Newsletter

S. N. Bose National Centre for Basic Sciences

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Editorial Message:

We sincerely thank everybody in the Institute for their overwhelming support to sustain the publication of the Newsletter. We have witnessed a greater contribution coming up from different departments. However, the contribution from the students and the supporting staff should have been somewhat more. The season witnessed a large number of conferences as you will see inside the newsletter. This all the time reminded us of the necessity of really good auditorium. The transfer to the new upcoming building has not taken place yet. The authority should consider this as utmost priority

Corrigendum:

The date of the 18th S. N. Bose Memorial Lecture was wrongly written as December 29, 2009 in the last issue (Vol-1, Issue-2). The actual date would be December 29, 2008.

S N Bose Memorial Lecture by Prof. Wolfgang Ketterle

Prof Wolfgang Ketterle of the MIT, the Nobel Prize receipient in physics in 2001 for experimental demonstration of the Bose Einstein Condensation, delivered the 19th S N Bose Memorial lecture of our Centre on 23rd January 2009 at the Vivekananda Hall of the Ramkrishna Mission Cultural Centre, Golpark. Prof. Ketterle described in detail the different phases of the experiment, the advances, the failures and the final race to the finish knowing that the competing group in Colorado were almost there. Prof. Ketterle also touched upon his subsequent work with a gas of ultra cold fermions. By a proper choice of conditions, the fermions could be made into a BCS like superfluid while under some other conditions the fermionic atoms could form bosonic molecules and then undergo Bose Einstein condensation. The lecture has been filmed and can be seen on our website by following the conference link. *Prof. J. K. Bhattacharjee*

8th C. K. Majumdar Memorial Lecture

The 8th C. K. Majumdar Memorial Lecture, "New Condensates of Matter and Light" , was delivered on January 5, 2009 by Prof. Peter Littlewood of Cambridge University's Cavendish Laboratory. Prof. Littlewood is a leading condensed matter theorist of the present era. The distinguished speaker dealt with the role of macroscopic phase coherence in superconductors, superfluids, ultra-cold atoms, and then in more contemporary systems like excitons and polaritons. They have now become a focus for the study of spontaneous coherence, lasing, and condensation in solids. The talk was indeed enlightening and evoked lot of questions from the audience. During his 2-day visit Prof. Littlewood was shown around the various laboratories and had many fruitful discussions with both theorists and experimentalists of the Centre. *Prof. A. K. Majumdar*

Advanced Materials Research Unit – (AMRU)

The Advanced Materials Research Unit, was inaugurated by Prof. Ole K Andersen (MPI, Stuttgart) on 24th February 2009 to promote computational based research for fundamental understanding of advanced materials. The Unit possesses **High Performing Computing Cluster** consisting of total 34 servers + 1 Master Node to run high end jobs. Each server is *2xIntel Xeon Quad Core / 2.5GHz Processors, 16 GB DDR2 RAM (2 GB per core)*. The softwares available for computation and for data processing are *AMBER 10, CHARMM 35, GAUSSIAN, GROMOS, and MS DMOL3.* The Unit also has one Electronic classroom consisting of 21 numbers of iMac computers. *Dr. T. Saha-Dasgupta*

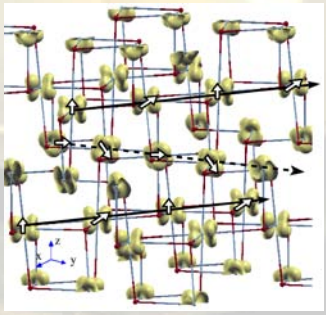
Pulsed Laser Deposition Facility

The Pulsed Laser Deposition system, consisting of Excimer Laser (model no COMPexPro 201, COHERENT, Germany) and high vacuum thin film deposition chamber, has been successfully installed. It has ArF(193nm)/ KrF (248nm) premix gas. Maximum pulse energy: 700mJ @ 248nm , 400mJ @ 193nm. Maximum repetition rate: 10Hz. Maximum average power: 7W@248nm, 4W@193nm. Beam size 24x6-12 mm^2. Using this system one can fabricate epitaxial/ polycrystalline thin films of different oxides, metals on appropriate substrates. *Dr. Barnali Ghosh*

