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RICHARD W. HOFFMAN
Case Western Reserve University

Long Range Order in Solids

R. M. White, T. H. Geballe

413 pp. Academic, New York, 1979.
\$39.50

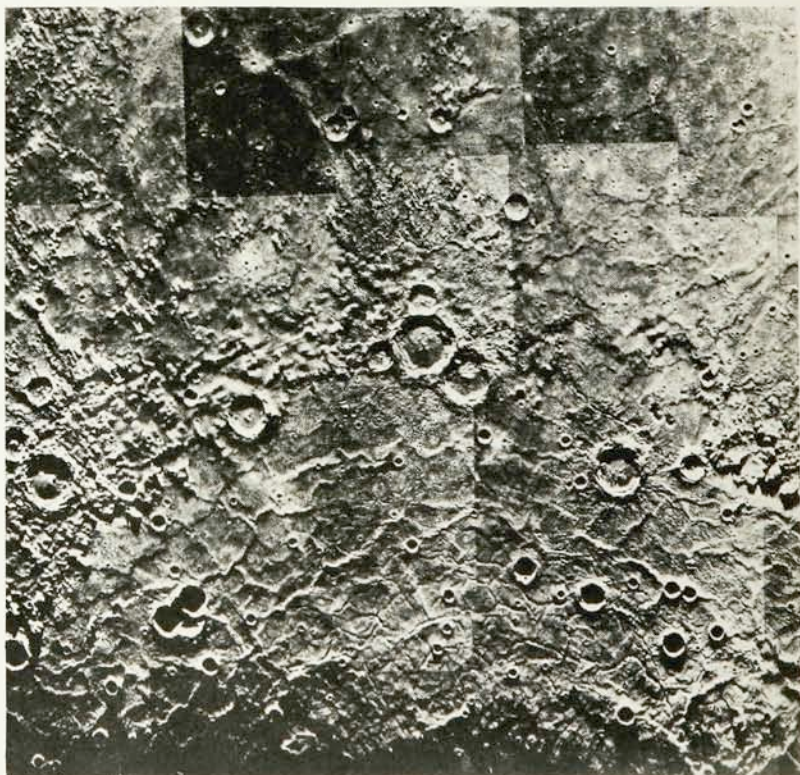
This book is Supplement 15 to the well-known series "Solid State Physics." Unlike most of the other volumes it does not treat a single topic exhaustively, but rather gives a reasonably coherent description at an intermediate level of a broad range of phenomena associated with the occurrence of superconductivity and magnetism in a wide variety of materials.

Long Range Order in Solids can be divided into four parts. First, the subject is introduced by a series of examples of orderings in condensed-matter systems, the terminology is defined, the most important general theorems quoted, and the phenomenological theory (Ginzburg-Landau) is discussed in some detail. The second part contains the rudiments of the theory of superconductivity and magnetism (for which both the spin models as

well as itinerant electron pictures are described). In the third part the authors present a variety of experimental results and relate them to the previously developed theoretical ideas. The last part of the book is devoted to inhomogeneous systems. This section encompasses a wealth of subjects: formation of localized magnetic moments, their effect on superconductivity, magnetic domain walls, flux lines in superconductors, surface effects, ordering in amorphous and granular materials.

The book can be used by graduate students of physics after taking a two-semester course in solid-state physics, but it will also appeal to materials scientists and engineers. The authors avoid almost completely the use of field-theoretical techniques and usually the theory is explained insofar as it is needed for understanding of the experiments. Thus the last decade's surge in the study for critical phenomena using the methods of renormalization group, the solution of the Kondo problem and the topological phase transitions in two-dimensional systems are only briefly outlined.

The restriction of the text to two major areas, namely superconductivity and magnetism (with occasional remarks about liquid crystals and charge-density waves) has allowed the authors to demonstrate the unifying power of the general



Mountainous border of Mercury's largest basin (provisionally named "Caloris") as seen by Mariner 10. Many photographs of this type are found in *Atlas of Mercury* (NASA, 1978) available from the US Government Printing Office for \$10.00 (no. 033-000-00695-1).

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Supergravity

Proceedings of the Supergravity Workshop at Stony Brook, 27-29 September, 1979

edited by P. VAN NIEUWENHUIZEN and D. Z. FREEDMAN, *Institute for Theoretical Physics, State University of New York, Stony Brook, Long Island, U.S.A.*

1989. xii + 342 pages
Price: US \$44.00/Dfl. 90.00
ISBN 0-444-85438-X

This volume contains 39 contributions from virtually all the leading experts in supergravity. The order of the articles contained in this book follows the order of the talks presented at the workshop. As almost all active supergravity practitioners were present at the workshop, this publication gives an excellent overview of the status of supergravity.

