

Main Research Interests

Modelling of physical phenomena via nonlinear partial differential equations, and their analysis.

— **Modelling and analysis of phase transitions.**

Key words: Stefan problem, surface tension, undercooling, metastability, phase nucleation, Gibbs-Thomson law, mean curvature flow.

See e.g.

A.V.: Models of Phase Transitions. Birkhuser, Boston (1996)

A.V.: Introduction to Stefan-type problems. In: Handbook of Differential Equations: Evolutionary Differential Equations vol. IV (C. Dafermos and M. Pokorný, eds.) North-Holland, Amsterdam (2008), chap. 8, pp. 377–484

— **Modelling and analysis of hysteresis phenomena, in particular in ferromagnetism.**

Key words: ferromagnetism, plasticity, hysteresis operators, discontinuous hysteresis, P.D.E.s with hysteresis.

See e.g.

A.V.: Differential models of hysteresis. Applied Mathematical Sciences, vol. 111. Springer, Berlin (1994)

A.V.: Mathematical models of hysteresis. In: The Science of Hysteresis (G. Bertotti, I. Mayergoyz, eds.) Elsevier (2006), chap. 1, pp. 1–123

— **Modelling of homogenization phenomena and analysis of multi-scale models.**

Key words: homogenization, two-scale convergence, scale transformations, Γ -convergence.

See e.g.

A.V.: Homogenization of a parabolic model of ferromagnetism. J. Differential Equations 250 (2011), 1521–1552

A.V.: Scale-transformations in the homogenization of nonlinear magnetic processes. Archive Rat. Mech. Anal. 198 (2010) 569–611

A.V.: Scale-integration and scale-disintegration in nonlinear homogenization. Calc. Var. Partial Differential Equations, 36 (2009), 565–590

— **Analysis of nonlinear partial differential equations and related variational inequalities.**

Key words: Doubly-nonlinear parabolic flow, monotonicity, Fitzpatrick theory, Structural compactness, Structural stability, Evolutionary Γ -convergence.

See e.g.

A.V.: On Fitzpatrick's theory and stability of flows. Rend. Lincei Mat. Appl. 27 (2016) 1–30

A.V.: Variational formulation and structural stability of monotone equations. Calc. Var. Partial Differential Equations 47 (2013), 273–317

A.V.: An extension of the Fitzpatrick theory. Commun. Pure Appl. Anal. 13 (2014), 2039–2058