

Jocelyn BONJOUR

## CURRENT and PREVIOUS POSITIONS

- Since Sept 2005* Full Professor at INSA Lyon (National Institute of Applied Sciences)  
Teaching at Department of Energy and Environmental Engineering  
Research at CETHIL (Centre for Energy and Thermal Sciences of Lyon)  
UMR5008 CNRS, INSA Lyon, Univ. Lyon1
- 2004-2005* Associate Professor (Maître de Conférences – HDR) at the Polytechnic School of Nantes University:  
Teaching at Department of Thermal and Energy Engineering  
Research at Laboratoire de Thermocinétique (LTN, UMR6607)
- 1998-2004* Assistant Professor (Maître de Conférences) at CNAM (Conservatoire National des Arts et Métiers) and at IFFI (French Institute of Refrigeration)

## QUALIFICATIONS

- 2004* **Habilitation à Diriger des Recherches** - UTC Compiègne  
"*Contributions du Génie Frigorifique et du Génie des Procédés pour un meilleur environnement*"  
(Contribution of Refrigeration and Process Engineering for a better Environment)
- 1996* **Ph.D.** - INSA Lyon - obtained with honours  
"*Amélioration des échanges de chaleur en ébullition naturelle convective par effet de confinement*"  
(Heat transfer enhancement during natural convective boiling by means of confinement)
- 1993* **M.Sc. in Energy Engineering (Diplôme d'Ingénieur + DEA)** - INSA Lyon

## TEACHING ACTIVITIES

~200 h of teaching per year at a level of M.Sc. in Engineering  
Main courses: Phase-change heat transfer, Thermodynamics, ...

## CURRENT and RECENT RESEARCH SUBJECTS

### Boiling heat transfer: fundamentals and application to evaporators of energy engineering systems

Even though the study of boiling phenomenon is relatively ancient, progresses were made concerning:

- pool boiling under low pressure (close to triple point): such conditions can be encountered in various engineering systems (especially sorption chillers) but are governed by unusual phenomena: strongly unsteady behavior, highly different kinetics of vaporization, differences in bubble shape and growth dynamics under unconventional force balances, etc. As a whole, studying boiling at low pressure is a tool to assess the general validity of the classical theories of pool boiling
- EHD during boiling heat transfer: the presence of electric fields around a surface on which boiling takes place modifies, because of electro-hydrodynamic (EHD) forces, the boiling behaviour. In favourable configurations, a heat transfer enhancement may be observed.
- enhancement of pool boiling heat transfer by means of wall nanostructuration: owing to the change of surface wettability due to aggregation (structuration) of nanoparticles, boiling heat transfer can be improved (or reduced) and the boiling critical heat flux can be increased. The challenges are both related to the mechanisms of structuration themselves and to the impact of the nanoporous coatings on the heat transfer and liquid flow.
- experimental determination and prediction of thermal and hydraulic behavior of conventional and next-generation refrigerants during flow boiling (carbon dioxide, synthetic refrigerants, in micro- or macrochannels, in geometrical singularities such as return bends, contractions, etc.). The extension of the current available knowledge to cases of high pressure (i.e. getting closer to the critical point than for the most usual ranges of pressure) was found to be useful for the development and optimization of evaporators of Organic Rankine Cycles (ORC) but also to get a more general understanding of the heat transfer mechanisms and formation of the various flow patterns during flow boiling.

## Phase-change devices (heat pipes) for thermal management of heat dissipating systems

Phase-change devices such as thermosiphons, capillary heat pipes, loop heat pipes (LHP), pulsating heat pipes (PHP), two-phase thermal spreaders (flat plate heat pipes, FPHP), are used for the thermal management of various systems, most of time for electronics cooling. They allow high heat flux densities extraction and transport under a low temperature gradient. Among my recent activities, one may quote:

- two-phase oscillating flow and heat transfer in capillary tubes as an approach of PHPs
- development and operation of a LHP for aircraft electronics cooling. The aircraft constraints (orientation, acceleration, safety, etc.) were addressed
- optimisation of two-phase thermal spreaders
- analysis of thin-film evaporation in cross-grooved capillary structures for FPHPs.

## Energy efficiency of refrigeration systems

To increase the energy efficiency or limit the environmental impact of refrigeration, some actions are:

- to improve the understanding of ice-slurry formation (analysis of crystallization mechanisms)
- to develop absorption air-conditioning systems able to support the road transportation constraints (vibrations, changes of orientation, acceleration, etc.)
- to develop methodologies for the assessment and reduction of overall energy consumption of refrigerated trucks or other refrigerated enclosure (refrigerated wine cellars, refrigerated medicinal / pharmaceutical enclosures).

