Preface: Applications of Mathematics to Mechanics

This issue of DCDS S is dedicated to applications of mathematics to mechanics.

In relation with this theme issue, we would like to mention the XIXth *Symposium on Trends on Applications of Mathematics to Mechanics* (STAMM), which was held at the University of Poitiers on 8-11 September 2014. The STAMM is the biennal conference organized by the International Society for the Interaction of Mechanics and Mathematics (ISIMM).

Consistently with the purpose of the Society, most of these works deal with mathematical models of phenomena issued from various applications. Several of them address homogenization or dimension reduction via Γ-convergence.

J-P. Chehab, A.A. Franco, and Y. Mammeri suggest method for identifying optimal structures in reaction-diffusion models of physicochemical systems. They illustrate their results on a one-dimensional Allen-Cahn equation, and provide numerical examples for applications.

M. Cicalese and M. Ruf deal with stochastic homogenization of discrete energies on a class of random lattices. They prove a homogenization result for stationary lattices via Γ-convergence.

P. Colli, G. Gilardi, E. Rocca, and J. Sprekels study the analytical aspects of a phase-field system of the type of Cahn-Hilliard, that models of tumor growth. They consider the asymptotic behaviour of the solution for large time and as two viscosity coefficients vanish, and derive error estimates.

G.R. Goldstein, J.A. Goldstein, and F. Travessini De Cezaro address nonautonomous linear second-order hyperbolic equation in abstract form in a complex Hilbert space, and prove the equipartition of energy.

G. Lazzaroni, M. Palombaro ,and A. Schlömerkemper study nanowire heterostructures and perform a discrete-to-continuum limit of the corresponding free energy by means of Γ-convergence techniques. In this way they justify experimentally observed dislocations.

C. Kreisbeck studies the dimension reduction of a three-dimensional variational model via Γ-convergence methods and homogenization techniques, providing applications for nonlinear elasticity and micromagnetics.

M. Liero, A. Mielke, M.A. Peletier, and D.R.M. Renger study the microscopic origin of generalized gradient structures, accounting for general non-quadratic dissipation potentials. They use the theory of large-deviation principles and Γ-convergence, and also derive a model of membrane.

As the reader will notice, all the published papers not only present novel results, but especially highlight new possible future developments. This is, in our opinion, a remarkable trait of the present collection and, hopefully, a fine perspective on this field.

Once again, let us express our deep gratitude to all authors and referees for their truly valuable commitment.

We especially acknowledge the support of the Ministère de L'Education Nationale, de l'Enseignement Supérieur et de la Recherche. We also thank the ISIMM, the Laboratoire de Mathématiques et Applications, the University of Poitiers, the Fédération Mires, the Communauté dAgglomération Grand Poitiers, the Région Poitou-Charentes and the CNRS for their support.

Guest editors :
Alain Miranville
Ulisse Stefanelli
Lev Truskinovsky
Augusto Visintin

REGION Poitou Charentes
la démocratie participative