

## **Philosophy in Current Multi-scale Manufacturing Research:**

### **Toward Manufacturing By Function**

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Current multi-scale manufacturing research has opened new opportunities and challenges to carry unprecedented functionalities of new products on different scales indispensable to the construction of safe, energy-saving and functional designs. They are of interest for wide applications, for example, rapid casting, micro-machining and micro-joining of multi-layered materials and structures, rightsizing forming, additive manufacturing, and many others. It is, however, difficult to achieve a scalable and robust technology for manufacturing with controlled designed functionalities which lead to the solution "product manufacturability" in industrial conditions. It requires taking into account upstream (design phase), from the functional needs, the overall quality in terms of:

- Material processing by assessing its multi-scale structural qualities related to its state as induced by the manufacturing operation;
- Product manufacturability by quantifying the impact of processing conditions on its functional requirements and service life (especially in the case of severely stressed products in extreme engineering).

If functional requirements can be established and well understood in terms of specification quality of the product after developing the appropriate manufacturing technologies, this does not apply to multi-scale structural characterization and mechanical properties of the product in service. Characteristics are being identified at the stage of product development. This seminar will present some of the recent advancement in the characterization of multi-scale manufacturing processes which were anticipated by the industry.



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Mohamed EL MANSORI is a Professor at the Department of Mechanical, Material Science and Manufacturing Engineering, Arts et Métiers ParisTech where he leads the MSMP([www.msmp.eu](http://www.msmp.eu))/Engineering and Multiphysics of Multiscale Manufacturing Research Group. He served as Deputy General Director in Charge of Research & Innovation of Arts et Métiers ParisTech, France. He also chaired the Mechanical Engineering and Manufacturing Research Group (LMPF-EA4106) at Châlons-en-Champagne.

Mohamed EL Mansori received B.Sc. degree in Physics from the University of Hassan II (Casablanca, Morocco:1993), and Ph.D. in Mechanical Engineering from the Institut National Polytechnique de Lorraine (Nancy, France:1997) followed by he was employed as a postdoctoral researcher at the Center for Advanced Friction Studies in the Southern Illinois University, USA, and then he joined, before ParisTech, the research group at the ERMES (Nancy, France) for five years to conduct research on the tribological behavior of engineering materials, especially under the influence of electro-magnetic environment.

His current research interests include the interface of thermo-mechanic characteristics of both metallic and composite materials and physics behind their tribological performance. The research activities carried out in the last decade were interdisciplinary by their very nature. They have been engulfed to the issues concerning the tribological characteristics of engineering systems and multiscale advanced manufacturing processes. These activities have led to the formation of a new research team which conceived and developed the concept of multi-scale process signature in conjunction with a new tribo-energetic approach for the fundamental understanding of advanced and sustainable manufacturing processes. The main interest of this approach was, in its capability, to "bridge the gap" between the traditional approach of academia and the industrial requirements. These resulted with a strong publication record of more than 150 papers in JCR referenced international journals, and more than 200 international and national conference proceedings. He has been an invited speaker to several international conferences as well as he has taught many short courses on tribology in the multiscale manufacturing process. His strong international exposure can be assessed by several invitations to technical/scientific meetings and international conferences.