1. Record Nr. UNINA9910830922503321

Autore	Vedmedenko Elena Y
Titolo	Competing interactions and patterns in nanoworld [[electronic resource] /] / Elena Y. Vedmedenko
Pubbl/distr/stampa	Weinheim, : Wiley-VCH, c2007
ISBN	1-280-85469-3 9786610854691 3-527-61050-2 3-527-61051-0
Descrizione fisica	1 online resource (217 p.)
Disciplina	530.41 548
Soggetti	Nanoscience Pattern formation (Physical sciences) Solid state physics Critical phenomena (Physics)
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Competing Interactions and Patterns in Nanoworld; Contents; Preface; 1 Introduction; 1.1 How the Story Began; 1.1.1 Structure Periodicity and Modulated Phases; 1.1.2 Ferromagnetic and Ferroelectric Domains; 1.2 First Theoretical Approaches for Competing Interactions; 1.2.1 Frenkel-Kontorova Model; 1.2.2 Theoretical Models of the Magnetic/Ferroelectric Domains; 1.2.2.1 Phenomenology of the Dipolar Interaction; 1.2.2.2 Phenomenology of the Exchange and Exchange-Like Interactions; 1.2.2.3 Mechanism of the Domain Formation; 1.3 Summary; 1.4 Exercises; References 2 Self-Competition: or How to Choose the Best from the Worst2.1 Frustration: The World is not Perfect; 2.2 Why is an Understanding of Frustration Phenomena Important for Nanosystems?; 2.3 Ising, XY, and Heisenberg Statistical Models; 2.4 Order-Disorder Phenomena; 2.4.1 Phase Transitions and their Characterization; 2.4.2 Order Below T(c); 2.4.3 Measure of Frustration: Local Energy Parameter; 2.5 Self-Competition of the Short-Range Interactions; 2.5.1 Ising

Antiferromagnet on a Lattice; 2.5.1.1 Triangular Lattice; 2.5.1.2 Kagome Lattice; 2.5.1.3 Ising Antiferromagnet on Aperiodic Tilings 2.5.2 Heisenberg Antiferromagnet on a Lattice2.5.2.1 Triangular and Kagome Lattices; 2.5.2.2 Aperiodic Tilings; 2.5.3 Three-Dimensional Spin Structure on a Periodic Two-Dimensional Lattice: Itinerant Systems; 2.5.4 Frustration Squeezed Out; 2.6 Self-Competition of the Long-Range Interactions; 2.6.1 Dipolar Interactions; 2.6.1.1 Localized Ising Moments on a Periodic Lattice; 2.6.1.2 Localized Vector Moments on a Periodic Lattice; 2.6.1.3 Localized Vector Moments on Aperiodic Tilings; 2.6.1.4 Delocalized Moments with Given Orientation: Two-Dimensional Electron Wigner Crystal
2.6.2 Multipolar Interactions: Why Might that be Interesting?2.6.2.1 Multipolar Moments of Molecular Systems and Bose-Einstein Condensates; 2.6.2.2 Multipolar Moments of Nanomagnetic Particles; 2.6.2.3 Multipole-Multipole Interactions; 2.6.2.4 Ground States for Multipoles of Even Symmetry: Quadrupolar and Hexadecapolar Patterns; 2.6.2.5 Ground States for Multipoles of Odd Symmetry: Octopolar and Dotriacontapolar Patterns; 2.7 Summary; 2.8 Exercises; References; 3 Competition Between a Short- and a Long-Range Interaction; 3.1 Localized Particles
3.1.1 Competition Between the Ferromagnetic Exchange and the Dipolar Interaction: Ising Spins3.1.1.1 Stripes or Checkerboard?; 3.1.1.2 Scaling Theory; 3.1.1.3 Stripes in an External Magnetic Field: Bubbles; 3.1.2 Competition Between the Ferromagnetic Exchange and the Dipolar Interaction: Vector Spins; 3.1.2.1 Films: Dominating Exchange Interaction; 3.1.2.2 Films: Dominating Dipolar Interaction; 3.1.2.3 Nanoparticles with Periodic Atomic Structure; 3.1.2.4 Nanoparticles with Aperiodic Atomic Structure; 3.1.3 Competition Between the Antiferromagnetic Exchange and the Dipolar Interaction
3.1.3.1 Periodic Lattices

Sommario/riassunto

Systems displaying competing interactions of some kind are widespread - much more, in fact, as commonly anticipated (magnetic and Ising-type interactions or the dynamics of DNA molecules being only two popular examples). Written for researchers in the field with different professional backgrounds, this volume classifies phenomena not by system but rather by the type of competing interactions involved. This allows for a straightforward presentation of the underlying principles and the universal laws governing the behaviour of different systems.Starting with a historical overview