised throughout these projects.

Università degli Studi di Modena e Reggio Emilia, Italy

Courses taught:

- Thermodynamics and heat transfer, academic years 2018/19 – 2019/20, with Prof. M.A. Corticelli
- Thermodynamics and heat transfer for Information Technology applications, academic year 2019/20, with Prof. A. Muscio
- Fuel cells, academic year 2018/19, with Prof. M. Romagnoli
- Fundamentals of fire-protection engineering, academic year 2018/19, with M. Bettati
- CFD fundamentals and aerodynamics, academic years 2018/19 – 2019/20, with Prof. E. Stalio
- Thermodynamics and heat transfer, from academic year 2019/20 on
- Energy management of industrial buildings, from academic year 2021/22 on, with Prof. D. Angeli until academic year 2022/23
- Hydrogen and fuel cells (doctoral course), from academic year 2022/23 on

Additional teaching appointments:

- Seminar lecturer, “Energy Management and HVAC”, 2017, held by Prof. P. Tartarini
- Teaching assistant, “Thermodynamics and Heat Transfer”, 2005-2010, held by Prof. P. Tartarini and Prof. M.A. Corticelli
- Teaching assistant, “Energy Management”, 2005-2010, held by Prof. P. Tartarini
- Seminar lecturer, “Energy Management”, 2005-2010, held by Prof. P. Tartarini
- Seminar lecturer, “HVAC and Hygrometric Comfort in Automobiles”, 2005-2010, held by Prof. P. Tartarini
- Qualified as an examiner (It.: *Cultore della materia*) in thermal fluids by the School of Engineering
- Examiner for all the courses in thermo-fluid dynamics, 2005-2011

Five students were co-advised throughout their B.Sc. theses (F. Tardini, M. Gualandi, M.M. Zaccanti, A.L. Piumacci, G. Borghi) over the period 2005-2018, under the supervision of Prof. P. Tartarini and Prof. M. Romagnoli. A student (E. Ferrari) was co-advised throughout her Master's thesis in 2018, under the supervision of Prof. P. Tartarini. A student (G. Marino) was co-advised throughout his Master's thesis in 2019, together with Prof. M. Romagnoli. A student (S. Gibertini) was advised throughout her Master's thesis in 2024 and a student (L. Fattori) was advised throughout her Master's thesis in 2026. Three students (A. Barilari, F.G. Cioni, G. Palummieri) are currently being advised through their Master's thesis. Two students (G. Cannistraci, M. Giosuè) were co-advised throughout their Master's thesis in 2023 and a student (F. De Seta) was co-advised throughout his

Master's thesis in 2024, together with Prof. D. Angeli. A student (M. Strianese) was advised throughout his B.Sc. thesis in 2020; three students (S. Gibertini, M. Giosuè, A. Zanichelli) were advised throughout their B.Sc. theses in 2021; a student (G. Rinaldi) was advised throughout his B.Sc. thesis in 2022; two students (M. Bonacini, M. Creatura) were advised throughout their B.Sc. thesis in 2023; four students (C. Ceccoli, S. Dallai, A. Mangani, G. Montecchi) were advised throughout their B.Sc. thesis in 2024 and five students (G. Bonadonna, G. Borghi, E. Cavoli, G. Coccozza, P. Leone) were advised throughout their B.Sc. thesis in 2025 and two students (L. Catellani, L. Donadelli) were advised throughout their B.Sc. thesis in 2026. Three students (A. Angeli, I. Piacentini, L. Ruini) are currently being advised through their B.Sc. thesis. A student (M. Giansoldati) was co-advised throughout his B.Sc. thesis in 2021 and a student (G. d'Auria) was co-advised throughout his B.Sc. thesis in 2022, together with Prof. D. Angeli. A student (M. Gerardi) was co-advised throughout his B.Sc. thesis in 2023, together with Dr. V. Testa. A student (C. Paolini) was advised throughout her industry internship in 2022 and a student (A. Russo) was advised throughout their industry internship in 2023. A student from Universidade Federal de Viçosa, Brazil (A.C. de Brito Pernisa) was advised throughout her internship at Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy in 2025. A student (R. Sedoni) was co-advised through his doctoral research together with Prof. D. Angeli; the doctorate started in November 2022 and the dissertation defense was held on 27th March 2026.