BOSE FEST at the SN Bose Center

The anual academic program, Bose Fest 2009 at the SN Bose Centre, was held on 1st and 2nd April at the EZCC auditorium at Salt Lake. The conveners were Dr. Ranjit Biswas and Dr. Priya Mahadevan. The programme began with a short address of the Director, Prof. A. K. Raychaudhuri who briefly discussed his outlook and some policy decisions for the Centre in the coming year. The rest of the schedule was divided between the Departments, namely the Departments of Theoretical Sciences and that of Chemistry, Biology and Macromolecular Science on the first day, and the Department of Astrophysics and Cosmology and the Department of Material Science on the second day. Four students were selected for best talks and five for best posters. The best talk awards went to Nilok Bose, Raka Dasgupta, Shreemoyee Ganguly and Snehashish Daschakraborty. The best poster awards went to Arnab Saha, Arya Paul, Biswajit Guchhait, Kingshuk Giri and Soumyajit Sarkar. *Dr. Priya Mahadevan*

Proposed orbital ordering in MnV_2O_4



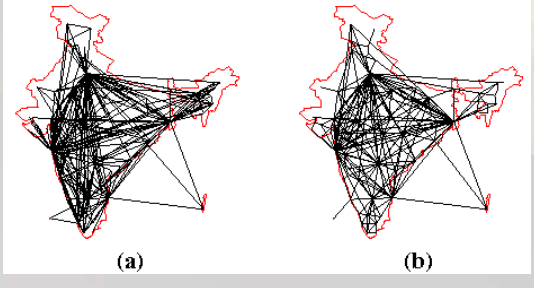
Based on density functional calculations, we proposed a possible orbital ordering in MnV_2O_4 (see Figure), which consists of orbital chains running along crystallographic *a* and *b* directions with orbitals rotated alternatively by about 45° within each chain. We showed that the consideration of correlation effects as implemented in the local spin density approximation (LSDA)+U approach is crucial for a correct description of the space group symmetry. This implies that the correlation-driven orbital ordering has a strong influence on the structural transitions in this system. We further find that the proposed orbital arrangement favours a non-collinear magnetic ordering of V spins, as observed experimentally. The proposed orbital ordering could also correctly predict the magnetic exchange couplings. [Sarkar et. al. Phys. Rev. Lett (in press)]. *Dr. Tanusri Saha-Dasgupta*

In brief:

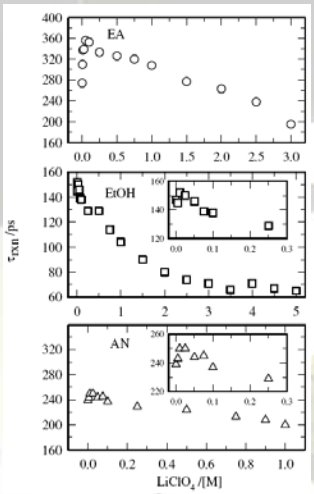
- The following students had submitted their Ph.D thesis : Kunal Bhattacharya, Tuhin Pradhan, Soma Das, Anjan Kr. Nandi, M Venkata Kamalakar and Tapati Sarkar
- Arindam Ghosh Hazra has been awarded Ph.D degree on March 2009.

  We had regular visitors from India and abroad under the Extended Visitor and Linkage programme (EVLP).
- Special talk on Employment Awareness was organized by the Placement Awareness Cell on April 13, 2009. The speaker was Dr. H. S. Maiti, Director, CGCRI, Kolkata.
- Students got placements during the period are:
  - Kunal Bhattacharya at ELTE TTK Biologiai Fizika Transzeken, Magyar Tudomanyos Akademia, Budapest
  - Soma Das Post doctoral Fellow, Karlsruhe Institute of Technology, Germany
  - Tapati Sarkar Post doctoral Fellow, CRISMAT Laboratory (ENSICAEN), Caen, France
  - Arindam Ghosh Hazra Lecturer in Physics, Sundarban Mahavidyalaya

