SATYENDRA NATH BOSE NATIONAL CENTRE FOR BASIC SCIENCES

Newsletter

Vol : 5 | Issue : 1 | Period : May-August 2012

Published on : 19.10. 2012

Editorial

We are happy to bring out this issue of newsletter on behalf of the Centre. The academic activities in the Centre are reflected through a large number of theses submitted in recent months. We have included the abstracts of these theses to give a glimpse of wide range of academic activities that are prevailing here. The revitalised Extended Visitors Linkage Programme has attracted a large number of renowned scientists all over the country and abroad as well to visit our Centre. The Memorial lectures and different conferences add new dimensions to our activities. The students' activities and those of non academic members also worth mention and covered in this issue to some extent.

3rd Chandrasekhar Memorial Lecture delivered by Prof. Eric Herbst

Kinsuk Acharyya

> He described how the discovery of molecules ranging from well known to exotic, changed our knowledge of molecular complexity throughout the Universe.

3rd Chandrasekhar Memorial Lecture was delivered by Prof. Eric Herbst on **"The Universe as a Giant Laboratory: The making of Complex Molecules from simple Atoms"** at Silver Jubilee Hall, S N Bose National Centre for Basic Sciences on 12th July, 2012. Prof. Herbst, is the Commonwealth Professor of Chemistry, Astronomy and Physics at the Department of Chemistry, University of Virginia. Prof. Herbst is a molecular spectroscopist, his work in unraveling the complex rotational-torsional spectra of methanol and other internal rotor-type molecules has aided astronomers in studying these molecules in space. He described how the discovery of molecules ranging from well known to exotic, changed our knowledge of molecular complexity throughout the Universe. Then he described chemical reactions that produce these molecules and regions of space that produce them. It is quite remarkable that dark molecular clouds, the birth places of stellar systems like us with a temperature as low as 10 K and density as low as few hundreds in cubic centimeter region, can produce wide range of complex molecules many of which are organic. He also addressed the issue of how large these molecules can grow. Then he discussed the difficulty astronomers faced while detecting these molecules and highlighted few state-of-the-art facilities like ALMA, SOFIA etc. which will be operational very soon. He also enlightened the audience by discussing if these discoveries can tell us anything about how life may have started.

CONTENTS

Freshers' Welcome 2012

Chandreyee Roy

Every year the newcomers in S. N. Bose National Centre for Basic Sciences are welcomed by throwing a Freshers' welcome party for them. This year it was organized by the 2nd year I PhD (Integrated PhD) students on 31st August, 2012. The S. N. Bose canteen had been decorated beautifully for this event. The show started with a cheery welcome speech by Debolina Basu, followed by the lighting of the inaugural lamp by the Director, Prof. A. K. Raychaudhuri after which he welcomed the freshers' via a speech. This was followed by the inaugural song by Shauri Chakrabarty. The program was punctuated by quite a few performances by various students in the Institute. There was a wonderful dance performance by Anuradha Das and melodious songs sung by Pratik Tarafdar and Shauri Chakrabarty. We got lost in the soft tunes of a mouth organ played by Saikat Debnath. Subhasish Chakrabarty, Ansuman Dey with their guitars and Biswajit Paul with his Synthesiser teamed up to produce really good music which made everybody feel very lively and tap their feet along with it. However a Freshers' party cannot be complete without the crowning of Mr and Miss Fresher. The selection procedure for this was pretty interesting. Each of the new comers were made to carry out a random task in front of everybody. They were judged on their level of sportiness and how well they performed their task. The ultimate winner in the end came out to be Poulomi Chakraborty in the women's category and Abhishek Roy in the men's category. It was a fun filled event where everybody enjoyed and laughed to their hearts content. Finally this small party ended with dinner in the Krishnachura Canteen. I would like to take this opportunity to thank my 2nd year I PhD classmates (Saheli Banerjee, Anita Halder, Dilip Sao, Debashish Das Mahanta, Souvik Mondal, Somnath Mukhpadhyay, Sumanta Kundu) and my senior Biplab Bhattacherjee without whom this program would not have been successful at all.

ACADEMIC REPORT

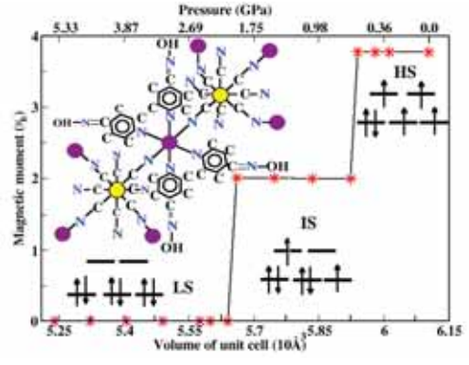
Pressure and Temperature Driven Spin-switching in Metal-organic Coordination Polymers from ab initio Calculations

Tanusri Saha Dasgupta

Spin-crossover (SCO) transition is a phenomenon that can occur in octahedrally coordinated transition-metal ions of d4-d7 configuration in which the spin state switches reversibly between different values due to an external perturbation such as pressure, temperature, or light irradiation. They have been observed for co-ordination polymers with Fe^{2+} building blocks, which hold promise for construction of advanced materials with various applications, such as spin-switchable memory devices.

