Preface

This special issue of *Current Science* has been brought out to mark sixty years of the Department of Physics, Indian Institute of Science, Bangalore. The Department started functioning in July 1933 with C. V. Raman as Professor and Head of the Department. The academic year 1993–94 saw several scientific meetings devoted to specific areas as part of the diamond jubilee celebration. Many colleagues had felt it would be appropriate to take stock of the national situation in condensed matter science, suggesting concrete action to catalyse activity in this area of great scientific depth and breadth, as well as applicability. A two-day discussion meeting thus took place at the IISc on April 18–19, with the theme 'Condensed matter science—current status and plan for action'. The programme for this two-day meeting appears at the end of this issue. This special issue contains some of the talks given at the meeting, including a marvelous retrospective on the first sixty years of the Department by S. Ramaseshan.

The choice of condensed matter science as a theme for noting the sixty years of the Department, is natural. As described by Ramaseshan, the Department pioneered research in several areas of solid state and condensed matter physics, well before the area developed to a large and separate identity. This broad area continues to be the main concern of the Department even today. Secondly, though the physics of condensed matter is both the major present concern and the major growth area of physics (accounting for about sixty per cent of research papers in that subject), though it overlaps with almost all of science and engineering at some of its boundaries, and though it is the scientific source of much physics based (high) technology, its growth in India has been quite hap-

hazard. The overall investment is woefully inadequate, and several major areas have hardly any practitioners. So in planning this meeting, we suggested the following to the participants: The meeting will consist of short presentations on a few aspects of Condensed Matter Physics. It is expected that these presentations will briefly describe major questions, phenomena or systems of interest, mentioning the situation in India and concentrating largely on future action. The following questions would be addressed: what are the choices to be made, whether there is enough manpower (actual, or potential in the form of Indians abroad), whether support should be for strengthening existing groups and how, or whether new groups and areas are to be developed, and whether new institutions are needed. Another set of questions pertains to applicability, applications, sources and nature of support for research and development, etc. Since the subject is vast and rapidly expanding, it is not possible to be exhaustive.

As the proceedings show, response was generally very apposite. In keeping with the many splendoured nature of the field, some contributions sketch a broad landscape while others paint detailed miniatures; there are individual sketches as well as institutional portraits. In this issue we have tried to consolidate the presentations thematically and re-organize them somewhat here.

Several broad themes emerged during the presentations and the vigorous panel discussion towards the end of the meeting. As pointed out succinctly by C. N. R. Rao, there is an urgent need for a COSIST programme in condensed matter science. This condensed matter initiative should have the goal of developing world class, broad-based centres (laboratories or research groups or even individuals) in at least a few major areas, for example the following:

Soft condensed matter

A mind-boggling diversity of systems (colloids, polymers, dispensions, microemulsions, etc.) shows unusual equilibrium and nonequilibrium physical behaviour attributable to softness, i.e. smallness of energy scales for medium-scale configurational changes. This is a quintessential small science area, very rich in new phenomena where physics, chemistry, biology and technology meet. A number of groups, working on diverse niches, can make them their own, and create science both basic and applied.

Semiconductor physics, optoelectronics, photonics

The activity in this high technology, high science area of manifest destiny is extremely low, especially in academic institutions.

Low temperature physics

There are very few places in the country where experiments on quantum phenomena at liquid helium temperatures are done regularly. Several low temperature laboratories, with other facilities such as high magnetic fields, are needed.

New materials and structures

This is an endless frontier, the ultimate source of condensed matter science and technology, and one that is very patchily explored by our community. An outstanding example is the class of electronically inter-

esting molecular materials. There are many large possibilities in this area. Many other families as diverse as oxides, monomaterials. fullerenes, heterostructures are being actively explored; a serious initiative in some of these areas is a necessity.

Condensed matter theory

The entire area of condensed matter science is characterized by a continuous and creative interaction between theory and experiment. A number of concepts and methods generated in efforts to understand complex condensed systems are finding wide applications elsewhere. A substantial increase in theoretical condensed matter activity would therefore be highly productive.

It is hoped that this clear commonality of opinion will have some concrete, positive effect.

Acknowledgements

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