

*Charles M. Newman:* TOPICS IN DISORDERED SYSTEMS. Birkhäuser Verlag, Basel-Boston-Berlin 1997, viii, 88 pages, 245 Fig's. ISBN 3-7643-5777-0, price DM 34.—

The book is a very up-to-date presentation of carefully selected topics concerning equilibrium mechanics of statistical models in random environments. It is based on the lectures for a postgraduate course on disordered systems given by the author at the mathematics department of ETH Zürich and on several papers written by the author with various co-authors in the period 1991–1997.

Rather narrow class of disordered systems is chosen—namely Ising models whose nonzero (pair) interactions (as described by couplings  $J_e^\Lambda$ , where  $e = \{x, y\}$  are the nearest neighbours bonds for  $x, y \in \Lambda$ ,  $\Lambda$  being a finite subset of  $\mathbb{Z}^d$ , but some results concerning Poisson point process are also included), are i.i.d. random variables.

Two cases of couplings independent of  $\Lambda$ , *i.e.* disordered ferromagnets with  $J_e \geq 0$  (Chapters 1,3) and spin glasses (Chapters 3, 4), with (symmetric)  $J_e$  equidistributed with  $-J_e$ , are treated in detail. A more general case of highly disordered systems with symmetric  $J_e^\Lambda$  strongly depending on  $\Lambda$  is shortly covered in Chapter 2. In these chapters, the attention is focused on the existence and number of ground states (at zero temperature) and Gibbs states (at higher temperatures) and on the connections of this subject with percolation problems (existence of the so called biogeodesics, spanning trees and forests) in systems of various dimensions  $d$ .

In the longest fourth chapter, a coherent mathematical background is developed for different concept and conjectures introduced with a loss of rigour in literature on spin glasses (“mean-field” model, (non)-self-averaging, replica symmetry breaking *etc.*) and several as yet unsolved research problems are presented and discussed.

A standard mathematical presentation with theorems and propositions subsequently proved is accompanied by more physically oriented remarks and discussions which make the book interesting not only to applied mathematicians and specialists in probability theory but also to materials scientists and condensed matter physicists.

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