

### Prof. Alok Kumar Majumdar of our Centre gets the Prof. R. Srinivasan Award



Prof. Alok Kumar Majumdar of our Centre was awarded the prestigious Prof. R. Srinivasan Award-2007 for Low Temperature Physics/Cryogenics in view of his sustained contributions to the growth of low temperature physics in the country, especially through the training of very good manpower. Of the significant contributions by Prof. Majumdar quoted in the award nomination is his role in setting up a modern group on magnetic studies of alloys using low temperature magnetic and transport measurements which includes a state-of-art 7 tesla superconducting magnet system with variable temperature insert for magneto-transport and thermoelectric studies. The group, now recognized in the country as a leading group in this area has brought international recognition as well.

#### Inside

Retirement of Prof. N. Nayak...	Pg 2
Scaling exponent .....	Pg 2
Monte-Carlo Simulations .....	Pg 2
Brief Items .....	Pg 2
Quantum entanglement .....	Pg 3
The Total Solar Eclipse .....	Pg 3
2 <sup>nd</sup> ICFSMA .....	Pg 3
Rabindra Jayanti .....	Pg 4
The Summit .....	Pg 4
Brief News .....	Pg 4
Arctic tern .....	Pg 4

#### Editorial Message:

The on-line Newsletter steps into the second year. We feel happy that the activity of publication could be sustained somehow. However, this would not go long unless more active support comes from the members of the Centre. This is going to be an alarming threat to the very existence of this activity. This does not mean that the Centre's activities are going down. It is in fact the opposite as you can see in the pages to follow. But people seem to be reluctant to report or to write on different things they are doing. Could we request everyone to come up so that the Newsletter would not die prematurely?

Institute link: <http://www.bose.res.in/>

A sample of his contributions are in areas such as :

- Observation of asymmetric scattering in Fe and its dilute alloys
- Magnetoresistance in canonical spin glasses (widely referred in most books on the subject)
- Resistivity minima in several bulk crystalline and amorphous systems interpreted in terms of quantum interference effects
- Compositional phase transition in Fe-Ni-Cr alloys (hotly pursued topic in India and abroad)
- Co-existence of antiferromagnetism and spin-glass phase in CuMn alloys
- Magneto-transport in Giant/Colossal magnetoresistive thin films
- Anomalous Hall effect in nanomagnetic systems

One of his current researches has been highlighted on Page-2.

Prof. Majumdar graduated from Kolkata's prestigious Presidency College and completed his Masters at the Science College in the same city in 1964. He then proceeded to Carnegie-Mellon University in the US and obtained his Ph.D. in 1971. In 1972, he returned to India and joined the faculty at Indian Institute of Technology, Kanpur. Then followed his long innings at IITK for 34 years till his retirement in 2006. Subsequently he joined the S. N. Bose National Centre for Basic Sciences as a Research Professor and has been an active member ever since. It was during his time at Kanpur that he built up the Low Temperature Laboratory. It was one of the laboratories in IITK whose doors we never found locked, even on Sunday afternoons. His students are now in positions of respect in leading institutions in India and abroad. Their careers reflect the care with which he built up his group. For those of us who came in contact with him both as a scientist and as a friend, the experience is one to be cherished. *Abhijit Mookerjee, Dean (Faculty)*

### The Shyama Prasad Mukherjee fellowship for our student

Rudranil Basu, a post-BSc student in our Centre has been awarded the prestigious Shyama Prasad Mukherjee fellowship by the CSIR this year for carrying out PhD. He



had his undergraduate studies in Vivekananda College in the city. He has been a Post-BSc student in our Centre since 2006 and completed the Master's degree in this course in 2008. Currently he is pursuing his PhD work here in our Centre on: "Aspects of Non-Perturbative Quantization of Gravity as Gauge Theory" under the guidance of Dr Samir Kumar Paul. He has already communicated a couple of research papers under the title: (1) 2+1 Quantum Gravity with Barbero-Immirzi like parameter on Toric Spatial Foliation, Rudranil Basu and Samir K Paul arXiv:0909.4238 gr-qc.(2) Entropy of Isolated Horizons revisited, Rudranil Basu, Romesh K Kaul and Parthasarathi Majumdar arXiv: 0907.0846v2 gr-qc