Alma Mater Studiorum – Università di Bologna, Italy

Co-advising activity was carried out on the M.Sc. thesis *Experimental analysis of environmental sensors in fire cases within enclosures*, by G. Ligi, advised by Dr. P. Valdiserri, Prof. A.W. Marshall and Dr. G. Semprini (March 2012). The activity was mainly conducted at FireTEC; a M.Sc. student (M.D. Price) was also supervised at the University of Maryland throughout his thesis, which resulted in further developments of this project.

Università degli Studi di Trieste, Italy

Co-advising activity was carried out on the M.Sc. thesis *Numerical simulation of a ship's cabin fire*, by Marco Vincis, advised by Dr. M. Piller (March 2014). This work arose out of a collaboration aimed at modeling fire development in enclosed spaces.

Università della Calabria, Italy

In 2020, he served as an adjunct member of the Doctoral Advisory Committee for the program in "Physical, chemical and materials science and technology" (It.: *Scienze e Tecnologie Fisiche, Chimiche e dei Materiali*), assessing the doctoral work by R. Pedicini.

Extramural courses

In May 2018, he delivered a 20-hour lecture series within the course *Fuel cell – Tecnologie e applicazione* (Fuel-cell technology and applications), offered by the Dipartimento di Ingegneria "Enzo Ferrari", Università degli Studi di Modena e Reggio Emilia, Italy to Toyota Material Handling Manufacturing Italy S.p.A., Italy. The course was funded by Fondimpresa, within an educational program on hydrogen-powered forklifts.

On 10th June 2025, he delivered a lecture on hydrogen and fuel cells (two hours) within the course *Tecnologie e materiali innovativi per l'efficienza energetica e la sostenibilità ambientale* (Advanced technologies and materials for energy efficiency and sustainability), organized by CIS S.cons.r.l. through an agreement with the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy and funded by the GREENCOMP project.

Since March 2022 (first edition), he has delivered a lecture series within the course *Tecnico esperto in impiantistica civile a risparmio energetico e risorse rinnovabili* (Facilities engineer expert in energy-saving solutions and renewable energy), offered by FORM.ART. S.c.ar.l. through an agreement with the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy and funded by Regione Emilia-Romagna. He also sat on the scientific committee of that course.

Public engagement activities

Communication, dissemination and awareness raising towards citizenship, industry and authorities was conducted on infrared thermography in the webinar *Termografia ad infrarossi, non solo Covid-scanner*, organized by *Fondazione REI* (Reggio Emilia Innovazione) on 4th June 2020, through a talk entitled *Fondamenti della tecnologia e ricerche in corso*. Communication, dissemination and awareness raising towards industry and authorities was conducted on energy efficiency in buildings in the webinar *Diagnosi energetica ed efficientamento di involucri e impianti*, organized by *Fondazione REI* (Reggio Emilia Innovazione) on 14th October 2024, following the *L'impresa in digitale – Servizio gratuito per la promozione presso le imprese di interventi per l'efficienza energetica* initiative by *Camera di Commercio dell'Emilia*.

He gave a talk entitled *Cogenerazione sostenibile: Idrogeno e celle a combustibile* on the sustainability of hydrogen economy; the speech was delivered on 8th October 2022 in Modena, Italy, during the *Festival dello sviluppo sostenibile 2022*. The same speech was also delivered on 20th May 2024 in Reggio Emilia, Italy, during the *Festival dello sviluppo sostenibile 2024*. He gave a talk entitled *Energia e ricerca – Opportunità per le imprese all'interno del DISMI UNIMORE* to promote the research conducted at the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy on energy within the *Piano Transizione 5.0 e la sfida per la sostenibilità* initiative by *CNA Reggio Emilia*; the speech was delivered on 9th October 2024 in Reggio Emilia, Italy.

