

## Foreword

This volume contains articles that were presented at the International Symposium on Neutron Scattering (ISNS), which was hosted by Bhabha Atomic Research Centre in January 2008, with the support from the Department of Atomic Energy through its Board of Research in Nuclear Sciences. The inaugural function was attended by Dr Anil Kakodkar, Chairman, Atomic Energy Commission, Dr G Venkataraman, who was the Chief Guest of this function, Dr S Banerjee, Director, Bhabha Atomic Research Centre, and Dr J V Yakhmi, Associate Director (S), Physics Group, BARC.

Neutron scattering has been and remains one of the principal physics research areas almost since DAE's R&D activities were launched in 1954. Indeed, soon after Dr Homi Bhabha started the atomic energy program in India, and Atomic Energy Establishment Trombay (AEET, the earlier name of BARC) was created, the task to set up Asia's first research reactor APSARA was taken up and completed in just about 16 months in August 1956. The physics research with it started almost immediately and neutrons from this reactor were not only used for nuclear physics research, but also for condensed matter research. These efforts were led by Dr P K Iyengar, who pioneered several experimental developments around APSARA beam lines. Amongst the other pioneers, who built equipment for using the neutrons from APSARA reactor for different kinds of experiments such as diffraction, inelastic scattering or magnetic neutron scattering, one person, my teacher and mentor, Dr G Venkataraman, was honoured at this Symposium. He narrated how those research facilities were set up almost from scratch and the fun they had catching a Bragg peak here or a phonon there with rudimentary equipment.

Things changed quite dramatically in the next few years and by early sixties, with the availability of 40 MW thermal reactor CIR (renamed CIRUS), the range of problems that were studied began to grow. Dr Venkataraman himself set up a rotating crystal spectrometer for the time-of-flight studies. In the mid-sixties, when I joined AEET, Trombay neutron scattering group had earned quite a name for itself. I would particularly like to recall the articles on thermal neutron scattering by K S Singwi and L S Kothari in the *Advances in solid state physics* series edited by Seitz and Turnbull and that by P K Iyengar in the book edited by Peter Egelstaff. We continued that tradition and Dr Venkataraman and I wrote an article on *External vibrations in complex crystals*, which appeared in *Reviews of modern physics* and some years later, a book titled *Dynamics of perfect crystals* which was published by the MIT Press, USA.

The neutron scattering program got a big boost in the mid-eighties with the start of the 100 MW thermal reactor Dhruva which was constructed entirely indigenously by a team in which Dr Anil Kakodkar, the current Chairman, Atomic Energy Commission was a main player. Dhruva was equipped with features like tangential beam holes and an intense effort was put in by a team led by

Dr K R Rao to build state-of-the-art neutron spectrometers. Over the years, that instrumentation has been continuously upgraded and used for a variety of problems of interest by different user groups in the country through the forum of IUC-DAE facilities, now renamed as UGC DAE Consortium for Scientific Research. You will get a flavour of the work being done by various groups through the papers presented at this meeting. Let me add that due to our homegrown efforts, our links with different neutron scattering groups over the world have been steadily rising over the years.

Indeed, Trombay neutron scattering group first got involved in international programs in the mid-sixties, under the IAEA's regional cooperation agreement (RCA) where we played a lead role to start neutron scattering facilities in places like Philippines, Indonesia, etc. We also built instruments and supplied to many countries, including Korea and Bangladesh. In the mid-eighties we built and set up a spectrometer for Rutherford Appleton Laboratory's spallation neutron source. Conceived by Dr B A Dasannacharya, this machine, the  $\Delta T$ -window spectrometer, was based on a neutron filter idea. It was entirely built indigenously and installed at RAL by J N Soni of Nuclear Physics Division in the eighties. This led to the start of a very fruitful partnership in neutron scattering with RAL. We are now exploring ways to renew this relationship. In this sense it was no wonder that we had sizable overseas representation at this meeting and I expect that we will continue on the growth path in our international linkages.

Arranging a meeting like ISNS2008 needed assistance from several quarters and I must acknowledge many people whose help has been important in the organization of this meeting. Foremost in this list is Dr Anil Kakodkar, Chairman, AEC, who provided all the encouragement to our efforts. He has not only been personally involved in setting up nuclear reactors, but has also been a strong supporter of the neutron scattering program in the country. Next is Dr S Banerjee, Director BARC, who gave us unstinted help in different matters. The support and advice given by Dr G Venkataraman, Dr K R Rao and Prof Sunil K Sinha in organizational matters and their consent to attend the ISNS2008 were most valuable. I must also express my indebtedness to members of the international advisory committee who readily agreed to serve on the committee and also for their guidance. I owe a debt of gratitude to all the participants, who gave an overwhelmingly gratifying response to our invitation to this meeting. In fact thanks to their interest, we had 48 invited talks and over 90 contributed papers. I also wish to record my appreciation for the efforts put in by my colleagues in the Solid State Physics Division led by Dr S L Chaplot and my senior-most associate Dr J V Yakhmi. They all worked hard for this event and I must thank them for their untiring efforts.

In the end I wish to thank the Editorial Board of *Pramana* for the publication of these proceedings.

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