## António Luis Nobre Moreira

Associate Professor with Habilitation

Instituto Superior Técnico

Mechanical Engineering Department

## Short Curriculum

António Luis Nobre Moreira

Associate Professor with Habilitation at the Mechanical Engineering Department of Instituto Superior Técnico, Universidade de Lisboa.

Director of IN+ - Center for Innovation, Technology and Policy Research

Director of the Laboratory of Micro Scale Interfacial Phenomena at the Mechanical Engineering Department of IST, UL.

Coordinator of the PhD Program in Sustainable Energy Systems.

Member of the board of directors of the Portuguese Automotive Cluster, Mobinov.

**Education**

1982: Engineering Diplom (5 years) in Mechanical Engineering, Instituto Superior Técnico, University of Lisbon

1985: Master in Mechanical Engineering, “Combustion Instabilities of Premixed Flames”, Instituto Superior Técnico, University of Lisbon

1991: PhD in Mechanical Engineering, “Aerodynamics of Industrial Burners “, Instituto Superior Técnico, University of Lisbon

2010: Habilitation in Mechanical Engieering, Scientific Area of Energy and Environment.

**Scientific areas of interest:**

Energy, Heat Transfer, Microfluidics, Interfacial Transport Phenomena, Engineering Thermodynamics

**Publications (last 5 years)**

**Journals**

* “Application of bioinspired superhydrophobic surfaces in two-phase heat transfer experiments”, Journal of Bionic Engineering, E. Teodori, P. Pontes, A. S. Moita and A. L. N. Moreira, to appear in the Journal of Bionic Engineering.
* “Effect of extreme wetting scenarios on pool boiling”, T. Valente, I. Malavasi, E. Teodori, A. S. Moita, M. Marengo and A. L. N. Moreira, Applied Thermal Engineering, (2016) <http://dx.doi.org/10.1016/j.applthermaleng.2016.11.079>.
* “Bubble dynamics and heat transfer for pool boiling on hydrophilic, superhydrophobic and biphilic surfaces”, E. Teodori, T. Palma, T. Valente, A.S. Moita and A.L.N. Moreira, Journal of Physics: Conference Series 745 (2016) doi:10.1088/1742-6596/745/3/032132.
* “Dynamics of droplets of biological fluids on smooth superhydrophobic surfaces under electrostatic actuation”, A.S. Moita, C. Laurência, J. A. Ramos, D. M. F. Prazeres and A. L. N. Moreira, Journal of Bionic Engineering, 13 (2016) 220 - 224.
* “Design, fabrication and test of an integrated multi-microchannel heat sink for electronics cooling”, V. Silvério, S. Cardoso, F. Cardoso, J. Gaspar and A.L.N. Moreira, *Sensors and Actuators A* 235 (2015).
* “Fluid dynamic and heat transfer processes between solid surfaces and non-Newtonian liquid droplets”, A. S. Moita, D. Herrmann and A. L. N. Moreira, *Applied Thermal Engineering,* 88, 33 – 46 (2015).
* “Influence of surface topography in the boiling mechanisms”, A. S. Moita, E. Teodori and A. L. N. Moreira, *International Journal of Heat and Fluid Flow,* Volume 52, April 2015, Pages 50–63. <http://dx.doi.org/10.1016/j.ijheatfluidflow.2014.11.003>
* “Empirical and modeling based correlations for pool boiling over micro-structured surfaces”, E. Teodori, A.S. Moita, A. L. N. Moreira, Journal *Interfacial Phenomena and Heat Transfer* (2014), 2 (3): 273-292
* “Characterization of pool boiling mechanisms over micro-patterned surfaces using PIV”, E. Teodori, A. S. Moita and A. L. N. Moreira, International Journal of Heat and Mass Transfer Volume 66, November 2013, Pages 261–270, 2013.
* “Intermittent multijet sprays for improving mixture preparation with low pressure injection systems”, M. R. O. Panão, A. L. N. Moreira and D. F. G. Durão, Exp Fluids (2013) 54:1550, DOI 10.1007/s00348-013-1550-2.
* “Effect of a cross-flow on spray impingement with Port Fuel Injection systems for HCCI engines”, M.R.O. Panão, A.L.N. Moreira and D.F.G. Durão. Fuel, Volume 106, April 2013, Pages 249–257.
* “Statistical analysis of spray impact to assess fuel mixture preparation in IC engines”, M. R. O. Panão, A. L. N. Moreira and D. F. G. Durão. *Fuel Processing Technology*, Volume 107, March 2013, Pages 64–70.
* “Diabatic flow boiling in circular transparent microchannels”, V. Silvério and A L N Moreira, Journal of Physics: Conference Series 395 (2012), doi:10.1088/1742-6596/395/1/012090.
* “Enhancement of pool boiling heat transfer by surface microstructuring”, A S Moita, E Teodori and A L N Moreira, Journal of Physics: Conference Series 395 (2012), doi:10.1088/1742-6596/395/1/012175.
* “Intelligent thermal management for full electric vehicles”,M. R. O. Panão, A. L. N. Moreira and D. F. G. Durão, *Applied Energy*, Volume 37, Pages 293–301, May 2012.
* “Microprocessor Cooling based on an Intermittent Multijet Spray System”, M. R. O. Panão, J. P. P. V. Guerreiro, A.L.N. Moreira. *International Journal of Heat and Mass Transfer*, Volume 55, Issues 11–12, Pages 2854–2863, May 2012.
* “High-power electronics thermal management with intermittent multijet sprays”, Miguel R. O. Panão, André M. Correia, António L.N. Moreira, *Applied Thermal Engineering* Volume 37, pp. 293-301, 2012.
* “Transient analysis of intermittent multijet sprays”, M. R. O. Panão, A. L. N. Moreira and D. F. G. Durão. *Experiments in Fluids*, Volume 53, Issue 1, pp.105-119, 2012.
* “Scaling the effects of surface topography in the secondary atomization resulting from droplet/wall interactions”, A. S. Moita and A. L. N. Moreira. *Experiments in Fluids*, Vol. 52, pp. 679–695, 2012.

