

MSM 09

The conference on Magnetism, Superconductivity and phase transitions on novel and complex materials : MSM09 was organized during 11th -14th November, 2009. The purpose of this meeting was to build bridges and foster collaborations between scientists all over the world in the fields of complex materials exhibiting magnetism, superconductivity and novel phase transitions.

Inside

Interaction between driven colloids Pg2
Electronic structure of FeCr ₂ S ₄	Pg2
Introduction to Parallel Computing.....	Pg2
Ph.D. award and Post. Doc offers.....	Pg2
CCP2009 & 3rd Thailand Nano- technology Conference.....	Pg3
List of the visitors.....	Pg3
Workshop on SEM.....	Pg4
Brown winged Kingfisher.....	Pg4



Editorial Message:

We beg apology for the delay that has happened in publishing this issue due to unavoidable reasons. The happiest thing that happened during this period was the transfer of the offices of the faculty members to the new premises. This is certainly a long waited move. However this movement makes us feel that we need a faculty lounge so that faculty members can have at least some contact. The new auditorium should also come up fast.

Institute link: www.bose.res.in/

The meeting was the sixth in the approximately biennial series on superconductivity and magnetic materials with the first one held in 1999 in Tehran. The topics covered were (i) Multifunctional oxides, (ii) Graphene, nanotubes and related carbon compounds, (iii) Magnetism at interfaces and in low-dimensions, and (iv) superconductors. The eminent scientists like Profs. T Maurice Rice, J Kirschner, Karsten Horn, George A Sawatzky, Ajay K Sood, Jorg Fink, T V Ramakrishnan were among the invited speakers. The participants consisted of renowned scientists, young scientists and research students from all over the world. The meeting was convened by Drs. Tanusri Saha-Dasgupta and Chhayabrita Biswas. The organizing committee included members from SNBose Centre (Tanusri Saha-Dasgupta, Chhayabrita Biswas, Priya Mahadevan, Kalyan Mandal) as well as from Indian Association of Cultivation of Sciences (Indra Dasgupta, Sugata Roy), SINP (KrishnaKumar Menon) and CGCRI (P. Sujathadevi). Overall, the MSM09 was very successful conference with the discussions on recent trends of science by prominent scientists.

Tanusri Saha Dasgupta

हिंदी महीना

सुष्मिता दासगुप्ता, प्रशासन

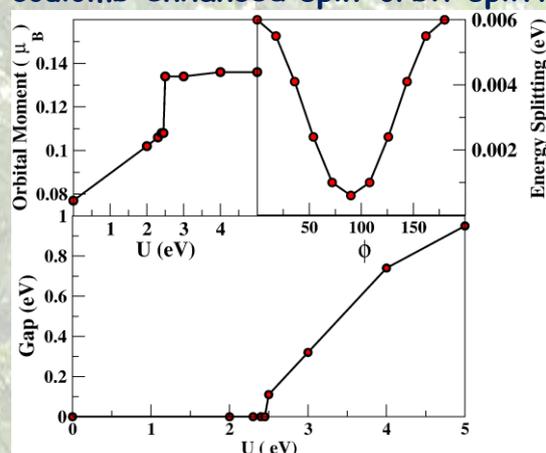
सभी का ध्यान आकर्षित करने के लिए प्रतिदिन केन्द्र के अतिथि गृह में श्वेतपट पर हिन्दी के शब्दों के अंग्रेजी अनुवाद लिखे गए। केन्द्र में एक दिन प्रश्नोत्तरी प्रतियोगिता का आयोजन किया गया। इस अवसर पर श्री राम नारायण सरोज (उपनिदेशक हिन्दी शिक्षण योजना), श्री जगदेश्वर चतुर्वेदी (प्रो. हिन्दी विभाग, कलकत्ता विश्वविद्यालय), श्री विपति (प्रध्यापक) द्वारा हिन्दी भाषा से संबंधित व्याख्यान प्रस्तुत किए गए एवं एक विद्यार्थी द्वारा हिन्दी में गीत प्रस्तुत किया गया। इस अवसर पर विभिन्न संस्थाओं तथा कार्यालयों में शुभकामना स्वरूप कार्ड भेजे गए। केन्द्र में एक दिन हिन्दी चलचित्र दिखाने की व्यवस्था की गई। इस अवसर पर क्रिएटिव डांस ट्रूप द्वारा नृत्यांजली (नृत्यनाटिका) का मंचायन किया गया। इन सभी कार्यक्रमों में केन्द्र के संकाय, सदस्यों, कर्मचारियों तथा विद्यार्थियों ने बड़े ही उत्साह के साथ हिस्सा लिया। सम्पूर्ण कार्यक्रम को केन्द्र के निदेशक महोदय ने अपनी उपस्थिति एवं व्याख्यान द्वारा सफलता प्रदान की।