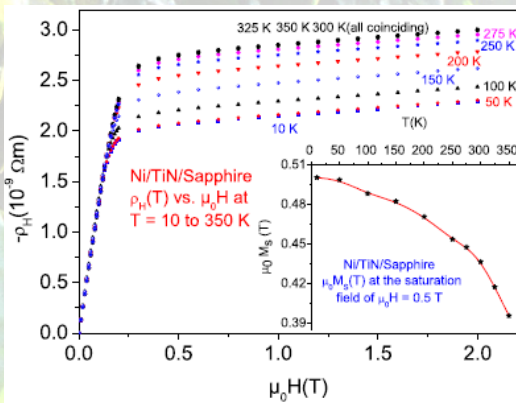
## Retirement of Prof. Nilakantha Nayak

**Professor Nilakantha Nayak** retired from the Centre on 31st July. Prof. Nayak's field of expertise is Quantum Optics. He has worked on several areas in this field ranging from cavity-QED, to laser physics and nonlinear optics. He has authored a number of papers and review articles on various aspects of this subject such as on atomic coherent states and spin squeezing, dissipative interactions in micromaser dynamics, two- and three-level Rydberg atoms interacting with micro-cavities, multiwave mixing, maser and laser theory, and quantum statistical properties of radiation. During the last few years Prof. Nayak focussed attention on the recently developing applications of quantum information protocols implemented by atom-photon interactions in quantum optical devices. His collaborative work in this area has led to several publications, and this direction is one of the objectives of a DST project entitled "Fundamental aspects of quantum theory and quantum information: a multidisciplinary approach", that has been recently awarded with Prof. Nayak as one of the Co-PIs and Dr. Archan S. Majumdar as PI. Prof. Nayak has also served the Centre in various administrative capacities, such as Vigilance Officer, and Acting Administrative Officer.

*Archan S. Majumdar, Dept. of Astrophysics & Cosmology*

### Scaling exponent within the side-jump mechanism of Hall effect size dependence in Ni nanocrystals

High-resolution Hall data in only  $3.5 \mu\text{g}$  of Ni nanocrystals, grown in a planar array on TiN, are reported. We conclude from the exponent,  $n \sim 1.06 \pm 0.01$  in  $R_s \sim \rho^n$ , where  $R_s$  is the extraordinary Hall constant and  $\rho$  is



the Ohmic resistivity, that the side-jump mechanism could still be operative if the nanocrystals are below a certain critical size and the mean free path of the electrons is strongly temperature dependent only in the magnetic layer. Also, the 1000 times larger value of  $R_s$  than those in bulk Ni makes it an ideal candidate

for magnetic sensors. *A. K. Majumdar, Dept. of Material Sciences*

### Monte-Carlo Simulations of Thermal Comptonization Process in a Two Component Accretion Flow Around a Black Hole

For over quarter of a century, the Monte Carlo simulation has been found to be an essential tool to understand the formation of spectrum in compact bodies. Sunyaev & Titarchuk showed that the power-law component of a black hole spectrum is due to inverse Comptonization. In the present paper, we attempt to solve the problem of spectral properties using a thick accretion disk of toroidal geometry as the Compton cloud which is supposed to be produced by the sub-Keplerian inflow. The outer boundary of the thick accretion disk is treated as the inner edge of the Keplerian disk. One positive aspect in treating the CENBOL in this manner is that the distribution of electron density and temperature can be obtained totally analytically. We compute the effects of thermal Comptonization of soft photons emitted from a Keplerian disk around a black hole by the post-shock region of a sub-Keplerian flow. We show that the spectral state transitions of black hole candidates could be explained either by varying the outer boundary of the CENBOL, which also happens to be the inner edge of the Keplerian disk, or by changing the central density of the CENBOL which is governed by the rate of the sub-Keplerian flow. (Contd to Pg. 3)

## Brief Items:

### Post-Doc offers:

Our students got Post-Doc Fellow position in different Laboratories around the world:

- ✚ Venkat Kamlakar at Institut de Physique et Chimie des Matériaux de Strasbourg, France
- ✚ Tapati Sarkar at CRISMAT Laboratory. (ENSICAEN), Caen, France
- ✚ Abhishek Pandey at Ames Laboratories, USA
- ✚ Roby Cherian Max Planck Institute, Stuttgart, Germany
- ✚ Shailesh Kulkarni at HRI Allahabad
- ✚ Manoj Yaadav at Upsala University, Upsala, Sweden

### Visitors and Bose Colloquia:

We had distinguished visitor like Prof. Biman Bagchi from IISc, Bangalore. The Bose Colloquia covering topics of wide interest have been delivered by a number of distinguished speakers from various academic Institutions. The speakers include, to name only a few, Prof. Muttalib, University of Florida, Prof. Abhirup Sarkar from ISI, Kolkata, Prof. S. Raha from Bose Institute, Kolkata etc.

