Annual Report

2003-2004

SATYENDRA NATH BOSE NATIONAL

CENTRE FOR BASIC SCIENCES

Block JD, Sector III, Salt Lake, Kolkata 700 098

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ENGLISH – PART A

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Satyendra Nath Bose National Centre for Basic Sciences

Acronyms

ASICTP: The Abdus Salam International Centre for Theoretical Physics, Trieste(Italy)
AICTE: All India Council for Technical Education, New Delhi
BARC: Bhaba Atomic Research Centre, Mumbai
BHU: Benaras Hindu University, Varanasi
BI: Bose Institute, Kolkata
BLTP: Bogoliubov Laboratory of Theoretical Physics, Dubna (Moscow)
CKM Lab: C. K. Majumdar Laboratory, S. N. Bose National Centre for Basic Sciences
CMDAYS: Condensed Matter Days
CPWD : Central Public Works Department, Govt. of India
CSIR: Council for Scientific and Industrial Research, New Delhi
CSP : Centre for Space Physics, Kolkata
CU: Calcutta University, Kolkata
DST: Department of Science and Technology, Govt. of India, New Delhi
DISCOMB: Disorder, Complexity and Biology
GB: Governing Body
HEP Group: High Energy Physics Group
HRI : Harish-Chandra Research Institute, Allahabad
IACS: Indian Association for the Cultivation of Science, Kolkata
ICONSAT: International Conference on Nano Science and Technology
IISc: Indian Institute of Science, Bangalore
IITB: Indian Institute of Technology, Mumbai (Pawai)
IMSc: Institute of Mathematical Sciences, Chennai
INSA: Indian National Science Academy, New Delhi
IOP: Institute of Physics, Bhubaneswar
ISI: Indian Statistical Institute, Kolkata
ISNA: Indian Science News Association
ISRO: Indian Space Research Organisation, Bangalore
IUCAA: Inter-University Centre for Astronomy & Astrophysics, Pune
IUC-DAEF : Inter-University Consortium - Department of Atomic Energy Facilities, Kolkata
IUPAP: International Union of Pure and Applied Physics,
JEST: Joint Entrance Screening Test
JINR: Joint Institute of Nuclear Research, Dubna (Moscow)
JNCASR: Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
JNU: Jawaharlal Nehru University, New Delhi
LCMP: Laboratory for Condensed Matter Physics
LIBSYS: The library software installed at SNB Library
NCBS: National Centre for Biological Sciences, Bangalore
NCRA: National Centre for Radio Astrophysics, Pune
NEERI: National Environmental Engineering Research Institute, Nagpur
NISTADS: National Institute of Science, Technology and Development Studies, New Delhi
NGPE: National Graduation Physics Examination
NPL: National Physical Laboratory, New Delhi
PRL: Physical Research Laboratory, Ahmedabad
RCI: Rehabilitation Centre of India, New Delhi
RRI: Raman Research Institute, Bangalore
SERC: Science and Engineering Research Council
SINP: Saha Institute of Nuclear Physics, Kolkata
SNBNCBS : Satyendra Nath Bose National Centre for Basic Sciences, Kolkata
SOHO: Solar and Heliospheric Observatory
STATPHYS: Statistical Physics
TIFR: Tata Institute of Fundamental Research, Mumbai
TPSC: Theoretical Physics Seminar Circuit
TRACE: Transition Region and Coronal Explorer
UGC: University Grants Commission, New Delhi
VECC: Variable Energy Cyclotron Centre, Kolkata
WBUT: West Bengl University of Technology, Kolkata

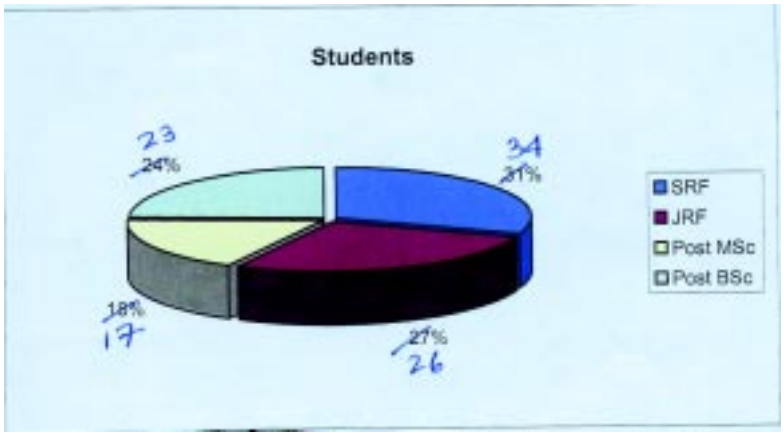
English

P A R T - A

Foreword

It is a matter of gratification to note that the S. N. Bose National Centre is being increasingly recognised as one of the leading institutions of the country in the area of research, training, manpower development and networking of activities. The total number of research students, about 80 now, is almost twenty times of what it was six years ago. Similarly, the number of visitors, conferences and seminars, and research publications in frontier journals - close to about three per faculty per year has also shown marked increase over the years. (See the adjoining figure.) Indeed, the Bose Centre is an unique place where teaching and research have been synchronised into a holistic programme with all round benefits accruing to the academic community. The remarkable improvement in the campus environment through thoughtful horticultural inputs as well as guest house and other infrastructure amenities has indeed added to the congeniality of the working atmosphere.

Amongst the major academic highlights of the Centre mention must be made of the 2003 and 2004 *S. N. Bose Memorial Lectures* and the 2003 *C. K. Majumdar Memorial Lecture*, held during this year's report. The 2003 Bose Memorial Lecture was delivered by Dr. Martin Blume, Editor-in-Chief, the American Physical Society, on *New Science with Synchrotons* on 24 November 2003. Dr. Blume, who has earlier been Professor of Physics, SUNY Stony Brook and Associate Director, Brookhaven National Laboratory, New York brought in his wide experience in narrating the history of development of x-ray sources, culminating in the most modern synchrotron accelerators, operating as light sources. The talk was very well attended by participants coming also from neighbouring institutes. Dr. Blume, in his capacity as Chief Editor of Physical Review Journals, also contributed to an interactive session at the Saha Institute of Nuclear Physics. In addition to the Bose Centre, he visited and lectured at the Tata Institute of Fundamental Reserach, Mumbai and the Indian Academy of Sciences, Bangalore. As it turned out, the 2004 Bose Memorial Lecture was also held during the period of this report. The Speaker was the distinguished probabilist, Prof. S. R. S. Varadhan, Frank J. Gould Professor of Physics at the Courant Institute of the New York University. Prof. Varadhan spoke on the topic *Particle Systems and their Scaling Limits* on 25 February 2004. The subject attracted a large number of mathematics/statistics students and researchers from the Indian Statistical Institute. The third Majumdar Memorial Lecture was delivered on 12 August 2003 by his erstwhile colleague from TIFR, Prof. Sudhanshu Sekhar Jha. Prof. Jha, having retired as Director of TIFR, is now a distinguished Professor at the IIT, Pawai. He spoke on *Superconductivity in Solids: Misconceptions and Realities*. The lecture reviewed the status of the BCS theory against the backdrop of high temperature super-conductivity. All the three distinguished scientists mentioned above, Profs. Blume, Varadhan and Jha, enriched the campus by planting trees, in a ritual that has become common with our Centre, in our effort to contribute to the overall greenary and to immortalize the solemn occasions.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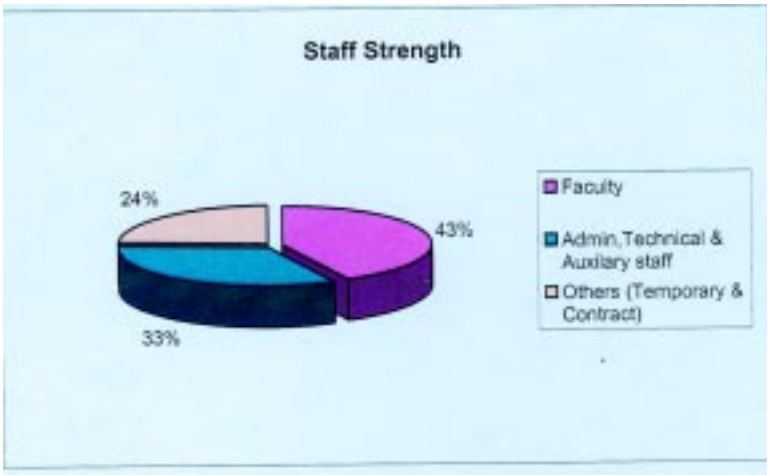
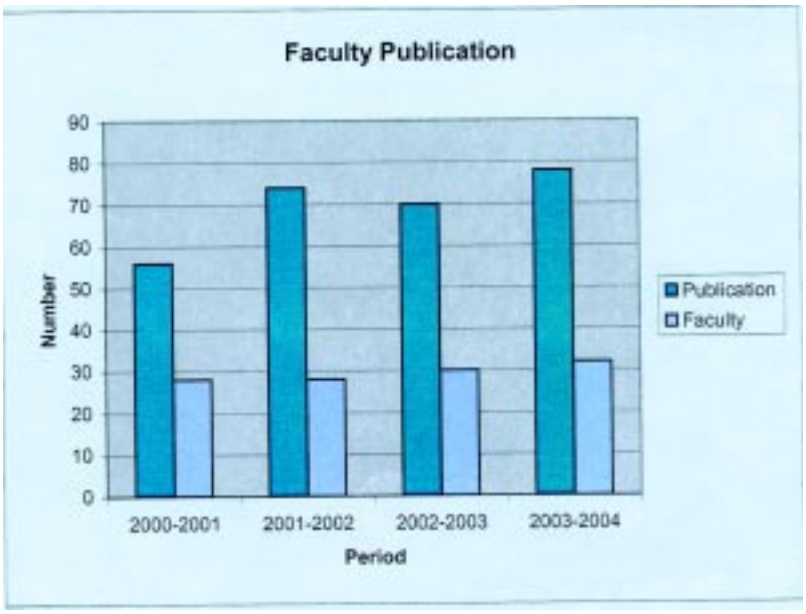
34
31%
18%
17
27%
26
SRF
JRF
Post MSc
Post BSc


Staff Strength
24%
43%
33%
Faculty
Admin,Technical & Auxiliary staff
Others (Temporary & Contract)


Faculty Publication
90
80
70
60
50
40
30
20
10
0
Number
2000-2001
2001-2002
2002-2003
2003-2004
Period
Publication
Faculty

Prof. M. G. K. Menon, Vikram Sarabhai Distinguished Professor of ISRO, who was honoured by the Indian National Science Academy for his "Promotion and Services to Indian Science", chose to give his medal lecture to the academically alive audience of Kolkata. Prof. Menon delivered his talk at our Centre on 24 December 2003 on the topic *Development of Science in India since Independence*, during which he narrated his vast experience in institution-building in various capacities of science administration in the country. As expected, the lecture was very well-attended.

The *Kolkata Kolon* lectures, which were initiated in April 2002, continued in its full vigour. The April 2003 Kolon was presented by Prof. P. T. Manoharan, IIT Chennai on *Does Nitric Oxide react with Cobalamin?* It was followed by Dr. Viyogi, VECC on 2 May 2003 on the topic of *Nuclear Physics at TeV Energies*. The June Kolon was given by Prof. Kankan Bhattacharya, IACS, on *Modern Science in India & Freedom Movement*, Prof. Amitava Raychaudhury spoke on 4 July 2003 on *Nu Physics & New Physics*. Prof. Samir Bhattacharya, IICB delivered the August Kolon lecture on *Why is diabetes an incurable disease yet?* while Prof. Siddhantha Roy, Bose Institute spoke on *Gene Regulatory Circuits: Biology, Chemistry and Physics* on 5 September. The November Kolon was delivered by Dr. A. P. Mitra, NPL on *Geospace Environment and Human Activities*. The December Kolon was given by Prof. Amitava Datta of Jadavpur University on *Particle Physics at the Dawn of the Twenty First Century*. The new year began with the January 2004 Kolon by Dr. Sabyasachi Bhattacharya, TIFR on *Moving Phases in Condensed Matter*. The March 2004 Kolon lecture was given by Dr. M. Siddiqui, Bose Institute on the topic *Demystifying Cancer*.

The winter season of 2003-2004 was witness to the usual flurry of seminar activities. A workshop and a conference on *Electronic and Magnetic Properties of Novel Materials* was organised during 5-14 January 2004. A large number of international scientists from USA, Germany, France and UK as well as leading experts from India participated. A national conference on Physics at the *Interface of Chemistry and Biology* was held on December 8 2003. The conference discussed the emergent interdisciplinary areas at the interface of Physics, Chemistry and Biology and also exchanged ideas and views about the future direction of research at the frontiers of these subjects. A novel workshop on *Biomedical Optics and Related Topics* was organised during 23-25 February 2004. This workshop, which drew participants from different parts of the country, drew special attention to the potential application of this subject to societal problems such as early detection of cancer.

Like previous years we held an *In-house Meeting* during 28-30 January 2004, in order to introspect our own research contributions. All the students, research scholars, post-docs and faculty participated and presented their work.

Our Centre is the nodal agency for running the Theoretical Physics Seminar Circuit (TPSC) of the Department of Science and Technology. In order to ascertain how this programme is doing and take stock of various TPSC issues we held a meeting of the country-wide Conveners during 1-2 March 2004. Almost all the participating institutes such as IOP, Bhubaneswar, IISc, Bangalore, IMSc, Chennai, TIFR, Mumbai, IIT Kanpur, PRL, Ahmedabad, Bharati Dasan University, Trichy, Cochin University, Cochin, Panjab University, Chandigarh, IIT, Guwahati, Viswa Bharati

University, Shantiniketan, Roorkee University, Roorkee, BHU, Varanasi and University of Hyderabad, Gachi Bawli, sent their representatives. Taking advantage of the presence of a large number of physicists in diverse areas we held a one-day symposium on 2 March 2004 on a variety of topics. At the end of the deliberations it was felt that the TPSC activity was thriving and contributing in a positive manner to the overall networking of scientists in the country. It was also recommended that the acronym TPSC should be broadly interpretated to bring within its umbrella strongly overlapping (with physics) subjects like chemistry and biology.

Before concluding, I want to mention once again that we are in the third year of the integrated post-B.Sc. Ph.D. programme and thanks to the generous and active support of the neighbouring institutes, this programme is doing well. I am happy to note that the Paul Foundation of Kolkata gave a cash award of Rs. 50,000/- jointly to Ms. Swati Bhattacharya and Mr. Mrinal Bera of our 2003 batch.

It is a pleasure to thank Ms. Shohini Majumder and Dr. V. K. Thomas for their help in finalising the Annual Report.

S. Dattagupta

Director

Report from Dean, Academic Programme

The post-B.Sc. Integrated Ph.D programme has now consolidated in its third year since inception. Ten students selected from successful candidates in the JEST 2003 and NGPE 2003 examinations joined the programme. Close cooperation between the participating institutions: the Saha Institute of Nuclear Physics, the Indian Association for the Cultivation of Science, the J.C. Bose Institute and the S. N. Bose National Centre, as well as the West Bengal University of Technology has helped to provide one of the most attractive research programmes in the country.

Our post-M.Sc. Ph.D. programme continued with students selected from successful candidates in the JEST 2003 examination. One student each from Bangladesh and Nepal joined the programme. The Centre has proposed in future to select students from foreign countries through the Third World Academy of Sciences, Trieste.

Four research students submitted their Ph.D. theses to the Jadavpur University: Tomy Scaria, Tapas Mitra, Chhanda Basu Chaudhuri and S. G. Manickam. Dr. B. B. Bhattacharya, former Director, Indian School of Mines, Dhanbad joined us as a AICTE, Emeritus Fellow.

As in earlier years, several members of our faculty participated in post graduate teaching in Calcutta University and Presidency College.

Abhijit Mookerjee

Dean, Academic Programme

Group Activities

1. Electronics Structure & Physics of Materials

The group has four theoreticians (A. Mookerjee, S. Mukherjee, P. Singha Deo and T. Saha-Dasgupta) and two experimentalists (P. K. Mukhopadhyay and K. Mandal).

The group also has twelve research fellows and three post-docs.

The Group organized an International Conference on Novel Materials in the winter of 2003-04 attended by several scientists from within the country as well as from Europe and the US.

The theoretical group has joint collaboration with Warwick University, UK and through the Indo-US project. Several DST projects are now running either individually or in collaboration with Department of Physics, University of Pune. There is close collaborative research among the members of the group with joint supervision of the research fellows. The main thrust area of research are: Electronic structure and statistical physics of materials with novel properties, mesocopic systems, experimental and theoretical study of magnetism in disordered alloys and of systems in the nano-scale: including clusters.