Interaction between driven colloids

Jaydeb Chakrabarti

In equilibrium, colloidal particles in a subcritical liquid suspension get surrounded by a drying layer, if the colloid has solvophobic interaction. Using Brownian dynamics computer simulations, we investigate the nonequilibrium response of this layer to a strong external driving force. We show that if big particles are driven so strongly that the small particles cannot follow the instantaneous positions of the big particles, the small particle degrees of freedom decouple from those of the big ones, leading to qualitatively new effects compared to the equilibrium situation. A dry big particle, driven in a subcritical liquid of small particles, gets anisotropically dressed up with the small particles. The medium of the small particles shows an initial elastic response followed by long time diffusion regime which is reflected in the drag force on a big particle moving through the small particles. The effective force between two driven dry particles, upon integration of the solvent particles, shows a deep minimum around the cross-over of the two mechanisms of the medium response. These observations can be verified by optical tweezer experiments on colloidal dispersions. The occurrence of the deep minimum in the effective force between the dry spheres suggests applications in separation processes in macromolecular dispersions.

Electronic structure of FeCr_2S_4 : Evidence of Coulomb enhanced spin-orbit splitting.



The electronic structure of the spinel compound, FeCr_2S_4 , was studied using density-functional-theory-based calculations. Our calculations provided a microscopic understanding of the origin of the insulating behaviour of this compound, which turned out to be driven by Coulomb enhanced spin-orbit coupling operative within the Fe-*d* manifold. We also investigated the possible role of the structural distortions and compare the calculated optical property data with that of the experimental one. **Tanusri Saha Dasgupta**

Journal Ref: Soumyajit Sarkar, Molly De Raychaudhury, I. Dasgupta, and T. Saha-Dasgupta, *Phys. Rev. B* **80**, 201101(Rapid Communication) (2009)

Upper panel: Variation of Fe orbital moment plotted as function of electron-electron correlation *U* applied on Fe site (left panel) and the splitting between Fe z^2-x^2 and $3y^2-r^2$ levels in eV plotted as function of the orientation of the spin quantization axis. Lower panel: Variation of band gap with *U* value applied on Fe site.

Introduction to Parallel Computing

Sudeep N Banerjee (AMRU)

The Advanced Material Research Unit (AMRU), a DST funded unit for research on interdisciplinary areas in the S. N. Bose Centre, organized a workshop on 'Introduction to Parallel Computing' during 6th to 8th October'09 at the S. N. Bose Centre. Vijayraghavan Sundarajan, and S.Kadam both from the CDAC, Pune covered various topics on parallel computation, namely, MPI and OpenMP, Advanced MPI Calls, Application of Parallel Computation to selective Physics Problems via Lectures as well as Hands-on sessions. D. Bhattacharyay from Biophysics Division, SINP and P. Majumdar from IACS discussed some of the current application of parallel computation in researches. The participants were the graduate students from various Institutions, like Indian Association for the Cultivation of Science, Kolkata, Saha Institute of Nuclear Physics, Kolkata JNCASR, Bangalore, IMSc, Chennai. The response from the school was very good. The participants were very keen to learn the basic and the advanced concepts of the materials covered. Instructors from CDAC helped the students in building up the fundamentals of HPC, MPI, OpenMP and also helped them in the Hands-on session. Students were able to run jobs in the AMRU cluster using individual user accounts. The Hands-on session was conducted in the Electronic Classroom. The participants requested for the lecture notes and slides, which are available in the AMRU website.

Ph.D. awarded to:

- 1) **Sagar Chakraborty**, under the supervision of J. K. Bhattacharya for his thesis on 'Turbulence in Rotating Fluids'.
- 2) **Tuhin Pradhan**, under the supervision of R. Biswas and J. Chakrabarti for his thesis on 'Medium effects on chemical reactions in electrolyte solutions, binary mixtures and confined environments: a spectroscopic study'.

