



Matteo Morciano

PhD in Energetics
M.S. in Mechanical Eng.

- May 11, 1990
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- matteomorciano@hotmail.it

Languages

- Italian ●●●●●
- English ●●●●●

IT Skills

Microsoft and Unix-type operating systems; Good knowledge in hardware.

- COMSOL
- MATLAB
- LAMMPS
- SOLIDWORKS
- AUTOCAD
- LABVIEW

Technical Skills

- Coding
- Manufacturing by 3D printing
- Prototyping
- Data acquisition
- Calibration of thermal sensors

Soft Skills

- Teamwork
- Interpersonal skills
- Flexibility

Profile Overview

I received **B.S. and M.S. in Mechanical Engineering** in 2015 at Polytechnic of Turin. I carried out my master thesis in the *Complex Multiscale Systems* group led by Prof. Serafim Kalliadasis in the Department of Chemical Engineering at **Imperial College London**. I received my **PhD in Energetics** in 2019 at Polytechnic of Turin. I worked in the *multi-Scale ModelIng Laboratory* group led by Prof. Pietro Asinari. During this period, I also spent six months in the *Nanoengineering* group led by Prof. Gang Chen at the **Massachusetts Institute of Technology (MIT)**. I am currently working as **post-doctoral researcher** at the Department of Energy (Polytechnic of Turin) in collaboration with the *Clean Water Center*. I am involved in studying water purification plant driven by solar energy and waste heat recovery. My interests and experience revolve around both modeling techniques and practical implementation of energy conversion systems.

Keywords

Desalination; Water treatment; Flow in Porous Media; Renewable Energies; Heat and Mass Transfer; Molecular Dynamics; Applied Thermodynamics.

Work Experience

Post-Doc

2019 - now **Postdoctoral Researcher** Clean Water Center @ Polito
Feasibility study and design of a water purification plant driven by solar energy; technical development of solar energy absorbers for efficient solar-to-heat conversion and/or water purification processes; modelling fluid flow in porous materials for energy-efficient desalination.

Education

Study

2015 - 2019 **PhD in Energetics (Cum Laude)** Polytechnic of Turin
PhD Thesis Polytechnic of Turin
Title: *Solar energy technologies for passive and low-cost water desalination.* **Description:** The research activity was focused on the development of water desalination technologies powered by solar energy. It presents several new approaches and prototypes for passive (namely capillary driven) solar desalination. The work includes design, numerical modelling and simulation, testing via deep integration of laboratory and field experiments and development activities. The main results are: (1) development of a low-tech solar steam generator able to outperform nano-structured materials based solutions, which has been published on *Scientific Reports - Nature*; (2) development of a stand-alone distiller able to produce up to $3 \text{ L m}^{-2} \text{ h}^{-1}$ at less than one sun, which has been published on *Nature Sustainability*.

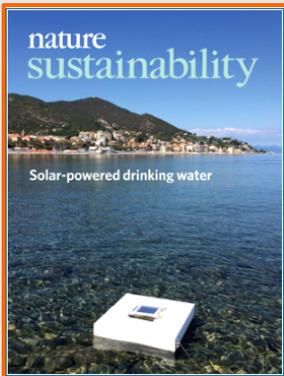
2013 - 2015 **M. S. in Mechanical Engineering (110/110)** Polytechnic of Turin
Master Thesis Imperial College of London
Title: *Nonequilibrium molecular dynamics simulations of nanoconfined fluids at solid-liquid interfaces.* **Description:** The research was focused on the study of fluid dynamics and rheological properties of fluids in nanoconfined geometries. A molecular dynamics approach was used to investigate the heat and mass transport phenomena at the nanoscale. This research has several applications: detailed analysis of the filling processes in porous media at nano/micro-scale, which eventually allows a more efficient design of, for example, lab-on-a-chip devices, nano/micro porous membranes for desalination and drug release devices for biomedical applications.

