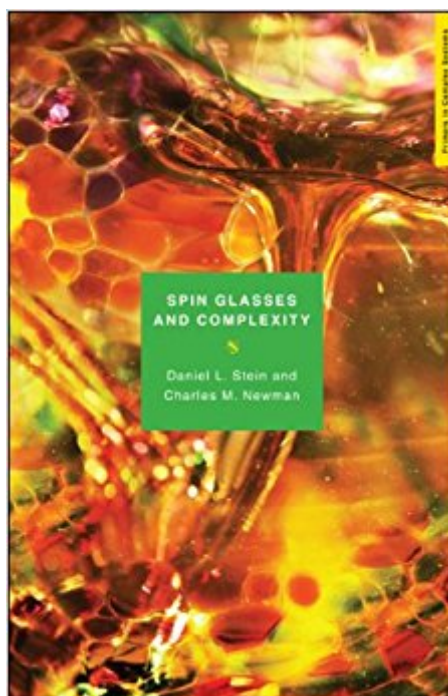The book was found

Spin Glasses And Complexity (Primers In Complex Systems)

Synopsis

Spin glasses are disordered magnetic systems that have led to the development of mathematical tools with an array of real-world applications, from airline scheduling to neural networks. Spin Glasses and Complexity offers the most concise, engaging, and accessible introduction to the subject, fully explaining what spin glasses are, why they are important, and how they are opening up new ways of thinking about complexity. This one-of-a-kind guide to spin glasses begins by explaining the fundamentals of order and symmetry in condensed matter physics and how spin glasses fit into--and modify--this framework. It then explores how spin-glass concepts and ideas have found applications in areas as diverse as computational complexity, biological and artificial neural networks, protein folding, immune response maturation, combinatorial optimization, and social network modeling. Providing an essential overview of the history, science, and growing significance of this exciting field, Spin Glasses and Complexity also features a forward-looking discussion of what spin glasses may teach us in the future about complex systems. This is a must-have book for students and practitioners in the natural and social sciences, with new material even for the experts.

Book Information

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Customer Reviews

Stein does a great job in explaining Spin Glasses in a simple, yet scientifically precise way. The book is written for a general audience but the references make it possible for one to dig into the technical details if needed.

exelent book

Good book addressed to general public by professional theoretical physicists. Similar in spirit to Eugene Stanley's book on surface growth.

This is a very readable, not-too-difficult, but not at all easy, introduction to a difficult topic. The authors (DS/CN) aimed to pitch the book between Scientific AmerÃan and the technical literature. At this they succeed, but thatÃƒÂ¢Ã â ¬Ã â„¢s something like aiming between the top of a shopping mall and low earth orbit. It would be more accurate to say that the presentation is somewhere between SciAm and an undergraduate stat mech textbook. ThereÃƒÂ¢Ã â ¬Ã â„¢s no way, for example, that you can read this book and tackle the famous review paper on the topic by Binder & Young (Rev. Mod. Phys. 1986) unless you already have a good number of math and physics courses under your belt. What the book can give you, though, is a road-map to many of the topics that paper covers.It will also give you an overview of some applications of the mathematical apparatus of spin glass research to other areas (Chap. 6). Here I really appreciated the authorsÃƒÂ¢Ã â ¬Ã â„¢ taste: they avoid trendy topics in economics or social physics, and stick to more reasonable fare: computational complexity, neural network computation and the protein folding problem. Cf. a paper on the arXiv about the spin glass physics of custody battles involving parents who either have more 2 or more children with multiple exes, or have children with one or more exes and are involved with a partner in a similar situation Ãƒ¢Ã â ¬Ã â • not only is the problem contrived but itÃƒÂ¢Ã â ¬Ã â„¢s very unlikely in real life to be entrusted to physicists.The survey of applications doesnÃƒÂ¢Ã â ¬Ã â„¢t end the book, though. ItÃƒÂ¢Ã â ¬Ã â„¢s followed by a chapter on short-range spin glasses, a family of models distinguished from those that assume an infinite spin glass, such as the Sherrington-Kirkpatrick (SK) model, which are discussed earlier. This chapter is slightly more demanding mathematically, and the authors even suggest itÃƒÂ¢Ã â ¬Ã â„¢s skippable altogether Ãƒ¢Ã â ¬Ã â • though IÃƒÂ¢Ã â ¬Ã â„¢d advise

against that, for a few reasons. First, if your math can handle the earlier chapters it can probably handle this one; second, this chapter is referred to several times in the conclusion. And third and most importantly, this material supports the conclusion's point that it might not be justified to push analogies too far between different types of complex systems (or "quasi-complex" systems, as the authors believe spin glasses to be, since the latter aren't adaptive). There might not be any "universality" in the behavior of complex systems — at some point, important behavior may be sui generis.Unfortunately, history shows that such insights will do little to discourage statistical physicists from branching into family counseling, or economists from spinning their very successful tales. For example, it's been observed for years that the equilibrium models that underlie macroeconomics and some aspects of microeconomics as well are nonsense — a point made elegantly in this book, though without reference to economics, when the authors point out that a system that's strongly characterized by its past is a system that's out of equilibrium (@45). Of course even spin glass physicists use unrealistic models, like SK. But those physicists don't make or influence any decisions that could affect your life, like whether to fire you, how much to pay you, or what should be the economic policy of the country as a whole. Even the financial crash of 2008 wasn't enough to convince economists who hadn't foreseen it that their models were wrong; the impact of this book on that issue is likely to be somewhat more modest.When I wrote to the authors to ask about a couple of points that had confused me, they both responded immediately, warmly, and effectively. Some of my questions grew out of my misreadings, but there are a couple of points a reader might want to keep in mind. One is that what makes the hierarchical tree in Fig. 5.6 "ultrametric" isn't just its structure, but also the particular metric used with it. The other is that although the various models aren't written with an express dependence on temperature T, there is a factor of exp[-E/(k_B)T] buried in there (see sec. 1.5). The absence of explicit T-dependence confused me when Chap. 6 started talking about adjusting T as a parameter; maybe this will be more clearly expressed in a future edition.The book includes a useful bibliography, though a little hard to scan because it's organized in order of citation as in some science journals like Science or Nature, rather than alphabetically as in mathematics or some non-science fields. The index isn't adequate: for example, "information" is mentioned often in the text in various senses of that word, but none are indexed. The authors told

me theyÃƒÂ¢Ã â ¬Ã â„¢d done it themselves, because a professional job is expensive ÃƒÂ¢Ã â ¬Ã â•since another Princeton U Press book I read recently had an even more amateurish index, I suspect that PrincetonÃƒÂ¢Ã â ¬Ã â„¢s contract terms with its authors might be a little too greedy, shifting the indexing cost to them without regard to the impact on the bookÃƒÂ¢Ã â ¬Ã â„¢s users. ThatÃƒÂ¢Ã â ¬Ã â„¢s a very minor point thatÃƒÂ¢Ã â ¬Ã â„¢s not so pertinent to whether you should read this book. If youÃƒÂ¢Ã â ¬Ã â„¢re new to spin glasses, you should.

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