## Contracts - Doctoral Supervision - PhD theses committees

*Since 2005* Industrial research contracts with PSA, Renault Trucks, Thales Alenia Space, Thalès Avionics, Carrier, Eurocave, AREVA ...

*Since 2005* Funded projects: Agence Nationale de la Recherche (4), FNRAE (Aerospace engineering foundation) (1), EU Projects (4), DGA (National Department of Defence) (1), FUI (Ministry of Industry) (1), CEFIPRA (Center for Franco-Indian collaboration) (2), ...

PhD thesis (co-)supervisor: 12 PhD theses already defended + 7 ongoing

Member of more than 80 PhD theses committees (8 abroad, e.g. Spain, Switzerland, Ireland, India, Mauritius Island) or committees for Habilitation à Diriger des Recherches.

## CURRENT and RECENT ACTIVITIES OF SERVICE TO THE COMMUNITY

### Local activities

- 2018 - ...* Dean for Doctoral Studies in Engineering of Université de Lyon (Doctral School MEGA : Mechanical Engineering, Energy Engineering, Civil Engineering, and Acoustics) : ~500 doctoral students all over Lyon
- 2013-2017* Elected Director of CETHIL (UMR5008), a research center of ca. 120 individuals among whom 40 professors-senior researchers, jointly headed by INSA de Lyon, CNRS and Université Lyon 1
- 2011-2013* Appointed Deputy Director of CETHIL
- 2011-2012* Local coordinator at INSA of KIC Innoenergy program (<http://eit.europa.eu/kics1/kic-innoenergy.html>)
- 2006-2010* Head of a research group at CETHIL (7 professors) devoted to "Transferts avec changement de phase et dans les systèmes" (Phase change heat transfer and applications to thermal systems)

### National activities

- 2006-2011* Head of a National Thematic Network (6 French laboratories) dedicated to "Isolated Bubble Dynamics and Heat Transfer during Pool or Flow Boiling" (GdR CNRS AMETH)
- 2006-2011* Member of a National Thematic Network dedicated to "Phase-Change Cooling Systems" (GdR CNRS SYREDI)
- 2011 - ...* Member of the Scientific Committee and of the Executive Board of Société Française de Thermique (SFT)
- 2011 - ...* Elected Member of Conseil National des Universités (CNU), section 62 (Énergétique, Génie des procédés)

## **International Activities**

2003 - ... Secretary (2003-2011) and then Vice President (2011-present) of Commission B1 (Thermodynamics and Transport processes) of the IIR (International Institute of Refrigeration, an intergovernmental international agency funded by 62 countries)

Nov. 2012 -... Regional Editor of International Journal of Refrigeration (Elsevier)

June 2012 - ... Member of the Editorial Board of Heat Pipe Science and Technology (Begell House)

June 2016 - ... Chairman of the Committee on the International Heat Pipe Conference

Member of the scientific committee of several conferences among which:

International Conference on Energy & Environment (Bucharest, Romania, Nov. 2011, Iasi, Romania, Oct. 2015, Bucharest, Romania, Oct. 2017).

IIR Conference on Thermophysical Properties and Transfer Processes of Refrigerants (Delft, NL, June 2013; Seoul, Korea, April 2017)

IIR Ammonia Refrigeration Technology Conference (Ohrid, Macedonia, May-June 2013, 2015, 2017)

International Heat Pipe Conference (Lyon, France, May 2012; Kanpur, India, Oct. 2013; Jeju, Korea, June 2016...)

13th Conference on Multiphase Flow in Industrial Plant (Sestri Levante, Italy, Sept 2014)

International Seminar of Heat Pipes, Heat Pumps, Power systems (Minsk, Belarus, Sept. 2015, Sept. 2018)

Chairman of the local organizing committee of 16<sup>th</sup> International Heat Pipe Conference, Lyon, May 2012 (<http://www.insavalor.fr/16ihpc>)

Reviewer for several peer-reviewed journals : Int. J. Refrig., Int. J. Heat Fluid Flow, Int. J. Heat Mass Transfer, Int. J. Therm. Sci., Appl. Therm. Eng., J. Micromech. Microeng., Chem. Eng. Sci., ...

## **PUBLICATIONS**

*Scopus Profile (Author ID: 7103019294) : 88 documents, 1474 citations, h factor = 23*

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**3 book chapters**

**85 articles in peer-reviewed journals**

**1 international patent**

**3 chapters of encyclopedias**