Abhijit Mookerjee
Group Head

2. High Energy Physics & Mathematical Physics

1. Members were actively engaged in research and various collaborations with colleagues were carried out.
2. Members participated in the various teaching (and orientation) programmes of the Centre.
3. Members were invited at various conferences, both within and outside the country.
4. Colleagues (both from within and outside the country) visited the Group for discussions and future collaborations.
5. Short courses in specialised topics were given by the group members to update the fresh students joining for their Ph.D programmes with the group members.

Rabin Banerjee
Group Head

3. Optics, Mesoscopic Phenomena & Chemical Physics

This group has seven faculty members and about eight students enganged in research work in the following topics of Optics, Quantum Optics and Laser Physics, Mesoscopic Physics and Chemical Physics :

1. Optical and acoustic scattering in bio-medical diagnostics.
2. Nonclassical states such as squeezing out noise in photonic and atomic (spin) systems.
3. Study of one-atom maser (micromaser) dynamics to investigate certain aspects of foundations of quantum mechanics and entanglement. Recently, a one-year programme called Quantum Information

Working Group has been started to initiate collaboration in this subject with researchers from other institutes.

4. Spectroscopic studies of molecular vibrations.
5. Spectroscopic studies of simple phenomenon in liquids, dense gases and ionic systems.
6. Important ultrafast dynamical phenomenon in biomolecular recognition.
7. Nonlinear dynamical processes in chemistry and biology.
8. Deformed electronic states in mesoscopic systems.

Details of individual activities can be found in the respective reports of the group members in the Annual Report.

Nilkantha Nayak
Group Head

4. Soft Condensed Matter, Complex System & Statistical Physics

The Soft Condensed Matter, Complex System & Statistical Physics group has been involved in organizing a number of conferences during last one year. Namely, (i) An international Conference on Statistical Physics : "Complex Networks : Structure, Function and Processes" during 27 June to 1 July 2004. (ii) "Pattern Formation in Non-Equilibrium Systems" during 11-13 July 2004. Both were satellite meetings of STATPHYS 22, held in Bangalore. Besides this, students and faculty members of this group attended important conferences like STATPHYS 22, during 4-9 July, DISCOMB 04 in Benaras during 12-15 July and CMDAYS 2004 in Shillong during 25-27 August. A seminar by Prof. Rahul Roy, ISI Delhi was organized on River Network Models.

Subhrangshu S Manna
Group Head

5. Astrophysics

Astrophysics group has one faculty member (S. K. Chakrabarti) and four Ph.D. students: S. Das, A. Nandi, S. Mandal and S. Samanta. Two students (SD and AN) are in a DST supported project on the emitted radiation from accretion flows around black holes.

The other two students are supported by the institute. The group met regularly to check the progress in each project. It also participated in astrophysics related activities in the nearby Centre for Space Physics, including the Telescope Making Workshop and the meetings on the 'Progress in Astrobiology', 'Astronomy with small telescopes' and 'Gravitational waves'.

Sandip K. Chakrabarti
Group Head

Seminars and Colloquia

The following speakers delivered talks at the various seminars organised at the Centre during 2003-04.

- Singha Deo, Prosenjit, SNBNCBS, Kolkata, *Spontanous Symmetry Breaking in a Quantum System*, 16 April 2003 (Graduate Research Colloquia).
- Dattagupta, S, SNBNCBS, Kolkata, *A Paradigm called Magnetism*, 22 April 2003 (Graduate Research Colloquium).
- Chakrabarti, Sandip K, SNBNCBS, Kolkata, *Advective Disk Paradigm: A New Tool of Black Hole Astrophysics*, 29 April 2003 (Graduate Research Colloquium).
- Malik, R P, SNBNCBS, Kolkata, *Noncommutative Mechanics*, 6 April 2003, (Graduate Research Colloquium)
- Mathur, Manu, SNBNCBS, Kolkata, *SU(N) Coherent States*, 7 April 2003.
- Paul, Samir K, SNBNCBS, Kolkata, *Gauge Theory, Solitons, Instantons and Moduli Space*, 7 April 2003 (Graduate Research Colloquium).
- Dutta Gupta S, University of Hyderabad, Hyderabad, *Nonreciprocity in Sub and Superluminal Pulse Transmission through Stratified Media*, 2 July 2003.
- Dutta, Pulak, Department of Physics & Astronomy, Northwestern University, USA, *Order at Soft-Hard Interfaces*, 15 July 2003.
- Majumdar, Satya, Laboratory de Physique Theorique et Modeles Statistique Universite Paris-Sud, Orsay, *Exact Solution of a Drop-push Model for Percolation*, 16 March 2004.
- Kral, Peter, Department of Chemical Physics, Weizmann Institute of Science, Israel, *Photovoltaic Phenomena in Nanotubes and Tubular Image States*, 22 March 2004.
- Kral, Peter, Department of Chemical Physics, Weizmann Institute of Science, Israel, *Photovoltaic Phenomena in Nanotubes and Tubular Image States*, 24 March 2004.

M. Sanjay Kumar
Seminar Secretary

The Theoretical Physics Seminar Circuit (TPSC)

Persons visiting Kolkata centre under TPSC programme in 2003-04 were as follows :

1. G.I. Menon, IMSc, Chennai, *Self-organized Pattern Formation in Motor-microtubule Mixture,* 19 September 2003.

2. Sibashish Ghosh, IMSc, Chennai, *Obustness of UPB-generated Bound Entagled States,* 29 October 2003.

3. Anirban Roy, IMSc, Chennai, *Probabilistic Cloning and Remote State Preparation*, 5 November 2003.

4. K. Rema, RRI, Bangalore, *Structure of Surfactant-polyelectrolyte Complexes*, 6 November 2003.

5. Rajarshi Ray, TIFR, Mumbai, *Scalar Fields Resonate to form Defects,* 19 November 2003.

6. S. Rajeev, University of Rochester, *Ricci Flow,* 19 December 2003.

7. G.V. Shivashankar, NCBS & RRI, Bangalore, *Tracking Fluctuations in Transcription Initiation within Single Cells*, 23 February 2004.

8. Pankaj Jain, IIT Kanpur, *Is there a Preferred Direction in the Universe?,* 27 February 2004.

9. T. Nakajima, Nihon University, *Anomalies in Non-commutative Gauge Theories,* 17 March 2004.

Additionally following talks were given by the visiting conveners of the various TPSC centres during TPSC Convener's Meeting held at SNBNCBS during 1-2 March 2004.

10. S. P. Tewari, University of Hyderabad, *Bose-Einstein condensates at Tools for Future Research*.

11. G. S. Singh, IIT Roorkee, *Effective-mass Mismatch Induced Effects in Quantum Heterostructures*.

12. M. Daniel, Bharathidasan University Trichy, *Magnetization Reversal in Ferromagnets via Soliton Flip*.

13. V. K. B. Kota, PRL, Ahmedabad, *Regular Structures in Many-particle Systems with Random Interactions*.

14. S. B. Santra, IIT, Guwahati, *Directed Spiral Percolation: Cluster and Hull Properties*.

15. B. Dey, University of Pune, *Precision Ginzburg-Landau Solutions for Ideal Vortex Lattices in an Isotropic Superconductors*.

16. B. Anantanarayan, IISc, Bangalore, *Searching for CP Violation Using Transversely Polarized Beam*.

17. S. Gupta, TIFR, Mumbai, *Solving the Fermion Sign Problem*.

18. Shri Singh, BHU, Varanasi, *Curvature Elasticity in Liquid Crystals*.

l9. S. Sil, Vishwa Bharati, Shantiniketan, *Multidimensional Bipolaron in One, Two and Three Dimensions*

During the above meeting of TPSC conveners, various decisions were taken to make TPSC a more successful and efficient programme. These decisions along with the minutes of the meeting are available at the TPSC web site *http://boson.bose.res.in/tpsc/index.html*. From this year TPSC web based nominations have been started. This will reduce the paperwork associated with the nomination procedure and streamline the TPSC activities in the future. From April 2004, Physics Department of Pondicherry University has been granted the status of a TPSC centre.

Sugato Mukherjee & Manu Mathur
Conveners, TPSC

Visitors at the Centre

Apart from the Seminar, TPSC and Guest Speakers who visited the Centre from time to time last year, the following scientists also came to work at the Centre during 2003-04.

1. Dr. Shalivahan, Assistant Professor, Indian School of Mines, Dhanbad, visited the Centre from 16 August 2004 to work with Prof B. B. Bhattacharya. They held discussion on (i) Magnetotelluric Signal Processing and (ii) Equivalence Problem of Electrical and Electromagnetic Methods of Geophysical Exploration.
2. Dr. L. K. Das, Director (Geophysics), Geological Survey of India, Kolkata, visited Bimalendu B. Bhattacharya (from 16 August 2004). They held discussions on Geophysical Studies over Bakreswar Geothermal Spring.
3. Prof. John V. Corbett, Department of Mathematics, Macquarie University, Sydney, Australia, visited the centre for academic interaction in the field of Quantum Information and Foundations, and for collaborative work with Drs. Dipankar Home, Archan Majumdar and Md. Manirul Ali, during 10-30 December 2003. He gave a talk on 'The Quantum Real Numbers : Quantum Geometry and Quantum Puzzles".

The Committees

Governing Body

The composition of the Governing Body of the Centre during the year 2003-2004 was as follows :

1. Professor V. S. Ramamurthy — *Chairman*
   Secretary
   Department of Science & Technology
   Government of India
   New Delhi

2. Professor P. K. Kaw — *Member*
   Director
   Institute of Plasma Research
   Gandhinagar

3. Professor N. Kumar — *Member*
   Director
   Raman Research Institute
   Bangalore

4. Professor G. K. Mehta — *Member*
   Vice Chancellor
   Allahabad University
   Allahabad

5. Joint Secretary & Financial Adviser — *Member*
   Department of Science & Technology
   Government of India
   New Delhi

6. Chief Secretary — *Member*
   Government of West Bengal
   Kolkata

7. Professor S. Dattagupta — *Member*
   Director
   S.N. Bose National Centre for Basic Sciences
   Kolkata

Prof. P. K. Kaw, Prof. N. Kumar, and Prof. G. K. Mehta have been nominated as members of the Governing Body for a period of 5 years effective July 2002.

Finance Committee

The following members constituted the Finance Committee during the year :

1. Professor S. Dattagupta — *Chairman*
   Director, SNBNCBS, Kolkata
2. Professor A. K. Ray Chaudhuri — *Member*
   Indian Institute of Science
   Bangalore
3. Professor R. Ramachandran — *Member*
   Former Director, Institute of Mathematical Sciences
   Chennai
4. Joint Secretary & Financial Adviser or his Nominee — *Member*
   DST, New Delhi
5. Administrative Officer — *Member-Secretary*
   SNBNCBS, Kolkata

Professor A. K. Ray Chaudhuri and Professor R. Ramachandran have been nominated as Members of Finance Committee for a period of 5 years starting from June 2000.

Building Committee

The members of the Committee for the year 2003-2004 are :

1. Professor S. Dattagupta — *Chairman*
   Director, SNBNCBS, Kolkata
2. Professor Bikash S. Sinha — *Member*
   Director, Saha Institute of Nuclear Physics
   & Director, Variable Energy Cyclotron Centre, Kolkata
3. Prof. H. S. Mani — *Member*
   Visiting Professor, IMSc.,Chennai &
   Ex-Director, HRI, Allahabad
5. Mr. Pratap Singh — *Member*
   Chief Engineer (EZ-1),CPWD
6. Shri Ranadhir Dey — *Member*
   Project Manager, (SO/SG), VECC, Kolkata

Academic Programme Advisory Committee

During the year 2003-2004, the Academic Programme Advisory Committee of the Centre consisted of the following members:

1. Professor G. S. Agarwal — *Chairman*
   Director, PRL
   Ahmedabad

2. Professor K. B. Sinha — *Member*
   Director, ISI
   Kolkata

3. Professor R. Nityananda — *Member*
   Director, NCRA
   Pune

4. Professor N. Sathyamurthy — *Member*
   Chemistry Department, IIT
   Kanpur

5. Professor A. K. Sood — *Member*
   Divisional Chairman, Physical Sciences
   IISc., Bangalore

6. Professor S. Dattagupta — *Member*
   Director, SNBNCBS
   Kolkata

7. Professor A. Mookerjee — *Member*
   Dean (Academic Programme)
   SNBNCBS, Kolkata

8. Dr. R. Banerjee — *Member*
   SNBNCBS, Kolkata

9. Dr. S. S. Manna — *Member*
   SNBNCBS, Kolkata

10. Dr. N. Nayak — *Member*
    SNBNCBS, Kolkata

The APAC constituted by the GB has come into vogue from June 2001.

The Staff and the Students

The Faculty

Name	Designation	Ph. D. from	Year	Area of Research
Sushanta Dattagupta	*Professor & Director*	Brookhaven National Laboratory / St. John's University, New York	1973	Structure and Dynamics of Condensed Matter Physics
Abhijit Mookerjee	*Sr. Professor & Dean*	University of Cambridge	1973	Physics of Materials
Sandip K. Chakrabarti	*Associate Professor*	University of Chicago	1985	Astrophysics
Subodh Kumar Sharma	*Associate Professor*	SINP, Kolkata *(Universiy of Calcutta)*	1977	Light Scattering
Nilakantha Nayak	*Associate Professor*	IIT, Kharagpur	1978	Quantum Optics and Laser Physics
Rabin Banerjee	*Associate Professor*	SINP, Kolkata *(University of Calcutta)*	1988	Quantum Field Theory
Anita Mehta	*Associate Professor*	University of Oxford	1986	Soft Condensed Matter and Complex Systems
Subhrangshu Sekhar Manna	*Associate Professor*	SINP, Kolkata *(University of Calcutta)*	1987	Statistical Mechanics
Debashis Gangopadhyay	*Reader*	SINP, Kolkata *(Jadavpur University)*	1988	Quantum Field Theory
Srilekha Banerjee	*Reader*	University of Calcutta	1982	Soft Condensed Matter
Samir Kumar Pal	*Reader*	IOP, Bhubaneswar *(Utkal University)*	1989	Mathematical Physics
P. Singha Deo	*Reader*	IOP, Bhubaneswar *(Utkal University)*	1996	Mesoscopic Systems
M. Sanjay Kumar	*Reader*	University of Hyderabad	1989	Quantum Optics
Manu Mathur	*Reader*	IMSc., Chennai *(University of Madras)*	1993	Quantum Field Theory & QCD
Rudra Prakash Malik	Reader	IOP, Bhubaneswar *(Utkal University)*	1989	Quantum Field Theory
Surajit Sengupta	Reader	IISc, Bangalore	1992	Theoretical Condensed Matter Physics

Name	Designation	Ph. D. from	Year	Area of Research
Sugata Mukherjee	Reader	Frei Universitat, Berlin	1985	Physics of Materials
Amitabha Lahiri	Reader	Syracuse University	1991	Quantum Field Theory
Ranjan Chaudhury	Reader *(w.e.f. 1.1.04)*	TIFR, Mumbai *(University of Mumbai)*	1988	Condensed Matter Theory
Pratip K. Mukhopadhyay	Reader *(w.e.f. 1.1.04)*	IISc, Bangalore	1989	Experimental Condensed Matter Physics
Gautam Gangopadhyay	Reader *(w.e.f. 1.1.04)*	IACS, Kolkata *(Jadavpur University)*	1993	Chemical Physics
Biswajit Chakraborty	Reader *(w.e.f. 1.1.04)*	IMSc, Chennai *(University of Madras)*	1993	Quantum Field Theory
Archan S. Majumdar	Reader *(w.e.f. 1.1.04)*	University of Delhi	1994	Foundations of Quantum Theory and Cosmology
Jaydeb Chakrabarti	Reader *(w.e.f. 1.1.04)*	IISc, Bangalore	1995	Soft Condensed Matter and Complex Systems
Partha Guha	Faculty Fellow	University of Oxford	1996	Mathematics
Anilesh Mohari	Faculty Fellow	ISI, Delhi	1992	Mathematics
Kalyan Mandal	Faculty Fellow	IIT, Kharagpur	1994	Experimental Condensed Matter
Tanusri Saha Dasgupta	Faculty Fellow	SNBNCBS, Kolkata *University of Calcutta*	1995	Physics of Materials
Ranjit Biswas	Faculty Fellow	IISc, Bangalore	1998	Physical Chemistry/ Chemical Physics
Samir K. Pal	Faculty Fellow *(w.e.f. 29.9.03)*	Jadavpur University Kolkata	2000	Biophysics and Spectroscopy
P. A. Sreeram	Computer Scientist	IOP, Bhubaneswar	1999	Quantum Many Body Theory