We explore a combination of density functional theory with supplemented Coulomb U (DFT+U) and ab initio molecular dynamics simulations to investigate the SCO phenomenon in coordination polymer, $Fe_2[Nb(CN)_8]$. (4-pyridinealdoxime) $8.2H_2O$. Our study shows that this approach is capable of capturing the SCO transitions driven by pressure (see figure below) as well as temperature. In addition to discovering novel spin-state transitions, magnetic states involving changes in the long-range magnetic ordering pattern are achieved.

Computed magnetic moment at the Fe site plotted vs the unit cell volume of the Fe-Nb complex. The hydrostatic pressures corresponding to selected volumes are marked in the upper ordinate. The t_2g and eg orbital occupations of Fe in HS, IS and LS states are shown schematically. The inset shows the crystal structure, highlighting the environment around Fe, represented as magenta (dark) balls and Nb, represented as yellow (light) balls. Ref: K. Tarafder, S. Kanungo, P. Oppeneer, and T. Saha-Dasgupta, Phys. Rev. Lett. **109**, 077203 (2012)



THESIS SUMMARY

Pairing and Condensation in Ultracold Quantum Gases

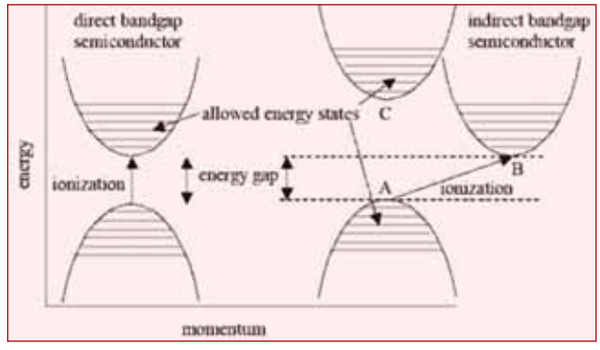
Raka Dasgupta
(Under the Supervision of Prof J. K. Bhattacharjee)

The purpose of this research was to explore some important aspects of ultracold atom theory. This study dealt with cold fermions that can exhibit BCS pairing or can form bosonic molecules via Feshbach resonance and undergo Bose Einstein condensation(BEC). An additional three-body interaction was taken into account, which made the BCS-BEC crossover process a non-reversible one. An interesting variation in this situation was the introduction of an imbalance in the fermion number, since pairing now had to work around the fact that not all fermions of type A(one of the species) had a fermion of type B (the other species) to pair with. The consequence, as it had been pointed out in current research, could be exotic pairing states. This thesis aimed to study static and dynamic properties of such an imbalanced system, and connect them with the attributes of the novel superfluid states. The natural dynamics of the system was probed and it was shown that the oscillation of the condensate fraction is periodic or quasi periodic, depending on the value of the Feshbach coupling. Quench dynamics in a driven BCS system was also studied, both for linear and periodic quench mechanisms.

Study of Electronic Structure of Disodered Systems

Prashant Singh
(Under the Supervision of Prof Abhijit Mookerjee)

It is well known that first principles description of the electronic structure and related properties of disordered solids have been a challenging problem. The Bloch theorem, which allows us to use lattice translation symmetry of the Hamiltonian to simplify the problem to a large extent, is no longer valid in the presence of disorder. This puts constraints in formulating a new quantitative calculational technique with the same degree of accuracy and efficiency as that for crystalline solids. The local density approximation (LDA), upon which majority of electronic structure methods are based underestimates the band gaps in such solids considerably. The motivation behind this thesis, was to develop a method which we can apply for semiconductors disorder alloys. Keeping above in mind, we have proposed an alternative approach to calculate the exchange-correlation potential. Here, the XC-potential is calculated as the work done in moving an electron in the electric field produced by its Fermi-Coulomb hole using the concept from electrostatics. The physical interpretation of this potential was provided by Harbola and Sahni (HS). Using HS approach within the exchange (EX) only approximation, where HS-EX is evaluated from Fermi hole, produces ground state as well as excited state (Band Gap; given in figure) properties comparable to experiments but with considerably reduced numerical efforts. We applied HS-EX within tight binding linearized muffin-tin potential in the atomic sphere approximation. The above physical picture and the vastly reduced computational effort make this approach worth following. This developemnt will work as the building block of semicondutor based disordered alloy calculation, which requires correct information of band positions which HS-EX explains more accurately than LDA based methods.



Heat Transport and Related Thermal Properties in Nanofluids and Nanostructured Materials

Rajesh Kumar Neogy
(Under the supervision of Prof A. K. Raychaudhuri)

Now a days the quest for more and more miniaturisation along with faster and faster processing speed of the devices has resulted in intense heat dissipation from such systems. This results in the hindrance of the efficiency. Such heat dissipation problem is not only associated with microelectronics but with all those things like machines, industries, thermal plants, nuclear reactors etc. So in order to increase the efficiency as well as the longevity of these devices we must get rid of such heat radiations. For dissipating heat a cooling system is required for heat transfer. In such devices a working fluid is circulated by a pump, and they extract out the heat from the system. Improvements in heat transfer efficiency can minimize the associated power consumption. Conventional heat transfer fluids such as water, ethylene glycol, and engine oil have relatively low thermal conductivities inherently. So such conventional methods of heat removal have been found rather inadequate to deal with such high intensities of heat fluxes. One of these attempts is the addition of nanoparticles to it and this mixed phase is now known as Nanofluid. This shows an anomalous increase in the heat transfer capability in contrast to heat transfer fluid.