**International Conferences**

* “An Experimental Setup for Flow Heat Transfer Investigation of Nanofluids”, A. Nikulin and A. L. N. Moreira, 1st European Symposium on Nanofluids (ESNf2017), 8-10 October 2017, Lisbon, Portugal
* “Nanoengineered Wettability for Heat Transfer Enhancement in Spray Cooling”, A. S. Moita, M. Maly, A. Nikulin and A. L. N. Moreira, 1st European Symposium on Nanofluids (ESNf2017), 8-10 October 2017, Lisbon, Portugal
* “Experimental and Numerical Study on Sensible Heat Transfer at Droplet/Wall Interactions”, E. Teodori, P. Pontes, A. S. Moita, A. L. N. Moreira, A. Georgoulas and M. Marengo, , ILASS–Europe 2017, 28th Conference on Liquid Atomization and Spray Systems, 6-8 September 2017, Valencia, Spain.
* “Time Resolved Infrared Analysis of Droplet Impacts onto Heated Surfaces Under Extreme Wetting Scenarios”, E. Teodori, P. Pontes, A. S. Moita and A. L. N. Moreira, ILASS–Europe 2017, 28th Conference on Liquid Atomization and Spray Systems, 6-8 September 2017, Valencia, Spain.
* “Performance characteristics of a MPI Engine fueled with dissociated methanol: A computational study“,N. Shashank, G. Gonçalves and A. L. N. Moreira, The 9th International Conference on Modelling and Diagnostics for Advanced Engine Systems (COMODIA), Okayama, Japan, 25th – 28th July 2017.
* “Thermographic analysis of interfacial heat transfer mechanisms with high temporal resolution”, P. Pontes, E. Teodori, A.S. Moita and A.L.N. Moreira, submitted to the 9th World Conferences on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Foz do Iguaçu, Brasil, 11 – 15 June 2017.
* “Assessment of biogas production pathways: application to Portugal”, M. Lopes, P. Baptista, E. Duarte and A. L. N. Moreira, to be presented at the 25th European Biomass Conference and Exhibition, 12 – 15 June 2017, Stockholm, Sweden.
* “Microfluidic Prototype of a Lab-on-Chip Device for Lung Cancer Diagnostics”, A. S. Moita, D. Vieira, F. Mata and A. L. N. Moreira, BIODEVICES 2017, 10th International Joint Conference on Biomedical Engineering Systems and Technologies, 21 – 23 Fevereiro 2017, Porto, Portugal.
* “Cost analysis of energy production from anaerobic digestion in an intensive swine farm”, F. C. Rodrigues, E. Duarte and A. L. N. Moreira, to be presented at the International Conference Progress in Biogas IV, March 8-11, 2017, Stuttgart, Germany.
* “Effect of surface wettability on the spreading and displacement of biofluid drops in electrowetting”, F. Mata, A. S. Moita, S. Cardoso, D.M.F. Prazeres, A.L.N. Moreira. ILASS – Europe 2016, 27th Annual Conference on Liquid Atomization and Spray Systems, Sep. 2016, Brighton, UK.
* “Laser induced fluorescence thermometry to characterize flow boiling in a silicon Microchannel Heat Sink for microsystems cooling”, V. Silvério, S. Cardoso And A. L. N. Moreira, 18th International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics. Lisbon, Portugal, 04-07 July, 2016.
* “Evaluation of a new designed microchannel heat sink for CPU cooling based on IR – thermography synchronized with high-speed flow visualization”, V. Silvério, S. Cardoso and A. L. N. Moreira, 18th International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics. Lisbon, Portugal, 04-07 July, 2016.
* “Non-intrusive wettability characterization on complex surfaces using 3D Laser Scanning Confocal Fluorescence Microscopy”, D. Vieira, A. S. Moita and A. L. N. Moreira, 18th International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics. Lisbon, Portugal, 04-07 July, 2016.
* “2 Phase Microprocessor Cooling System with Controlled Pool Boiling of Dielectrics over Micro-and-Nano Structured Integrated Heat Spreaders”, M. Moura, E. Teodori, A. S. Moita, A.L.N. Moreira, IEEE ITherm Conference, The Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, May 31 – June 3, 2016, Las Vegas, NV, USA.
* “Flow boiling instabilities of low-latent heat of vaporization liquids in single microchannels”, V. Silvério and A. L. N. Moreira, 1st Thermal and Fluid Engineering Summer Conference, TFESC, August 9-12, 2015, New York City, USA
* Valente, T., Teodori, E., Moita, A. S., Moreira, A. L. N. (2015) Effect of wettability on nucleate boiling. 11th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Kruger National Park, South Africa, 20-23 July, pp. 168-177
* “Effect of extreme wetting scenarios on pool boiling”, T. Valente, I. Malavasi, E. Teodori, A. S. Moita, M. Marengo and A. L. N. Moreira, 14th UK Heat Transfer Conference 2015, Edinburgh, Sept 7 – Sept 8, 2015.