Academic Programme Coordinator

Sukumar Mallick *(w.e.f. 27.10.03)**

** given the additional responsibility of Administrative Officer with effect from 29 March 2004*

Senior Scientists

Binayak Dutta-Ray, Visiting Scientist
H. S. Mani *(left : May 2003)*
K. Srinivasan, Visiting Scientist *(joined : September 2003)*
B. B. Bhattacharya, Emeritus Professor *(joined : January 2004)*

Research Associates

Manideepa Mitra	*Condensed Matter Physics*
Sumita Datta	*Statistical Mechanics*
Uday Kumar	*Expt. Cond. Matter Physics*
Parthasarathi Joarder	*Astrophysical Magnetohydrodynamics(joined : November 2003)*

Library

V. K. Thomas - *Librarian*
Ruma Majumdar, *Technical Assistant (joined : April 2003)*
Amitabha Bhattacharya, *Trainee (joined : May 2003)*

Computer Centre-in-Charge

P. A. Sreeram, *Computer Scientist*

Administrative, Technical and Auxiliary Staff

Rina Das	*Scientific Officer D (In-charge, Braille Project)*
Dulal Chandra Banerjee	*Officer on Special Duty/Acting Administrative Officer (left: February 2004)*
Apurba Kanti Sarkar	*Accounts Officer*
Sunish Kumar Deb	*Section Officer*
Shohini Majumder	*Administrative Assistant (Communications)*
Dipti Prakash Banerjee	*Office Superintendent*
Sukanta Mukherjee	*Assistant (General)*
Tapan Kumar Sen	*Assistant*
Sanad Kumar Shukla	*Assistant*

Sirsendu Ghosh	*Senior Stenographer*
Santosh Kumar Singh	*Stenographer*
Jaydeep Kar	*Upper Division Clerk*
Prasenjit Talukdar	*Upper Division Clerk*
Gopal Chandra Ghosh	*In-charge of General Amenities*
Shiba Prasad Nayak	*Pump Operator*
Aditya Pal Choudhury	*Project Assistant*
Sushanta Kumar Biswas	*Driver*
Bijoy Kumar Pramanik	*Guest House Attendant*
Arun Kumar Bhattacharya	*Library Stack Attendant*
Bhupati Naskar	*Library Stack Attendant*
Pradip Kumar Bose	*Tradesman 'A'*
Partha Chakraborty	*Attendant*
Partha Mitra	*Attendant*
Ratan Acharya	*Attendant*
Swapan Ghosh	*Attendant*

Engineering

B. K. Bhattacharyya	*Engineer*
Shibaji Das	*Jr. Engineer (Civil)*
Bibhas Kumar Shikdar	*Jr. Enginner (Electrical) (joined: November 2003)*

Personnel with Temporary Status

Sudhanshu Chakraborty, *Attendant* (Accounts / Administration)
Biman Roy, *Attendant* (Despatch Section)
Sukamal Das, *Attendant* (Maintenance)
Dulal Chatterjee, *Attendant* (Maintenance)
Somnath Roy, *Attendant* (Accounts/Administration)
Nimai Naskar, *Gardener*
Biswanath Das, *Gardener*
Rabi Orao, *Gardener*
Hiralal Das, *Cleaner*
Ramchandra Das, *Cleaner*
Motilal Das, *Cleaner*
Prakash Das, *Cleaner*
Kartick Das, *Cleaner*

Students

Senior Research Fellows

Sivakumar G. Manickam[#]	*Astrophysics (left : September 2003)*
Tomy Scaria	*Quantum Field Theory (left : April 2003)*
Anuj Nandi[#]	*Astrophysics*
Dipankar Rana**	*Chemical Physics*
Durga Paudyal	*Condensed Matter Physics*
Kamal Krishna Saha	*Condensed Matter Physics*
Rumani Karmakar	*Statistical Physics*
Santabrata Das[#]	*Astrophysics*
Sumana Banerjee	*Chemical Physics*
Swarnali Bandopadhyay	*Mesoscopic System*
Abhishek Choudhuri	*Condensed Matter Physics*
Ain-Ul Huda	*Condensed Matter Physics*
Manirul Md. Ali	*Foundations of Quantum Mechanics*
Sujata Paul	*Statistical Mechanics/Chemical Physics (left : May 2004)*
Suvankar Chakraborty	*Condensed Matter Physics*
Mukul Kabir*	*Condensed Matter Physics*
Monodeep Chakrabarti*	*Condensed Matter Physics*
Aftab Alam	*Condensed Matter Theory*
Ankush Sengupta	*Soft Condensed Matter*
Debashis Chaudhuri	*Condensed Matter Physics*
Kuldeep Kumar	*High Energy Physics*
Soumen Mondal	*Astrophysics*
Atish Dipankar Chakraborty***	*Condensed Matter Physics*
Ram Narayan Deb***	*Condensed Matter Physics*

 # working in projects under Dr. Sandip Chakraborty
** working in the Warwick Project under Prof. Abhijit Mookerjee*
*** working as External Student under Dr. G. Gangopadhyay since October 2000*
**** working as External Student under Prof. Abhijit Mookerjee*

Junior Research Fellows

Biplab Ghosh

Jayee Bhattacharya

Jayeeta Lahiri* (*left : July 2003)*

Malay Bandopadhyay

Nupur Mukherjee

Subarna Mitra

Sudeshna Samanta

Suman Sinha

Swati Routh *(left : April 2003)*

Swayambhoo Mitra

Abhishek Pandey

Debabrata Dutta

Manas Kumar Roy

Mrinal Kanti Bera

Mutta Venkata Kamalakar

Navin Chandra

Shashank Shalgar

Sunandan Gangopadhyay

Swati Bhattacharya

** Working in a project of Dr. K. Mandal*

Post-M. Sc. Students (Batch: 2003)

Anjan Kumar Nandi

Arindam Ghosh Hazra

Badiur Rahman

Dipanjan Chakraborty

Kunal Bhattacharya

Manoj Kumar Yadav

Manoranjan Ghosh

Rupa Sarkar *(joined: 12 February 2004)*

Sanjay Saha

Sourav Samanta

Tuhin Pradhan *(joined : 11 February 2004)*

Post-B. Sc. Integrated Ph. D. Students (2nd Batch: 2002)

Ashis Bakshi

Chandrasekhar Chatterjee

Saikat Chatterjee

Santosh Roy

Soma Das

Tapati Sarkar

Post-B. Sc. Integrated Ph. D. Students (3rd Batch: 2003)

Arnab Saha

Arya Paul

Ayan Paul

Bipul Das

Karabi Biswas

Sagar Chakraborty

Saptarshi Mitra

Subrata Sarkar

Subhrojyoti Bhowmick

Facilities

Computer Centre

The Computer Centre acquired a 4 slave node +1 master node rack mounted diskless Beowulf Cluster which was configured and made operational in-house. Each node is a dual Xeon 2.4 GHz processor, with 2 GB RAM. Four more slave nodes of the same configuration were acquired through a DST project of Dr. Surajit Sengupta. The setup used in this Beowulf Cluster is unique in India (this also happens to be the second diskless Beowulf cluster in India). One Intel dual Xeon based workshop was procured. The LAN in the Centre is being expanded and new PCs are in the pocess of being procured. Overall, the computer centre is expected to increase it's computing power by a large amount within the next few years.

Surajit Sengupta & P. A. Sreeram
Computer Centre-in-Charge

Library

- The SNB Library collection comprises of documents in the field of Basic Sciences especially Physics, Mathematics, Chemistry, Electronics, Biology, Computer Science, History of Science etc. The Library added 1,400 books (spending about 41.50 lakhs) into its stock during the year under report. It subscribed to 52 scientific journals (besides three online archives), 12 magazines and 8 newspapers, amounting to Rs. 54 laks. On top of that, 13 journals are received free. Out of the 52 scientific journals, 43 had online accessibility also.
- The Library makes provision for general reading too. Books in Social Sciences and Humanities (in English, Hindi and Bengali), and some magazines and newspapers are purchased for this purpose.
- The Library provides for photocopying of library materials to supplement the lending and reference service. Besides, the Library extended services like spiral binding, lamination and scanning.
- The computerization of the Library has been completed with the automation of lending services. It works on LIBSYS 4 (on Linux platform).
- A colour printer has been added to the Library which is made available to all the Members of the Library.
- Some more materials have been added to the S. N. Bose Archive.
- Binding of journals is almost completed.
- The Library maintains inter-library collaboration with SINP Library and ISI Library, and is an institutional member of British Council Library.

- The Library is open 6 days a week. The Library hours are:

  Monday- Friday: 8.00 am to 8.00 pm

  Saturday: 9.00 am to 5.30 pm

V. K. Thomas
Librarian

Laboratory for Condensed Matter Physics

During the year measurements on AC linear and non linear magnetic susceptibility were carried out on magnetic (bulk and nano particles) and superconducting materials. These properties were also measured with and without applied DC magnetic fields. Finally sound velocity and attenuation studies on the alloys were also studied.

An Egyptian research associate on INSA JRD Tata overseas fellowship joined in the lab from February. For his work he measured sound velocity and attenuation of a pure Al system and showed how would the internal defect density relax as a function of isothermal annealing. Also he measured the concentration dependence of defects in Al_xMg_{1-x} systems through sound velocity and attenuation and their correlation with XRD and positron annihilation life time measurements.

Finally measurements on nano particles were carried out with two groups – one at IUC, DAEF, Calcutta centre and the other at IIT/KGP.

Pratip Kr. Mukhopadhyay
In-Charge, Laboratory of Condensed Matter Physics

C. K. Majumdar Laboratory

During the financial year, April 2003-March 2004, C. K. Majumdar Laboratory was actively involved in teaching as well as in research activities. It is a great pleaure to mention that the third batch of students of Post-B.Sc. Integrated Ph.D. Programme has successfully completed their experimental classes in CKM Laboratory.

We have strenghthened our optics section by purchasing a vibration isolation table, He-Ne laser, power-meter, microscope, spectrometer and other optical items. We have included some spectroscopy experiments in the programme. Joining of three new academic members, Prof. K. Srinivasan, Dr. R. Biswas and Dr. S. K. Pal has improved the teaching in the experimental classes. Prof. S. Sen, Prof. B. Bal and Prof. S. Sarkar from Saha Institute of Nuclear Physics and Dr. P. K. Mukhopadhyay of SNBNCBS also participated in the teaching programme.

Board of Research in Nuclear Science has granted a project to Dr. K. Mandal to start experimental work on Magnetic Barkhausen Noise in CKM Lab. Dr. Mandal is also continuing another project on Nanoferrite funded by Department of Science and Technology. Efforts are going on to start some experimental research work on biophysics.

Kaushik Roy Choudhury (IIT, Bombay), Nilotpal Ghosh (Suri Engineering College) and Siddhartha Mal (IIT, Mumbai) worked in CKM Lab for six weeks under the Summer Programme of the Centre. Suman Sinha and Subarna Mitra are working for their Ph.D. dissertation. Several research papers from this laboratory have been published in international

journals and presented in various conferences.

Kalyan Mondal
In-Charge, C. K. Majumdar Laboratory

Guest House

The Centre has its own modern Guest House and cafeteria located within the premises. Apart from serving regular meals to the staff members of the Centre as well as visitors, the cafeteria also serves as a venue for hosting lunches and high teas on special occasions, seminars, conferences etc. of the Centre. There are 04 fully furnished air-conditioned suites with attached baths kitchenettes, 15 single, 6 double fully air-conditioned furnished rooms and 21 fully furnished non-air-conditioned rooms with attached baths in the Guest House. The Guest House is catered with 24 hrs STD / ISD facilities with attachment conferencing system including continuous attendance by experienced persons manned for the purpose.

Sanad K. Shukla
Guest House In-Charge

Welfare Measures and Language Policy

The Centre is continously making utmost effort to improve its general welfare and security measures, languauge policy and training programmes as per GOI order/ notification published from time to time.

The Centre has constructed a Common Room, Tennis and Badminton Courts and Volleyball Court to promote indoor/outdoor games extensively. About 250 various types of trees have been planted to maintain ecological and environmental balance. A small green house has also been developed for planting of seasonal flowers etc. to cater to the needs of beautification of Centre's lawn. Along the boundary wall 4 feet wide moorum pavement has been provided for security purpose as well as for constitutionals. A car shed for parking Centre's vehicles and a drivers room has also been constructed keeping security considerations in mind.

Periodically the Centre sends employees for various training programmes in the interest of the Centre as well as to improve the work efficiency and career prospects. As per GOI Rajbhasa programme, the Centre sends employees by rotation to attend Hindi classes. The Centre has made a practice of producing bilingual nameplates, rubberstamps and letterheads.

The Centre maintains GOI reservation policy in recruitment and promotion matters.

Personal Profile

I. Faculty

Rabin Banerjee

Publications

(a) In journals

1. R. Banerjee (2003), A note on duality symmetry in non-linear gauge theories, *Phys. Lett B*, 576, 237.
2. R. Banerjee, B. Chakraborty and K. Kumar, (2003), Membrane and noncommutativity, *Nucl. Phys. B.*, 668, 179.
3. Y. Abe, R. Banerjee and I. Tsutsui (2003), Duality symmetry and plane waves in noncommutative electrodynamics, *Phys.Lett. B.*, 573, 248.
4. R. Banerjee (2004), Anomalies in noncommutative gauge theories, Seiberg Witten transformation and Ramond-Ramond couplings, *IJMP A*, 19, 613.
5. R. Banerjee (2004), Gauge theories on sphere and Killing vectors, *Annals of Phys.* (NY), 311, 245.

Collaborative works

With my Japanese colleagues (Y. Abe and I. Tsutsui) I have worked on duality symmetry and plane waves in noncommutative electrodynamics. This work appeared in Phys. Lett. B573 (2003) 248 (hep-th/0306272).

With my Korean colleagues (C. Lee and H. Yang) I have obtained new maps connecting noncommutative gauge theories with their commutative equivalents. This work will be published in Phys. Rev. D (hep-th/0312103). Also, with the same Dr Yang, I obtained some exact maps in such theories that have proved effective in describing various phenomena. This work appeared in hep-th/0404064.

With my colleague from Presidency College (Dr. Pradip Mukherjee, who is also a Visiting Associate of our Centre) and a joint student Mr Anirban Saha, I have worked on the problem of symmetries in string and membranes. This work appeared in Phys. Rev. D70 (2004) 026006 (hep-th/0403065).

With my student Mr Kuldeep Kumar (CSIR fellow) and my colleague from the Centre, Dr Biswajit Chakraborty, I have worked on the issue of noncommutativity in membranes. This work was published in Nucl. Phys. B668 (2003) 179 (hep-th/0306122).

Finally, with the same student (Mr Kuldeep Kumar) I have worked on providing maps for anomalies and currents in noncommutative gauge theories. This has appeared in hep-th/0404110.

Invited talks given

1. *Anomalies in noncommutative gauge theories, Ramond couplings and Seiberg Witten map*, Nihon Univ., Tokyo, May '03; Tokyo Univ., June '03; Seoul Natl. Univ., Seoul, July, '03; Kyushu Univ., Japan, May '03.
2. *Hamiltonian formulation of noncommutative gauge theories*, Ibaraki Univ., Japan, June '03.
3. *Noncommutativity in quantum mechanics and Landau problem*, Hiroshima Univ., May '03.

4. *Gauge independent approach to non-commutativity in open strings*, Yukawa Inst., Kyoto, Japan, May' 03.
5. *Noncommutativity in strings and membranes*, Sungkyunkvan Univ., Korea, August '03.
6. *Duality symmetry in quantum mechanics and field theory*, colloquium at Sungkyunkvan Univ., Korea, September '03.
7. *Duality symmetry in nonlinear electrodynamics*, Sogang Univ., Korea, September '03.
8. *Duality symmetry in ordinary and non-commutative gauge tbeories*, POSTECH (Pohang Inst. of Sc. and Tech.) Korea, October '03.
9. *Maps for currents and energy momentum tensors in noncommutative gauge theories*, KIAS, Korea, December '03.

Research guidance

1. Co-supervisor (along with B. Chakraborty) of Dr. Tomy Scaria who obtained his Ph.D. degree from Jadavpur University, December, '03.
2. Supervising the Ph. D work of Kuldeep Kumar, a CSIR fellow at the Centre.
3. Supervising the Ph. D work of Sunandan Ganguly, a research fellow at the Centre.
4. Co-supervising (along with P. Mukherjee, Presidency College) the Ph. D work of Anirban Saha, a CSIR fellow at Presidency College.