**New students:** The admission to various courses in our Institute is completed. There have been nine students in the Post-BSc integrated Ph. D program in Physical Sciences. Total 24 students joined the Post-MSc PhD program, out of which 9 students have qualified the CSIR-UGC and the remaining ones qualified through the All-India JEST examination.



### *Monte-Carlo Simulations.....(From Pg.2),*

We confirm the conclusions of the previous theoretical studies that the interplay between the intensity of the soft photons emitted by the Keplerian flow and the optical depth and electron temperature of the Comptonizing cloud is responsible for the state transitions in a black hole (Himadri Ghosh, Sandip K. Chakrabarti and Philippe Laurent; Accepted for publication in IJMPD, 2009, arXiv:0905.2252). *Himadri Ghosh, Dept. of Astrophysics & Cosmology*

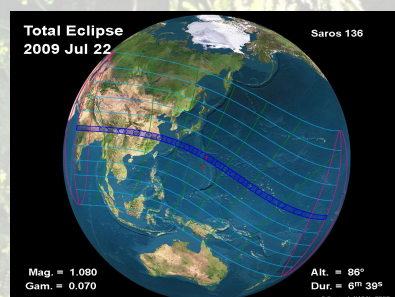
### *Quantum entanglement in a non-commutative system*

We explore the effect of two-dimensional position-space noncommutativity on the bipartite entanglement of continuous-variable systems. We first extend the standard symplectic framework for studying entanglement of Gaussian states of commutative systems to the case of noncommutative systems residing in two dimensions. Using the positive partial transpose criterion for separability of bipartite states, we derive a condition on the separability of a noncommutative system that is dependent on the noncommutative parameter  $\theta$ . We then consider the specific example of a bipartite Gaussian state and show the quantitative reduction in entanglement originating from noncommutative dynamics. We show that such a reduction in entanglement for a noncommutative system arising from the modification of the variances of the phase-space variables (uncertainty relations) is clearly manifested between two particles that are separated by small distances. S. Adhikari, B. Chakraborty, A. S. Majumdar, and S. Vaidya, Phys. Rev. A. 79, 042109 (2009).

*S. Adhikari, Dept. of Theoretical Sciences*

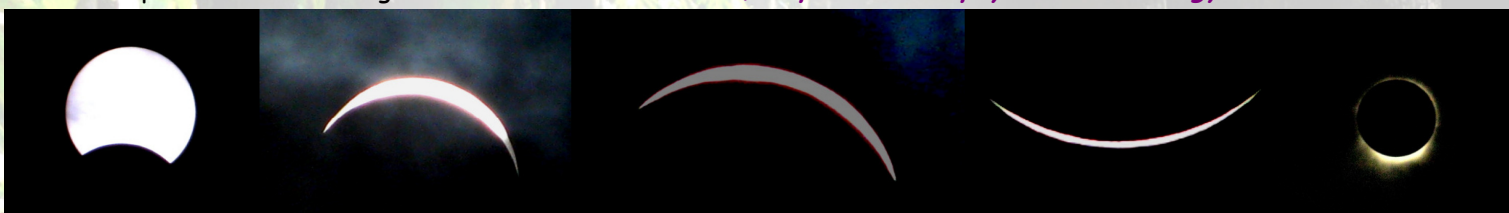
### *The Total Solar Eclipse*

On Wednesday, 2009 July 22, a total solar eclipse was visible from within a narrow corridor that traversed half of Earth shown in the following Figure. The path of the Moon's umbral shadow began in India and crossed through Nepal, Bangladesh, Bhutan, Myanmar and China. After leaving mainland Asia, the path crossed Japan's Ryukyu Islands and curves southeast through the Pacific Ocean where the maximum duration of totality reached 6 min 39 s with the maximum eclipse occurring in the ocean at 02:35:21 UTC about 100 km south of the Bonin Islands, southeast of Japan. A partial eclipse was seen within the much broader path of the Moon's penumbral shadow, which included most of eastern Asia, Indonesia, and the Pacific Ocean.



This solar eclipse was the longest total solar eclipse to occur in the 21st century, and will not be surpassed in duration until 13 June, 2132. At this day of eclipse we were at Khagrabari in Coochbehar ( $26^{\circ}20'17.81''$  N,  $89^{\circ}26'50.17''$  E) of West Bengal. The eclipse started here from early morning 05:28 hrs to 07:40 hrs (IST). The total solar eclipse lasted nearly four minutes — from 6.26 am to 6.30 am — at Coochbehar and the sun was not visible at all. The sky was mostly cloudy while eclipse started. The sky got partly clear at total solar eclipse time. The sun was visible with a faint cloud layer in front of it during third & fourth contact of eclipse. Diamond Ring was almost clearly visible from Coochbehar. I took some pictures which are given below.