* ”Dynamics of droplets of biological fluids over enhanced surfaces with and without electrostatic actuation”, J. A. Ramos, A. S. Moita, D. F. M. Prazeres and A. L. N. Moreira 26th European Conference on Liquid Atomization and Spray Systems, Bremen, Germany 8-10 September 2014.
* “Multiscale interfacial transport studies for heat transfer enhancement”, A. L. N. Moreira, Keynote paper presented at the 15th International Heat Transfer Conference (IHTC-15), August 10-15, 2014, Kyoto, Japan, DOI: 10.1615/IHTC15.kn.000002.
* “Study of the combined effects of liquid properties and surface micro-patterning on pool boiling heat transfer”, E.Teodori, A. S. Moita, A.L.N Moreira. 15th International Heat Transfer Conference (IHTC), Kyoto, Japan, 10 – 15 August, 2014.
* “Assessment of ultrasonic sprays for spray drying”, M.O. Panão, A.L.N. Moreira, J. Vicente and E. Costa, 17th International Symposium on Applications of Laser Techniques to Fluid Mechanics, 7 – 10 July 2014, Lisbon, Portugal.
* “Experimental characterization of the post-impact behavior of non-Newtonian droplets”, A. S. Moita, D. Herrmann and A.L.N. Moreira, 17th International Symposium on Applications of Laser Techniques to Fluid Mechanics, 7 – 10 July 2014, Lisbon, Portugal.
* “Pool Boiling Heat Transfer Over Micro-Treated Surfaces: A Mechanistic Approach”, E. Teodori, A. S. Moita and A. L. N. Moreira. 5th International conference on Heat Transfer and Fluid Flow in Microscale, 22-26 April 2014, Marseilles, France.
* “Droplet impacts of non-Newtonian fluids for bioengineering applications”, A. S. Moita, D. Hermann and A. L. N. Moreira, ILASS – Europe 2013, 25th European Conference on Liquid Atomization and Spray Systems, Chania, Greece, 1-4 September 2013
* “Evaluation of pool boiling heat transfer over micro-structured surfaces by combining high-speed visualization and PIV measurements”. A. S. Moita, E. Teodori and A. L. N. Moreira, 10th International Symposium on Particle Image Velocimetry, July 1-3, 2013; Delft, The Netherlands.
* “Flow boiling instabilities in transparent microchannels”, V.Silvério and A.L.N. Moreira. 8th World Congress on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Lisbon, 16 – 20 June, 2013.
* “Pool boiling heat transfer over micro-patterned surfaces: experiments and theory”, A. S. Moita, E. Teodori and A.L.N Moreira, Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Lisbon, 16 – 20 June, 2013.
* “Pool boiling over enhanced surfaces under extreme wetting conditions”, I. Malavasi, M. Marengo, A. S. Moita and A.L.N Moreira. Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Lisbon, 16 – 20 June, 2013.
* “Geometric effects in the design of multijet atomizers”, M. O. Panão, J. D. Delgado and A. L. N. Moreira. 12th International Conference on Liquid Atomization and Spray Systems ICLASS, Heidelberg, 2 – 6 September, 2012.
* “From single droplet impact to micrometric droplet chains: scaling the effect of surface topography”, A. S. Moita and A. L. N. Moreira. 12th International Conference on Liquid Atomization and Spray Systems ICLASS, Heidelberg, 2 – 6 September, 2012.
* “Diabatic nucleate boiling in circular transparent microchannels”, V. Silvério and A. L. N. Moreira. *6th European Thermal Sciences Conference Eurotherm 2012*. September 04 - 07, 2012. Poitiers
* “Enhancement of pool boiling heat transfer by surface micro-structuring”, A. S. Moita, E. Teodori and A. L. N. Moreira. *6th European Thermal Sciences Conference Eurotherm 2012*. September 04 - 07, 2012. Poitiers
* “Pool boiling mechanisms over micro-textured surfaces”, A. S. Moita, E. Teodori and A. L. N. Moreira. Presented at the *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*, Lisbon 9-12 July, 2012.
* “Secondary atomization of micrometric fuel droplets impinging onto heated targets”, A. S. Moita, S. Sauer and A. L. N. Moreira. Presented at the *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*, Lisbon 9-12 July, 2012.
* “Intermittent multijet sprays for improving mixture preparation in HCCI engines”, M. R. O. Panão, A. L. N. Moreira and D. F. G. Durão. Presented at the *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*, Lisbon 9-12 July, 2012.
* “Statistical analysis of spray impact to assess fuel mixture preparation in IC engines”, M. R. Oliveira Panão, A. L. N. Moreira and D. G. Durão. Presented at the The *Eleventh International Conference on Combustion and Energy Utilization* (11th ICCEU), Coimbra, Portugal, May, 9-13, 2012.