The emphasis of these proceedings is on superspace, as the emphasis has shifted, during the past year, from the ordinary space approach toward superspace and superloops. New results on auxiliary fields for $N=2$ supergravity and on different geometrical approaches are presented. Of great importance is the work on spontaneous symmetry breaking mass formulae and possible experimental connections.

The topics covered include: superspace, tensor calculus, superloops, gauging superalgebras, dimensional reduction, spontaneous symmetry breaking, geometry of supergravity, conformal supergravity, constraints in superspace, unitarity, renormalizability, self-duality, unified gauge theories, fiber bundles, gravitational instantons, anomalies, higher spin equation and index theorems.

Until now, there has been no complete list of articles published on the subject of supergravity. This book contains a unique bibliography in that it includes all 400 articles which have been published on supergravity up to October 1979.

CONTENTS: Preface. List of Participants. **Contributors:** C. A. Aragone, R. A. Arnowitt, P. Breitenlohner, T. E. Clark, T. L. Curtwright, A. D'Adda, R. D'Auria, S. Deser, B. De Wit, M. J. Duff, S. Ferrara, P. Fré, D. Z. Freedman, C. Fronsdal, P. G. O. Freund, S. J. Gates, Jr., M. Gell-Mann, H. Girardello, M. T. Grisaru, P. Howe, M. Kaku, U. Lindström, J. Lukierski, S. W. MacDowell, F. Mansouri, K. A. Milton, P. Nath, N. K. Nielsen, M. J. Perry, T. Regge, H. Römer, M. Roček, D. K. Ross, C. Schaer, J. Scherk, J. H. Schwarz, W. Siegel, K. S. Stelle, P. K. Townsend, L. F. Urrutia, J. W. Van

Holten, P. Van Nieuwenhuizen, A. Van Proeyen, J. Wess, P. C. West, C. K. Zachos, Bibliography.

Future Directions in Studies of Nuclei far from Stability

Proceedings of the International Symposium on Future Directions in Studies of Nuclei far from Stability, September 10-13, 1979, Nashville, Tennessee, USA.

edited by JOSEPH H. HAMILTON, *Vanderbilt University, Tennessee*, EUGENE H. SPEJEWski, *Oak Ridge Associated Universities*, CARROL R. BINGHAM, *University of Tennessee*, and EDWARD F. ZGANJAR, *Louisiana State University, U.S.A.*

1980. x + 430 pages
Price: US \$61.00/Dfl. 125.00
ISBN: 0-444-85448-7

The field of Nuclei far from stability has advanced to be one of the major frontiers in nuclear physics. This book deals with the theoretical and experimental status of nuclear structure studies and, in particular, the future direction of such studies as illustrated through investigations on nuclei far from beta stability.

This book resulted from the international symposium, Future Directions in Studies of Nuclei Far From Stability, sponsored by UNISOR and Vanderbilt University. The conference was attended by delegates from 21 countries. The symposium was held to discuss which new directions should be most vigorously pursued to advance understanding of nuclear structure. To highlight the theme of the symposium, several leading nuclear structure theorists from different schools of thought were invited to share insights and suggest new directions, including even wild speculations based on their work. Reports of new results, new facilities and new directions being planned by the various major experimental groups in the field were also presented. The contributions clearly demonstrate that the Study of Nuclei Far From Stability is one of the new frontiers in nuclear structure physics.

CONTENTS: Preface. Papers were contributed by the following authors: C. R. Bingham, J. H. Hamilton, E. H. Spejowski, K. S. Toth, E. F. Zganjar, A. Faessler, V. Paar, J. L. Wood, R. L. Mlekosaj, W. G. Nettles, A. V. Ramayya, F. T. Avignone, III, H. K. Carter, T. Fényes, T. Toriyama, T. Nishio, M. Kanbe, K. Hisatake, P. J. Nolan, S. Xi-Jun, G. Jun-sheng, P. zong-you, G. veng-xiang, W. Andrejschiff, G. Andersson,

