

Preface

To the old saying that if you want to learn something about a subject, teach a course on it, I would add the much more arduous option of writing a book about it. The upside, of course, is that you may gain a perspective on a longtime favorite subject which can be achieved in no other way. The fact is that the opportunity to write such a book as this is, indeed, a rare opportunity, especially for someone who by the calendar is well into retirement years.

While for a physics researcher, high T_c itself was the *opportunity of a lifetime*, and revisiting the old milestones within is a genuine nostalgia trip, it is also important to reflect on the purpose of such a book as this. Now that the great majority of experimental high- T_c studies are finished, who could be interested in such a book? To give some kind of answer to this, let me pinpoint the 2006 M²S Conference in Dresden.¹ Not only was it at this conference that the idea for this book was hatched, but the conference itself evinced an astonishingly high level of interest in high- T_c issues, especially the theoretical aspects. Since it is now a number of years since a review of high- T_c studies with NMR has appeared, there may be a need on the part of theorists and other interested parties for an organized summary of results and of the ideas which have been advanced to bind them together.

The foregoing offers a partial answer to the “Why now?” question, but let me note that excellent answers to that question also emerge from the subject, itself. Although many issues were settled as of ten years ago, new ideas and even new phenomena have appeared since that time. Let me offer two examples. The confirmation by N. Curro and coworkers of a dynamical exponent crossover in the high temperature phase diagram opens up a new arena of potential experimental activity. Pines and coworkers had predicted such an effect; other theorists, including Varma, had predicted a phase boundary in that region. Another interpretive breakthrough is to be credited to Uldry and Meier, who in 2005 created a new, general method for

¹This was the 8th International Conference on Materials and Mechanisms of Superconductivity and High Temperature Superconductors, Dresden, July 9–14, 2006.

analyzing relaxation (T_1) data in terms of temperature-dependent spin-spin correlation coefficients for close-neighbor copper sites. Discussed at some length in this volume, this method rests on a very firm theoretical foundation. It has the great virtue that it separates these correlation effects from the temperature dependence of the quasiparticle dynamics, itself, which theoretical modelers have been trying to get at. If this extraordinarily simple method had been “available” fifteen years ago, I suggest that our understanding of these issues would be greatly advanced from where it is.

As for regrets, they come mainly under the heading of omissions. There are many excellent pieces of work which are not included, simply for want of time and space. The book was conceived of as a monograph and is in no sense an encyclopedia, not even within the narrow purview of high- T_c NMR. As an example, I greatly regret omitting the large and fascinating subject of impurity doping in cuprates, from which we have nonetheless learned a lot.

Let me conclude by mentioning just a few of the people who have contributed, directly and indirectly, to the initiation and creation of this book. First let me thank Prof. Hiroshi Yasuoka, for bringing me to Tokai-mura in Japan for a five-plus year extension of my career in solid-state NMR, and through which I also became involved in the European physics scene. Let me thank Prof. Drs. Frank Steglich and Jürgen Haase, for their support during my extensive stay in Dresden in 2006 (and later). Invaluable support came from the Department of Physics at the University of Michigan in providing work space and the library facilities required for a project such as this. I want especially to thank Prof. Chandra Varma of the University of California at Riverside, for shepherding this book into existence through his role as editor for Springer Verlag, and for his reading of much of the manuscript, giving penetrating, enlightening, and invaluable comments on the presentation. I also thank Jinan Yang for help with computer issues and with preparation of the figures.

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