RECENT PROGRESS IN RANDOM MAGNETS

This page is intentionally left blank.

RECENT PROGRESS IN RANDOM MAGNETS

Editor

D. H. RYAN

Dept. of Physics, McGill University,
Montreal, Canada

World Scientific

Singapore • New Jersey • London • Hong Kong

Published by

World Scientific Publishing Co. Pte. Ltd.

P O Box 128, Farrer Road, Singapore 9128

USA office: Suite 1B, 1060 Main Street, River Edge, NJ 07661

UK office: 73 Lynton Mead, Totteridge, London N20 8DH

RECENT PROGRESS IN RANDOM MAGNETS

Copyright © 1992 by World Scientific Publishing Co. Pte. Ltd.

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the Publisher.

ISBN 981-02-0885-5

Printed in Singapore by Utopia Press.

Foreword

Shortly after moving to McGill I borrowed some conference proceedings from a colleague. When I explained that I needed references for a short review involving spin glasses, he asked: "Why are you wasting your time with spin glasses? That field is dead." This book is in part a reply to that comment. The number and variety of contributions collected here should convince even the most sceptical reader that spin glasses are alive and well. Moreover significant advances are being made.

In collecting chapters for this book I had three aims in mind: (i) they should reflect areas where progress has been made in the last few years; (ii) they should be primarily experimental in content and (iii) they should actually be about spin glasses. I cannot claim total success in the first, as that would mean that I believed the book to be complete. All I can hope is that the omissions are not too obvious. The second aim was to balance the overwhelmingly theoretical content of most recent books. While there is nothing wrong with theory in moderation, I felt that it was high time that the other side got a chance. Finally, the field of "spin glasses" has broadened over the years to include such diverse areas as complexity, neural networks and fractals, which, to my mind are somewhat off the subject. I therefore restricted the content to real spin glasses *i.e.* systems with a random magnetic ground state. I then took a liberal definition of spin glasses to keep the coverage reasonably broad – essentially all random magnetic systems are included – so that random fields and random anisotropy are included as well as the canonical random exchange.

Those who are interested in reviews of the current theoretical situation are referred to several recent books: "*Spin glasses*" by K.H. Fischer and J.A. Hertz (Cambridge, 1991) which provides a thorough introduction to the theory; "*Spin glass theory and beyond*" by M. Mezard, G. Parisi and M.A. Virasoro (World Scientific, 1987), which also includes reprints of the major papers over the last twenty-five years; "*Spin glasses*" by K. Binder and A.P. Young in Reviews of Modern Physics **58** (1986), 801; and the proceedings of the two Heidelberg Colloquia on spin glasses (1983) and glassy dynamics (1987) edited by Morgenstern and van Hemmen (Springer).

My thanks go first to the contributors, without whom this book would not exist. They endured a barrage of phone calls and faxes with good humour, and always had a new excuse. I naïvely thought that all the computers would make the job easier: the contributors could simply e-mail in the files and I could print them out. However, there seems to be a semi-infinite supply of mutually incompatible wordprocessors. As a result, I am indebted to D. Koziol who re-formatted many of the files and fixed them up so they could be printed.

D.H. Ryan
McGill University

This page is intentionally left blank.

CONTENTS

Foreword	v
Exchange Frustration and Transverse Spin Freezing <i>D. H. Ryan</i>	1
Investigation of the Reentrant Spin Glass Phase by Neutron Scattering <i>I. Mirebeau, M. Hennion, S. Mitsuda and Y. Endoh</i>	41
Random Anisotropy and Phase Transitions in Magnetic Glasses <i>D. J. Sellmyer and M. J. O'Shea</i>	71
Magnetic Anisotropy of Spin Glasses <i>J. S. Kouvel</i>	123
Phase Transitions in Magnets with Random Uniaxial Anisotropy <i>Y. Y. Goldschmidt</i>	151
Finite Size Effects in Metallic Spin Glasses <i>J. Bass and J. A. Cowen</i>	177
Slow Dynamics in Spin Glasses and Other Complex Systems <i>E. Vincent, J. Hammann and M. Ocio</i>	207
Spin Density Waves in Spin Glasses, Rare-Earth Metallic Alloys and Artificial Superlattices <i>S. A. Werner and J. J. Rhyne</i>	237
Random Field Ising Model Experiments: Statics and Dynamics <i>D. P. Belanger</i>	277
The Random Field Enigma <i>Y. Shapir</i>	309