Private consultancy experience

- Experimental tests of a water-mist fire-protection system for saunas (June 2014 – June 2017)
Client: Bettati Antincendio S.r.l., Italy
- Experimental tests of a HFC (Heptafluoropropane)-based system for fire protection of horizontal compactable archives (October – December 2016)
Client: Bettati Antincendio S.r.l., Italy
- Appointed as an assistant to Prof. F. Leali (main consultant) for thermal measurements in a suit related to a cement-production plant (August 2017)
Client: Modena court, Italy

Professional development

- Fluent course (basic) by Fluent Inc., Università degli Studi di Modena e Reggio Emilia, Modena, Italy, June 2005
- 6th UIT Summer School in Thermo-Fluid Dynamics “Computational Thermo-Fluid Dynamics”, Certosa di Pontignano, Italy, August-September 2006
- Short course “Particle Image Velocimetry – Theory, Practice, Applications”, organized by Prof. K.T. Kiger and Prof. J. Westerweel, University of Maryland, College Park, MD, USA, May 2007

Service

Faculty board

Since April 2022 (XXXVIII doctoral cycle within the Italian system) he has served as a member of the faculty board of the doctoral program in Industrial Innovation Engineering (It.: *Scuola di Dottorato di Ricerca in Ingegneria dell'Innovazione Industriale*), offered by the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

Committee member

In 2023, he served as the president of the committee for a position within the technical staff of the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy. He served as a committee member for eight post-doctoral positions (one in 2020, one in 2021, three in 2022, one in 2024, one in 2025 and one in 2026, contract extensions included) and eight fellowships (one in 2020, three in 2021, three in 2022 and one in 2026) at the Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

From July 2018 through November 2019, he was a member of the admission committee to evaluate candidates for the Master's programs in Mechanical and Motor Vehicle Engineering, offered by the

Dipartimento di Ingegneria “Enzo Ferrari”, Università degli Studi di Modena e Reggio Emilia, Italy. From December 2019 through February 2025, he served in the same position for all the undergraduate programs offered by the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

In December 2025, he was appointed departmental delegate for tutoring. From February through December 2025, he served as a member of the tutoring committee of the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

Since December 2023, he has been a member of the teaching committee of the doctoral program in Industrial Innovation Engineering (It.: *Scuola di Dottorato di Ricerca in Ingegneria dell’Innovazione Industriale*), offered by the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy. Since July 2025, he has served as a member of the joint faculty – students committee of the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

In 2024, he served as the president of the selection committee to evaluate proposals for the *Bando a cascata a favore delle imprese del Mezzogiorno* (call for proposals reserved to enterprises and companies located in Southern Italy) and for the *Bando a Cascata a favore delle imprese della Regione Emilia-Romagna* (call for proposals reserved to enterprises and companies located in Emilia-Romagna) of the *Ecosystem for sustainable transition in Emilia-Romagna* research and innovation program (Spoke 2), within the PNRR (*Piano Nazionale di Ripresa e Resilienza*). He also chaired some review panels for the intermediate evaluation of the progress of the funded projects.

Since July 2025, he has served as a selected reviewer for the Italian VQR (*Valutazione della Qualità della Ricerca*) research assessment 2020 – 2024, organized by the Italian agency for the evaluation of the higher education system and research (ANVUR).

From October 2023 through February 2026, he served as the delegate for En&Tech interdepartmental center of Università degli Studi di Modena e Reggio Emilia, Italy at the Clust-ER Industrie Culturali e Creative (Create) by Regione Emilia-Romagna, Italy. In February 2026, he was appointed delegate for the same center at the Clust-ER Energia e Sostenibilità (GreenTech) by Regione Emilia-Romagna, Italy.

Tutor

Since 2021, he has served as a tutor of the students enrolled in the third year of the undergraduate program in Management Engineering (It.: *Corso di Laurea in Ingegneria Gestionale*) offered by the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy. In that position, he delivered orientation to potential students of the same program and of the undergraduate program in Smart Industry Engineering (It.: *Corso di Laurea Professionalizzante in Ingegneria per l’Industria Intelligente*) offered by the Dipartimento di Scienze e Metodi dell’Ingegneria, Università degli Studi di Modena e Reggio Emilia, Italy.

Editorship

Energies by MDPI – Member of the topical advisory panel, section J: Thermal management, since January 2021

Energies by MDPI – Guest editor (with M. Romagnoli) of the special issues “Advanced manufacturing of fuel cells and fuel-cell components” and “Advanced manufacturing of fuel cells and fuel-cell components: 2nd edition”

Fire by MDPI – Guest editor (with Y. Liu, T. Liu and P. Zhu) of the special issue “Fundamental research and case studies on clean and efficient fire suppression technologies”

Co-editor (with G. Allesina, D. Angeli, G.S. Barozzi, M.A. Corticelli, A. Muscio, S. Pedrazzi ed E. Stalio) of the textbook *Elementi di fisica tecnica per l’ingegneria*, inspired by the textbooks by M.J. Moran, H.N. Shapiro, D.D. Boettner, M.B. Bailey, B.R. Munson and D.P. DeWitt, published by Mc-Graw – Hill in 2022

Reviewer

Elsevier – Thermal Engineering Books collection (1 book proposal, 2018); Città Studi Edizioni by De Agostini Scuola (*Fisica Tecnica* by G. Cesini, G. Latini and F. Polonara, 2020).