2009 - 2013 **B. S. in Mechanical Engineering** Polytechnic of Turin
Bachelor Thesis Polytechnic of Turin
Title: *Study of power-recirculating gearbox test rigs.*

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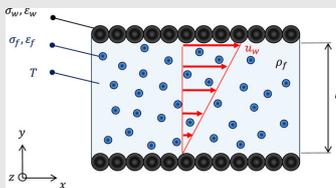
Research Gallery —



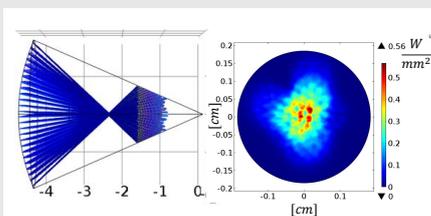
Passive multi-effect distiller prototyped for energy-efficient desalination in remote areas. Chiavazzo E., **Morciano M.** et al. *Passive solar high-yield seawater desalination by modular and low-cost distillation.*



Active multi-effect distiller prototyped for energy-efficient desalination in remote areas. **SALTLESS project**



Morciano M. et al. *Nonequilibrium molecular dynamics simulations of nanoconfined fluids at solid-liquid interfaces.*



Studying the CSP installed at Polito - Geometry and Optical properties by using COMSOL.

International Experience

- Mar - Aug 2018 **Researcher/Visiting PhD Student** at *Device Research Laboratory (DRL) and Nanoengineering group*; Department of Mechanical Engineering, **Massachusetts Institute of Technology (MIT)**.
- Mar - Jun 2015 **Researcher/Visiting Student** at *Complex Multiscale Systems group*; Department of Chemical Engineering, **Imperial College, UK**. Website: (<http://www.imperial.ac.uk/complex-multiscale-systems/our-group/international-visiting-students/mr-matteo-morciano/>).

Publications

- E. Chiavazzo, M. Morciano, F. Viglino, M. Fasano, P. Asinari. *Passive solar high-yield seawater desalination by modular and low-cost distillation.* Nature Sustainability 1, 763–772 (2018), DOI: 10.1038/s41893-018-0186-x
- M. Alberghini*, M. Morciano*, M. Fasano, F. Bertiglia, V. Fericola, P. Asinari, E. Chiavazzo. *Multistage and passive cooling process driven by salinity difference.* Science Advances 6(11) (2020). DOI: 10.1126/sciadv.aax5015 (* M. Alberghini and M. Morciano share the first authorship)
- M. Morciano*, M. Fasano*, U. Salomov, L. Ventola, E. Chiavazzo and P. Asinari. *Efficient steam generation by inexpensive narrow gap evaporation device for solar applications.* Scientific Reports 7, 11970 (2017). ISSN 2045-2322, DOI: 10.1038/s41598-017-12152-6 (* M. Morciano and M. Fasano share the first authorship)
- M. Morciano*, M. Fasano*, L. Bergamasco, A. Albiero, M. Lo Curzio, P. Asinari, E. Chiavazzo. *Sustainable freshwater production using passive membrane distillation and waste heat recovery from portable generator sets.* Applied Energy 258 - 114086 (2020). DOI: 10.1016/j.apenergy.2019.114086 (* M. Morciano and M. Fasano share the first authorship)
- F. Signorato*, M. Morciano*, L. Bergamasco, M. Fasano, P. Asinari. *Exergy Analysis of Solar Desalination Systems: Passive Multi-Effect Membrane Distillation.* Energy Reports 6, 445-454 (2020). DOI: 10.1016/j.egy.2020.02.005 (* F. Signorato and M. Morciano share the first authorship)
- M. Alberghini, M. Morciano, L. Bergamasco, M. Fasano, L. Lavagna, G. Humbert, E. Sani, M. Pavese, E. Chiavazzo and P. Asinari. *Coffee-based colloids for direct solar absorption.* Scientific Reports 9, 4701 (2019), DOI: 10.1038/s41598-019-39032-5
- M. Morciano, et al. *Nonequilibrium molecular dynamics simulations of nanoconfined fluids at solid-liquid interfaces.* The Journal of Chemical Physics 146.24 (2017): 244507. ISSN 0021-9606, DOI: 10.1063/1.4986904
- M. Morciano, M. Fasano, M. Secreto, U. Jamolov, E. Chiavazzo and P. Asinari. *Installation of a concentrated solar power system for the thermal needs of buildings or industrial processes.* Energy Procedia 101, 956-963 (2016). ISSN 1876-6102, DOI: 10.1016/j.egypro.2016.11.121
- M. Fasano, D. Borri, A. Cardellini, M. Alberghini, M. Morciano, E. Chiavazzo, and P. Asinari. *Multiscale simulation approach to heat and mass transfer properties of nanostructured materials for sorption heat storage.* Energy Procedia 126, 509-516 (2017). ISSN 1876-6102, DOI: 10.1016/j.egypro.2017.08.229