Teaching activities

1. Taught a full one semester course on *Quantum field theory : A modern perspective* at Sungkyunkvan University, Korea, September to December '03.
2. Short course (4 lectures) on *Duality symmetry and plane waves in gauge theories*, Seoul National Univ., Seoul, Korea, November '03.
3. Currently teaching a combined Post B.Sc./Post M.Sc. class at the Centre on *Quantum field theory* (January-May '04).

Other scientific/educational /administrative activities

1. Invited professor at Sungkyunkvan University, Korea (July-December '03) and Seoul National University, Korea (November '03).
2. Visitor at High Energy Physics Research Lab (KEK, Tuskuba, Japan) as a JSPS researcher (April to June '03).
3. Chairman of Scrap Disposal Committee
4. Member of Complaints Committee set up recently.

Srilekha Banerjee

Ongoing projects

Simulation studies on raft formation in multicomponent biomembranes, jointly with Dr. Jayasree Saha, Viswa Bharati, Santiniketan.

Comparative studies on optical properties of normal and diseased tissues using a polydisperse model, jointly with Dr. S. K. Sharma, SNBNCBS, Kolkata.

Conferences/symposia/workshops attended

1. One day meeting on *Physics at the interface of Chemistry and Biology* held at SNBNCBS, 8 December 2003.
2. In-house meeting III held at SNBNCBS, oral presentation on *Domain formation in a*

multicomponent fluid membrane, 27-29 January 2004.

Other scientific and educational activities

1. Taught Post-MSc. (2003-04) batch: *Numerical Analysis and Programming* (PHY 505 -theory and practicals) August-December 2003.
2. Taught Post-B.Sc. 2nd Semester: *Scientific Communication* (HUM 201:Numerical Methods and Programmings -theory and practicals), January-May 2004.
3. Organised a workshop on *Biomedical optics and related topics*, held at SNBNCBS during 23-25 February 2004, as a co-convener.

B. B. Bhattacharya

Joined SNBNCBS on 15.1.2004 as AICTE Emeritus Fellow after superannuating as Director, Indian School of Mines (ISM), Dhanbad and Professor, Department of Applied Geophysics, ISM, Dhanbad on 31 December 2003.

Conferences / workshops / symposia attended

1. Delivered Key Note address in the *International Conference on Technology and Management for Sustainable Exploitation of Mineral and Natural Resources* (TAMSEEM 2004) held during 5-7 February 2004 at Indian Institute of Technology (lIT), Kharagpur. Title: *Challenges and opportunities for educational institutes in sustainable exploitation of natural resources.*

Invited talks given

On Enviroment Day at Visva-Bharati University, Santiniketan. Title: *Reminiscences of a leader of an Indian scientific expedition to Antarctica.*

Ranjit Biswas

Publications

1. Kevin Dahl, Ranjit Biswas, and Mark Maroncelli (2003), The photophysics and dynamics of diphenylbutadiene in alkaline and perfluoro alkane solvents, *Journal of Physical Chemistry B*, 7838, 107.
2. J. A. Ingram, R. S. Moog, N. Ita, Ranjit Biswas and M. Maroncelli, (2003), Solute rotation and solvation dynamics in a room temperature ionic liquid, *Journal of Physical Chemistry B*, 5926, 107.
3. Ranjit Biswas and Samir Kumar Pal, (2004), Caging enzyme function: a-chymotrypsin in reverse Micelle, *Chemical Physics Letters*, 221, 387.

Conferences/workshops/symposia attended

Organised a one day conference at SNBNCBS on 8 December 2003 titled *Physics at the interface of chemistry and biology.*

Research guidance and teaching activities

1. *Research Guidance:* One student (joined February 2004).
2. *Teaching Activities:* Involved in running the Optics Lab (practical) for the 1st and 2nd semester students (August-December 2003 & January-May 2004).
3. Offering an advanced course (sharing with Dr. Jaydeb Chakrabarti) for the Post- M.Sc. students of the Centre.

Other scientific and academic activities

Three projects have been submitted to DST and CSIR. The fourth one is in the writing stage which will be submitted to the DST soon.

Projects submitted to DST in March 2004:

1. *Study of solvation and rotational dynamics in supercritical fluid, binary supercritical mixtures and ionic liquids by using picosecond diode lasers* (Principal Investigator: Dr. Ranjit Biswas)
2. *Study of biomolecular recognition using picosecond – Rejoined time correlated single photon counting* (Principal Investigators : Dr. Ranjit Biswas and Dr. S. K. Pal)
3. *Simulation studies of various dynamical processes in ionic liquid and supercritical fluid* (Principal Investigators : Dr. Ranjit Biswas and Dr. Jaydeb Chakrabarti)

Projects submitted to CSIR in April 2004: *Electron transfer in electrolyte solution* (Principal Investigator: Dr. Ranjit Biswas)

Jaydeb Chakrabarti

Research and development programme

A. Biology inspired physics

The searching of active part of a genome by signalling protein is key to gene expression and its control. The kinetics of the search mechanism, being orders of magnitude faster than simple diffusive process, is still a big mystery to the molecular biologists, despite the fact that a lot of progress has been achieved in understanding the equilibrium binding energy. There have been conjectures that the searching is aided by other mechanisms, like the sliding of the protein along the DNA chain and the transfer of the protein from one part of the chain to another. But the details of these facilitating mechanisms are far from being understood. We are trying to shed light on these mechanisms in the context of a highly simplified model. We calculate the dynamics of a small ball which is bound to one bead with probability p of an overdamped harmonic chain with excluded volume interaction. We focus on the effects of variation and inhomogeneity of p. These calculations yield valuable insight into the search mechanism that can be verified by experiments.

Presently we are incorporating macroscopic association and dissociation of the protein onto DNA in our model . This work is in collaboration with. Prof. Siddhratha Roy of Bose Institute, Calcutta.

B. Equilibrium properties of liquids

The effective pair interaction between particles is the key quantity to understand both the static and the dynamic properties of a complex system. The effective interaction between a pair of particles involves the tracing out of all the degrees of freedom, considered as a background, other than the relevant ones. The depletion potential between big spheres in a sea of tiny hard spheres is one such example which has been worked out in great details. In reality, however, the background particles may be much more complicated and can exhibit nontrivial phase behaviour. One important question to ask is : What is the effect of the phase of the background system on the effective interaction of a system of

interest? This question has drawn relatively little attention so far. We are considering to this end the following problem: A pair of big particles immersed in a background of Lennard Jones particles in a gas phase close to liquid-gas critical point. We are carrying out the tracing of the background degrees of freedom by the Grand Canonical Monte Carlo methods. This work is in collaboration with Prof. H. Loewen, Univ. of Duesseldorf, Germany. The preprint is under preparation.

C. Flow induced potential in nanoparticle assemblies

Nanoparticles show diverse properties that make them important in several areas ranging from chemistry to biology. We show the generation of an electrical potential difference of the order of 5-30 m V when liquids flow over an assembly of metal nanoparticles. The potential difference is found to increase linearly with the flow rate. Further, the potential difference depends on the dipole moment of the flowing fluid suggesting that the scattering of the electrons by Coulomb field of the flowing dipoles is the main mechanism for the generation of the potential in contrast to the electrokinetic effects. A theoretical model is proposed here that incorporates the damped classical motion of the electrons knocked out of the metallic nanopartide surface due to Coulomb scattering by the flowing dipoles with the electrons of the nanoparticle, qualitatively explains the experimental observations.

This work is in collaboration with Prof. T. Pradeep and Mr. C. Subramanian, RSIC and Department of Chemistry, IIT Madras. A paper has been communicated to J. Appl. Phys.

D. Reentrance effect in the lane formation of driven colloids

Recently it has been shown that a strongly interacting colloidal mixture consisting of oppositely driven particles, undergoes a nonequilibrium transition towards lane formation provided the driving strength exceeds a threshold value. We predict here a reentrance effect in lane formation: for fixed high driving force and increasing particle densities, there is first a transition towards lane formation which is followed by another transition back to a state with no lanes. Our result is obtained both by Brownian dynamics computer simulations and by a phenomenological dynamical density functional theory. This work is in collaboration with Prof. H. Loewen, University of Duesseldorf, Germany and J. Dzubi'ella, University of Cambridge, UK. Preprint: arXiv:cond-Matt.0403475 (2004).

Publications

J. Chakrabarti and S. Roy (2004), Simulation of the Kinetics of a sphere attached to a fluctuating polymer: Implications for target search by DNA binding proteins, *Phys. Rev. E*, 69, 021904, also appeared in 1 March 2004 issue of *Virtual Journal of Biological Physics Research.*

Collaborative works

Project I. Flow induced potential in a nanoparticle assembly (with Dr. T. Pradeep, Department of Chemistry, IIT Madras) : The experiments in Dr. Pradeep's lab shows that the flow of a dipolar liquid over a nanoparticle assembly induces a voltage of the order of 10 mV in the direction transverse to the flow. We qualitatively explain the phenomenon by

considering a classical equation of motion of the charges knocked out from the nanoparticle surface with the flowing dipoles of the fluid.

Project II. Effective interaction between two big particles in a LJ bath below the critical point (with Prof. H. Loewen, University of Duesseldorf, Germany) : A LJ fluid below the gas-liquid critical point shows phase-coexistence between a gas and a liquid phase. We consider in a bath of LJ particles a pair of particles much larger than the bath LJ particles. We consider two cases : (1) The bath is close to the gas phase in the bulk phase diagram and the bath particles have LJ interaction with the big particles. The big particles get wetted due to favourable interaction by the bath LJ liquid phase which is metastable in the bulk phase diagram. (2) The bath is close to the liquid phase and the interaction between the big and the bath particles is repulsive where the big particles are dried. In both cases our Grand Canonical Monte Carlo simulations show the presence of long ranged effective interactions. In the first case there is a long range attraction due to the bridging of wetting liquid layers on the two big spheres. In the second case there is a long-ranged attraction due to via depletion mechanism.

Conferences/symposia

1. Participated in Canadian Association for Physics Conference, UPEI, Canada (June 2003).
2. Participated in one day meeting on *Problems in physics, chemistry and biology interface* (December 2003).

Teaching programmes/invited talks

1. Taught a Post-MSc course on *Advanced statistical mechanics*
2. Talk on *Search mechanism of protein over DNA chain* in :
   i) University of Duesseldorf (May 2003)
   ii) FOM-AMOLF, Amsterdam, The Netherlands (May 2003)
   iii) CAP Conference, UPEI, Canada (June 2003)
3. One day meeting on *Problems in physics, chemistry and biology interface* (December 2003)

Research guidance

Navin Chandra jointly with S. Ray of Bose Institute.

Academic visit to Prof. H. Loewen in University of Duesseldorf and Dr. J. Polson, UPEI, Canada

S. K. Chakrabarti

Research Interest

My area of research has been mainly to study astrophysical flows around black holes. On the analytical front, the solutions of advective accretion flows including viscous heating and radiative cooling processes, general relativistic flows, time-dependent solutions with oscillation of shocks have been studied. Spectra have been computed from accretion flows using bremsstrahlung, comptonization and synchrotron processes. On the observational front, tile black hole candidates GRS 1915+105, Cyg X-1, Cyg X-3, SS433, A0620-00, etc. have been observed using Giant Meter Radio Telescope. SS433 has been observed with NASA satellite RXTE. These data have been analyzed. Data analysis of several other black holes has been

made using archieved data. Some work on astrobiology has been carried out mainly to produce complex molecules using grain chemistry.

Publications

i) In journals

1. S. K. Chakrabarti, S. Pal, A. Nandi, B.G. Anandarao, S. Mondal (2003), Photometric evidence of ejection of bullets in the black hole candidate SS433, *Astrophys. J. Lett.*, 595, L45.
2. I. Chattopadhyay, S. Das and S. K. Chakrabarti (2003), Radiatively driven electropositron jets from two component accretion flows, *MNRAS*, 348, 846.
3. S. K. Chakrabarti and S. Das, (2004), Properties of accretion shock waves in viscous flows around black holes, *MNRAS*, 349, 649.
4. S. K. Chakrabarti, K. Acharya, B. Bose, S. Mandal, A. Chatterjee, N. M. Nandi, S. Pal, R. Khan (2003), Monitoring of sudden ionospheric disturbances (SID) from Kolkata, *Ind. J. Phys.*, 77B, 173.
5. K. Acharya, S. Chakrabarti and S. K. Chakrabarti (2004), Formation of simple bio-molecules during collapse of a intersteller cloud - A preliminaty analysis, *Ind. J. Phys.*, 78(B), 7.

(ii) In proceedings

1. S. K. Chakrabarti (2003), Accretion Process on stars and compact objects in *Recent Trends in Astro and Plasma Physics in India*, Eds. S. K. Chakrabarti, S. Das, M. Khan and B. Basu, (Review).
2. S.K. Chakravarti (2003), Plasma astrophysics around black holes in recent trends in *Astro and Plasma Physics in India*, Ed. S. K. Chakrabarti, S. Das, M. Khan and B. Basu, p.146 (Review).
3. A. Nandi and S. K. Chakrabarti (2003), Ejection of inner accretion disk in Microquasars : Magnetized TCAF (MTCAF) Model in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 120.
4. S. Das and S. K. Chakrabarti (2003), Parameter space for accretion flows around black holes: Effects of energy dissipition in *New Views on Microquasars*,. Eds. P. Dourouchaux, Y. Fuchs and J. Rodnguez, p. 120.
5. I. Chattopadhyay and S. K. Chakrabarti (2003), Radiatively driven jets around black holes in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodnguez, p.126.
6. S. K. Chakrabarti (2003), Two component advective flow paradigm in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p.101.
7. S. K. Chakrabarti and S.Mandal, Spectral properties of two temperature advective flows in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 117.
8. A. Nandi and S. K. Chakrabarti, The outflows and jets in microquasars: the TCAF paradigm in *New Views on Microquasars*. Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 105.

9. S. Das and S. Chakrabarti (2003), Behavior of standing shocks around black holes and the outflow rates in *Recent Trends in Astro and Plasma Physics in India*, S.K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.70.
10. I. Chattopadhyay, S. Das, S. MandaI & S. K. Chakrabarti (2003), Behavior of standing shocks around black holes and the outflow rates, in *Recent Trends in Astro and Plasma Physics in India*, S.K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.76.
11. M. M. Samanta, D. Ryu & S. K. Chakrabarti (2003), Consequences of radial shock oscillations in two dimensional advective flows in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.81.
12. A. Nandi & S. K. Chakrabarti (2003), GRS 1915+105: A galactic black hole candidate in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.103.
13. S. Pal & S. K. Chakrabarti (2003), SS433 - A puzzling cosmic gun in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.108.
14. K. Acharyya, S. Chakrabarti & S.K. Chakrabarti (2003), Formation of bio-molecules during star formation in *Recent Trends in Astro and Plasmaphysics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.259.

(iii) Book reviews

1. *The Universe in Gamma Rays* by Volker Schonfelder (Springer Verlag) for Indian Journal of Physics [published in IJP, v. 77B(4), 473-4 (2003)].
2. *Interplanetary Dust* by E. Gruen et al. (Springer Varlag) for Indian Journal of Physics, published in IJP, v. 77B(5), (583-584) (2003)].

Invited seminars and colloquia

1. *Recent developments in advective accretion flows*, a colloquium at Service d' Astrophysique, SACLAY (France) in August 2003.
2. *Advective accretion flows*, a colloquium at SNBNCBS (July 2003).
3. *Advective accretion disks* at Meudon Observatory, Paris (August 2003).
4. *Advective accretion disks* at Starsbourg Observatory, France (September 2003).
5. *Advective accretion disks* at University of Milano, Mirate, Italy (September. 2003).
6. *Mysterious universe* at Malda Auditorium (January 2004)

Invited/contributed talks at conferences and symposia

1. *Role of disk models in identifying astrophysical black holes* at APT1 session of the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003)
2. *Mysterious universe* at the Telescope Making Workshop at Bidhan Nagar Govt. High School (June 2003)
3. *Constituents of the universe* at the District-wise Space Science Symposium, Coochbehar (Feb. 2004).

4. *Space science-The final frontier?* at the Conceference on Modern Science organized by the Institute of Engineers, Kolkata (June 2003).

5. *Warnings through VLF observation of the space weather* at the Conference on Environmental Pollution at the Women's B.Ed College, Chandannagar (March 2004).

6. *Multiwavelength campaign of SS433* at APT1 Session of the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003).

7. *Spectral signature of winds from accretion disks around black hole candidates* at APT5 Session of the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003).

8. *Spectral properties of two component and two temperature accretion flows around black holes* at APT5 Session of the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003).

9. *QPOs from radial and vertical oscillation of shocks in advective accretion flows* at APT4 session of the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003).

10. *Fate of glycene during collapse of interstellar clouds and star formation* at 'Life in the Universe' Conference in Trieste (September 2003).