Fire Safety Journal (14 articles, since 2009), International Journal of Energy for a Clean Environment (1 article, since 2009), Building and Environment (5 articles, since 2010), International Journal of Thermal Sciences (5 articles, since 2010), Atomization and Sprays (13 articles, since 2011), Experimental Thermal and Fluid Science (5 articles, since 2012), Fire and Materials (1 article, since 2013), Case Studies in Thermal Engineering (3 articles, since 2015), International Journal of Heat and Mass Transfer (10 articles, since 2015), Advances in Materials Science and Engineering (1 article, since 2015), Heat Transfer Engineering (2 articles, since 2015), Biosystems Engineering (1 article, since 2016), Infrared Physics and Technology (2 articles, since 2017), Applied Thermal Engineering (10 articles, since 2017), Materials (2 articles, since 2017), ACS Omega (2 articles, since 2017), Advances in Mechanical Engineering (1 article, since 2018), Fire Technology (6 articles, since 2018), Energies (5 articles, since 2018), Thermal Science (1 article, since 2018), Expert Systems with Applications (2 articles, since 2018), Applied Sciences (1 article, since 2019), Environmental Engineering and Management Journal (1 article, since 2019), Journal of Building Engineering (8 articles, since 2019), Symmetry (1 article, since 2020), Processes (1 article, since 2020), Process Safety and Environmental Protection (13 articles, since 2020), Surface and Coatings Technology (1 article, since 2020), SN Applied Sciences (2 articles, since 2020), Medical Engineering & Physics (3 articles, since 2020), Micromachines (1 article, since 2021), Journal of Materials Engineering and Performance (1 article, since 2021), Additive Manufacturing (2 articles, since 2021), Physics of Fluids (2 articles, since 2021), Sustainability (3 articles, since 2021), Coatings (1 article, since 2021), Journal of The Electrochemical Society (1 article, since 2021), Sensors (1 article, since 2022), Algorithms (1 article, since 2022), Thermo (1 article, since 2022), Fire (1 article, since 2023), Metals (1 article, since 2023), World Electric Vehicle Journal (1 article, since 2023), International Journal of Thermophysics (1 article, since 2023), International Journal of Adhesion and Adhesives (1 article, since 2023), Chemical Engineering Journal (1 article, since 2024), Transportation Research Interdisciplinary Perspectives (1 article, since 2025), Energy Conversion and Management (1 article, since 2025), International Journal of Hydrogen Energy (3 articles, since 2025), Journal of Sustainable Development of Energy, Water and Environment Systems (2 articles, since 2025), Indoor Air (1 article, since 2025), Nordic Pulp & Paper Research Journal (1 article, since 2025), Building Simulation (2 articles, since 2025) and ACS Sustainable Chemistry and Engineering (2 articles, since 2026).

11th International Symposium on Fire Safety Science (1 contribution, 2014), 5th Mechanical Engineering Research Day - MERD'18 (1 abstract, 2018), The Third International Conference on Energy Engineering and Environmental Protection - EEEP 2018 (1 contribution, 2018), The 8th Global Conference on Materials Science and Engineering - CMSE 2019 (1 contribution, 2019), 74^o Congresso Nazionale ATI (Italian Society of Thermal Science and Engineering) - 74th ATI National Congress (3 contributions, 2019), The Third International Conference on Mechanical, Electric and Industrial Engineering - MEIE 2020 (1 contribution, 2019), 13th International Symposium on Fire Safety Science (1 contribution, 2019), The 2nd International Conference on Advances in Civil and Ecological Engineering Research - ACEER 2020 (1 contribution, 2020), 17th International Heat Transfer Conference - IHTC 17 (1 contribution, 2023), 78^o Congresso Nazionale ATI (Italian Society of Thermal Science and Engineering) - 78th ATI National Congress (6 contributions, 2023), 20th Conference on Sustainable Development of Energy, Water and Environment Systems - SDEWES (1 contribution, 2025) and 18th International Heat Transfer Conference - IHTC 18 (2 contributions, 2026).