Optimal solution for Indian Air-traffic Network



The optimal inter-city passenger transport network has been constructed using the Zipf's law for the city populations and Gravity law describing the fluxes of inter city passenger traffic. Using a fixed rate for travel cost it is observed that while the total traffic cost decreases, the total establishment cost increases with link density yielding the optimal cost at a specific link density. At a finite link density the network is scale-free. Using this method the scale-free Indian air-route network has been reproduced and the nodal degrees are compared node-to-node with real network. Fig. (a) shows the real network and Fig. (b) shows the model network. The correspondance is very good (Physica A; arXiv:0809.3877). *A. K. Nandi, K. Bhattacharya and Prof. S. S. Manna*



Intramolecular Charge Transfer Reaction in Solutions of Low to High Electrolyte Concentrations: Interplay between Friction and Solvation

Recently we have studied the effects of electrolyte on excited state intra-molecular charge transfer (ICT) reaction in very dilute to concentrated electrolyte solutions of ethyl acetate (EA), acetonitrile (AN) and ethanol (EtOH). In the limit of very low electrolyte concentrations, the reaction rate ($=1/\tau_{rxn}$, τ_{rxn} being the reaction time) is found to *decrease* with increasing electrolyte concentration, the extent of decrease being the maximum in EA and the minimum in AN. At moderate to higher electrolyte concentrations, however, the rate increases upon further addition of electrolyte. The observed non-monotonic electrolyte concentration dependence of rate is explained in terms of a novel interplay between friction and solvation in the solution phase. (Journal of Solution Chemistry, 2009, 38, 517-530) *Tuhin Pradhan and Dr. Ranjit Biswas*

k-essence model of Inflation, Dark Matter, and Dark Energy

The nature of both dark matter and dark energy remain largely unknown to date. Also it is strongly believed that the early universe underwent an inflationary expansion. Therefore, there may be a single mechanism responsible for the early and current expansion of the universe. Several models can be found in the literature that try to unify inflation, dark matter and dark energy. The distinguishing feature of the k-essence class of scalar field models is that the Lagrangian contains noncanonical kinetic terms motivated from the Born-Infeld action of string theory. We investigate the possibility for k-essence dynamics to reproduce the primary features of inflation in the early universe, generate dark matter subsequently, and finally account for the presently observed acceleration. We first show that for a purely kinetic k-essence model the late-time energy density of the universe when expressed simply as a sum of a cosmological constant and a dark matter term leads to a static universe. We then study another k- essence model in which the Lagrangian contains a potential for the scalar field as well as a noncanonical kinetic term. We show that such a model generates the basic features of inflation in the early universe, and also gives rise to dark matter and dark energy at appropriate subsequent stages. Observational constraints on the parameters of this model are obtained (PHYSICAL REVIEW D 79, 103517, 2009). *Nilok Bose and Dr. A. S. Majumdar*

India-Singapore Joint Physics Symposium (ISF09) http://www.bose.res.in/~isf09/

The India-Singapore Joint Physics Symposium, (Jan 6th - 8th, 2009) brought together various scientists of India and Singapore on a platform where they can exchange ideas and think of sharing resources in the future. There were 11 delegates from National University of Singapore. The main topics discussed were Electronic Structures and Computational Materials, Magnetic and Functional Materials, Micro and Nano Patterning, Bio Physics Interface and Quantum effects (entanglements, computation etc.,). *Dr. P. K. Mukhopadhyay*

4th Advanced school on Nanoscience and Technology http://bose.res.in/conferences/Advertisement.pdf

The Centre organized the 4th Advanced School on Nanoscience and Technology from January 12-24, 2009. Nearly 27 participants came from about 20 institutions spread all over the country. The advanced school had a focal theme of Physics at nanoscale, Physical and Chemical routes of synthesis, Nanolithography and advanced characterization of nanomaterials and applications in particular in the area of biological sciences.The school consisted of twenty six lectures. Apart from the lectures there were practical training courses on synthesis, characterization of different nano materials and different types of nanolithography techniques like optical, e - beam lithography etc. *Prof. A. K. Raychaudhuri*

Workshop on Magnetic Nanomaterials and Their Applications (MNTA-2009)

