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OCP Science Best Poster Award in Unconventional Computing

OCP Science is pleased to announce the laureate of the Best Poster Award at the Workshop on Unconventional Computation "Quo Vadis?" (Santa Fe, March 2007), organized by the Center for Nonlinear Studies, Los Alamos National Laboratory and the Santa Fe Institute. René Doursat (CNRS and Ecole Polytechnique, Paris) received the award for his poster "Embryomorphic engineering: How to design hyper-distributed architectures capable of autonomous segmentation, rescaling and shaping."

R. Doursat's research activities address the modeling and simulation of complex systems—especially spiking neural networks, artificial life and multi-agent systems—aimed at a new form of engineering inspired by biological and social complexity. In the above work, he presents an original model of artificial system growth based on morphogenesis. Virtual organisms are implemented as lattices of cells that interact locally to form reproducible global patterns and shapes. A gene regulatory network guides the behavior of each cell as it divides and differentiates. R. Doursat promotes a new field, *embryomorphic engineering* to emphasize the need for hyperdistributed architectures and self-organized development as prerequisites for evolutionary innovation. Its goal is to replace traditional rigid design with decentralized control and autonomy. Instead of directly making systems, future hardware and software architects will rather "meta-design" mechanisms of self-assembly, self-regulation and evolution.

R. Doursat also works on the unconventional type of computation performed by the brain. He feels that the classical metaphors of Turing machines, control theory or signal processing are inadequate for neural computation. Here too, the next paradigm shift should involve models of large-scale dynamical systems that essentially construe the brain as a *pattern formation machine*. The dense mesh of neurons and synapses creates an "excitable medium" that can support the emergence and interaction of fast, spatiotemporal patterns of activity and connectivity at a mesoscopic structural level.

René Doursat is currently a research engineer at the Complex Systems Institute, CNRS & Ecole Polytechnique, Paris, after a visiting assistant professor position in computer science at the University of Nevada, Reno, where he continues a collaboration with the Brain Computation Laboratory. He also has several years of industry experience as a software engineer and architect. An alumnus of the Ecole Normale Supérieure, Paris, R. Doursat completed his Ph.D. at the Université Paris 6 in 1991, followed by a postdoctoral fellowship at the Institute of Neuroinformatics, Ruhr-Universität Bochum, Germany. He then pursued opportunities in start-up high-tech companies in Paris and San Francisco, where he relocated in 1998. Since 2004, he has resumed academic research and teaching on a full-time basis. In two and a half years, he has published a dozen new contributions on six different topics and created and taught three original undergraduate and graduate courses in computer science and complex systems.