Teaching programme

1. *Advances in high energy astrophysics*- A full lecture course at SNBNCBS in the Post-MSc. programme, April-July, 2003.

2. Three projects were completed by S. Sinha (*Gravitational waves*), N. Mukherjee (*Gamma ray bursts*) and B. Das (*Large scale structure of the Universe*).

3. A project on *Particle and fluid motion around rotating black holes* was completed by S. Sinha (August-Sept. 2003).

Ph. D. programme

(i) Students who received degree

I. Chattopadhyay received Ph.D. Degree from Jadavpur University.

(ii) Students who submitted theses

S. G. Manickam submitted Thesis on *Quasi-periodic oscillations in the x-ray emission from black hole candidate* to Jadavpur University.

(iii) Students who are being supervised

Anuj Nandi *(DST Project, SNBNCBS)*

Santabrata Das *(DST Project, SNBNCBS)*

Soumen Mandal *(SNBNCBS)*

Sudeshna Samanta *(SNBNCBS)*

Membership of organising committees of conferences

Convenor of *Districtwise space science symposium* held at Ravindra Bhawan, Coochbehar (Feb. 2004).

Projects

(i) Principal Investigator of the projects

1. *Quasi-periodic oscillations of x-rays from black holes* funded by Indian Space Research Organization (ISRO).

2. *Creation of a data bank for Space Astronomy* funded by Indian Space Research Organization (ISRO).

3. *Emitted radiation from two component accretion disks around black holes* funded by

Department of Science and Technology (DST).

(ii) Co-Investigator of projects

1. Synthesis of biomolecules during star formation and their detection in millimeter and microwaves.
2. Structure of proto stars and outflows during collapse of interstellar clouds and their relation to complex organic molecule formation in space ASTROSAT- An Indian multiwavelength astronomy satellite for studies of cosmic source over a wide spectral band.

Awards, appointments

Senior Associate, Abdus Salam International Centre for Theoretical Physics, Trieste.

Chairman of Astrophysical Black Holes session at the Xth Marcel Grossman Meeting in Rio de Janeiro (July 2003).

Chairman of Astrochemistry Session at the Conference on Life in the Universe, September 2003.

News item

Wrote invited article on *Opportunities in astronomy, astrophysics and space science* which was published in Times of India, May 2003.

Biswajit Chakraborty

Research and development programmes

We have carried out studies in various aspects of noncommutativity, starting from its origin through string and membrane end-points (with Rabin Banerjee and Kuldeep Kumar) and also its effect on hall conductivity in a planar noncommutative system (with S. Gangopadhyay and A. Saha (Presidency College).

Publications

1. R. Banerjee, Biswajit Chakraborty and K. Kumar (2003), Membrane and non-commutativity, *Nucl. Phys. B*, 668, 179-206.
2. B. Chakraborty, S. Gangopadhyay and A. Saha, Quantum hall effect on noncommutative plane through Seiberg-Witten map, hep-th/0312292.

Collaborative works

1. The dynamics of open membranes of cylindrical topology, when it is coupled to a background 3-form and the boundary is attached to p-branes is considered. The roles of boundary conditions and constraints in the Nambu-Goto and Polyakov formulations is studied. Noncommutative features of boundary string coordinates, are revealed by algebraic consistency arguments and not by treating boundary conditions as primary constraints, as is usually done. – R. Banerjee, B. Chakraborty and K. Kumar (Nucl. Phys. B668 (2003) 179-206).
2. A nonrelativistic system, coupled to a constant back ground magnetic field, defined on a noncommutative plane is considered. An effective commutative system, upto first order in the noncommutative parameter, by using Seiberg-Witten map is obtained. The Hall conductivity in this equivalent formulation to find that it receives no noncommutative correction in the first

order analysis is then computed. – B. Chakraborty, S. Gangopadhyay and A. Saha (hep-th/0312292).

Teaching programme

1. Taught (jointly with Dr. A. S. Majumdar) the course on *General theory of relativity and cosmology* for the Post-M.Sc. batch 2002-03 from March 2003 to May 2003.
2. Teaching since January '04 (jointly with Dr. A. S. Majumdar) the course on *General theory of relativity & cosmology* for both the Post-B.Sc. batch 2002-04 (4th Semester) and Post-M.Sc. batch 2003-04 (2nd Semester).

Research guidance

1. Supervised (jointly with Dr. R. Banerjee) the Ph.D. thesis of Dr. Tomy Scaria, who defended his thesis on September '03 and has already been awarded a provisional certificate.
2. Supervised the Post-B.Sc. project of Mr. Sunandan Gangopadhyay and since then guiding his Ph.D. work.
3. Supervised the summer project of two students (Mr. S. Bhattacharyya from IIT Bombay and Mr. S. Paul from University of Pune).

Administrative work

Was a member of the Post M.Sc. Teaching Committee.

Ranjan Chaudhury

Publications

1. R. Chaudhury, A. Som, S. Sahoo, I. Mukhopadhyay, J Chakrabarti (2003), Scaling violations in coding DNA, *Europhys. Lett*., 62(2), 271.
2. R. Chaudhury (2003), Dynamical spin susceptibility in the t-J model in the superconducting phase, *Theoretical and Mathematical Physics*, 136(1), 1022.

Conferences/workshops/symposia attended

Attended the *Workshop and Conference on Physics of Novel Materials*, held at SNBNCBS in January 2004.

Research guidance and teaching activities

Research guidance

1. Started guiding Mr. Bibekanand Mallick towards Ph.D., a student at lACS, jointly with Dr. J. Chakrabarti (lACS) on some problems at the interface of theoretical molecular biophysics and statistical mechanics.
2. Started guiding Mr. Sudipta Deb towards Ph.D., a faculty at Chittagong Engineering Colege, Bangladesh and an external student at the Centre, jointly with Prof. A. Mookerjee (SNBNCBS) on problems involving superconductivity of disordered t-J model.

Teaching activities

1. Taught the course on *Superconductivity and magnetism* jointly with Dr. K. Mandal to the Post-M.Sc. students in 2003.
2. Has been teaching the entire course on *Magnetism and Superconductivity* to the combined 2nd year Post-B.Sc. and 1st year post-M.Sc. students from January 2004 onwards.

3. Started giving informal weekly lectures at IACS for the students working on theoretical molecular bio-physics in the group of Dr. J. Chakrabarti.

Talk delivered

Delivered a talk entitled *Dynamics and melting of spins in layered antiferromagnets* in the In-House Meeting held in January 2004.

Other scientific and educational activities

1. Served as the Chairman of one of the Post M.Sc. interview Committees in 2003.
2. Served as the Invigilation-in-Charge of one of the invigilation committees for JEST 2004.

Rina Das

Braille project

1. Project for transcribing Braille books for Honours course of Calcutta University students of different districts funded by West Bengal Book Board, Govt. of West Bengal is going on in full swing.
2. I have completed the pioneering work of manufacturing a fully indigenous Personal Braille printer with the help of a small scale unit. General Shankar Roy Choudhury, PVSM(Retd), MP (Rajya Sabha), gave me support by providing fund from MPLAD.
3. We have sent a proposal for manufacturing Interpoint Brailler to Ministry of Social Justice & Empowerment, Govt. of India.
4. Continuing work with partially blind students for setting up a Low Vision Centre for the medico rehabilitative aspects of people with low vision.
5. Last year I was invited by the Pro-Vice-Chancellor, Jadavpur University, to work actively with them for implementing the U.G.C approved scheme to facilitate Higher Education for Persons with Special Needs (HEPSN). This year also I am working with them on a bigger project – the Centre of Excellence for Special Education.
6. I have started working on the Concept of Integration and Inclusive Education for Disabled Children and have started discussion with the Pro VC, West Bengal University of Technology.
7. Implementing the idea of setting up a Digital Library for Visually Handicapped persons initially at a small scale as a concept proving measure.
8. Continuing the Computerised Braille Training for Faculty members of Jadavpur University and staff members of the Special Education project. This was financially supported by Jadavpur University.

Other scientific and educational activities

1. Took an active part in formulating the course details for the Value-Added Education Programme for the engineering students of Heritage Institute of Technology (HIT), a degree level engineering college under the West Bengal University of Technology (WBUT).
2. Coordinated with several government organisations to organise a state government technical organisation for conducting tests and later awarding certificates to the students.

3. Visited several times to give direct guidance to the teachers and students of HIT for setting up laboratory for Electronics and Instrumentation Engineering Department.
4. Invited as an expert for conducting mock interviews at the Heritage Institute of Technology.
5. Coordinated with the General Manager of Central Tool Room, Government of India, at Bonhoogly for design of head for indigeneous Braille printer.
6. Invited as external expert for selection of candidates to work in the Centre of Excellence in Special Education under the University with Potential for Excellence scheme of the University Grants Commission.
7. Lectured at a number of RCI recognised courses at various blind institutes.
8. Associated with WBUT for their TBI programme.
9. Associated as a member of the project formulation committee for attracting foreign funding such as Japan ODA and UNESCO program at the University level.
10. Associated with the Disaster Management programme in the Centre of Excellence for Mobile Computing and Communication, Jadavpur University.

S. Dattagupta

Teaching

i) Taught a course on *Quantum Mechanics III: Atoms and Molecules* to the Post-B. Sc. integrated Ph. D. students, Monsoon Semester, August-December 2003.

ii) Taught a course on *Statistical Mechanics*, to the Post-B.Sc. integrated Ph. D. students, Spring Semester, January-March 2004 (to be continued to May 2004).

Publications

i) In journals

1. Varsha Banerjee and S. Dattagupta (2003), Dielectric permittivity of a duteron glass, *Phys. Rev. B*, 68, 54202.
2. P. A. Sreeram, Manidipa Mitra and S. Dattagupta (2003), Exact quantum treatment of the Anderson-Hasegawa double- exchange model in the presence of superexchange, *Pramana*, 61, 601.
3. S. Dattagupta (2003), Dissipation, *Current Science*, 85, 961.
4. S. Dattagupta (2004), Generalized spin Boson analysis of C-axis transport in layered superconductors, *Special Issue of Chemical Physics*, 296, 267.

ii) Book

S. Dattagupta and S. Puri (2004), Dissipative Phenomena in Condensed Matter Physics, Springer Verlag , Heidelberg.

Talks given

1. *A Paradigm called Magnetism* in a colloquium at Department of Physics, Indian Institute of Science, Bangalore, 15 April 2003.
2. *A Paradigm called Magnetism* in a colloquium at Department of Physics, North-western University, Evanston, Illinois, 13 May 2003.

3. *Synchrotron-Radiation based Perturbed Angular Correlation (SRPAC) studies - An application to glass transition*, in an Indo-US meeting on Synchrotron Radiation, Argonne National Laboratory, Illinois, 16 May 2003.

4. *Generalized Spin-Boson analysis of C axis transport in layered superconductors*, Max Planck Institute, Dresden, 21 May 2003.

5. *A Paradigm called Magnetism*, in a colloquium at Fachbereich Physik, University of Essen, 28 May 2003.

6. *A Paradigm called Magnetism*, in a colloquium at Technical University, Munich, 7 June 2003.

7. *On Internet-based school education in science* in an Indo-US meeting on Higher Education at NEERI, Nagpur on 17 July 2003.

8. *A Paradigm called Magnetism*, TIFR colloquium, 6 August 2003.

9. *Synchrotron Radiation-based Perturbed Angular Correlation* - at a Seminar in TIFR, Mumbai, 7 August 2003.

10. *On Magnetism* in a colloquium at Poona University, Pune, 8 August 2003.

11. *Dissipation* in a colloquium at IUCAA, Pune, 10 August 2003.

12. Four lectures on *Stochastic Modelling*, in the Indian Academy's Refresher Course on Statistics, Probability and Stochastic Processes, SNBNCBS, 5-21 August 2003.

13. Presidential address on *Dissipation* at the Annual Meeting of the National Academy of Sciences, held at Physical Research Laboratory, Ahmedabad, 10 October 2003.

14. *Dissipation* in a colloquium at the Institute of Theoretical Physics, Beijing, China, 20 October 2003.

15. *Dissipation* in a colloquium at Physics Department, Banaras Hindu University, Varanasi, 5 November 2003.

16. *A Paradigm called Magnetism*, in a colloquium at Physics Department, IIT, Kanpur, 6 November 2003.

17. *Friction* in an evening Horizon lecture of the Physics Society of IIT, Kanpur, 6 November 2003.

18. *S. K. Mitra Memorial Lecture on Dissipation*, organised by the Indian Science News Association, Institute for Radio Physics and Electronics, Kolkata, 10 February 2004.

19. Four "Moderator" Lectures in SERC School on *Statistical Mechanics*, held at TIFR, Mumbai, during 16-21 February 2004.

20. *Dissipation* in a colloquium organised by the Chemistry Division, BARC, Trombay, 19 February 2004.

21. North Bengal University Frontiers in Physics lecture on *Friction*, New Jalpaiguri, 8 March 2004.

22. Lecture on *Dissipation*, in a symposium honouring Prof. R. Rajaraman on his 65th birthday, held at School of Physical Sciences, JNU, New Delhi, 9 March 2004.

23. Presidential lecture on *Nanoscience* at the annual prize distribution ceremony of Belur Vidyamandir, 13 March 2004.

Membership of committees

1. Convener, Sectional Committee in Physics and Member of the Council of the Indian Academy of Sciences, Bangalore.
2. Member, Scrutinee Committee for Election of Fellows and Council of the National Academy of Sciences, Allahabad.
3. Member, CSIR Emeritus Scientist Committee.
4. Member, Research Council of the National Physical Laboratory, Delhi.
5. Member, Council of the Indian Statistical Institute, Kolkata.
6. Member, Governing Body of the Jagadish Bose National Talent Search (JBNSTS).
7. Member, Advisory Committee and Executive Council of the West Bengal University of Technology (WBUT).
8. Member, Scientific Advisory Committee, Bose Institute, Kolkata.
9. Member, Academic Advisory Committee, JNCASR, Bangalore.
10. Chairman, IUPAP National Committee of INSA, New Delhi.
11. Chairman, SRF & RA Committee in Physical Seminar, CSIR.

Visits abroad

1. Member of an Indian delegation to the Indo-US seminar on Synchrotron Radiation, Argonne National Laboratory, 14-16 May 2003.
2. Visited KFA Juelich under an invitation from the "Follow Up" programme of the Alexander von Humboldt Foundation, 26 May-27 June 2003.
3. Represented India at the TWAS Annual Meeting in Beijing, China, 15-19 October 2003.

Academic honours

1. Elected (by the Council of the National Academy of Sciences, Allahabad) as President of Physical Sciences, at the Annual Session held at Physical Research Laboratory, Ahmedabad, October 2003.
2. 6th Sisir Kumar Mitra Memorial Lecture Award of the Indian Science News Association, Kolkata, February 2004.
3. Honorary Professor, JNCASR, Bangalore.

Binayak Dutta Ray

Have completed study on a Toy Model of Fano Resonances with Swarnali Bandopadhyay and Professor H. S. Mani which will be appearing soon in the Americal Journal of Physics.

Working on an analogy in Electronics of Negative Time Delay along with of Dr. Bijoy Bal and two Post-B.Sc. students.

M. Sanjay Kumar, Bijoy Bal and myself have introduced a projects-based course involving a combination of theoretical ideas, design and implementation of a table-top experiment and possible computer simulation centering around some physical phenomena. Out of the six projects undertaken by the students, five have proven to be extremely successful with respect to unleashing initiative, enthusiasm and creativity of the students. It marks an important step in pedagogy at the Centre.

Debashis Gangopadhyay

Publications

R. Bhattacharyya and D. Gangopadhyay (2003), Vacuum expectation value of the Higgs field and Dyon charge quantisation from spacetime dependent Lagrangian, *Mod. Phys. Lett. A*, 18, 2207.

Research guidance and teaching

1. An external candidate, R. Bhattacharyrya awarded Ph.D. degree of Jadavpur University.
2. Co-lecturer in *Mathematical Methods* to Post. B.Sc. students, 2003.
3. *Statistical field theory* course to Post M.Sc. students of 2003-2004.

Gautam Gangopadhyay

Publications

1. S. Banerjee and G. Gangopadhyay (2003), Quantum beat in pump-probe signal of a molecular system, *J. Phys. B*., 36, 2967-2985.
2. S. Paul and G. Gangopadhyay (2003), Power law relaxation kinetics in reversible enzymcatalyzed reaction due to diffusion, *J. Chem. Phys*., 119, 3501-3508.
3. G. Gangopadhyay and B. Dutta Ray (2004), Born-Oppenheimer approximation: A toy version, *Am. J. Phys.*, 72. 389-392.
4. M. R. Nath, S. Sen and G. Gangopadhyay (2003), Dynamics of cascade three level system interacting with the classical and quantized field, *Pramana-J. Phys.*, 61, 1089-1100.

