

# Lecture Notes in Physics

## Editorial Board

R. Beig, Wien, Austria  
J. Ehlers, Potsdam, Germany  
U. Frisch, Nice, France  
K. Hepp, Zürich, Switzerland  
W. Hillebrandt, Garching, Germany  
D. Imboden, Zürich, Switzerland  
R. L. Jaffe, Cambridge, MA, USA  
R. Kippenhahn, Göttingen, Germany  
R. Lipowsky, Golm, Germany  
H. v. Löhneysen, Karlsruhe, Germany  
I. Ojima, Kyoto, Japan  
H. A. Weidenmüller, Heidelberg, Germany  
J. Wess, München, Germany  
J. Zittartz, Köln, Germany

**Springer**

*Berlin*

*Heidelberg*

*New York*

*Barcelona*

*Hong Kong*

*London*

*Milan*

*Paris*

*Singapore*

*Tokyo*

**Physics and Astronomy**



ONLINE LIBRARY

<http://www.springer.de/phys/>

## Editorial Policy

The series *Lecture Notes in Physics* (LNP), founded in 1969, reports new developments in physics research and teaching -- quickly, informally but with a high quality. Manuscripts to be considered for publication are topical volumes consisting of a limited number of contributions, carefully edited and closely related to each other. Each contribution should contain at least partly original and previously unpublished material, be written in a clear, pedagogical style and aimed at a broader readership, especially graduate students and nonspecialist researchers wishing to familiarize themselves with the topic concerned. For this reason, traditional proceedings cannot be considered for this series though volumes to appear in this series are often based on material presented at conferences, workshops and schools (in exceptional cases the original papers and/or those not included in the printed book may be added on an accompanying CD ROM, together with the abstracts of posters and other material suitable for publication, e.g. large tables, colour pictures, program codes, etc.).

## Acceptance

A project can only be accepted tentatively for publication, by both the editorial board and the publisher, following thorough examination of the material submitted. The book proposal sent to the publisher should consist at least of a preliminary table of contents outlining the structure of the book together with abstracts of all contributions to be included.

Final acceptance is issued by the series editor in charge, in consultation with the publisher, only after receiving the complete manuscript. Final acceptance, possibly requiring minor corrections, usually follows the tentative acceptance unless the final manuscript differs significantly from expectations (project outline). In particular, the series editors are entitled to reject individual contributions if they do not meet the high quality standards of this series. The final manuscript must be camera-ready, and should include both an informative introduction and a sufficiently detailed subject index.

## Contractual Aspects

Publication in LNP is free of charge. There is no formal contract, no royalties are paid, and no bulk orders are required, although special discounts are offered in this case. The volume editors receive jointly 30 free copies for their personal use and are entitled, as are the contributing authors, to purchase Springer books at a reduced rate. The publisher secures the copyright for each volume. As a rule, no reprints of individual contributions can be supplied.

## Manuscript Submission

The manuscript in its final and approved version must be submitted in camera-ready form. The corresponding electronic source files are also required for the production process, in particular the online version. Technical assistance in compiling the final manuscript can be provided by the publisher's production editor(s), especially with regard to the publisher's own Latex macro package which has been specially designed for this series.

## Online Version/ LNP Homepage

LNP homepage (list of available titles, aims and scope, editorial contacts etc.):

<http://www.springer.de/phys/books/lnpp/>

LNP online (abstracts, full-texts, subscriptions etc.):

<http://link.springer.de/series/lnpp/>

K. Baberschke M. Donath W. Nolting (Eds.)

# Band-Ferromagnetism

Ground-State and Finite-Temperature Phenomena



Springer

## Editors

Prof. Klaus Baberschke  
Freie Universität Berlin  
Institut für Experimentalphysik  
Arnimallee 14  
14195 Berlin, Germany

Prof. Wolfgang Nolting  
Humboldt-Universität zu Berlin  
Institut für Physik  
Invalidenstr. 110  
10115 Berlin, Germany

Prof. Markus Donath  
Westfälische Wilhelms-Universität  
Physikalisches Institut  
Wilhelm-Klemm. Str. 10  
48149 Münster, Germany

---

*Cover picture:* see contribution by M. Donath in this volume

---

Library of Congress Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Band ferromagnetism : ground state and finite temperature phenomena / K. Baberschke ... (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ; Tokyo : Springer, 2001  
(Lecture notes in physics ; 580)  
(Physics and astronomy online library)  
ISBN 3-540-42389-3

ISSN 0075-8450

ISBN 3-540-42389-3 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law. Springer-Verlag Berlin Heidelberg New York

a member of BertelsmannSpringer Science+Business Media GmbH <http://www.springer.de>

© Springer-Verlag Berlin Heidelberg 2001

Printed in Germany The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by the authors/editor

Camera-data conversion by Steingraeber Satztechnik GmbH Heidelberg

Cover design: *design & production*, Heidelberg

Printed on acid-free paper

SPIN: 10847373      57/3141/du - 5 4 3 2 1 0

# Preface

The fascinating phenomenon ferromagnetism is far from being fully understood, although it surely belongs to the oldest problems of solid state physics. For any investigation it appears recommendable to distinguish between materials whose spontaneous magnetization stems from localized electrons of a partially filled atomic shell and those in which it is due to itinerant electrons of a partially filled conduction band. In the latter case one speaks of band-ferromagnetism, prototypes of which are the classical ferromagnets Fe, Co, and Ni. The present book is a status report on the remarkable progress that has recently been made towards a microscopic understanding of band-ferromagnetism as an electron correlation effect.

The authors of the various chapters of this book “Band-Ferromagnetism: Ground-State and Finite-Temperature Phenomena” participated as selected experts in the 242nd WE-Heraeus-Seminar (4-6 October 2000) held under almost the same title in Wandlitz near Berlin (Germany). It was the second seminar of this type in Wandlitz. (The first in 1998 dealt with the complementary topic of the physics of local-moment ferromagnets such as Gd). Twenty-six invited speakers from ten different countries together with fifty-five further participants, who presented contributions in form of posters, spent three days together discussing in an enthusiastic and fertile manner the hot topics of band-ferromagnetism.

Generous financial support by the Wilhelm und Else Heraeus-Stiftung, by the Sonderforschungsbereich 290 (Metallische dünne Filme: Struktur, Magnetismus und elektronische Eigenschaften) of the Deutsche Forschungsgemeinschaft, and also by the Wohnungsbaugenossenschaft Hellersdorfer Kiez e. G. made it possible to bring together experimentalists and theoreticians working in different areas and with different techniques in the field of band-ferromagnetism. The idea was to document the present state of affairs, to learn from each other, and to pinpoint important areas for future research. The support of the sponsors is gratefully acknowledged.

Many colleagues have helped to organize the workshop and to prepare the manuscript of the accompanying book. We wish to thank the members of the Lehrstuhl Festkörpertheorie at the Humboldt-Universität zu Berlin for doing an excellent and active job. Special thanks are due to Priv.-Doz. Dr. Michael Potthoff who really worked hard in composing the various contributions to this book. The collaboration with the Springer-Verlag was always effective and delightful.

Berlin, Münster  
April 2001

*K. Baberschke  
M. Donath  
W. Nolting*