approaches in palaeobiochemistry or molecular palaeontology can be taken up. However, a related approach that was discussed at the meeting and which could possibly be taken up almost without much delay relates to what may be called as **molecular archaeology**, i.e. molecular biological studies with the human and other organismal remains known to be present in a number of archaeological sites—these studies may provide very interesting and significant data for archaeology, anthropology, demography, history, etc. In these studies also, one would need to be very careful about the contaminations that may happen at the site or in transit.

Another important step that was decided upon in the meeting was to organize a laboratory workshop jointly by the Department of Geology, Panjab University and the Institute of Microbial Technology (IMTECH), Chandigarh, where interested geologists/palaeontologists can learn the relevant molecular biological techniques and the molecular biologists get familiar with fossil materials and the vagaries of extracting DNA from such sources. In any case the session was a good meeting point for specialists working with as diverse material as the living and the dead.

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Solid state physics meet

The 1993 Solid State Physics Symposium sponsored by the Board of Research in Nuclear Sciences (BRNS) of the Department of Atomic Energy (DAE) was held at the Bhabha Atomic Research Centre, Bombay, from 27 to 31 December 1993. This annual symposium, part of a series started by DAE thirty six years ago, is eagerly looked upon by the solid state physics community in the country.

Over the years this conference has continued to grow. This year the organizers received over 850 abstracts of contributed papers of which about two thirds were accepted. This included 51 Ph D thesis abstracts, about 35 oral presentations and remaining (443) poster papers. Besides there were 21 invited talks making it a very densely packed conference! It should be obvious that any account of this symposium, (given by an individual), involving diverse topics and many presentations going on in parallel, will be imperfect. Anyway this report will present a chronological record of the meeting to avoid bias.

The inaugural session started with a comprehensive account by K. R. Rao giving the evolution and the current situation of this symposium series. B. A. Dasannacharya in his introductory remarks recalled how participation by eminent persons such as K. S. Krishnan enlivened the 1959 Waltair meeting, pointing to a rich heritage enjoyed by this symposium. R. Chidambaram (Chairman, AEC) mentioned the need to strengthen collaboration between national laboratories and universities and how IUC–DAEF could contribute towards this task. A. N. Prasad (Director, BARC) spoke about the important role played by developments in solid state physics contributing towards technological advancements in several fields like space, defence, communication and so on.

Coming to the scientific sessions, the symposium was off to a flying start with a seminar on clusters and nanophase materials. As we know the field of small particles attracted attention of statistical physicists for long and an account of it is available in the book by R. Kubo published in the early sixties. This field has seen renewed activity because new preparation methods have been developed of producing clusters and nonophase materials. The seminar touched on four facets of the field. P. Ayyub described clever use of phase transitions and microemulsion route to production of nanophase materials. This was followed by an excellent account of influence of grains size on the ferroelectric properties, especially of the titanates, by D. Pandey. Attention was then drawn to metal clusters by M. K. Harbola who brought out that while the local density functional method can give reasonably good results for magic numbers and polarizabilities (to within 10–15%) more accurate calculations are needed and one has to take account of exchange and correlation effects. Ajay K. Sood gave an exposition of Raman scattering, optical absorption and photoluminescence studies performed by him, particularly to unravel the contrasting behaviour of C_{60} and C_{70} fullerenes as regards their amorphization under pressure.

In the afternoon session two comprehensive talks on SQUIDS were delivered, one based on Hi–T_c materials and the other using conventional low T_c niobium films. A. K. Gupta surveyed the development, he and his team have been involved with at NPL for the past 6 years, using a number of ways of making Josephson junctions on numerous Hi–T_c materials. He showed that other than the application for recording MEG, both for NDT as well as other medical applications, currently available sensitivities achieved by Hi–T_c SQUIDS are adequate. M. P. Janwadkar presented the details of the microfabrication facilities set up at IGCAR for making junctions and input coil, etc. With the development of transducer fabrication essentially accomplished, one could look forward to home-made SQUID sensors, as remarked by R. Srinivasan, the session chairman.

In the first session on the second day there were two presentations by P. Chaddah and R. Bhatt. Chaddah showed that in sintered ceramic superconductors the inter-grain and intra-grain regions act as two different phases of the material and by exploiting the differences between their response to an applied magnetic field, one can, in particular, measure the lower critical field in Hi–T_c materials. Bhatt

examined theoretically how disorder alters the properties of normal fermi liquid, such as the susceptibility and specific heat at low temperatures. He suggested that one should look for disorder-induced effects even in Hi–T_c materials. The second session of the forenoon had oral presentations from five students who have just completed their Ph Ds. All the presentations were on very current and topical areas like Hi–T_c and related systems, quasi-periodic solids, amorphous magnetic systems, etc.