Invited lectures

Talk delivered on *Born-Oppenheimer approximation* in Kalyani University, Kalyani on 4 February 2004.

Research guidance and teaching activities

Sumana Banerjee is working for Ph. D. thesis under my supervision.

Dipankar Rana, a part-time researcher is also working for his Ph. D. thesis.

Partha Guha

Publications

1. P. Guha (2003), Integrable geodesic flows and super polytropic gas equations, *Journal of Geometry and Physics*, 46, 243.
2. P. Guha (2003), Projective and affine connections of S^1 and integrable systems, *Journal of Geometry and Physics*, 46, 231.
3. P. Guha (2003), A note on asymptotic helix and quantum mechanical structure, *International Journal of Mathematics and Mathematical Sciences*, 48, 3031-3039.
4. P. Guha (2003), Geometry of Chen-Lee-Liu type derivative nonlinear Schrodinger flow, *Regular and Chaotic Dynamics*,Vol. 8, 213-224.
5. P. Guha (2003), Moyal deformation of 2D Euler equation and discretization, *Journal of Nonlinear Mathematical Physics*, Vol. 10, Supplement 2, p. 69-79.
6. P. Guha (2004), A note on bidifferential calculi and bihamiltonian system, *Archvum Mathematicum*, 40, No.1, 17-22.
7. P. Guha (2004), Transvectant, integrability and the Born-Infeld equation,

Modern Physics Letters A, Vol. 19, No.l0, 775-782.

8. P. Guha (2004), A remark on transformations of time-dependent Hamiltonians, *Mathematicala and Computer Modelling*, Vo1.39, 505-509.

Teaching

1. *Geometrical Mechanics*, Post-M.Sc. Programme, Fall 2003, S. N. Bose National Centre for Basic Sciences.
2. *Differential Equations*, Spring 2003, University of Colorado at Colorado Springs.
3. *Advanced Linear Algebra*, Spring 2003, University of Colorado at Colorado Springs.

Invited research talks

Motion of Curves: Integrable Structure, Geometric Phases and Applications to Biopolymers, Lecture, January 20, 2003.

Amitabha Lahiri

Articles

1. A. Lahiri (2002), Parallel transport on non-Abelian flux tubes, hep-th/0312112.
2. A. Lahiri surface holonomy and gauge 2-group, hep-th/0402227, to be published in Int. J. Geom. Math. Mod. Phys., special invitational issue on *Geometry of Gauge Fields*.

Mathematical Reviews

1. Review of Gauging by symmetnes by J. A. Neto et al, Math. Rev. MR1971751.
2. Review of *Exotic tensor gauge theories and duality* by P. F. de Medeiros and C. M. Hull, Math Rev. 1969728.

Other scientific and educational activities

Taught an optional course called *Group theory geometry and topology* to Post-B.Sc. and Post-M.Sc. students at the SNBNCBS.

Archan S. Majumdar

Publications

1. Md. Manirul Ali, A. S. Majumdar, D. Home and Shyamal Sengupta (2003), Spin dependent observable effect for free particles using arrival time distribution, *Phys. Rev. A.*, 68, 042105.
2. A. S. Majumdar (2004), Primodal braneworld black holes: Significant enhancement of lifetimes through accretion, *Pramana J. Phys.*, 62, 737.

Invited lectures in conferences/ symposia/ workshops

1. Presented an invited lecture *On certain Observable Implications of Cosmology* at the National Workshop on Astroparticle Physics and Space Science, High Altitude Centre, Bose Institute, Darjeeling, 2003.
2. Presented a course entitled *Decoherence in Qubits*, at SERC School on Quantum Information Theory and Quantum Optics, Physical Research Laboratory, Ahmedabad, 2004.
3. Presented an invited lecture entitled *Cosmology of braneworld black holes* at the Workshop on High Energy Astrophysics HEA04 - at the Indian Institute of Technology, Kharagpur, 2004.

Teaching & research guidance

1. Teaching a course on *General Theory of Relativity and Cosmology* jointly with B. Chakraborty to a combined batch of Post-B.Sc and Post-M.Sc students.
2. Supervised the Summer Projects of Animesh Datta, a student of IIT, Kanpur and Anirban Das, student of lIT, Kharagpur.
3. Supervising the Ph.D. work of Md. Manirul Ali.
4. Supervising the Ph.D. work of Biplab Ghosh jointly with N. Nayak.
5. Supervising the Ph.D. work of Nupur Mukherjee.

Other academic activity

Appointed viva-voce examiner by Jadavpur University at the defence of the Ph.D. thesis by Anirban Roy, student of ISI, Kolkata.

Rudra Prakash Malik

Publications

1. R. P. Malik (2003), Cohomological aspects of gauge theories: Superfield formalism, *Ann. Phys.*, (NY)., 307, 1-40.
2. R. P. Malik (2003), Abelian 2-form gauge theory: Special features, *J. Phys. A: Math Gen.* 36, 5095-5114.
3. R. P. Malik (2003), Hamiltonian and Lagrangian dynamics in a Noncommutative Space, *Mod. Phys. Lett. A*, 18, 2795-2806.
4. R. P. Malik (2004), Superfield approach to (non-) local symmetries for one-form Abelian Gauge Theory, *J. Phys. A: Math Gen.*, 37, 1059-1078.
5. R. P. Malik (2004), Nilpotent symmetries for QED in superfield formalism, *Phys. Lett. B.* 584, 210-219.

Conferences/workshops/symposia attended

1. Attended (i) *School of Mathematics in String and Field Theory* (2-12 June 2003) held at ASICTP; (ii) *Summer School on Particle Physics* (16 June-4 July 2003) held at AS-ICTP during my visit to ASICTP, Trieste, Italy (18 May-20 July 2003).
2. During my visit to JINR, Dubna, Moscow Region, Russia, I attended a *Workshop on Supersymmetries and Quantum Symmetries: SQS '03* (24-29 July 2003) held at BLTP, JINR, Dubna. This workshop was devoted to the 75th birth anniversary of the well-known theoretical physicist late Prof. Victor I. Ogievetsky who was the group leader of the division: Problems in Supersymmetry at BLTP, JINR.
3. Attended *In-House Meeting* of the Centre held at the Centre from 27-29 January 2004.

Invited Lectures delivered

1. *New symmetries for 2-Form Abelian Gauge Theory*, 17 July 2003, HEP group at ASICTP, Trieste, Italy.
2. *Notoph Gauge Theory as Hodge Theory* at BLTP, 24 July 2003 at Dubna, Moscow Region, Russia.
3. *Nilpotent Symmetries for Matter Fields: Superfieid formalism*, 27 January 2004 at In-House Meeting, SNBNCBS.

Teaching activities

I am giving a course on *Mathematical Methods* (PHY 202) to the Post-B.Sc. students (1st year, 2nd Semester) of our Centre from 12.1.2004 to 15.5.2004. The course is suppose to inculcate the "problems solving abilities" in the students. This is why a whole range of problems are given to the students as "Home-assignments" which are evaluated by the teachers as promptly as possible. Two tests are also conducted by the teachers before the final examination.

Administrative activities

Member, Telephone and Transport Committees, SNBNCBS.

Kalyan Mandal

Publications

i) In journals

1. K. Mandal, S. Pan Mandal, M. Vazquez (2003), Annealing effect on the giant magnetoimpedance of amorphous microwire, *Indian Joumal of Physics*, 77A, 599-602.
2. S. Chakraverty, K. Mandal, S. Chatterjee, S. Kumar (2004), The magnetic properties of $NiFe_2O_4$-SiO_2 nanocomposite, *Indian Journal of Physics*, 78A, 177-183.

ii) In conference proceedings

1. K. Mandal, A Yan, O. Gutfleisch, A. Handstein and K.H. Muller (2004), Magnetocaloric effect in iron rich alloys, in *Proceedings of the National Seminar and Conference on Cryogenics and its Frontier Applications*, Ed. S. K. Saha, A. K. Das, p. 110-112.
2. K. Mandal, P. Kerschl, A. Yan, O. Gutflelsch, A. Handstein and K.H. Muller (2004), Phase transition and magnetocaloric effect, in *Proceedings of the Winter School 2004* of IFW Dresden, p. 8.

iii) Sponsored projects and project reports

1. K. Mandal (2003), Synthesis and characterization of ferrite nanoparticles, funded by the Department of Science and Technology, Government of India.
2. K. Mandal (2004), Characterization of magnetic materials by nondestructive magnetic Barkhausen noise measurements, funded by Board of Research in Nuclear Sciences, Government of India.

Conferences/symposia/workshops attended

1. *Winter School - 2004* held at Leibnit Institute of Solid State and Materials Research, Dresdan, Germany, 14-17 January 2004.
2. *National Seminar and Conference on Cryogenics and its Frontier Applications*, held in Bengal Engineering College, Howrah on 25 March 2004.

Invited talks given

1. *Phase transition and magnetocaloric effect* at Leibniz Institute of Solid State and Materials Research, Dresden, 15 January 2004.
2. *Magnetocaloric Effect in Iron Rich Alloys* at Bengal Engineering College, Howrah, 25 March 2004

Other scientific and educational activities

i) Teaching

Teaching experimental classes : I have taken solid-state physics and nuclear/atomic physics experimental classes of Post-B.Sc. Integrated Ph.D. programme.

Theoretical classes: I have taken the theoretical classes of *Magnetism and Superconductivity* course on Post-M.Sc. programme jointly with Dr. Ranjan Choudhury.

ii) Research Guidance :

Ph. D. students:

(i) Suvankar Chakraverty

(ii) Suman Sinha

(iii) Subarna Mitra

Post-M.Sc. Project :

Suman Sinha (Project: Bond length and particle size in nanostructured materials: Experiment and theory, supervised jointly with Sugata Mukherjee)

Post-B.Sc. Integrated Ph.D. Programme:

Saikat Chatterjee (Project: Giant magnetoimpedence effect in amorphous wire)

Summer project:

i) Kaushik Roy Choudhury (Project: Construction of a Helmoltz coil)

ii) Nilotpal Ghosh (Project: Interfacing of vibrating sample magnetometer)

iii) Siddhartha Mal (Project: Determination of real and imaginary part of magnetic susceptibility by LCR meter)

iii) Other academic/administrative work

1. Taken viva-voce examination of Rabindranath Bhowmik of Saha Institute of Nuclear Physics, Salt Lake, Kolkata (a student of Prof. R. Ranganathan) for his Ph.D degree.
2. Served as a referee for Institute of Physics Publishing, England.
3. Member, Purchase Sub-Committee
4. Member, Post-B.Sc. Integrated Ph. D. Committee
5. In-Charge, C. K Majumdar Laboratory

Professional honours/awards/distinction earned

Received *Humboldt Research Fellowship* in 2003 from Alexander von Humboldt Foundation, Germany.

Subhrangshu Sekhar Manna

Publications

1. Arnab Chatterjee, Bikas K Chakrabarti and S. S. Manna (2003), Money in gas-like markets: Gibbs and Pareto Laws, *Physica Scripta* T106, 36-38.
2. S. S. Manna, G. Mukherjee and Parongama Sen (2004), Scale-free networks on a vertical plane, *Phys. Rev. E.*, 69, 017102.
3. M. Balesi and S. S. Manna (2003), Scalefree networks from a Hamiltonian dynamics, *Phys. Rev. E*, 68, 047103.
4. S. S. Manna (2003), Diffusion limited friendship network: A model for six degrees of separation, *Phy. Rev. E.*, 68, 027104.

5. S. S. Manna and A. Kabakcioglu (2003), Scale-free network on Euclidean space optimized by rewiring of links, *J. Phy. A*, 36, L279.
6. Parongama Sen and S. S. Manna (2003), Clustering properties of a generalised critical Euclidean network, *Phys. Rev. E*. 68. 26104.
7. Arnab Chatterjee, Bikas C. Chakrabarti and S. S. Manna (2004), Pareto Law in a kinetic model of market with random saving propensity, *Physica A*, 335, p.155-163.

Invited talks

Talk delivered at Forschungszentrum, Julieh, Germany on *Networks*.

Research guidance and teaching activities

1. Taught a course on *Fractals and Multifractals* to Post-M.Sc. students during April-May 2003.
2. Taught a course on *Monte Carlo Methods* to the students of the orientation programme held in August 2003.
3. Ms. Rumani Karmakar and Mr. Gautam Mukhopadhyay have been working with me for their Ph. D. degrees. Both students have made their registration with Jadavpur University. Their works are going on well. In this year Rumani has submitted two papers and Gautam has published one paper.

Other scientific and educational activities

The In-house Meeting III for the year 2003 was organized during 27-29 January, 2004.

There were around 70 short seminars of 12+3 minutes duration. All academic members starting from junior most research fellows to senior most faculty participated. Six senior scientists from different organizations in Kolkata chaired the sessions, namely Gautam Bhattacharya (SINP), Raj Kumar Moitra (SINP), Parongama Sen (CU), Bilwagopal Ghosh (SINP), Dipankar Home (BI) and Jayanta Kumar Bhattacharjee (IACS). On the last day evening, there was a programme on Baul songs by Shri Bishnu Das Baul.

Manu Mathur

Visits

Visited IMSc. Chennai from 18 March 2004 for two weeks.

Other scientific and educational activities

Went to the World Book Fair 2004 in Delhi from 15-19 February 2004 to select books for the library.

Managed the TPSC activities of the Centre and all other TPSC centres and associate centres as one of the national conveners.

Organised the meeting of all the TPSC conveners on 1-2 March 2004.

Anita Mehta

Research and development programme

1. With Dr. J. M. Luck, Service de Physique Theorique, Saclay and Dr. A. S. Majumdar, S. N. Bose National Centre, I have worked on a cross-disciplinary problem involving black hole formation, using the tools of statistical mechanics.

One paper is currently in the referral process, while another is being written.

2. With Dr. G. C. Barker, Institute of Food Research, Norwich and Dr. J. M. Luck, Service de Physique Theorique, Saclay, I have written a paper on the formation and dynamics of bridges in granular media. Our paper is currently under referral.
3. I have also been working on my monograph on granular materials, which has been commissioned by Cambridge University Press.

Publications

i) In journals

1. Anita Mehta and J. M. Luck (2003), Why shape matters in granular compaction, *J. Phys. A. Math. Gen*., 36, (June 2003), L365-L372.
2. J. M. Luck and Anita Mehta (2003), A column of grains in the jamming limit: Glassy dynamics in the compactation process, *European Journal of Physics B*, 35, 399-411.

(ii) Publications in Books

1. Anita Mehta, 'Science and Society: The perspective of an Indian woman scientist', in *Les Scientifiques et les droits de l'Homme*, eds. Lydie Koch-Miramond and Gerard Toulouse, Editions de la Maison des sciences de l'homme, Paris, 2003.
2. *Refereed Publication:* 'Shaken, not stirred: why gravel packs better than bricks', Anita Mehta and J. M. Luck, in *Unifying Concepts in Granular Media and Glasses* edited by A. Coniglio, A. Fierro, H. J. Herrmann and M. Nicodemi.

Conferences/workshops attended

1. Invited speaker at *International Workshop on Unifying Concepts in Granular Media and Glasses*, 25-28 June, 2003, Villa Orlandi, Anacapri, Capri (Italy).
2. Invited Fellow at *The role of Science in the Information Society*, Geneva, December 2003.
3. Invited speaker at *Women in Science : Is the Glass Ceiling Disappearing ?*, NISTADS, New Delhi, March 2004.

Invited lectures

1. Service de Physique Theorique, CEA Saclay (June 2003).
2. University of Naples, Physics Department (September 2003).
3. Department of Physics, University of Rome, 'La Sapienza' (September 2003).
4. Department of Physics, University of Geneva (December 2003).
5. Department of Informatics, University of Indiana, Bloomington, Indiana (March 2004).

Other scientific and educational activities

1. Member of Organising Committee for Pattern Formation in Nonequilibrium Systems, Calcutta Satellite Meeting to Statphys-22, Bangalore (11-13 July 2004).
2. Member of Local Organising Committee of Condensed Matter Days, Jadavpur University, Calcutta, (August 2003).
3. Visiting Professor at Centre for Complex Systems, University of Rome (September 2003).

4. Visiting Professor at Service de Physique Theorique, CEA Saclay (May-June 2003).
5. Associate of International Centre for Theoretical Physics, Trieste.
6. Member of Board of Editors for Granular Matter (Springer-Verlag, Heidelberg).
7. Member of National Selection Committee for Rhodes Scholarships, New Delhi (January 2004).

Anilesh Mohari

Publications

1. A. Mohari (2004), Ergodicity of Le'vy flows, stochastic processes and their application, available online in *Science Direct* from 18 March, Elsevier Sciences.