Considering an upsurge of R&D on nanoscience and technology in near future, we organized a workshop on "Magnetic Nanomaterials and Their Applications" during 27th -28th January 2009 to take stock of the situation. Prof. K. M Krishnan of University of Washington, USA delivered the keynote address of the workshop on "Biomedical nanomagnetics: A spin through new possibilities". About 65 researchers from various universities/institutions of India attended the workshop. *Dr. Kalyan Mandal*

Meeting on Physics and Chemistry of Oxide Materials (www.bose.res.in/~mipgm09)

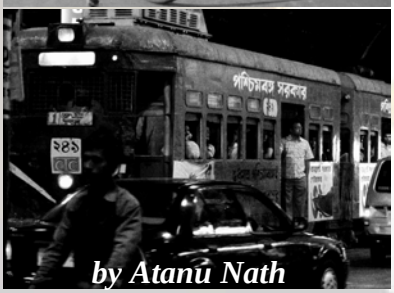
The purpose of this meeting (23rd - 26th Feb. 2009) was to bring together the experimentalists and theoreticians working in the ever green field of oxide materials. The topics covered various aspects of oxides, like charge & orbital ordering in oxides Multiferroicity, Oxide heterostructures, Oxide Nanoparticles, Phase separation and Magnetism. The speaker list included some of leading experts in the field from outside India as well as within India. The Advanced Materials Unit in the Centre was inaugurated during this meeting by Prof. Andersen. *Dr. Tanusri Saha-Dasgupta*

Workshop on Tools of Theoretical Physics and the Problem of Turbulence

The problem of turbulence has so far evaded all the standard techniques of perturbation theory or mapping the problem to an apparently different but more tractable problem. This workshop (February 12 – 16, 2009) was arranged to assess how bad the situation really is and to explore whether the newly developed correspondence between theories of gravity and conformal field theories could hold out any hope for the future. It also included discussion on related physical systems which show turbulence like anomalies. Considering the rather esoteric nature of the workshop, the response was very strong. Both the statistical physics and the high energy physics communities participated actively over the one week long, somewhat intensive program. *Prof. J. K. Bhattacharjee*

Lineated barbet (Megalaima lineata)

Borho basanta bauri in Bengali. Although a resident bird of our area, one can only see this bird in Chintamoni Kar bird sanctuary in Narendrapur or in Botanical garden in Shibpur. Size is like that of a Salik. It has a very loud low frequency call that can set your mood for adventure when you enter the woods. It uses its strong beak to make hollows in wood to nest or to flush out insects. Dr. Prosenjit Singha Deo



by Atanu Nath

এক বর্ষার দিন

দেবমাল্য মুখোপাধ্যায়

আকাশে আজ নাব্‌লো বলে চোখের কোণে জল
আনন্দে আজ দিশাহারা পা টলমল।
মন আর দেহ ভিজছে সোঁদা মাটির সঙ্গে
জলের নাচের ফোঁটায় ফোঁটায় শিহরণ সব অঙ্গে

পা দুটো আর স্থির নেই, ছুটছে খোলা মাঠে
হাঁসগুলো সব জড়ো হয়েছে পুকুরের ওই ঘাটে।
বাচ্ছা মেয়েটা ছাতা ধরে রাস্তার পারে দাঁড়িয়ে
মনের সুখে জলের স্বাদ নেয় হাতখানি বাড়িয়ে।

নদীর ওপার দেখা যায় না - ভেজা চশমার কাঁচ
এ দিক্ ও দিক্ জলে থৈ থৈ, পূর্ণ আনাচ কানাচ।
গ্রীস্মে হত তৃণরা আজ জীবন ফিরে পেল
বহু তৃষ্ণায় তৃষ্ণার্ত মন জীবন বারি পেল।

Annual Cricket Tournament

In last week of January this year, Annual cricket tournament was organized by students of the Centre. Two teams, named as ψ and ψ*of 11 player each were lead by Niraj kumar Chaubey and Chinmay Gupta respectively, played a series of three matches. All three matches were full of ecstasy and excitement. Team ψ became the tournament champion by winning the series by 2-1

Kapil Gupta