

Preface to the Second Edition

This is the second edition of *Principles of Nanomagnetism*, a book for the reader who is looking for a textbook, with a systematic presentation of this subject. In this edition, in view of the great vitality of Nanomagnetism, I have expanded and updated every chapter and the *Bibliography* and the *Further Reading* sections at the end of each chapter. Exercises that in most cases complement the text, and their solutions, have also been introduced. I have expanded significantly in this edition the treatment of the themes related to spin effects, such as spin injection and spin pumping. I have included the spin Hall effect and spin thermal effects, such as the Seebeck and Peltier spin effects; two short Appendices, on the Hall Effect and on Thermoelectricity, were introduced to supplement the discussion of these themes. A Glossary was added, with elementary definitions of important terms in Nanomagnetism, in a language accessible to the nonspecialist. New figures, and specially color figures for the online version, were introduced throughout the book. Some minor corrections were also made.

I would like to thank the contribution to this edition given by the colleagues that have read parts of the manuscript, A. Azevedo, C.M. Chaves, W.D. Folly, J. Geshev, A.M. Gomes, A.M. Gonçalves, A. Mello, E.C. Passamani, K.R. Pirola, T.G. Rappoport, S.M. Rezende, L.C. Sampaio, F.C. da Silva, J.P. Sinnecker, H. Vigo-Cotrina especially L.A.S. de Oliveira, who read several chapters; new figures prepared by J.P. Sinnecker are also acknowledged.

For comments and corrections related to this volume see www.cbpf.br/nanomagnetism.

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The field of Nanomagnetism is a young branch of the study of magnetic phenomena, phenomena that have been a source of amazement and stimulus for speculation for more than three thousand years (Guimarães 2005).

Nanomagnetism, despite being a young area, has already affected every sphere of human activity, through its fundamental contribution to make the computer an ubiquitous instrument for communication, control of industrial processes, medical diagnosis, scientific investigation, or leisure. The studies of particulate and thin film magnetic media and other related questions led to improvements that have multiplied, in five decades, the amount of data that can be encoded into a unitary area by some fifty million times.

The 2007 Nobel Prize in Physics, awarded to Albert Fert and Peter Grünberg, is an important recognition of the extraordinary achievements of the research in Nanomagnetism. The unfolding revolution brought about by Spintronics is intimately connected and enhances the relevance of these developments.

Nanomagnetism already encompasses a very wide range of remarkable properties and phenomena, as illustrated in the case of thin films, for example, by the volumes of the series on *Ultrathin Magnetic Structures* (Bland and Heinrich 2005).

In the present book, I have attempted to organize, out of the myriads of publications, those results that might be more revealing of the principles that every student, material scientist, or physicist have to be familiar with. The fast pace of evolution of Nanomagnetism adds to the difficulty of this project, but this fascinating subject turns this into a stimulating and very pleasant challenge to be taken up.

I have also made an effort to facilitate the conversion of the expressions that describe the magnetic properties of nano-objects from CGS to SI units, and vice versa, since the question of units is a recurrent obstacle in the path of the student of Magnetism.

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