Post Doctoral Offers:

- 1) **Sagar Chakraborty** at Niels Bohr Institute, Denmark;
- 2) **Hemant Kashyap** at University of Iowa, US

A Report on CCP2009 & 3rd Thailand Nanotechnology Conference

Sugata Mukherjee

(a) Conference on Computational Physics 2009:

The Conference on Computational Physics 2009 (CCP2009) was held this year at Kaohsiung (Taiwan) in Grand Hi-Lai Hotel during 15-19 December 2009. CCP is one of the largest conference on computational physics held annually since 1998, jointly sponsored by IUPAP, APS, EPS among various other co-sponsors. This years programme included fields such as Condensed Matter Physics, High Energy Physics, Plasma & Space Physics, Quantum Information, Complex Systems, Atomic & Molecular Physics etc. The plenary speakers and their topics included H.E. Stanley (Liquid Water), S.G. Louie (Graphene Nanostructures), J.I. Cirac (Quantum Information), C.T. Chan (Metamaterials & Illusion Effects), K. Kaneko (Complex Systems Biology), K. Schneider (Magnetohydrodynamic Turbulence), W. Yang (DFT), G. Kotliar (DMFT & Correlated Systems), S. Hashimoto (Simulations at Femtoscale), W. Christian (Digital Library of Simulations) and A. Ukawa (Physics, Algorithms & Machines). There were numerous high quality invited and contributed presentations (both oral & poster) in various areas given in four parallel sessions, notably by -- M.Y. Chou (Transport properties of Graphene), C.C. Kaun (Spin Polarized Conductance in Gold Nanojunctions), A.P. Young (Quantum Adiabatic Algorithm), B.N. Harmon (Magnetic Properties of Pnictides), F. Aryasetiawan (Constrained RPA for Hubbard U), A.W. Sandvik (Valence Bond States & Qm Phase Trans), A. Oshiyama (Large scale DFT calculations on Nanostructures) among others. Amanda S. Barnard (Australia) was given the IUPAP Young Scientist Award for 2009. J.Y. Hsu (NCKU, Tainan) was the Chairman of CCP2009 and he organized the conference extremely well in the beautiful city of Kaohsiung, bringing out excellent programme, both scientific and otherwise, which was attended by over 300 participants from almost all corners of the world. Next year CCP2010 will be held in Trondheim (<http://www.ccp2010.no>) under the chairmanship of Alex Hansen. It would be nice to see if CCP could be held in India in near future.



(b) 3rd Thailand Nanotechnology Conference:

The 3rd Thailand Nanotechnology Conference was held in Asian Institute of Technology near Bangkok during 21-22 December 2009. The conference was organized by the Centre of Excellence on Nanotechnology under the chairmanship of J. Dutta. This conference focussed mostly on synthesis and application of nanomaterials in various fields such as catalysis, biotechnology, environment, energy research etc. The plenary speakers included M.S. El-Shall (Nanoparticles & Catalysis), K.M. Paknikar (Applications in Cancer research), J. Shapter (Nanotubes), J.V. Yakhmi (Gas sensors from Nanomaterials), M. Lay (Networks of SWNT). Invited speakers included Y. Greish (Polymeric nanofibrous media), S. Mukherjee (Electronic properties of Nanomaterials), K. Saoud (Catalysis on bimetallic nanoparticles), B. Elouadi (Quantum wires) with several contributed presentations (both oral & poster). This conference was attended by over 150 participants which offered excellent opportunity to interact and also visit the Centre of Excellence on Nanotechnology at AIT.

List of the visitors during September 2009 to December 2009

The Bose Colloquium was delivered by eminent scientists from different Institutions in India and abroad as well. The speaker list includes: S. M. Bhattacharya. IOP, Bhubaneswar ; M. Burma, TIFR, Mumbai; D. P. Mukherjee, ISI, Kolkata, P .K. Bandopadhyay, Houston, Texas, US; D. Sen, IISc, Bangalore, India.

Workshop on Application of Dual Beam Scanning Electron Microscope and Environmental Scanning Electron Microscope.

A two day (8th and 9th October, 2009) workshop was organized on Focus Ion Beam and Environmental SEM by S. N. Bose National Centre for Basic Science in co-ordination with ICON Analytical Pvt. Ltd Kolkata. The workshop consisted of lectures and hands on training. The lectures were given by Prof. Philip D Prewett, University of Birmingham, UK, Dr. Oliver Wilhelmi, FEI, Netherland, Prof. M.L. Sharma, Icon Analytical Pvt. Ltd.



The conveners of the workshop were Dr. Barnali Ghosh and Dr. Kaustuv Das. The participants consisted of faculties, research associates and students from all over India. The workshop was very interactive and effective for the participants. **Kaustuv Das**

Brown winged kingfisher



A rare bird of this planet. Many foreigners come to see this bird, that can be sometimes sighted in Sundarban, and often in vain. It was the first sighting and first photographing for me in my latest trip to Sajnekhali on 31st Dec. 2009.

P. Singha Deo

Editorial Board: *Jaydeb Chakrabarti, S. K. Sharma, Ranjit Biswas, Kinshuk Acharyya, Chhayabrita Biswas, Kapil Gupta, Mahua Mitra, and Mitali Nanyasi.*

The opinions expressed here are opinions of individuals, the administration of the centre and the editorial board are not responsible for these opinions.