

## MESM 2008 – Philadelphia University

### Keynote Title:

*“Complex systems, emergent computing and applications to engineering”*

### Speaker:

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### Abstract:

Complexity is inherent to living systems. The meaning of living systems complexity is based on continuous evolution of structural organizations crossed by energetic fluxes. The whole comprehension of all the interactions of the living systems components inside their environment is needed to understand them. As a major complexity property, we can say that the reduction of the complete interaction network of the components of a living system does not allow to understand it, breaking with its complexity. The current natural and social World deals with this complexity property and need an accurate comprehension of this complexity, both for environmental purposes and for economical or geopolitic purposes. The Earth ecosystem equilibrium evolution is nowadays highlighted by local perturbations generated by human development and deep climatic perturbations could result of that. Geopolitic is also nowadays in fast and deep evolution as the result of the intensive development of modern communication processes which has transformed the old geographical cultural clustering. Interaction networks and patterns of emergent organizations are the keys of complex systems concepts understanding with which the current world must deal. Dissipative structures (following I. Prigogine) are the basis of the energetic approaches of self-organization criticality phenomena. We will present how computer science which can be considered as the science of modelling, dealing with information theory and systems conception can propose today, some models for self-organization processes. Cellular automata, sand pile models, segregation models (based on the works of the nobel price Thomas Schelling), agent-based modelling, social insects modelling for swarm intelligence can be the basis of relevant simulations for a better understanding of natural, economical or geopolitical systems that we have to face today.

### Speaker short bibliography:

Cyrille Bertelle is professor in Computer Science in Le Havre University, France. He is director of Le Havre component of LITIS which is the research laboratories aggregation of Computer Science, Information Technologies and Systems in Haute-Normandie region. This research center is labelled by the French Ministry of High Education and Research (EA 4108) and include more than 150 researchers (half of them are professors and assistant professors and half of them are PhD students). Professor Cyrille Bertelle is also co-director of Le Havre University Master of Science in Mathematics and Computer Science. He manages the research orientation of this master (MIASC) specialized in complex systems modelling. He contributes to many international conferences organizations. In next October, he will be the general Chairman of the International Conference ESM'2008 helded at the University of Le Havre. During the past years, he has managed and he will manage the organization of many international workshops: "Emergent Properties in Natural and Artificial Complex Systems" in ECSS 2005, Paris, France, November 2005 and in ECSS 2007, Dresden, Germany, October 2007, "Modeling, Computation and Systems" in IEEE-ICECS 2005, Gamarth, Tunisia, December 2005, "Complex Systems and Self-organization Modelling" in ESM 2006, Toulouse, France, October 2006 and in ESM 2007, St Julian's Malta, October 2007. He has edited 3 books in 2006 for Springer Verlag "Understanding Complex Systems" collection, for ESM 2006 and ESM 2007 conferences proceedings. He will be the editor of two other books for Springer Verlag before the end of 2008.