The oral papers presented in the afternoon session involved a number of studies of Hi–T_c materials covering structure determination using neutron diffraction, SQUID-based magnetization measurements, fabrication of SNS junctions using LNO and YBCO, theoretical models for organic superconductors, careful positron annihilation studies in fullerenes, a study on lithium doped a-Si(H) film, etc. In the evening G. Venkataraman lectured on the life and work of Satyendra Nath Bose. The delightful talk enthrilled the audience just as Satyen Bose enjoyed creating new physics in the twenties.

The first session on the third day started with U. Deniz's talk on drug model membrane interaction. She pointed out that the motivation of the subject is to gain an understanding at the molecular level of how a drug works. She presented her DSC, XRD and proton as well as phosphorous NMR data to probe the 'chain melting' transition temperature in many model membrane systems. In addition, she described neutron diffraction and fluorescence anisotropy measurements (of other groups) which have been used to help understand drug action of real pharmocological formulations. The next invited talk by P. Raj covered the topic of hydrogen in intermetallics. This field, hydrogen in metals and alloys, with a 100 year history, is even today a subject of basic research as well as of technological importance. Ternary hydrides involving transition elements have been carefully studied by Raj and his group through a variety of techniques like XRD, specific heat, susceptibility, magnetization measurements, Mössbauer spectroscopy, absorption isotherms and so on. As he explained, the ubiquitous property of hydrogen to donate or pick up electrons, manifests in wonderfully diverse behaviours exhibited by such systems most notably the magnetic properties. The second session had five thesis presentations again on very topical subjects.

In the afternoon session, S. L. Chaplot reviewed the recent phonon measurements for the two most hotly pursued solids namely, fullerenes and Hi–T_c materials. The most remarkable feature as he showed is that high quality data have been obtained from tiny (~ mm^3) crystal specimens. He also described his theoretical calculations as well as X-ray phonon measurements performed at Hamburg on Be/diamond and partial density of vibrational states measured using neutrons through isotopic substitution. This talk was followed by a presentation by S. B. Ota devoted to origin of incommensurate structural transitions in solids He showed his results on specific heat in CuO which reveal an incommensurate phase transition and also discussed a few theoretical models. Later, in the IPA meeting a lucid Presidential address by N. Mukunda on 'symplectic geometry and its uses in physics' delivered with typical clarity made it a succession of enjoyable evenings.

The fourth day saw an excellent exposition from Tapash Chakraborty on how one obtains the electronic states for confined quantum systems. As we know, GaAs/($Ga_x Al_{1-x}$)As-based layers (and other arrangements) offer a rich variety of structures-like quantum wells, quantum wires, quantum dots, etc. exhibiting very interesting quantum phenomena. In particular for quantum dots he presented results for both cases; quantum dots with and without magnetic field. The need to include electron correlation was beautifully brought out in his talk. B. G. Mulimani of Karnatak University presented his theoretical work on the thermopower and magnetic-thermopower in 2D electron systems like silicon MOSFETs and some semiconductor heterojunctions. He showed that the measured thermopower can be understood using the diffusion and phonon drag contributions but more work is needed to understand the magnetic thermopower. Then there was a seminar on porous silicon. With B. M. Arora's initial remarks on the importance of this development, the stage was set for Sonali Banerjee to describe her extensive studies on the photoluminescence in many samples prepared under a variety of conditions. She brought out the importance of passivation and nano crystallinity of the material. S. K. Deb then described how Raman scattering studies can be used to establish the shapes and differences in particle size depending upon material being a p or n type. His studies clearly show that earlier idea of chemical species being involved in this phenomena (involving silaxane) is incorrect, but more work is required for a clearer understanding.

The same session included two unscheduled speakers—A. K. Grover and J. V. Yakhmi—on the Hi–T_c topic. Grover presented some new results on the bismuth 2212 system revealing what he called 'dimensionality crossover effects' and presenting a comprehensive phase diagram in the HT plane for this system. Yakhmi provided an update on the reported appearance of superconductivity above 250 K in $Bi_2Sr_2Ca_7Cu_8O_y$ and $HgBa_2Ca_2Cu_3O_y$ (1223) and in 1245 systems discovered by French groups. He also cautioned about problems connected with high vapour pressure associated with mercuric compounds.

In the afternoon session, B. V. R. Tata presented his light scattering evidence for the colloidal suspension—polystyrene in water system—going through the vapour/liquid phase transition as one changes the impurity ion concentration via addition of exchange resin. He also demonstrated that Monte Carlo simulation delivers the same phase transition, if he uses Sogami potential instead of DLVO potential and thus repudiated the claims of the German Group about the validity of DLVO potential for his system. The next talk of the session was delivered by Prasenjit Sen. Studies on the use of low energy ion beams for implantation purposes and higher energy beams for radiation damage, have been pursued at BARC/other DAE laboratories like IGCAR/VECC for two decades. The natural extension of using such beams for modification of material properties is now being also pursued at the Nuclear Science Centre, Delhi and Sen presented a number of results using both the low and high energy beams available from the Pelletron. These included surface modification in alloys and production of novel phases, studies in met glasses and radiation-induced phase changes in the bismuth-based Hi–T_c superconductor $Bi_2Sr_2Ca_1Cu_2O_y$ to $Bi_2Sr_2Ca_2Cu_3O_z$. Mechanisms for the occurrence of such radiation-induced changes are not fully understood.