It will be published in printed form in July 2004.

Abhijit Mookerjee

Publications

1. K. K. Saha, T. Saha-Dasgupta, A. Mookerjee and I. Dasgupta (2004), Symmetry reduction in the augmented space recursion formalism for random binary alloys, *J. Phys.: Condens. Matter*, 16, 1409.
2. A. Alam and A. Mookerjee (2004), Vibrational properties of phonons in random alloys: An augmented space recursion technique in k-representation, *Phys. Rev. B*, 69, 024205.
3. Biplab Ganguli, K. K. Saha, T. Saha-Dasgupta, A. Mookerjee and A. K. Bhattacharya (2004), Electronic and optical studies of $ZnIn_2Te_4$, *Physica B: Condensed Matter*, 348, 352.
4. M. Chakraborty, A. Mookerjee and A. K. Bhattacharya (2004), Electronic structure and magnetism of nickel thin films, *Int. J. Mod. Phys.* C, 17.
5. M. Kabir, A. Mookerjee and A. K. Bhattacharya (2004), Structure and stability of Cu-clusters: A molecular dynamics study, *Phys. Rev. A*, 69, 043203.
6. Durga Paudyal, Tanusri Saha-Dasgupta and Abhijit Mookerjee (2004), Magnetic properties of X-Pt (X = Fe,Co,Ni) alloy systems, *J. Phys. Condens. Matter*, 16, 2317-2334.
7. Durga Paudyal and Abhijit Mookerjee (2003), Electronic structure and ground state properties of non-magnetic NiPt systems, *Int. J. Mod. Phys. B*, 17, 4447-4456.

Thesis submitted under my supervision

1. Tapas Mitra: submitted to Jadavpur University and oral completed
2. Chhanda Basu Chaudhuri: submitted to Jadavpur University
3. Ain-ul-Huda: submitted to Jadavpur University

Talks given

1. *First principles study of alloy phase diagram and phase stability:* Nepal Physical Society, Kathmandu.
2. *Perturbative renormalization of non-linear, stochastic equations:* Mathematical Society of Bangladesh, Dhaka.
3. *Study of stochastic non-linear equations:* ISNA Workshop on non-linearity and complexity, lIT, Kanpur.

Projects

1. *Study of clusters and their interaction with surfaces:* with Prof. A. K. Bhattacharya, University of Warwick, UK (funded by Warwick University, UK).
2. *Study of electronic structure of metal and alloys*: with Prof. Mesbahuddin Ahmed, University of Dhaka, Bangladesh (funded by the Network Project, ICTP, Trieste)

Other scientific and educational activities

1. Taught *Quantum Mechanics* to M.Sc. Part I students at Presidency College, Kolkata.
2. Edited the *Proceedings of the ISNA conference on Non-linearity* held in Kolkata during January, 2003.

Sugata Mukherjee

Courses given

Condensed Matter Theory for combined Post-B.Sc. and Post-M.Sc. students, November '03 -February '04.

Symposium and workshop attended

1. *Workshop and Conference on Novel Materials*, SNBNCBS (January 2004), poster on *Laser induced melting of semiconductors.*
2. *In-house meeting* of SNBNCBS, talked on *Melting of Silicon clusters.*
3. Invitation to attend *Indo-US Workshop on Nanoscale Materials* at Puri.

Other scientific and educational activities

1. Co-organiser of TPSC Conveners' meeting at SNBNCBS, 1-2 March 2004.
2. Member of the organising committee *Workshop on Physics of Novel Materials* at SNBNCBS, 5-10 January 2004.
3. Co-convener of Theoretical Physics Seminar Circuit (TPSC).
4. Guidance of the Post-M.Sc. project of Suman Sinha, July-August 2003.

Pratip Kumar Mukhopadhyay

Externally funded project

The project grant, on vibrating reed apparatus for use with magnetic alloys granted by Council for Scientific and Industrial Research, New Delhi, India, (2002-05), is continuing.

On going research

1. *Preparation of soft nano ferrites* : With the help of Dr. Pabitra Chakrabarty of Department of Physics, Ashutosh College, Kolkata and Dr. D. Das of IUC-Calcutta Centre, we have prepared some $Mg_x\ Zn_{x-1}OFe_2O_3$ nano ferrite. These were made by them at the IUC, and then the a.c. susceptibilities were measured in our lab. Mössbauer data are taken at IUC. We have already communicated a major part of work. Also two more papers were presented in national and international level conferences. This work is going on.
2. *Non linear a.c. susceptibility with Bi2223 and positron annihilation studies* : Various samples of Bi2223 were made under different preparation conditions. These were characterized by scanning electron microscope. Linear a.c. susceptibilities of them were measured too. Now we are in the process of measuring the non linear

suceptibilities of them. Dr. E. Badawi from El Minia University, Egypt is carrying out PAS studies at his lab. This work is also going on.

3. *Elastic properties of magnetic alloys*: This is a project that is supported partially by the CSIR. Dr. Uday Kumar is working on Nimo and Ni_xPt_{1-x} systems. Although we finished the characterization of the systems long back, due to some problem in annealing schedule and the like, we could not finish this work at time. We are trying to finish this work as soon as possible.

4. *Shape memory alloys*: From January 2004, we are trying to work on NiAlCo alloys with Drs. P. Chaddah and Dr. S. B. Roy. It is yet to start fully- due to various reasons, but it is expected to form a very important part of our work on magnetic alloy system.

5. *Aluminium Magnesium alloys*: With Dr. E. Badawi, we measured sound velocity and attenuation for a lot of A_xMg_{l-x} alloys. This was from February 2004. These are now correlated with PAS and XRD studies and getting communicated soon.

6. *Preparation of nano LCMOs:* With Dr. T Nath of IIT/KGP, we are making nano CMR systems (LCMO) through a novel technique called "Chemical Pyrophoric process". We are getting encouraging results in it. It started in January 2004.

Research guidance

One summer student from lIT, Bombay worked with me from 20 May to 1 July 2003.

Conference presentations

1. Activities at LCMP - oral presentation in the *In-House Meetitng* at SNBNCBS on 28 January 2004

2. Preparation of nanocrystalline nickel-zinc copper ferrite and its characterization by Mössbauer spectroscopy and ac susceptibility - P. K. Chakrabarti, B. K. Nath, P. K. Jal, S. Das, U. Kumar, P. K. Mukhopadhyay and D. Das presented in the *Condensed Matter Days* , 2003 at Jadavpur University, Kolkata from 29-31 August 2003.

3. Mössbauer and ac susceptibility studies on cobalt zinc ferrite nano particles prepared by coprecipitation method - P. K. Chakrabarti, B. K. Nath, Uday Kumar, D. Das and P. K. Mukhopadhyay presented in the *ICONSAT 2003*, Kolkata from 17-20 December 2003.

4. Mössbauer and ac susceptibility studies on $Co_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles - B. K. Nath, P. K. Chakrabarti, T. Roy, S. K. Brahma, U. Kumar, P. K. Mukhopadhyay and D. Das presented in the *DAE Solid State Phsyics Symposium*, Gwalior in December 2003.

Other scientific and educational activities

Teaching Programme

1. From August 2003, looking after the teaching lab for Post B.Sc. students. Accordingly, in August, coordinated the projects for 2nd year students till December 2003 and conducted the exam. From January 2004, with the help of experimental colleagues, we are carrying out the 2nd semester experimental course,

particularly the Solid State Physics portion.

2. Along with Dr. P. Joarder, looking after the project for the Post-B.Sc. students for astronomical observations.
3. Looking after the administrative aspects of the CKM Lab also.
4. As for the expansion of the teaching lab, looking after the setting up of a nano materials laboratory, with AFM based technique and noise spectroscopy as main string experiments. This work started from January 2004.

Other scientific and educational activities

I became a council member of the Indian Physical Society in 2003.

Dr. Emad Badawi from El Minia University, Egypt got an INSA-JRD Tata fellowship to work for five months in a lab of his choice in India. He chose LCMP over others and came here in February 2004.

Nilakantha Nayak

Research interests

Quantum Optics, Laser Physics, Multiwave Mixing, Foundations of Quantum Mechanics and Quantum Entanglements.

Publications

(i) In journals

1. A. Dantan, M. Pinard, V. Josse, N. Nayak and P. R. Berman (2003), Atomic spin squeezing in a Lamda-system, *Phys. Rev. A.*, 67, 045801.
2. Y. V. Rostovtsev, A. B. Matsko, N. Nayak, M. S. Zubairy and M. O. Scully (2003), Improving engine efficiency by extracting laser energy from hot exhaust gas, *Phys. Rev. A.*, 67, 053811.

Ongoing projects

1. *Quantum entanglement* in collaboration with Dr. Archan Majumdar.
2. *Spin squeezing* in collaboration wit Prof. B. Dutta-Ray.

Talks given

1. I gave an invited talk on *Reduction of Quantum Mechanical Noises in Photonic and Atomic Systems* at the National Seminar on Recent Advances in Physics at the Gopalpur-on-Sea organised by the Berhampur University and the Institute of Physics, during 19-20 September 2003.
2. I presented my work on *Spin Squeezing* at the In-house Meeting of the Centre, 27-29 January 2004.

Other scientific and educational activities

Teaching work

1. I gave a course on *Quantum Optics and Mesoscopic Physics* for the second semester, with Dr. P. Singha Deo, to the Post-M. Sc. students (2002-03) of the Centre.
2. I gave a course on *Electromagnetic Theory* for the first semester, jointly with. S. K. Sharma, to Post-M.Sc. students (2003-04) of the Centre.

Research guidance

Mr. Ram Narayan Deb from the Darjeeling College (He was in the Post-M. Sc. batch the Centre for the year 2000-2001) has been working with me for the last year.

Samir K. Pal

Publications

i) In journals

1. S. K. Pal and A. H. Zewail (2004), Dynamics of water in biological recognition, *Chemical Reviews*, 104 , 2099.
2. A. Kamal, T. Xia, S. K. Pal, L. Zhao and A. H. Zewail (2004), Enzyme functionality and solvation of Subtilis in Carlsberg: From hours to femtoseconds, *Chem. Phys. Lett.* 387, 209.
3. R. Biswas, S. K. Pal (2004), Caging enzyme function: α-Chymotrypsin in Reverse Micelle, *Chem. Phys. Lett.*, 387, 221.
4. L. Zhao, S. K. Pal, T. Xia and A. H. Zewail (2004), Dynamics of ordered water in interfacial enzyme recognition: Bovine pancreatic phospholipase A2, *Angew. Chem. Int.* Ed., 43, 59.

(ii) In proceedings

1. S. K. Pal, L. Zhao, T. Xia, and A. H. Zewail, Site and sequence selective ultrafast hydration of DNA, *Proceedings of the National Academy of Sciences* (PNAS, USA) 100 (2003) 13746.
2. S. K. Pal, L. Zhao and A. H. Zewail, Water at DNA surfaces: Ultrafast dynamics in minor groove recognition, *Proceedings of the National Academy of Sciences* (PNAS, USA) 100 (2003) 8113.

Research guidance and teaching

Research guidance

Two Ph. D. students are working under my supervision. There are five summer students working with me in various fields as mentioned below.

(i) Rupa Sarkar, Ph. D. Student, UGC-JRF-Biophysics

(ii) Manoranjan Ghosh, Ph.D. Student, Post M.Sc. SNBNCBS- Biophysics

(iii) Sreeja Kumar, Summer Student, CMS College, Coimbatore- Biophysics

(iv) Parijat Majumder, Summer Student, Calcutta Univ.- Biophysics

(v) Sounik Saha, Summer Student, IIT Kanpur- Biophysics

(vi) Karabi Biswas, Summer Student, PBIR, SNBNCBS- Electronics

(vii) Subrata Sarkar, Summer Student, PBIR, SNBNCBS- Electronics

Teaching

Involved in *Electronics* practical teaching for 1st and 2nd semester PBIR students (courses are PHY 191 & 291).

Conferences and meeting

One of the local organizer and speakers of the *Conference on Biomedical Optics* held at SNBNCBS in February 2004.

Talks

Delivered two talks at IITB and TIFR Bombay on April 2004.

Samir K. Paul

Ongoing projects

1. Samir K. Paul and Siddhartha Sen, The appearance of the resolved singular

hypersurface in the classical phase space of the Lie group SU(n), *Journal of Mathematical Physics* (to appear); hep-th/ 0211159 .

Conference/workshop/symposium attended

1. Participated in the *National Workshop in String Theory* held at IIT, Kanpur during 8-21 December 2003.
2. Reported some works in the *Inhouse Meeting* 2003.

Other scientific and educational activities

Taught *Lie Groups and Lie Algebra* in the Post-M.Sc. classes (Mathematics) in session 2003-2004.

T. Saha Dasgupta

Publications

(i) In journals

1. H. Meskine, T. Saha-Dasgupta and S. Satpathy (2004), Is the self-trapped magnetic polaron energetically stable in the electron doped manganites?, *Phys. Rev. Lett.*, 92, 056401.
2. Durga Paudyal, Tanusri Saha-Dasgupta and Abhijit Mookerjee (2004), Magnetic properties of X-Pt (X = Fe,Co,Ni) alloy systems, *J. Phys.: Condens. Matter*, 16, 2317.
3. Kamal Krishna Saha, T. Saha-Dasgupta, Abhijit Mookerjee and Indra Dasgupta (2004), Symmetry reduction in the augmented space recursion formalism for random binary alloys, *J. Phys.: Condens. Matter*, 16, 1409.
4. I. S. Elfimoy, T. Saha-Dasgupta and M. A. Korotin (2003), Role of c-axis in V_2O_3, from the band-structure point of view, *Phys. Rev. B*, 68, 113105.
5. Roser Valenti, T. Saha-Dasgupta and F. Mila (2003), Ab initio investigation of $VOSeO_3$, a spin gap system with coupled Spin dimers, *Phys. Rev. B*, 68, 024411.
6. Roser Valenti, T. Saha-Dasgupta, Claudius Gros and H. Rosner (2003), Halogen-mediated exchange in the coupled-tetrahedra quantum spin systems $Cu_2Te_2O_5X_2$, *Phys. Rev. B*, 67, 245110.
7. Biplab Ganguli, Kamal Krishna Saha, Tanusri Saha-Dasgupta, Abhijit Mookerjee and A. K. Bhattacharya (2004), Electronic and optical properties of $ZnIn_2Te_4$, *Physica B* 348, 382.

Collaborative works

1. With Prof. Sashi Satpathy, University of Missouri, USA (under DST-NSF project)

   Carried out calculations to explain the different routes to charge ordering and insulating nature of the ground states in Fe-based perovskites, $CaFeO_3$ and $La_{1/3}Sr_{2/3}$ $CaFeO_3$.
2. With Prof. R. Valenti, Institute feur Theoretische Physik, University of Frankfurt/Main, Germany.

   Carried out calculations on low-dimensional nano-tubular spin systems $Na_2V_3O_7$ and orbital fluctuation dominated system, TiOCl.
3. With Prof. O. K. Andersen, Max-Planck Institute, Stuttgart, Germany as a part of on-going collaboration on NMTO

method-based applications, carried out calculations on the prototype Mott-insulator compound V_2O_3 to clarify the role of c-axis pair hopping from one-electron point of view.

Seminars/Invited talks at conferences

1. Invited talk at Naval Research Lab, Washington DC, USA, in March 2004. *Talk: NMTO method and applications.*
2. DST meeting, University of Pondicherry, February 2004. *Talk: Unconventional CMR materials*.
3. In-house meeting, SNBNCBS, January 2004. *Talk: Magnetic Polarons*
4. TPSC talk at JNCASR, Bangalore, December 2003. *Talk: Realistic modeling of complex materials.*
5. Invited talk at *Condensed Matter and Statistical Physics* Seminar, TIFR, Bombay, September 2003. *Talk: Understanding Physics and Chemistry of Complex Materials by N-MTO method.*
6. Invited talk at Conference on *Electronic Structure*, Ringberg, Germany, July 2003. Talk: *Understanding* $V_2 0_3$.

Research Guidance

1 PhD student: Durga Paudyal (jointly with Prof. A. Mookerjee).

Other scientific and educational activities

1. Guest scientist, Max-Planck Institute FKF, Stuttgart, Germany, June-July 2003.
2. Visiting scientist, Ecole Normale Superieure, Paris, France, July 2003.
3. Organised *Workshop on Physics of Novel Materials: Electronic and Magnetic Properties,* 5-10 January 2004 at S. N. Bose National Centre (jointly with Abhijit Mookerjee and Sugata Mukherjee).
4. Organised follow-up *Conference on Physics of Novel Materials: Electronic and Magnetic Properties*, 12-14 January 2004 at S. N. Bose National Centre (jointly with S. D. Mahanti, Michigan State University, USA).