We have tried to take one step further in this field by observing the effect of the application of external perturbation like electric field in nanofluid and its performance in enhancing the thermal conductivity. So we tried to capture the dynamic thermal parameters for the nanofluids using 3ù method which is a dynamic heat transfer measurement technique.

Nanofluid is a dispersion of nanoparticles in a fluid that shows an enhancement in the thermal conductivity value which much higher than that obtained theoretically from the Effective Medium Theory (EMT).

Most of the reported studies on thermal conductivity measurements on nanofluids have been done in static condition where a steady thermal gradient is set-up by a known thermal power. There are a few reports on what will happen to these values when we apply an external perturbation or excitation (like a.c electric field or a thermal oscillation) to it i,e the heat transport in dynamic condition. In this thesis work we investigated this aspect of thermal conductivity in nanofluids using a dynamic method of measurement.

For the thesis work we developed the method to make nanofluids of different types and also worked on methods to make them stable. As a part of the work we also synthesized a stable Gold Nanonetwork (to check the effect of morphology on thermal conductivity) by using PLD laser. Such types of networks are made surfactant/precursor free and still are very stable. They span a large surface area and are very rigid also.

As a part of the thesis we have also developed a 3ù method for dynamic thermal measurements, in which a metal film (Pt) is used both as a heater and thermometer so that the thermal oscillation of the film (which is immersed in the nanofluid) in response to an oscillating heat input can be measured precisely.

We observed an interesting phenomenon that, these thermal parameters have a frequency dependence associated with these nanofluids when we make measurement in dynamic condition by varying frequency of the applied heating electric current. We find that this response may be linked to formation of local aggregations in nanofluids that can be controlled by applying a surfactant that inhibits the formation of local clusters. We have also investigated the dynamic heat transport in Au Nanonetwork and established that such stable network, formed by a one-shot method can be an effective nanofluid.

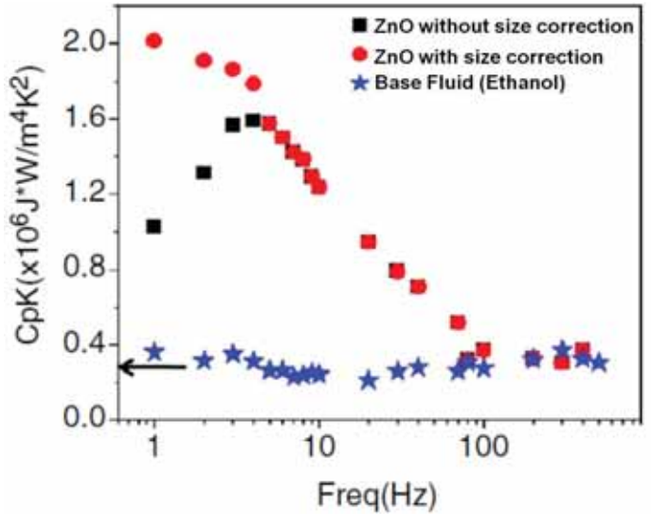


Fig. 4.8. Variation of the CpK of ZnO nanofluid and ethanol at 40°C. The estimated CpK based on the Maxwell equation is marked in the figure. The data for the nanoflued show the as measured data (referred to as uncorrected) and that corrected for finite heater size.

Theoretical Studies On The Nonadiabatic Effects In Molecular Aggregates

Kinshuk Banerjee
(Under the supervision of Dr Gautam Gangopadhyay)

Molecular aggregates with their dense electronic states and many nuclear degrees of freedom involve nuclear dynamics on coupled potential energy surfaces that goes beyond the Born-Oppenheimer (BO) adiabatic approximation. In this context we have studied the spectra and dynamics of aggregates of organic conjugated polymer chains which have revolutionalized the field of organic optoelectronics as well as coupled quantum dots forming artificial molecules treating the nonadiabaticity exactly. The molecular aggregates are studied at the level of dimer and generalized to arbitrary size of the aggregate treating the electronic and vibrational motion on equal quantum mechanical footing. We have explored the interplay of symmetry, disorder and nonadiabatic coupling in these molecular materials with the role of the topology of the potential energy surfaces. We have investigated the nonadiabaticity from the viewpoint of quantum entanglement between electronic and nuclear degrees of freedom and studied its role in governing the experimental observables like luminescence and tunneling current in these systems.