**PhD supervisions**

* “Surface enhancement for the control of interfacial transport phenomena”, Emanuele Teodori, co-supervision of Dr Ana Moita, 2017
* “Advanced cooling systems for fast response thermal control”, Vânia Cristina Silvério, Instituto Superior Técnico, July 2016.
* “Análise termodinâmica de gotas multicomponentes incidentes em superficies aquecidas”, Ana Sofia Moita, Instituto Superior Técnico, DEM, Dezembro 2009.
* Miguel Rosa Oliveira Panão, “Experiments on Impinging Intermittent Sprays”, Instituto Superior Técnico, DEM, Dezembro 2008.

**Master supervisions**

* “Development of a Range Extender for electric vehicles”, Francisco António Gaspar Lopes (Co-supervision of Prof. Jorge Martins da UMinho), 2017
* “Evaluation of biogas production from horse manure and assessment of biogas pathways in Portugal”, Madalena Soares Pereira Lopes, (Co-supervision of Dr. Patricia Baptista), 2017.
* “Estudo de soluções de racionalização energética num grupo industrial do sector de atividade pecuária”, (Co-supervision of Eng Eng. Mário Matos), Carlos Manuel de Amorim Leão, 2017.
* “Desenvolvimento e validação de um método não intrusivo para caracterizar a molhabilidade de superfícies com estruturas complexas utilizando a técnica 3D de microscopia confocal de fluorescência de varrimento a laser”, Author: Joana Lúcia Marques Pereira (Co-orientação da Dr Ana Moita), 2017.
* “Análise dos custos de produção de energia a partir da digestão anaeróbia em uma unidade de produção intensiva de suínos” (Co-supervision: Professor Santino Di Bernardino do LNEG), Filipe Charrua da Costa Lopes Rodrigues, 2016.
* “Estudo dos mecanismos de transmissão em escoamentos com convecção forçada e mudança de fase – aplicação a sistemas de recuperação de energia térmica de veículos” (Co-supervision of Dr Ana Sofia Moita), Filipe André Ferreira, 2016.
* “Use of methanol based syngas for waste heat recovery in vehicles”, Sakleshpur Nagaraja, Master in Engineering and Energy Management, (Co-supervision of Dr Gonçalo Gonçalves), 2016.
* “Test and optimization of a two-phase thermosyphon cooling system for microprocessors under real working conditions” (Co-supervision of Dr Ana Sofia Moita), Vasco Tavares Brito e Abreu, 2016.
* “Aplicação da ISO50001 a uma indústria de produtos quimicos com vista à implementação de Planos de Racionalização de Energia”, António de Alvarenga Vieira Dias, (Co-supervision of Eng. Adélia Pimentel), 2016.
* “Análise termográfica dos mecanismos de transmissão de calor em interfaces com elevada resolução temporal”, Pedro Daniel Fernandes Pontes, (Co-supervision of Dr Ana Sofia Moita), 2016.
* “Refrigeração do propulsor elétrico de um veículo Fórmula Student”, Pedro Miguel de Aguiar Fontes, (Co-supervision of Professor Paulo José da Costa Branco), 2016.
* “Characterization of bubble dynamics and heat transfer processes in pool boiling under extreme wetting scenarios”, Tiago Mesquita Palma, (Co-supervision of Dr Ana Sofia Moita), 2016.