E. Hagberg, C. Schück, A. Knipper, C. Richard-Serre, V. Berg, A. Zerrouki, J. Gerevey-Rivies, S. Frauendorf, F. R. May, V. V. Pashkevich, P. O. Hess, J. A. Maruhn, W. Greiner, E. W. Otten, M. Danos, A. H. Wapstra, V. V. Volkov, L. Funke, G. Winter, J. Döring, F. Dubbers, P. Kemnitz, E. Will, G. Scharff-Goldhaber, R. A. Meyer, E. A. Henry, O. G. Lien, III, H. C. Griffin, S. M. Lane, R. P. Jaffe, P. C. Stevenson, G. Skarnermark, J. Åystö, J. Cerny, K. Kumar, F. Iachello, W. Scheid, W. Greiner, K. A. Erb, L. K. Peker, L. P. Somerville, G. N. Flerov, R. Fouchier, I. Ragnarsson, D. S. Brenner, R. E. Chrien, R. Gill, M. Stelts, J. C. Hill, F. K. Wahn, E. Roeckl, P. G. Hansen. List of Participants.

Current Topics in Materials Science, Volume 4

edited by E. KALDIS, *Laboratorium für Festkörperphysik, Zürich, Switzerland*

CURRENT TOPICS IN MATERIALS SCIENCE, Vol. 4

1980 approx. 606 pages
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ISBN 0-444-85348-0

This volume is the fourth in the series Current Topics in Materials Science. The series presents authoritative interdisciplinary reviews of the most significant recent developments in the fields of solid state chemistry and physics, electronics, metallurgy and ceramics, crystallography and mineralogy. The series aims to be a source of topical information for the specialist and also an aid in the continuing education of research workers and advanced students.

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concepts, even in the somewhat limited setting provided by the mean-field theory, without becoming too fragmentary.

Overall, the authors succeeded in writing a well-balanced and widely accessible account of an active field of condensed-matter physics.

JOSEPH SAK
Rutgers University

Functional Integration and Quantum Physics

B. Simon

303 pp. Academic, New York, 1979.

\$29.50

Writing in 1929, Norbert Wiener remarked, "Mathematical attacks on the quantum theory, except from the side of the professional physicist, have proved disappointing so far, and indeed Professor Weyl's treatment of the group theory is the only contribution from the side of the pure mathematician which has definitely become incorporated into the physics quantum theory."¹ Certainly, this is no longer true; in fact, Barry Simon's book *Functional Integration and Quantum Physics* describes recent developments in quantum dynamics that exploit one of Wiener's unique mathematical contributions—the functional integral. Wiener, who wrote frequently on the statistical basis for quantum mechanics, would have recognized as logical heir to his Maxwellian versus Gibbsian point of view² the present relation between real time and Euclidean (imaginary) time. This Euclidean framework has become the primary setting for constructive quantum field theory, which has spurred much of the development in quantum mechanics Simon discusses.

Functional integration serves to provide the main mathematical theorem by which the Euclidean framework enters quantum physics via the Feynman-Kac formula. This represents the semigroup generated by the Schrödinger Hamiltonian as an integral over a function space with respect to a Gaussian probability measure. Development of this formula as well as essential background from probability theory takes up Simon's first two chapters. By means of these ideas, Elliot Lieb has given a formula that allows estimates of the number of energy eigenvalues below a given value, as well as the stability-of-matter bound for a neutral system of electrons and fixed positive charges. Physical ideas from Thomas-Fermi theory play a key role here. When the Schrödinger equation requires velocity-dependent potentials, such as for magnetic fields, K. Ito's theory of stochastic integrals provides an extension of the Feynman-Kac formula, which may have further application to gauge theories.

This discussion is particularly welcome, as Ito's ideas are not so accessible to physicists. Apart from a final chapter with overviews on special topics, among them constructive (Euclidean) field theory, the two remaining chapters treat properties of eigenvalues such as monotonicity in the coupling strength as well as perturbation theory and variational principles. This line of ideas inherited from statistical mechanics is possible in the imaginary time as opposed to the real-time formulation of quantum mechanics.

Throughout the book the discussion is expertly written and includes a wealth of detail amply rewarding the reader who wishes to become armed with the "tools of the trade." It is not, however, a book for the casual reader, for familiarity with integration theory and functional analysis is essential. It will therefore be of interest primarily to probabilists and mathematically oriented physicists. For students with this background, the book could serve as a text for an advanced graduate course. The less mathematically prepared reader will need to make a large step to enter this branch of mathematical physics. Amongst leading exponents of this art, Barry Simon has done more than his share producing books that are timely and provide entry to avenues of current research. This book is no exception.

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JOHN L CHALLIFOUR
Indiana University

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