First principles study of silicate minerals

Swastika Chatterjee
(Under the supervision of Prof. Tanusri Saha Dasgupta)

This thesis is dedicated to the study of structural, electronic and magnetic properties of Fe containing silicate minerals. We have used a combination of first principles Density Functional Theory and classical Monte-Carlo technique for studying both defect-free and vacancy bearing mineral structure. We have mainly concentrated on two minerals, primarily on olivine (M_2SiO_4) and to a lesser extent on pyroxene ($M_2(SiO_3)_2$), where M can be Mg or Fe, in varying proportions. The basic structural-units/building-blocks in both these minerals are same. They are the Si-O tetrahedral units and two kinds of metal-O octahedral units, M1 and M2, differing in site symmetry. Our study finds the importance of Fe-O co-valency in deciding the site preference of Fe in Fe-Mg olivine and pyroxene. In pyroxene we find that co-valency works hand-in-hand with size factor in making Fe prefer M2 site, whereas in olivine, co-valency and size factor compete with each other, the former trying to put Fe into M1 site and the later trying to make Fe occupy M2 site. Since the size difference between M1 and M2 is not that

significant, co-valency dominates, making Fe prefer M1 site [1]. We have further addressed the issue of temperature dependence of site preference of Fe and attempted to determine whether there is a cross-over of site preference of Fe beyond a certain temperature, which is highly debated in the experimental community. We find that out of the two competing factors, co-valency and size difference between the two octahedra, co-valency dominates throughout, making Fe prefer M1 octahedral site throughout the temperature range of study [2]. We next take up the study of the electronic properties of vacancy bearing iron-silicate. Using quantum-mechanical density-functional based tools we simulate a defect structure, which is chemically close to naturally occurring laihunite structure, by introducing appropriate number of vacancies at the cationic sites of Fe_2SiO_4. Our simulated structure is structurally very similar to the reported laihunite structure, showing that our theory is robust enough to deal with defect containing complicated mineral structures. We find that on introduction of vacancy some of the Fe with nominal oxidation state of 2+ changes their nominal oxidation state to 3+, to maintain the overall charge neutrality. These two types of Fe atoms further show different site preferences, Fe^{2+} preferring M1 and Fe^{3+} preferring M2, hence leading to a charge ordered state. We have also studied the underlying magnetic order of this mineral [3]. Our next study revolves around an indirect method to determine the track that is undertaken by a diffusing vacancy in a Fe containing silicate mineral. This is an important topic since vacancy migration track contain a lot of information regarding the media in which migration is taking place and direct, in situ determination of such a track is a difficult task. Our technique makes use of the facts that Fe^{2+} and Fe^{3+} have two different site preferences, Fe^{3+} and vacancy move inside the crystal as a single unit (i.e, as the vacancy migrates, it converts two of its nearest Fe^{2+} to Fe^{3+} and the Fe^{3+} in the track traced by the vacancy converts back to Fe^{2+}) and any kind of cationic migration can happen only via a vacancy. On performing a Monte-Carlo simulation employing these facts, we find that trail of vacancy appears in the form of Fe^{2+} occupying wrong M2 sites all along the path of the crystal [4].

[1] S. Chatterjee, T. Saha-Dasgupta, S. Sengupta, K. Chatterjee, N. Mondal, Physical Review B 79, 115103 (2009).

[2] S. Chatterjee, S. Bhattacharyya, S. Sengupta, T. Saha-Dasgupta, Physics and Chemistry of Minerals v. 38, #4, 259-265 (2010).

[3] S. Chatterjee and T. Saha-Dasgupta, Physical Review B 82, 035108 (2011).

S. Chatterjee, T. Saha-Dasgupta and S. Sengupta, Europhysics Letters 98, 29001 (2012).

Electronic Structure of Complex Crystalline Solids

Soumyajit Sarkar

(Under the supervision of Prof. Tanusri Saha Dasgupta)

This thesis deals with study of microscopic origin of many exciting and intriguing physical properties of different spinel compounds via first-principles calculations. These complex phenomena are associated with many degrees of freedom, and thus accurate quantitative information is essential for understanding of the resulting behaviour. In the present thesis, density functional theory based first-principle calculations are carried out using different basis sets - like, plane wave based basis, linearised augmented plane wave basis, linear muffin tin orbital basis etc. *N*th order muffin tin orbital method has been used in extracting the relevant information needed for modeling of a complex crystalline solid from a full local density approximation calculation. We propose a possible orbital ordering in MnV_2O_4, which consists of orbital chains running along crystallographic *a* and *b* directions with orbitals rotated alternatively by about 45 within each chain. We further find that the proposed orbital arrangement favors a noncollinear magnetic ordering of V spins, as observed experimentally. Our calculation provides a microscopic understanding of the origin of the insulating behaviour of low temperature phase of $FeCr_2S_4$. This insulating phase turns out to be driven by Coulomb enhanced spin-orbit coupling operative within the Fe-*d* manifold. We further perform a comparative study of $FeCr_2S_4$ with another very similar spinel compound, $FeSc_2S_4$, which behave rather differently. Our study points out that the contrasting behaviour is driven by the differences in hybridization of Fe *d* states with Cr/Sc *d* states and S p states in the two cases. This leads to important differences in the nature of the magnetic exchanges as well as the nearest-versus next-nearestneighbour exchange parameter ratios, resulting into significant frustration effects in $FeSc_2S_4$ which are absent in $FeCr_2S_4$. Our study on $CuIr_2S_4$, which exhibits metal to insulator transition accompanied by a structural transition, reveals that the transition can be rationalized in terms of formation of one-dimensional bands which gives rise to an orbitally driven *Peierls* state. We investigate orbital ordering in FeV_2O_4, a spinel with orbital degrees of freedom both at Fe and V sites that exhibits two tetragonal phases, one compressed at high temperature and another elongated at low temperature. Further, we find that the single-ion anisotropy effect with hard and easy *c* axis favoring the compressed and elongated tetrahedral phases respectively, gives rise to magnetocrystalline anisotropy-dependent shapes in this system. Our first-principles study helps to develop better understanding of underlying physics of the interplay between different degrees of freedom in spinel compounds at the microscopic level. This, in turn, helps to the identification of materials with desirable functional properties in this class of systems. Our electronic structure calculations also lead to a to connection between theory and experiment.