*Kinsuk Giri, Dept. of Astrophysics & Cosmology*



### *Report for 2<sup>nd</sup> ICFSMA, 2009*

The conference, second in the series of International Conference on Ferromagnetic Shape Memory Alloys, took place in Spain this year. It was held in the Universidad del Pais Vasco, Basque Country, Bilbao, from July 1 to 3. It may be recalled that the first of the series, the 1<sup>st</sup> ICFSMA 2007 conference was conceived and held here in our Centre, in November 2007. In the conference, apart from major reports on the archetypal  $\text{Ni}_2\text{MnGa}$  and its derivative systems, there were also reports on other alloys with interesting properties. Some demonstrations were also given by different Companies making smart material products. The conference ended with a resolve to hold the next, i.e. the 3<sup>rd</sup>. ICFSMA conference in Dresden in Germany in 2011. In addition, publicly we (the organizing members of the 1<sup>st</sup> conference) were thanked by the present (2009) and future (2011) organizing committee members for starting a successful series.

*P. K. Mukhopadhyay, Dept. of Material Sciences*





## *Rabindra Jayanti Celebration'2009*

This year on 15<sup>th</sup> May we celebrated the Rabindra Jayanti at our Centre. This was also the first time performance in our Centre to commemorate the Rabindra Jayanti. The occasion this year was a special one because the year 2009 is the 100<sup>th</sup> year of publication of Rabindranath Tagore's poetical work 'Gitanjali' for the writing of which the poet received the Nobel Prize in literature. To celebrate the occasion we organized a cultural programme of songs, recitations and dance performances by our staff members, faculty members and students and this way we paid tribute to this literary icon. We started rehearsal a couple of days before the final day at a room in our Guest House. We all were determined to give our best to make the occasion a grand success. On the final day we all thronged at the Canteen to witness our Rabindra Jayanti programme. Canteen Hall was duly decorated with photos of Rabindranath Tagore, flowers and lights. The programme started with a chorus song of Rabindranath followed by several solo performances of songs and recitations. Mouth-organ was played with Rabindra Sangeet tunes by one of our staff members. A dance performance followed by three of our staff members in the tune of Rabindra Sangeet. The guests and visitors were completely captivated with our splendid performance. We were all very much excited with our performances and decided to observe Rabindra Jayanti each year from now at our Centre with enthusiasm and respect to the 'World Poet'.

*Subhodeep Seal, Administration*

### *The Summit*

Made it at last!  
Roping and roping up  
Peering through puzzles  
And now the touch of the  
peak  
Weary warm feet  
Sweet sweating!  
The past is but a mist  
The tears  
The tearing tiring trials  
The failed, fallen face!

Yet trying  
Trying was living  
Living lonely  
Only with the aim  
Grueling in the dark  
For a dot of delight  
Seldom achieved!

Hi! My mother  
Past is not a mist  
Bearing the pains  
Not in vain!

Oh! No, no!  
No more tear  
My dear!

*Sunish Kumar Deb,  
Administration*

### *Arctic tern*

Finland is a country of adventuring, hiking, canoeing, sailing etc. There are about 350 breeding bird species in Finland. Here is an arctic tern, tempting the juvenile one sitting on mast to fish for itself. Mom is bringing the fish close to the juvenile's beak and flying away again and again. Great drama and great dynamics



*Prosenjit Singha Deo, Dept. of  
Chemical, Biological &  
Macromolecular Sciences*

### *Brief News:*

1. The Centre has tried to enhance the capabilities of its administrative employees by encouraging them to attend various training programmes and workshops, namely the Administrative Vigilance held the Institute of Secretarial Training and Management in New Delhi during 24-28 August, 2009.
2. A number of staff members successfully completed 'Pragya' and 'Praveen' examinations of the Department of Officially Language, Govt. of India in May 2009.
3. The Centre has installed 1 no. 500 KVA Silent type Diesel Generator Set (DG Set) for uninterrupted supply of power at the time of load-shading and 1 no. new 630 KVA Dry type Transformer to cope up with the electricity need as the Centre is in infrastructural development stage.

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

■ The opinion expressed here are opinions of individual. The administration of the centre and the editorial board are not responsible for these opinions.