**Research Management (sample of main research projects)**

* *“BIOAPPRONFS WETT - BIOMIMETIC APPROACHES OF NATURAL FUNCTIONAL SURFACES WITH HIERARCHIAL MICRO & NANO STRUCTURE AND THE EXTREME WETTABILITY”*

FP7-People-2011-IRSES, Ref.: 295224.

* *“Dynamics of INterfacial transport phenomenA in MIcro scale energy Conversion Systems”,* Project RECI/EMS-SIS/0147/2013 - 2018.
* *“The effects of surface wettability and roughness on microchannel evaporative heat transfer – Application to cooling systems”,* Project PTDC/EME-MFE/109933/2009.
* *“Advanced Intermittent Spray Cooling Systems”, Coordenador,* Projecto PTDC/EME-MFE/69459/2006, 2007-2010.
* *“* *Sustainable Mobility Days”* *FP6 – 044602,* 2007 – 2009 with: IST (P), CIRPS University of Rome “La Sapienza” (I), Imperial College of Science Technology and Medicine (UK), Charles University Environment Centre, Prague – Czech Republic
* *“Human Oriented Sustainable Transport“, FP6 – 044602,* 2007 – 2009, with IST (P), Delft University (NL), Royal Institute of technology of Stockholm (SE), CIRPS University of Rome “La Sapienza” (I), Matra- (F), Cargo technologies (AUS), PI Technologies (UK), Stile Bertone S.p.a. (I), Enginion (D), LT Consultant (F), Jelley Limited (UK) KVD (NL).

**Research Management (sample)**

Conference Chair of the 13th - 17th International Symposium on Applications of Laser Techniques to Fluids Mechanics, 2014, 2012, 2010, 2008, 2006, Lisboa.

Member of the Organizing Committee of:

* Eleventh International Conference on Combustion and Energy Utilization (11th ICCEU), University of Beira Interior in cooperation with Technical University of Lisbon and University of Coimbra, May, 9-13, 2012.
* 24th Annual Conference on Liquid Atomization and Spray Systems, September 05-08, 2011, Lisbon, Portugal.
* Sustainable Mobility Days: European Research on Vehicles for Sustainable Mobility, Imperial College of London, 21st September 2007.

Committee Member of the 8th World Congress on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Lisboa, Portugal, 16 – 20 June 2013.

**Recent Invited Talks**

“Towards Physical Modeling Thermal-and Fluid Dynamics of Spray Wall Impingement”, 2nd International Workshop on Near-Wall Reactive Flows, TU Darmstadt, 1-2 June 2017

“The role of nanoengineered wettability in phase change heat transfer”, Invited Lecture presented at the 2nd International Conference on Heat Trasnfer Devices, April 7 - 8, 2017, in Barcelona.

“Experimental characterization of multiscale liquid/solid interfacial phenomena with emphasis on the micro-modification of surfaces to enhance heat transfer in micro-heat dissipators”, Seminário no Department of System Design Engineering da Keio University. 18 – 19th July, 2014.

“Multiscale interfacial transport studies for heat transfer enhancement”, *Keynote Lecture* na 15th International Heat Transfer Conference (IHTC-15), 10 – 15 August 2014, Kyoto, Japan.

“Spray wall impingement: Thermo-fluid-dynamic issues with application to the FP7”. Workshop on “Spray generation and transport: basic studies and applications”, Invited Presentation, University of Bergamo, Dipartimento di Ingegneria Industriale, 29 May 2007.

“Towards Physical Modeling the Thermal-and Fluid Dynamics of Spray Impact in Port Fuel Injection Systems”. DITICE workshop on drop/wall interaction: Industrial applications, Experiments and Modelling, Invited Presentation. University of Bergamo, Italy, 19th May 2006.