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Topological Disorder in Condensed Matter

Proceedings of the
Fifth Taniguchi International Symposium,
Shimoda, Japan, November 2-5, 1982

Editors: F. Yonezawa and T. Ninomiya

With 158 Figures

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Preface

This volume contains papers presented at the Fifth Taniguchi Symposium on the Theory of Condensed Matter, which was held between 2-5 November, 1982, at Shimoda, Japan. The topic of the Symposium was "Topological Disorder in Condensed Matter."

The objective of the Taniguchi Symposium is to encourage activity in those fields of research not in the limelight at the moment but regarded as very promising, such as our theme. Topological disorder refers to the disorder in the positions and connectivities of atoms in amorphous solids and liquids. The development of the physics of topologically disordered systems, though extremely important fundamentally and for application purposes, falls far behind compared to that of other kinds of disordered systems because the structure characterization of topologically disordered systems is still at a rather primitive stage. The structure characterization is the key to comprehensive understanding of physical properties of any material. Recently, several new attempts at structural analyses have been reported. Encouraged by this fact, our motivation in organizing the symposium was to investigate the possibilities of theoretical approaches to open a breakthrough in the present research situation on this subject.

A rough sketch of the problem is made in the Introduction to give the readers a general outline of the subject. Part I is devoted to several attempts to synthesize and characterize topological disorder more or less by analytical means. On the other hand, the articles in Part II are concerned with computer simulations whose importance in this field is increasing. Part III includes discussions on elementary excitations in topologically disordered lattices. Part IV treats statistical mechanics in two-dimensional disorder with the hope that some of these treatments might have some bearing on three-dimensional disorder and so contribute to the better understanding of the latter. Part V contains two papers on related topics. Finally, a summary of the Symposium is given by M.H. Cohen, whose elaboration is highly appreciated. However, since some of the talks at the Symposium were combined together into a single written paper in these proceedings, the detailed arrangement of the summary is slightly different from that of the proceedings.

The Taniguchi Symposium on the Theory of Condensed Matter was supported by the Taniguchi Foundation. Mr. Toyosaburo Taniguchi, who is the former president of Toyobo Co., Ltd., has supported various academic activities in the natural and human sciences for many years. His speech delivered at the reception in Kyoto after the Symposium is given in the Foreword, from which his philosophy behind this support is evident.

On behalf of all the participants, we would like to express our sincere thanks to Mr. Taniguchi and the members of the Taniguchi Foundation.

Tokyo, Yokohama, May 1983

Toshiyuki Ninomiya · Fumiko Yonezawa

Foreword

Speech by Toyosaburo Taniguchi

My Dear Friends:

I am very happy, pleased and honored to be here this evening with many distinguished friends, guests, and scholars from so many different countries.

The Taniguchi Foundation wishes to extend a warm and sincere welcome to the many participants in the Fifth International Symposium on the Theory of Condensed Matter, who have come all these many miles to be with us.

For many years, we have been supporting symposia in various academic fields, with the conviction that in order to translate the objectives of the Foundation effectively into action with the available funds, it is necessary to select fields which are not necessarily in the limelight of popular interest, which means those fields which, we are afraid, could be low in funding.

We would rather choose for the Foundation projects from the more modest academic fields than those that stand out in gaudy, gorgeous popular acclaim.

Whenever I meet with the younger people participating in our symposia, I am deeply impressed by the unselfish and sincere dedication to their mission of pursuing the vocations they are in.

I sincerely hope and trust that even after ascending the climb to academic fame within, say, the next 30 years, they will perpetuate their ties, join forces, and help to forge closer bonds of friendship and cooperation in a manner that will make a major contribution to the well-being of mankind and permanent world peace.

We would like to add that we desire to limit the number of the participants to about 15, because we wish to arrange for a close-knit community setup. Many participants have told us over the years that this arrangement has been most successful, stimulating, productive, and truly worthwhile. And, consequently, it is our hope that these symposia can be continued as long as the fund permits.

As the number of participants becomes excessively greater, the substance of the symposium becomes vague and dissipated, and the perfume is lost, so we beg your understanding of these basic philosophies that guide us.

Kyoto, the 1200-year-old capital of Japan, is widely known as a treasure house of cultural and historical interest in Japan. It is also, in truth, a city nestled in surroundings of great natural beauty. We sincerely hope you will enjoy your short stay in Kyoto.

In conclusion, we sincerely trust that all the participants, both Japanese and foreign, will return home, bearing heartwarming memories of the Symposium and the pleasant times we have enjoyed together.

Thank you.

**Participants in the Taniguchi International Symposium,
November 2 - 5, 1982**



Seated (left to right)

N. Rivier F. Yonezawa T. Ninomiya M.H. Cohen D. Weaire J.F. Sadoc
D.R. Nelson M. Suzuki

Second row (left to right)

T. Ogawa H. Suzuki T. Matsubara K. Kawamura T. Fujiwara K. Kitahara

Third row (left to right)

H. Kawamura M. Kimura S. Miyashita H. Takano K. Sekimoto

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