EVENTS

CFOCM 2012

Tanusri Saha Dasgupta

The International Conference on Functional Oxides and New Carbon Materials, held during 6-8 May, 2012 was organized as a part of the ongoing Silver Jubilee Celebration of the Centre. The conference addressed the scientific excitement surrounding functional oxides and new carbon materials. In particular topics such as multifunctional oxides, multiferroics, magnetism in interfaces and in low dimension, superconductivity, graphene, nanotubes and related carbon materials were discussed. The conference was attended by participants and speakers from abroad as well as within India. The speaker list included P. Ganguly (Pune), R. Pohl (Cornell, USA), T.V. Ramakrishnan (IISC, Bangalore), R.C Budhani (NPL, Delhi), S.Dattagupta (Visvabharati, Shantiniketan), P. Chaddah (UGC-DAE CSR, Indore), R. Mahendiran (NUS, Singapore), A. Ghosh (IISc, Bangalore), M.Sanyal (SINP, Kolkata), D.E. Logan (Oxford University, UK), H.R.Krishnamurthy (IISc, Bangalore), K.Damle (TIFR, Mumbai), A. Sundaresan (JNCASR, Bangalore), P. Raychaudhuri (TIFR, Mumbai), S. Banerjee (IIT, Kanpur), K.Nagapriya (GE, Bangalore), D.Kumar (JNU, Delhi), A. Mookerjee (SNBNCBS, Kolkata), A.K Majumdar (IISER, Kolkata), S. Banerjee (SINP, Kolkata), D.Kumar (JNU, Delhi). Apart from invited talks, there was a poster session, and about 25 posters were presented. The conference also celebrated the 60-th birthday of the present Director, Prof. A. K. Raychaudhuri.

International Conference on Chemical Evolution of Star Forming regions and Origin of Life

Kinsuk Acharyya

An international conference on **'Chemical Evolution of Star Forming regions and Origin of Life'** was organized at S N Bose National Centre for Basic Sciences between 10th July and 13th July, 2012. The conference was aimed to provide a platform to revisit some of the new developments made in the subject and to provide students and young post docs to interact with leading figures in the subject. Among the invited speakers were, Prof. Eric Herbst (University of Virginia, USA), Prof. Bishun Khare (NASA AIMS research laboratory, USA), Prof. Martin McCoustra (Heriot-Watt University, GB), Gianfranco Vidali (Syracuse University, USA), Stefan Andersson (University of Gothenberg, Sweden), Naoki Watanabe (Hokkaido University, Japan), Sergio Pilling (UNIIVAP, Brazil), Prof. Wen Ping Chen (National Central University, Taiwan), S. V. S. Murty (PRL), Devendra Ojha (TIFR), Jayant Murthy (IIA). Topics covered are: overview of interstellar medium, gas-grain chemistry, observations of chemical compositions of star forming regions, laboratory astrochemistry and astrobiology, numerical simulations of collapse and fragmentation of star forming regions along with chemical evolution, role of physical parameters such as mass, angular momentum, magnetic fields, and radiation environments on the chemical evolutions of SFRs, exo-solar planets, martian environment, etc. Around 50 participants from different countries attended this conference and it was a very successful conference. Conference proceedings will be published by AIP.

2012 Transit of Venus put on spectacular show for the last time this century

Ramkrishna Das

An observational campaign was organized on June 6, 2012 at SNBNCBS to witness the rare astronomical event of Venus transit across the face of the Sun. A *transit* of a Venus occurs when the planet passes directly between the earth and the sun and we see a small dark spot gliding slowly across the disk of the sun. However, this alignment is rare, which makes it practically once in life time opportunity. Despite being so rare, transits of Venus have played an important role in the history of astronomy. Such event provides a unique opportunity to determine the length of the *Astronomical Unit*, which is the average distance between the earth and the sun, a fundamental length scale in the universe. Spectroscopic observations during transits could be useful to investigate the atmosphere of the planet.

In Kolkata's sky the 2012 transit started at 3:40 am and lasted for about 6 hours and 40 minutes. The live show was arranged at the terrace of the main building using a 4 inch refracting telescope fitted with Baader solar filter. Though the sky was cloudy early in the morning, it became clearer at the later stage giving a clear view of the transit. Hundreds of enthusiasts including the members of the centre thronged at the observing site for having a glimpse of this extremely rare event of the century. A mosaic of few photographs of this spectacular event is presented here.