Awards

- 2018 **Best Oral Presentation Award** at the Ph.D Day (Department of Energy at Polytechnic of Turin).
- 2017 **Best Poster Presentation Award** at the Ph.D Day (Department of Energy at Polytechnic of Turin).
- 2017 **Travel grant** awarded by the management committee of the European Cooperation in Science and Technology (COST) Association (620 €).

Research Projects

2016 **SALTLESS project** (39700€, “Proof of Concept” grant by Politecnico di Torino to the best technology transfer projects in the energy field): research collaboration with Médecins Sans Frontières (<http://www.msf.org/>) to design and implement a water desalination device powered by waste heat from the exhausts of Diesel electric generators installed in field hospitals.

Selected Talks

Jul 2019 **Oral presentation** at the 4th Energy for Sustainability International Conference – Designing a sustainable future, Turin (Italy). Desalination and water purification by solar thermal energy: a dynamical model of year-long efficiency and cost.

Jul 2019 **Invited speaker** at the Lanzarottus Day on Sustainable water treatment, Varazze (Italy).

Jul 2019 **Invited speaker** at the International Summer School IPROMO, Ormea (Italy).

Apr 2018 **Invited speaker** at the group meeting of the NanoEngineering Group (Mechanical Department, MIT).

Nov 2016 **Invited prototype exposition** at the Maker Faire, Rome (Italy).

Sept 2016 **Poster presentation** at the 71° Congresso ATI – Associazione Termotecnica Italiana, Turin (Italy).

Jun 2016 **Poster presentation** at the 10° Congresso AIGE – Associazione Italiana per la Gestione dell’Energia, Naples (Italy).

Nov 2015 **Oral presentation** at the Annual Meeting of the APS Division of Fluid Dynamics, Boston (MA). Mass transfer properties of nanoconfined fluids at solid-liquid interfaces: from atomistic simulations to continuum models.

Selected Attended Conferences

Apr 2018 Material Research Society (MRS) Spring Meeting and Exhibit, Phoenix (Arizona).

Oct 2017 1st European Symposium on Nanofluids and Nanouptake training school, Lisbon (Portugal).

Sept 2017 UIT (Unione Italiana Termofluidodinamica) Summer school: Heat transfer and fluid flow in multiphase system, Siena (Italy).

Apr 2017 3rd International Conference on Desalination using Membrane Technology MEMDES, Las Palmas de Gran Canaria (Spain).

Oct 2016 European Maker Faire at Rome, to present a Multi Effect Distillation device implemented with my research team.

Technology Transfer Activities

2016 Selected for **Innovation for Change** at CERN, SAFM (Management school). Challenge: Water scarcity in agriculture proposed by Aquasis Solutions. Presented Project: Hydropia, a feasible solution to tackle water scarcity for agricultural purposes in arid areas.

Teaching Activities

2017 **Co-supervision of the ‘Maker Competition @ Polito’**
Assistant in laboratory

2017 **Energy storage and transport**
Assistant in classroom and laboratory

2016 **Numerical Design of Thermal Systems**
Assistant in classroom and laboratory

2016 - now **Master Thesis supervisor or co-supervisor**
More than 15 students