Academic

V AIGE (Italian Society of Energy Management) *National Congress*, 8-9 June 2011, Modena, Italy - Member of the Organizing Committee

10th *International Symposium on Fire Safety Science*, 19-24 June 2011, College Park, MD, USA - Supporting activity

15th *International Heat Transfer Conference (IHTC-15)*, 10-15 August 2014, Kyoto, Japan - Chairman of "Spray and Atomization" session (15th August 2014), co-chaired with Prof. S. Inoue

SFEM (Sector Forum Energy Management) *Working Group HYDROGEN* by CEN/CENELEC and JRC (Joint Research Centre), since January 2015 - Expert representative of Università degli Studi di Modena e Reggio Emilia, Italy

74° Congresso Nazionale ATI (Italian Society of Thermal Science and Engineering) – 74th ATI National Congress, 11-13 September 2019, Modena, Italy – Member of the Organizing Committee and chairman of “Efficienza energetica negli usi industriali” session (12th September 2019)

HEATING FOR RESIDENTIAL USE Working Group within the European Hydrogen Valleys Partnership by JRC (Joint Research Centre), since November 2019 – Expert representative of Regione Emilia-Romagna, Italy

17th International Heat Transfer Conference (IHTC-17), 14-18 August 2023, Cape Town, South Africa – Chairman of Poster Session 19: Two-phase, bubble flow & water film; two-phase, application; two-phase, spray/droplet; two-phase/multiphase flow; two-phase, numerical simulation & condensation (17th August 2023), co-chaired with Prof. T. Fisher

ATI – Associazione Termotecnica Italiana (Italian Society of Thermal Science and Engineering) – Secretary of the Regione Emilia-Romagna section, since May 2024

19th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 8-12 September 2024, Rome, Italy – Chairman of “Buildings 3” session (11th September 2024), co-chaired with Mr. G.E. Dino

1st African Conference on Sustainable Development of Energy, Water and Environment Systems (AF.SDEWES), 27-31 May 2025, Oujda – Saïdia, Morocco – Member of the scientific advisory board

20th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 5-10 October 2025, Dubrovnik, Croatia – Member of the scientific advisory board

21st Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 30 August - 3 September 2026, Gran Canaria, Spain – Member of the scientific advisory board

ATI – Associazione Termotecnica Italiana (Italian Society of Thermal Science and Engineering) – Auditor, since September 2026

22nd Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 3-8 October 2027, Dubrovnik, Croatia – Member of the scientific advisory board

Government

CSEA Cassa per i servizi energetici e ambientali, since June 2020 – Member of the panel of experts within RdS Ricerca di Sistema, to serve as a reviewer for R&D projects on electric power systems, funded by the Italian Ministry of Economic Development (MISE Ministero dello Sviluppo Economico)

Affiliations

- Professional qualification of Engineer (Italy, *Ingegnere* title), awarded June 2005
- The Italian Union of Thermal-Fluid Dynamics (It.: *Unione Italiana Termofluidodinamica* – UIT), Member since March 2024
- Italian Society of Thermal Science and Engineering (It.: *Associazione Termotecnica Italiana*), Member since September 2019
- Italian Association for Thermal Fluid Sciences (It.: *Associazione della Fisica Tecnica Italiana*), Member since September 2018
- American Chemical Society (ACS), Member since December 2011
- InterMech – MO.RE., *Centro Interdipartimentale per la Ricerca Applicata e i Servizi nel Settore della Meccanica Avanzata e della Motoristica dell'Università degli Studi di Modena e Reggio Emilia*, Member since March 2020
- En&Tech, *Centro interdipartimentale per la ricerca industriale ed il trasferimento tecnologico nel settore delle tecnologie integrate per la ricerca sostenibile, della conversione efficiente dell'energia, l'efficienza energetica degli edifici, l'illuminazione e la domotica*, Member since July 2020
- H2 – MO.RE., *Centro Interdipartimentale di Ricerca e per i Servizi nel settore della produzione, stoccaggio e utilizzo dell'Idrogeno*, Member since March 2022
- Marquis Who's Who in the World, Edition 2011 – present
- Marquis Who's Who in Science and Engineering, Edition 2016 – present
- Marquis Who's Who in America, Edition 2016

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