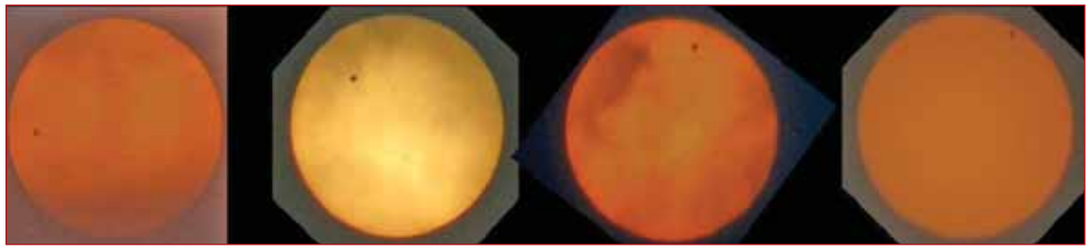


Figure: A mosaic of photographs (arranged in chronological order) snapped at different time through clouds shows the planet Venus (black dots) on the solar disk (Photo credit: Sudip Garain & Tamal Basak).

Book Exhibition

Saumen Adhikari

The Library of the S N Bose Centre organized a Book Exhibition during 5th June 2012 to 7th June 2012 from 10 am to 5 pm at the dining hall of Krishnachura Hostel. The Exhibition was inaugurated by our honourable Registrar, Dr. Ranjan Chaudhury. Six book suppliers participated with a good collection of books on fiction, literature, reference and other miscellaneous categories. The faculty members, staffs and students visited the Book Exhibition as per their convenient time and selected more than seven hundred books to enrich the library collection. The Book Exhibition ended with a grand success.

स्वतंत्रता दिवस

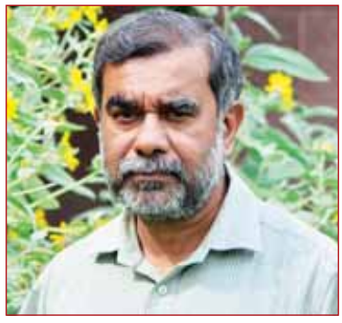
देवाशीष मित्र

15 अगस्त वर्ष 1947। दो सौ साल की पराधीनता के बाद भारत को मिली आज़ादी। भारत के नीले आकाश में पहली बार लहराया तिरंगा झंडा। 65 साल बीत गए हमें आज़ादी मिले हुए, आज भी 15 अगस्त के दिन वैसे ही हर्ष की अनुभूति होती हैं जब तिरंगा झंडा आसमान में लहराता हैं। गर्व होता हैं कि हम भारतवासी, एक स्वाधीन देश के नागरिक हैं।

लेकिन ये स्वतंत्रता हमें अनगिनत स्वाधीनता संग्रामियों के श्रम, लहू कुर्बानियों से मिली है। हर वर्ष की तरह आज भी हम पुलकित हृदय से स्वतंत्रता दिवस को मनाते हैं और याद करते हैं हमारे स्वतंत्रता सेनानियों को जिन्होने हमें खुले आसमान के नीचे रहने के लिए खुदको कुर्बान कर दिया। हर वर्ष की तरह इस साल भी हमारे केंन्द्र में उत्साह के साथ स्वतंत्रता दिवस मनाया गया। केन्द्र के बग़ीचे को फूल, माला, तिरंगे झन्डे से सजाया गया। हमारे केंन्द्र के सुरक्षा विभाग के सभी कर्मचारियों ने मार्च–पास्ट किया। निदेशक एवं कुलसचिव की अनुपस्थिति में प्रो. संदीप कुमार चक्रवर्ती (अध्यक्ष संकाय) ने ध्वजारोहण किया। केंन्द्र के सभी कर्मचारियों तथा विद्यार्थियों ने राष्ट्रीय गीत गाकर राष्ट्र के प्रति सम्मान प्रदर्शित किया। अन्त में जलपान के साथ कार्यक्रम की समाप्ति हुई।

NEWS & VIEWS

Academic members of our Centre honoured with Awards



Professor Rabin Banerjee - Senior Professor, Department of Theoretical Sciences, S N Bose National Centre for Basic Sciences, Kolkata is one of the recipients of the 'Thomson Reuters Research Excellence - India Citation Awards 2012' in Theoretical Physics and Cosmology research field. Prof. Banerjee has authored more than 150 publications and some of his key works include Poincaré gauge symmetries, hamiltonian symmetries and trivial gauge transformations, Quantum Tunneling Beyond Semiclassical Approximation, & Hawking Radiation and Covariant Anomalies, Prof. Banerjee has also worked on aspects of black holes and their thermodynamic properties, formulation and applications of constrained dynamics, Lagrangian and hamiltonian analysis of Poincare gauge theory, Yang Mills theory on supersphere and a generalised uncertainty principle.

Prof. Tanusri Saha Dasgupta received the Dr. P. Sheel Memorial Lecture Award given by National Academy of Sciences, India (NASI).

Dr. Mithun Kumar Mitra, Visiting Reader of the Centre has been awarded Ramanujan Fellowship, 2012.

Dr. Soumendu Dutta , Research Associate – III of the Centre has been awarded under the DST INSPIRE Faculty Scheme, 2012

Raka Dagupta, student of the Centre was awarded one of the three Best Poster prizes in the 514.Wilhelm and Else Heraeus-Seminar "Quo vadis BEC? IV", which was held in Bad Honnef (Germany) during 21-25 August, 2012. The title of the poster was "Dynamics as Probe for Population-Imbalanced Fermionic System".

