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Book of Abstracts - Extract

2015

UNIVERSITÀ DEL SALENTO

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Scientific Program - Timetable

Sunday 22	Time	Monday 23	Tuesday 24	Wednesday 25	Thursday 26	Friday 27
	9:15		Contributed sessions (15 in parallel)	Plenary Lecture Moritz Diehl	Contributed sessions (15 in parallel)	Contributed sessions (14 in parallel)
	9:30					
	9:45					
	10:15	Registration		von Mises prize lecture		
	10:30					
	10:45					
	11:15		Coffee Break	Coffee Break	Coffee Break	Coffee Break
	11:30					
	11:45					
	12:15		Plenary Lecture Thomas Böhlke	General Assembly	Plenary Lecture Ferdinando Auricchio	Contributed sessions (11 in parallel)
	12:30					
	12:45					
	13:15	Opening	Lunch	Lunch	Lunch	
	13:30					
	13:45	Univ. Chorus Performance				Closing
	14:15	Prandtl Lecture Keith Moffatt	Plenary Lecture Enrique Zuazua	Contributed sessions (15 in parallel)	Plenary Lecture Daniel Kressner	
	14:30					
	14:45					
	15:15	Plenary Lecture Giovanni Galdi	Plenary Lecture Nikolaus Adams		Plenary Lecture Stanislaw Stupkiewicz	
	15:30					
	15:45					
Registration pre-opening	16:15	Coffee Break	Coffee Break Poster session	Coffee Break	Coffee Break Poster session	
	16:30	Minisymposia & Young Reseachers' Minisymposia (10 in parallel)	Contributed sessions (14 in parallel)	Contributed sessions (15 in parallel)	Contributed sessions (15 in parallel)	
	16:45					
	17:15					
	17:30					
	17:45					
	18:15		Public lecture Francesco D'Andria			
	18:30					
	18:45					
	19:15	Opening reception at Castle of Charles V				
	19:30					
	19:45					
	20:15			Conference dinner at Hotel Tiziano		
	20:30					
	20:45					
	21:15					
	21:30					
	21:45					

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MS3: Topological Defects in Solids

Topological defects have been an active field of study since the pioneering work of Volterra on the mathematical theory of dislocations a century ago, and are very important also in mechanics, for example in the study of the plastic behavior of solids. Relevant connections to topological defects in Ginzburg-Landau models, used to describe for example superconducting or magnetic materials, have meanwhile become apparent. Recent progress in the mathematical analysis of some models generated a renewed interest, which extends from the energetic (variational) treatment to evolution problems.

In this minisymposium we intend to address some of the most interesting recent results on models for topological defects in solids, focusing on the common mathematical structure and spanning over different applications, which include in particular dislocations and plasticity, singularities in elastic plates, as well as Ginzburg-Landau models.

Discrete to continuum analysis of magnetic systems with continuous symmetries

Marco Cicalese, Matthias Ruf, Francesco Solombrino
Technische Universität München

We review some recent results regarding the behaviour of energy-driven classical spin systems with continuous symmetries through the construction of approximate continuous problems. In particular we discuss the multi-scale behaviour of the so called xy-helical model in dimension 1 and 2 in the case of S^1 or S^2-valued spins. The emergence of concentration phenomena related to the formation of topological vortex-type singularities as well as of phase changes due to chirality transitions will be emphasized.

References

[1] M. Cicalese, F. Solombrino. Frustrated ferromagnetic spin chains: a variational approach to chirality transitions. Journal of Nonlinear Science, to appear.

[2] M. Cicalese, M. Ruf, F. Solombrino. A variational analysis of the xy-helical spin system. In progress.

Derivation of the line tension energy for dislocations in 3D

Sergio Conti, Adriana Garroni, Michael Ortiz
Universität Bonn, 53115 Bonn, Germany
Sapienza, Università di Roma, 00185 Roma, Italy
California Institute of Technology Pasadena, CA 91125, USA

Dislocations are line defects in crystals which are fundamental to understand plastic deformation. I will present a three dimensional model of dilute dislocations based on linear elasticity and determine its asymptotic behavior in terms of Gamma convergence in the limit of small lattice spacing. As a result one obtains a line-tension model, which is an energy on matrix-valued divergence-free measures concentrated on lines. The line-tension energy can be determine by the leading term of the elastic energy of infinite straight dislocations after a relaxation process that may require microstructure.

Quantization effects in dislocation energies

Stephan Luckhaus
Mathematisches Institut, Universität Leipzig, 04009 Leipzig, Germany

In small angle grain boundaries the stored energy in principle could depend on the cutoff of the elastic energy to the core, the core energy itself or the size of the Burgers vector. Here we give an argument – up to now with rigorous upper, heuristic lower bounds – that the leading order term depends on the size of the Burgers vector.

Energy scaling law for the regular cone

Heiner Olbermann
Hausdorff Center, Bonn

Consider a thin elastic sheet in the shape of a disk whose reference metric is that of a singular cone. I.e., the reference metric is flat away from the center and has a defect there. This setting is called the regular cone, since one expects that minimizers of the elastic energy are approximately conical. We want to find upper and lower bounds for the minimum elastic energy that have the same scaling with respect to the thickness of the sheet h. Establishing a suitable lower bound is supposed to be hard, the main difficulty lying in the vast amount of potential candidates for energy minimization supplied by the constructions by Nash and Kuiper of C^1-isometric immersions. Isometric immersions have zero stretching energy – hence one needs a general principle that shows that the maps occurring in the constructions by Kuiper are associated to high bending energy. This is also the main problem in proving lower bounds for the so-called confinement or crumpling problem, which consists in fitting a thin elastic sheet into a container whose size is smaller than the diameter of the sheet. Here we suggest an ansatz for proving such lower bounds. We apply it to the regular cone under a technical assumption on the shape of the sheet. Under this assumption, we show that the elastic energy per unit thickness of the regular cone in the leading order of h is given by $Ch^2|\log h|$, where the value of C is given explicitly.