

BOOK REVIEWS

Condensed Matter Physics. Balkrishna Agarwal and Hari Prakash (eds). Narosa Publishing House, 6 Community Centre, Panchsheel Park, New Delhi 110 017. 1999. 309 pp. Price not mentioned.

The book under review is a published version of the paper presented in a conference at Allahabad University, to celebrate the Platinum Jubilee of its physics department, as well as the birth centenary of K. S. Krishnan, the celebrated Indian physicist and Head of the above department during 1942–1947. The title of the book sets the attempt as an optimistic one between the covers of a single publication. There are 54 articles in the book, covered under six broad categories: High T_c superconductors and strongly correlated system, Quantum confined system, Semiconductors, Liquid crystals and polymers, Materials and devices, Non-linear and quantum optics and a miscellaneous section. The list though not exhaustive, certainly attempts to cover some of the most interesting topics being pursued all over the world by condensed matter researchers. The articles range from pure technical ones to review articles in the respective fields. The miscellaneous section has covered some topics that have close association with condensed matter physics and a couple of review articles of historical interest. The review articles in quantum Hall effect and in high T_c superconductors have given very clear picture of present-day understanding of these phenomena and the existing theoretical challenges.

The contributions are from almost all the parts of the country and they form a good sample of condensed matter physics being practised in the country at present. This branch is the most prolific branch of physics research in the country. It may safely be said that as a research field, condensed matter physics has the largest chunk of physicists. Some of the papers are bordering between condensed matter physics and technology. Two of the contributions are purely technology-oriented, one from USA deals with design of electrical transmission lines that use high T_c superconducting wires and another one surveys the future status of semiconductor industry in the country. There are a large number of contributions from computations, specially from electron energy

calculation groups. This feature is prominent in all the six categories mentioned above. The use of Full Potential Localized Muffin Tin Orbital method has been repeatedly used by several groups for calculating energy band structures in many physical systems ranging from thin film multilayers, metallic glasses to doped fullerenes.

One aspect of condensed matter research throughout its history has been the quest for new and novel materials. The discoveries in the eighties include the discovery of high temperature superconductors in ceramic materials and quantum Hall effect in two-dimensional electron gas. This trend has continued unabated with the discovery of fullerenes and carbon nanotubes in the nineties. Some of these topics have been well covered in several articles in this book. But due to the diverse nature of the topics in the conference, one can only get a flavour of these research fields of extreme current interest.

There are very large number of articles dealing with the behaviour of materials at interfaces, semiconductor superlattices, lattice matched semiconductor thin films, etc. The attempt in solid state physics today is to look for modified properties in lower dimensions, which can be tailored by specialized sample preparation methods. Condensed matter physics has surely been heading to lower dimensions! This trend can be attributed to several factors. The capability to produce precisely-tailored samples has increased in the last decade or so. Fabrication of samples using techniques like molecular beam epitaxy, ion-beam mixing and gas guns are routinely taken up. Characterization tools, which include surface-sensitive techniques as well as capability to perform a measurement with tiniest amount of sample have also improved drastically. Adding to the growth is the improvement in the computational technique to perform more accurate calculation with larger systems and with system parameters much closer to reality than yesteryears. Augmented space recursion for phase stability of alloys is one such technique discussed in the present volume. There are several articles in this book, which actually attempt to emulate material design through computational route. Though the acceptability of these calculations may still be debated, the trend is clear. One feels that in the coming years the compu-

tational tool may become a necessary exercise for material development.

Apart from the inroads made into lower dimensions, condensed matter physics has also picked up topics which are far away from classical solid state physics (if one is allowed to use such a term). Dyson has expanded this theme beautifully in his classic book *Infinity in Every Direction*. Soft materials, granular materials, fractals are the fascination of experimentalists as well as theoreticians at present. This book is no exception in this trend. There are several articles dealing with the electronic properties of liquid crystals and polymers. There are articles on soft matter Schottky diodes and bistable switching in ferroelectric liquid crystal mixtures. These trends have far-reaching technical ramifications. There is one lucid review on the self-organized criticality, which points out the presence of the phenomena in several natural processes.

Two back-to-back review articles on Krishnan's contribution to magnetism and his contribution to sampling theory in the miscellaneous category stand tribute to one of the great Indian physicists of the last century. These articles bear witness to Krishnan's effortless journey from one field to another.

One cannot fail to notice that in all the experiments in the book, accelerators are conspicuously absent, except for one report on ion channelling. Accelerators, though for long time a tool in the hands of nuclear physicists and particle physicists, have pervaded condensed matter physics experiments to a great extent, all over the world. The first synchrotron light source has already started operating in the country and one hopes that in future accelerator-based experiments will also play a larger role in condensed matter research in our country.

The font size and the margins keep changing from article to article in the book. Also, some of the standard scientific symbols, e.g. Å are printed wrongly throughout the book. The editorial efforts in these directions fall much short of desired.

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