Ph D Programm

The following students have been awarded Doctoral Degree:

1. Dr. Abhinandan Makhal on 25.05.2012 from Jadavpur University under the supervision of Dr. Samir Kumar Pal.
2. Dr. Bipul Das on 13.06.2012 from West Bengal University of Technology under the supervision of Prof. Kalyan Mandal.

In this session 10 students have been admitted in Integrated Ph.D Programme and 37 students have been admitted in Ph.D Programme.

EVLP activities

1. An international conference on "Functional Oxides and New Carbon Materials" convened by Prof. J. K. Bhattacharjee and Prof. T. S. Dasgupta; International conference on "Chemical Evolution of Star Forming regions and Evolution of life" organized by Prof. S. K. Chakrabarti, Dr. Kinsuk Acharyya and Dr. Ankan Das.
2. The 3rd Chandrasekhar Memorial Lecture: Professor Eric Herbst, Commonwealth Professor of Chemistry, Astronomy & Physics, University of Virginia, "The Universe as a Giant Laboratory: The making of complex molecules from simple atoms", 12.07.2012
3. Bose colloquium delivered by (i) Prof. Risto Nieminen of Aalto University, Finland, (ii) Prof. Sourav Pal, CSIR-NCL, Pune and (iii) Prof. Sandip Kumar Chakrabarti, SNBNCBS.
4. A special lecture was delivered by Tamoghna Das, IACS, Kolkata.
5. Prof. Sujit Sarkar, Prof. Vaibhav Prabhudesai,Prof. M. Krishnamurthy, Dr. Samir K. Pal, Prof. Sudipto Roy Choudhury and Prof. Amitabha Lahiri gave institute colloquium.
6. Dr. Nilotpal Ghosh, Dr. Biplab Sanyal, Dr. Sohail Ahmad and Dr. Satadeep Bhattacharjee visited our centre VASP program. Dr. Biplab Sayal and Dr. Sohail Ahmed also gave an open talk.
7. A two days seminar (May 31 – June 1, 2012) was organized to celebrate the 'Associates Day'. The Associates under the Extended Visitors & Linkage Programme delivered an 'open talk' showcasing the work done in collaboration with the Bose Centre.
8. This summer, 15 students visited our centre to do summer research project and worked under the supervision of our faculty members and they also gave a presentation after completion of their project.

STUDENTS' PAGE

SNB Football Tournament

Biplab Bhattacherjee

As the morning sun sparked with all its glory on 15th of August, the enthusiasm and passion for football of SNB students came up with yet another eventful day other than the flag hoisting and the high tea.

Arranged in a very short time,after lots of ifs and buts, it was another day of football, another day of passion, another day of friendly fight and togetherness. The outline of the tournament was drawn by Soumyakanti Bose, a real football lover in association with Arka Chaudhury, a die hard fan of football, by arranging 21 students in three teams. The tournament kicked off under bright sunlight, which made the start a bit hectic and the two teams, Team A and B, sweated it out to restrict the match to a nil-nil draw. With a strong defence from Arindam Das against the likes of Soumyakanti and co. and with swift counter attacks from Anup, kept Team-A lively in the match. Getting injured in the first minute of the game, I was dodgy throughout. However with a few minutes break, our team was against the fresh legs of Team-C, with Manotosh Chakrabarty leading from the front. It was a hard outing for us, after a half an hour of play in the sun, to keep brakes on the opposition. Yet we managed not only to stop them from scoring, but keep their defence busy as well. At the end it was another goalless outing for both the teams. Now it was time for us to wait and try our luck out.

With all the previous two matches ending in a draw, a win for any of the team B or C, would land our team A into the finals against the winning team. In the mean time it started raining, giving the players an extra boost to try hard for a win. It was Arka Chaudhury of Team C, who kept our hopes alive with an early goal in the first half. But then it was Team B who kept attacking with their lively strikers Subhasish and Soumyakanti throughout but fruitlessly untill it was just a minute to end and Subhasish with his golden foot scored the equalizer to finish the game 1-1 which pushed our team-A out of the tournament setting up a final clash among Team-B and Team-C. It was 4 o'clock in the afternoon, the two teams headed towards the green wet outfield for the final clash. Both the teams started cautiously, preferring counter-attacks to score, and myself enjoying the job of refereeing. The alertness of both the teams was reflected in the full time result which was a nil-nil draw and the match was dragged to extra time. In the extra time both the teams were relentlessly looking for the few yards goal mark and finally a same side goal pushed team-C to the backseat. Hereafter it was Manotosh Chakrabarty all around with glimpses of Ashutosh Singh and Biswajit Paul to find the net. But at the end it was Team-B with the likes of Soumyakanti and co. that emerged victorious. The tournament was a success story not only because of the facts that, it was a well executed and everyone was sporting throughout but because we saw new faces in Subrata, Somnath, Dilip, Anup and Debasish, which we need to keep the tradition going. Outside the field it was overwhelming to have a permanent spectator in Debmalya Mukhopadhyay. And finally the tournament ended with Sabyasachi Ghosh applauding everyone and saying "KUCHH MITHA HO JAAYE" with Dairy Milk in his pocket for all.