In the first session on the fifth morning R. E. Amritkar in his talk on fractals and growth processes presented different models for the growth of fractal objects.

These included diffusion-limited aggregation model (DLA), ballistic-driven aggregate growth (BDAG), etc. He gave many examples of growth of real 'fractal' objects. In the last invited talk on magnetic studies using heavy ion beams, S. N. Mishra showed a novel use of accelerator beams for probing magnetic ordering in a host material through the use of isomeric nuclei produced by a nuclear reaction and then looking at time differential angular distribution of gamma rays or TDPAC. He brought out the strengths and limitations of the method and presented a host of data on the formation of local moments in a number of systems.

The second session was devoted to oral presentations with a fairly wide coverage of different topics such as density functional calculations, X-ray scattering, neutron scattering, models for crystallization, anisotropic X–Y model, etc.

The organizers had to accommodate a large number of poster papers and therefore the time available for discussion was restricted. To somewhat mitigate this difficulty poster sessions were so arranged that papers on the same topic were distributed over different days. Some of the broad features which emerged from the sessions may be recorded as follows. About one third papers were not presented as the authors were absent. The experimental papers outnumbered theoretical ones by almost five to one, showing that the experimental facilities for condensed matter research have greatly improved in the last decade. A number of studies on phase transitions were reported using NMR, EPR, TDPAC techniques. A variety of film deposition techniques like MBE, RF sputtering, LB method, etc. were covered. Magnetic studies in intermetallic alloys, spinels, etc. were reported using magnetometry, Mössbauer spectroscopy, neutron diffraction, etc. Studies in many liquids and liquid crystals were reported using NMR, Raman, XRD and dielectric constant measurements, etc. Amongst Hi–T_c materials study of irreversibility line, looking for dimensionality effects and role of synthesis conditions on the properties of these materials were reported by several groups. Persons interested in details could consult the book containing extended abstracts of the papers and printed under the title 'Proceedings of the DAE Solid State Physics Symposium', Volume 36C. The invited talks are going to be published as a Special Issue of the *Indian Journal of Pure & Applied Physics* published by the Publication Directorate of CSIR, New Delhi.

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RESEARCH NEWS

Genetic defects in hereditary motor sensory neuropathies

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Neuropathies consist of a group of diseases of peripheral nerves resulting in weakness and wasting of muscles of the limbs, impairment of various modalities of sensations or autonomic functions either alone or in combination. The causes of neuropathies are diverse. The loss of function of nerves results from the degeneration of axons of nerve fibres (axonopathies) or loss of myelin, the material around nerve fibres produced by specialized cells called Schwann cells (demyelinating neuropathies).

Electrophysiological tests can detect abnormalities of nerve function such as slowing of nerve conduction velocities which is seen in demyelinating neuropathies or loss of amplitude of action potentials generated in the muscles in response to electrical nerve stimulation, in axonopathies.

Nerve biopsies in demyelinating neuropathies reveal segmental loss of myelin of nerve fibres and reduction in the number of myelinated fibres. Chronic demyelination and remyelination can result in the formation of 'onion-bulb' appearance due to ensheathing of single nerve fibres in several layers of Schwann cell processes.

The hereditary motor sensory neuropathies (HMSNs) are a heterogenous group of inherited neuropathies whose aetiology was hitherto unknown. Rapid advances in molecular biological techniques in the last few years have improved the understanding of the genetic defects in some types of HMSNs.

The major types of HMSNs are types I, II and III. HMSN type I presents in the first or second decade of life. Genetically two distinct forms, autosomal dominant (AD) and autosomal recessive (AR) have been well identified. In some families of HMSN I, the disease has been linked to the Duffy blood group on the long arm of chromosome 1 and have been designated as HMSN Ib. They constitute only a minority of patients with HMSN. Most families of HMSN I are not linked to the Duffy locus (HMSN type Ia) and have the disease locus on chromosome 17. There are also reports of a non Ia–non Ib form, in which loci on chromosome 1 and 17 have been excluded.

Molecular biological studies in Trembler and allelic Trembler J mice, the animal models of demyelinating neuropathy, have thrown light on the pathogenesis of AD type of HMSN Ia. These mice have features of an autosomal dominant demyelinating or hypomyelinating neuropathy with localization to a region in chromosome 11 of the mouse genome, which is homologous to human chromosome 17.

In these mice, two-point mutations have been found in the newly described myelin gene, the PMP-22 gene, the expression of which is demonstrated only in the peripheral nervous system of mice[1]. The point mutations comprise of substitution of aspartic acid for glycine and proline