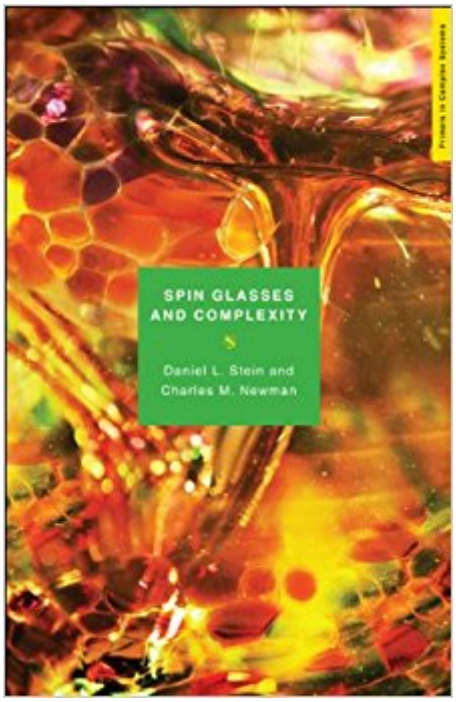
# Spin Glasses And Complexity (Primers In Complex Systems)



## 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

File Size: 2902 KB

Print Length: 336 pages

Publisher: Princeton University Press; 1 edition (January 15, 2013)

Publication Date: January 15, 2013

Sold by:Ã Â Digital Services LLC

Language: English

ASIN: B009F7S70E

Text-to-Speech: Enabled

X-Ray: Not Enabled

Word Wise: Enabled

Lending: Not Enabled

Screen Reader: Supported

Enhanced Typesetting: Enabled

Best Sellers Rank: #514,439 Paid in Kindle Store (See Top 100 Paid in Kindle Store) #13 inÃ Â Kindle Store > Kindle eBooks > Nonfiction > Science > Physics > Solid-State Physics #72 inÃ Â Kindle Store > Kindle eBooks > Nonfiction > Science > Mathematics > Chaos & Systems

#103 inÃ Â Books > Science & Math > Physics > Chaos Theory

## 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 American 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 ÃƒÂ¢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 ÃƒÂ¢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 conclusionÃƒÂ¢Ã â ¬Ã â„¢s point that it might not be justified to push analogies too far between different types of complex systems (or ÃƒÂ¢Ã â ¬Ã Å“quasi-complexÃƒÂ¢Ã â ¬Ã Â• systems, as the authors believe spin glasses to be, since the latter arenÃƒÂ¢Ã â ¬Ã â„¢t adaptive). There might not be any ÃƒÂ¢Ã â ¬Ã Å“universalityÃƒÂ¢Ã â ¬Ã Â• in the behavior of complex systems ÃƒÂ¢Ã â ¬Ã â • 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, itÃƒÂ¢Ã â ¬Ã â„¢s been observed for years that the equilibrium models that underlie macroeconomics and some aspects of microeconomics as well are nonsense ÃƒÂ¢Ã â ¬Ã â • a point made elegantly in this book, though without reference to economics, when the authors point out that a system thatÃƒÂ¢Ã â ¬Ã â„¢s strongly characterized by its past is a system thatÃƒÂ¢Ã â ¬Ã â„¢s out of equilibrium (@45). Of course even spin glass physicists use unrealistic models, like SK. But those physicists donÃƒÂ¢Ã â ¬Ã â„¢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 wasnÃƒÂ¢Ã â ¬Ã â„¢t enough to convince economists who hadnÃƒÂ¢Ã â ¬Ã â„¢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 ÃƒÂ¢Ã â ¬Ã Å“ultrametricÃƒÂ¢Ã â ¬Ã Â• isnÃƒÂ¢Ã â ¬Ã â„¢t just its structure, but also the particular metric used with it. The other is that although the various models arenÃƒÂ¢Ã â ¬Ã â„¢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 itÃƒÂ¢Ã â ¬Ã â„¢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 isnÃƒÂ¢Ã â ¬Ã â„¢t adequate: for example, ÃƒÂ¢Ã â ¬Ã Ëœinformation ÃƒÂ¢Ã â ¬Ã â„¢ 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.



Spin Glasses and Complexity (Primers in Complex Systems) Tomart's Price Guide to Character & Promotional Glasses: Including Pepsi, Coke, Fast-Food, Peanut Butter and Jelly Glasses; Plus Dairy Glasses & Mil Tomart's Price Guide to Character & Promotional Glasses Including Pepsi, Coke, Fast-Food, Peanut Butter and Jelly Glasses; Plus Dairy Glasses & Milk Diversity and Complexity (Primers in Complex Systems) Perfect Sight Without Glasses - The Cure Of Imperfect Sight By Treatment Without Glasses - Dr. Bates Original, First Book - Natural Vision Improvement: TextBook - Teacher/Student Edition Collector's Guide to Cartoon & Promotional Drinking Glasses : Pepsi - McDonalds - Sports - Disney - Coca-Cola - Much More (over 3000 glasses) Complex Adaptive Systems: An Introduction to Computational Models of Social Life (Princeton Studies in Complexity) Simply Complexity: A Clear Guide to Complexity Theory Spin to Win: A Roller Derby Lesson Plan, Emphasizing Spin Techniques for Blockers & Jammers (Encyclopedia Skate-annica Book 1) Rapid Prototyping Software for Avionics Systems: Model-oriented Approaches for Complex Systems Certification (Iste) The Passive Voice and Reported Speech: Your grammar torch to shed light on passive voice, reported speech, complex subject, complex object and cleft (Brookgarbolt's treasure Book 2) How Goats Can Fight Poverty: Complex problems do not always need complex solutions Making Things Work: Solving Complex Problems in a Complex World Transgender Lives: Complex Stories, Complex Voices Dynamics, Information and Complexity in Quantum Systems (Theoretical and Mathematical Physics) Complexity and Planning: Systems, Assemblages and Simulations (New Directions in Planning Theory) Mind and Nature: A Necessary Unity (Advances in Systems Theory, Complexity, and the Human Sciences) Systems Thinking, Third Edition: Managing Chaos and Complexity: A Platform for Designing Business Architecture Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture Bose, Spin and Fermi Systems: Problems and Solutions