Photography-Tripod

Snehasis Daschakraborty

"Photography is one of the oldest arts which can be a signature of creative output of human mind."

Photography is one of the oldest arts which can be a signature of creative output of human mind. Before starting photography, everyone should have a basic understanding. Here I shall briefly discuss the essential three constraints upon which the whole of photography is based. If photography is a *tripod* then the three *legs* correspond to (i) Aperture value, (ii) Shutter speed and (iii) Sensor sensitivity or ISO speed. The first *leg* i.e. aperture value is the measure of the diameter of lens opening and is represented by *f*-stops (e.g. *f* / 5.6), where *f* is the focal length of the lens. The smaller the number, larger the opening of the lens, higher the amount of light enters through the lens. Another more important significance of aperture value is the depth of the field. The depth of the field is directly proportional to the *f*-stop number. So if one wants to take landscape photographs, then one should go for higher *f*-stop number, meaning smaller opening of the aperture which makes the photograph with good depth (or sharpness) throughout the space. On the other hand for close-up photography, one should try with lower *f* stop for making the blurred background. The second *leg* of the *photography-tripod* is the shutter speed. The shutter speed controls the amount of time that a certain volume of light coming through the lens (determined by the aperture) is allowed to stay on the film or digital media in the camera. The range of shutter speed, that depends upon camera, usually from as slow as 30 sec to as fast as 1/4000 sec. By varying the shutter speed, one can make interesting photographs. For examples, freezing of any motion can be done by very high shutter speed and on the other hand, motion can be incorporated by its low value. The last *leg* of the *tripod* is ISO speed. It regulates the light by changing the sensitivity of the sensor (or film). At very low light situation it is extremely useful for better photography.

With this *photography-tripod*, one can play with the *legs* with the correct exposure to get the expected photographs.

In the above photograph I have used the *legs* as following :
Aperture : ***f/22*** Shutter speed : **1/320 sec** ISO speed : **200**

IN NATURE

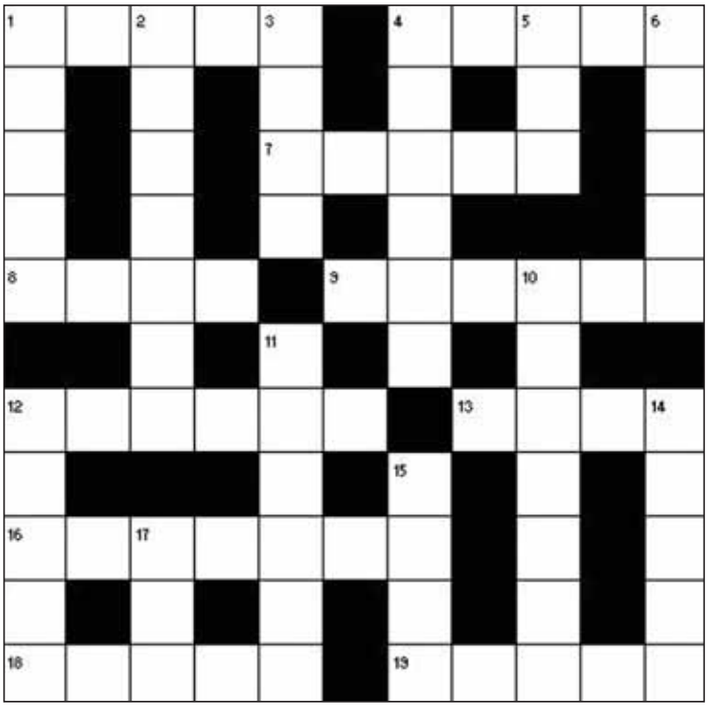
Orchidaceae

Chhayabrita Biswas

The Orchidaceae, commonly known as "Orchids", is a plant family with an extraordinary diversity between 21,950 and 26,049 species. The world's richest concentration of orchid varieties is found in the tropics, mostly Asia, South America and Central America, The most commonly cultivated plants are Phalaenopsis and Cattleya. The variety, rarity mysticism that surrounds the flower contributes to the love and curiosity of poets and writers. Shakespeare seemed to have used orchids (long purple) in two very appropriate images of sex and death - for the lust Ophelia had aroused in Hamlet and for her drowning. Unfortunately, our desire for mordenization and comfort has led to considerable decline of orchid population in the wild.

CROSSWORD

Mahua Mitra & Mitali Bose



Across:

1. an Italian word for half, middle or medium
4. one empowered to act for another
7. a prolamine protein derived from corn
8. the den or dwelling of a wild animal
9. kind of songbird
12. an acute double-edged short surgical knife
13. at one time in the past; formerly
16. to summon a spirit by supernatural power
18. a cavalry sword
19. last letter of greek alphabet

Down:

1. an elementary substance
2. an indeterminately huge number
3. Greek liqueur flavored with anise
4. illuminate
5. Greek Goddess of the dawn
6. to impart knowledge or skill to
10. deprive of confidence
11. not interesting; dull
12. a point
14. more than what is usual
15. a cipher
17. a tip

PHOTOGRAPHY

Snehasis Daschakraborty

SATYENDRA NATH BOSE NATIONAL CENTRE FOR BASIC SCIENCES

Designed & Printing by Graphique International, 9331096233