M. Sanjay Kumar

Invited talks given

Gave two lectures on *Decoherence-free Subspaces* in the *SERC School on Quantum Information and Quantum Optics* held at Physical Research Laboratory, Ahmedabad, during 1-14 February 2004.

Research guidance and teaching activities

Have been one of the coordinators of a new project-based course for the IV semester Post-B.Sc. students, January-May, 2004.

Surajit Sengupta

Research and Development

Laser induced melting/freezing

Together with Debasish Chaudhuri, I have obtained, recently, the phase diagram of a two dimensional hard disk solid in a periodic potential using a numerical renormalization group technique. This is an extension of our work on two dimensional melting and a continuation of the project on laser induced phase transitions in colloids. This work has been submitted for publication and exists as a Los Alamos eprint.

Nucleation in solids: Ferrites and Martensites

For the past few years I, in collaboration with Madan Rao of RRI, Bangalore have been trying to understand in detail the nucleation mechanism of nonequilibrium structures in solids, especially that of Martensites. For this purpose we have proposed a model solid which has two equilibrium phases of square and rhombic crystalline order. The nucleation and growth behaviour of Martensites in this model system has been obtained using simulations and nonequilibrium statistical mechanics theory. This is published in Physical Review Letters.

Non-equilibrium interfaces

Together with Abhishek Chaudhuri, I am studying the equilibrium and dynamic aspects of solid-liquid interfaces. This work is a continuation of our previous work on Ising interfaces.

Phase transitions and failure of confined solids

Studies of small assemblages of molecules with one or more dimensions comparable to a few atomic spacings are significant in the context of nano-technology. Here we show that small size and hard constraints can produce essentially new phenomena without a counterpart in the bulk system. We report results of computer simulations of the simplest possible, nontrivial, molecular system, namely, two-dimensional hard disk "atoms" confined within a quasi one-dimensional channel. Bulk hard disks in two dimensions are known to melt from a high density triangular lattice to an isotropic liquid with a narrow intervening hexatic phase. In contrast, for channel widths of a few atomic spacings, we find evidence for a *smectic* phase which nucleates as well-defined bands within the solid demarcated by equilibrium solid-smectic interfaces. The smectic phase arises when the size of the system in the direction parallel to the fixed walls is increased. A crystal to smectic transition, though predicted for anisotropic molecules, is extremely unusual for hard disks - the anisotropy in this case arising purely from the confined geometry. Our results may be directly verified in experiments on sterically stabilized "hard sphere" colloids confined in glass channels and for similarly confined atomic systems.

Testing replica theories for equal-time correlations in liquids with quenched disorder

We test approximate replica-based theories of equilibrium liquid state structure in the presence of random quenched disorder against detailed Monte Carlo simulations of the inverse twelfth power soft-disk system in two dimensions. The disorder is modelled by a Gaussian distributed quenched random potential with short ranged spatial correlations. A variety of liquid state approximate closure schemes, the mean-spherical (MSA), Percus-Yevick (PY) and hypernetted chain (RNe) approximations, are used to obtain both diagonal and off-diagonal replicated correlations which are compared with the simulation results. We find that within the replica symmetric phase, the contribution of the disorder potential to the diagonal correlations is relatively weak and the overall magnitude of the off-diagonal component small. Both MSA and PY approximations represent the replicated correlation functions with reasonable accuracy, though the RNC approximation underestimates the structure at high densities. Our results are potentially

applicable to a wide range of two-dimensional problems involving disorder, such as rare gases adsorbed on disordered substrates at sub-monolayer coverage, colloidal particles on a rough surface, magnetic bubble domains, flux lattices in dirty superconductors etc. This work is in collaboration with Ankush Sengupta and Gautam I. Menon of I.M.Sc. Chennai.

Dynamics of superparamagnetic nano particles

In collaboration with Suvankar Chakravarty, S. Dattagupta, P. A. Sreeram and Malay Bandhyopadhyay, I am trying to model the dynamical response of Nickel Ferrite magnetic nanoparticles in a Silica-gel matrix. This work has been submitted for publication and exists as a Los Alamos eprint.

Teaching

Shared a course on *Statistical Mechanics* in the second semester for Post-B.Sc. students. I have also taught a short course on *The Renormalization Group* to Post-M.Sc. students.

Academic administration

Since joining the Centre functioning as the Computer-in-charge at the computer centre.

In addition obtained a research grant, from the Department of Science and Technology, Govt. of India entitled *Emergence of Coarse Grained Behaviour from Molecular Simulation of Solids* for obtaining a Beowulf cluster. The Beowulf cluster is now functional.

Publications

(a) In journals

1. M. Rao and S. Sengupta, (2003), Nucleation of solids in solids: Ferrites and Martensites, *Phys. Rev. Lett.* 91, 045502 and *hys. Rev. Lett.*, 91, 209901.
2. K. Zahn, A. Wille, G. Maret, S. Sengupta, and P. Nielaba (2003), Elastic properties of 2D colloidal crystals from video microscopy., *Phys. Rev. Lett.*, 90, 155506.

Collaborative works

1. Collaboration with the group of Profs. Peter Nielaba and G. Maret at the University of Konstanz, Germany on the elastic properties of superparamagnetic colloids.
2. Collaboration with Prof. Madan Rao of Raman Research Institute, Bangalore on the kinetics of Martensitic transformations.

Visits, conferences and symposia

International Conference in Nano Science and Technology, (ICONSAT 2003) at Hyatt Regency, Kolkata, 17-20 December 2003.

Talks given

Invited talk at *International Conference in Nano Science and Technology,* (ICONSAT 2003) at Hyatt Regency, Kolkata.

Projects

1. *Dynamics of Vacancies* by Malay Bandhyopadhyay.
2. *Forced Ising Interfaces* by Jayee Bhattacharya.

Thesis supervision

Thesis supervisor for Abhshek Chaudhuri on *Dynamics of Solid Interfaces*, Debashis Chaudhuri on *Elastic properties of static ad dynamic inhomogeneties in solids* and Ankush Sengupta on *The effect of quenched randomness on solid state structural transitions*. In addition Malay Bandhyopadhyay and Jayee Bhattacharyya are

working on their thesis problems in collaboration with Prof. S. Dattagupta and Dr. P. A. Sreeram respectively as co-supervisors.

S. K. Sharma

Publications

(i) In journals

1. S. K. Sharma and Srilekha Banerjee (2003), Role of approximate phase functions in Monte Carlo simulations of light propagation in tissues, *Opt. A: Pure Appl. Opt.* 5, 294302.

Conferences/workshops/symposia attended

1. *International Conference on Mathematical Biology* at IIT, Kanpur (19-21 February 2004).
2. Workshop on *Biomedical Optics and Related Topics* at S. N. Bose National Centre for Basic Sciences, Kolkata (23-25 February 2004).

Talks given

1. *Studies on light propagation in Biomedical tissues* at SNBNCBS at Biomedical Applications Section, Centre for Advanced Technology, Indore (18.9.03).
2. *A Monte Carlo study of light propagation in a soft tissue model*, in In-house meeting held on 27-29th January 2004.
3. *A Monte Carlo study of light propagation in a soft tissue model: Diagnostic possibilities* at IIT, Kanpur International Conference on Mathematical Biology.
4. *Light propagation in soft tissues* at S. N. Bose National Centre for Basic Sciences (in Workshop on Biomedical Optics and Related Topics.

Research guidance and teaching activities

1. Mr. Manas Roy, an integrated Ph.D. student has joined for his research. His work has just started on ultrasound tissue characterization.
2. Helping Mr. Ratan Saha who is a Ph.D. student at Saha Institute for Nuclear Physics, Kolkata. We presented a paper in a conference at Amritsar.
3. Supervised the project of Mr. Manas Roy, Integrated Ph. D. student.
4. Taught Electrodynamics (PHY 506) to Post-M. Sc. students (jointly with Dr. N Nayak).
5. Resource person for the project based course for integrated Ph. D. students (PHY 407).
6. Member, Committee for examining Integrated Ph. D. student projects.
7. Examiner (viva), 1st semester integrated Ph. D. Students.

Other scientific and educational activities

1. Convener (jointly with Dr. Srilekha Banerjee), Workshop on Biomedical Optics and Related Topics.
2. Served on selection committees for Post-M. Sc. students and integrated Ph. D. student selections.

Ongoing projects

1. Role of ultrasound scattering in biomedical tissue characterization (with

Professor Swapan K Sen of Saha Institute of Nuclear Physics).

2. Inversion methods in light scattering (with Dr. Ashim Roy of Indian Statistical Institute, Calcutta).
3. Effective medium theories (with Professor A. R. Jones, Imperial College, London).
4. Tissue characterization by light scattering (with Dr. Srilekha Banerjee, SNBNCBS).

P. Singha Deo

Publications

(i) In journals

1. Swarnali Bandopadhyay and **P. Singha Deo** (2003), Friedel sum rule for a single-channel quantum wire, *Phys. Rev. B*, 68, 113301.
2. **P. Singha Deo**, P. Koskinen, M. Koskinen, M. Manninen (2003), Fractional periodicity of persistant currents: A signature of broken internal symmetry, *Europhys. Lett*., 63, 846.
3. S. Viefers, P. Koskinen, **P. Singha Deo**, M. Manninen (2004), Quantum rings for beginners: Energy spectra and persistent currents, *Physica E*, 21, 1-35.

(ii) In conference proceedings

M. Manninen, P. Koskinen, M. Koskinen, **P. Singha Deo**, S. M. Reimann and S. Viefers, Spectrum, persistent current and electron localization in quantum rings, to be published in *Proceedings of the International Symposium on Clusters and Nano-Assemblies: Physical and Biological Systems*, Richmond, November 10-13, 2003.

Invited talks given

1. *Spontaneous symmetry breaking in quantum systems* at IOP, Bhubaneswar in July, 2003.
2. *Spontanous symmetry breaking in quantum systems*, at JNU, Delhi in August, 2003.

Other scientific and educational activities

Teaching

1. Taught a course on *Quantum optics and mesoscopic phenomena* to Post-M.Sc. students from 25 March to 25 July 2003.
2. Taught a part of the course on *Quantum Mechanics* to Post-M.Sc. students from 12 August to 24 September 2003.

Research guidance

Supervising the thesis of Swarnali Bandopadhyay.

P. A. Sreeram

Research & development programme/ projects

1. *Manganites:* Continued work on the exact solution of the two and four site Anderson-Hasegawa model with superexchange (Co-workers: Prof. S. Dattagupta and Dr. Manidipa Mitra).
2. *Ising interfaces:* Currently an ongoing work. We are calculating the interface energy in a two dimensional Ising system in the presence of an inhomogeneous magnetic field. (Coworkers: Ms. Jayee Bhattacharya and Dr. Surajit Sengupta).

Publications

P. A. Sreeram, Manidipa Mitra and Sushanta Dattagupta (2003), Quantum treatment of the Anderson Hasegawa model in the presence of superexchange, *Pramana*, Vol.61, 601.

Conference/symposia/workshops attended

Workshop on *Physics of Novel Matenals: Electronic and Magnetic Properties* held at S. N. Bose National Centre, Kolkata from 5-10 January 2004. Presented a poster entitled *Quantum treatment of the Anderson Hasegawa model in the presence of superexchange* by P. A. Sreeram, Manidipa Mitra and Sushanta Dattagupta.

Other scientific and educational activities

Teaching Programme : Tutor for *Statistical Mechanics* course offered to the first year Post-B. Sc. students at the Centre.

Research Guidance : Currently guiding Ms. Jayee Bhattacharya in her thesis work. We are currently looking at the interface energy of two dimensional Ising spin system (with Dr. Surajit Sengupta).

Administrative Work

1. In charge of the computer centre at the Centre. Configured a diskless rack-mounted Beowulf Cluster with one master and 4 slave nodes. The cluster was later upgraded to 8 slave nodes.
2. Member, Computer Users Committee
3. Member, Purchase Sub-Committee
4. Member, Library Committee
5. Member, Sports and Recreation Committee

K. Srinivasan

Publications

K Srinivasan and Shailesh Srivastava, of SSSIHL as coauthor, Coupled cavity analysis of the resonant loop mirror: Closed form expressions and simulations for enhanced performance lasing is under review by *Applied Optics*.

Conference/workshop attended

Attended *National Workshop in Nonlinear Optics* organized by Sri Sathya Sai Institute of Higher Learning, Prasanthinilyam, December 2003.

Invited talks given

1. *Selective Overview of nonlinear effects in optical fibers* at the National Workshop in Nonlinear Optics organized by Sri Sathya Sai Institute of Higher Learning, Prasanthinilyam, 5 December 2003.
2. *Some non-spectroscopic applications of Raman Scattering*, TPSC seminar talk, Banaras Hindu University, Varanasi, 12 March 2004.

Teaching and educational activities

1. *Electromagnetic theory and Optics* (Full course) for the second semester, Post-B.Sc students.
2. *Methods of Experimental Physics* (part of the course) for the fourth semester, Post-B.Sc. students.
3. Physics Laboratory/Optics Laboratory sessions: Full time supervision since March first week.
4. The setting up of the teaching optics laboratory is in progress.
5. Laboratory notes in optics for the Post-B.Sc. class are under preparation.

II. Research Associates

Sumita Datta

Publications

1. S. Datta and J. K. Bhattacharjee (2003), Spiked harmonic oscillator: 1/N expansion, *Int. J. Mod. Phys.*, Vol. 17, No. 14, 2761-2772.
2. S. Datta, S. A. Alexander and R. L. Coldwell (2004), Properties of selected diatomics using variational Monte Carlo methods, *J. Chem. Phys.* Vol. 120, No.8, 3642-3647.

Talks given

1. *Importance sampling in Fryman Kac path integral approach to quantum mechanics* at SINP Theory Division on 25 June 2003.
2. *Solving many body problems by generalized Feynman Kac method* at the Department of Physics, Poona University on 27 July 2003.
3. *Thermodynamic properties by path integral Monte Carlo technique-an application to Bose condensates* in GMW Workshop at INSA organized by DST, India on 27 November 2003.

Parthasarathi Joarder

Work in progress

Characteristics of hydromagnetic surface waves (collaborative work with Dr. V. M. Nakariakov, Department of Physics, University of Warwick, Coventry, U.K.).

Damping of magnetoacoustic waves in solar coronal loops with SOHO and TRACE observations (collaborative work with Prof. B. Roberts, School of Mathematics and Statistics, University of St. Andrews, St. Andrews, Scotland, U.K.).

Talks given

A talk on *Propagation properties of hydromagnetic surface* at SNBNCBS on the occasion of the In-house Meeting of the Centre, December 2003.

Scientific and educational activities

Involved in designing and teaching experiments suitable for the first and second year Post-B.Sc. (Physics) students at the SNBNCBS involving the seven inch Questar Telescope at the Centre. An outline of such an experiment, namely *Determination of the distance to the moon by parallax method* has been published in "Nova: Proc. Mini-School on Introductory Astronomy and Astrophysics" organised on 4-8 February 2004 at the Department of Physics and IIPC, Kalyani Govt. Engineering College, Kalyani, Nadia, West Bengal in collaboration with the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune and the IUCAA Reference Centre at Shiliguri, West Bengal. This work was done jointly with Mr. Shashank Shalgar, third year Post-B.Sc. student at the Centre and Mr. Nikhilesh Pal, Rohini Astrophysics, Kolkata.

Also involved in other scientific activities, such as astronomical imaging and image processing, with the help of the SNBNCBS telescope. The imaging work is being done with Mr. Atis Dipankar Chakraborty, a lecturer of the Rahara Ramkrishna Mission College and an external Ph.D student of the Centre. Along

with the faculty members and the engineers of the Centre, I have also been involved in the regular maintenance and safe-keeping of the SNBNCBS telescope guiding two 2nd year Post-B.Sc. students: Mr. Chandrashekhar Chatterjee and Mr. Saikat Chatterjee, for their fourth semestar experiment on designing, fabricating and calibrating an astronomical micrometer for measuring angular diameters and angular sizes of astronomical bodies. This is being done in collaboration with Mr. Shashank Shalgar, 3rd year Post-B.Sc. student of the Centre.

Uday Kumar

Publications

(i) In journals

1. B. K. Nath, P. K. Chakrabarti, S. Das, Uday Kumar, P. K. Mukhopadhyay and D. Das, Mössbauer, XRD and ac susceptibility studies on nanoparticles of zinc substituted magnesium ferrite, *European Physical Journal B, (accepted).*
2. Emad Badawi, Uday Kumar and P. K. Mukhopadhyay, Characterization of Al-alloys (50xx) by using positron annihilation, x-ray diffraction and vibrating reed techniques, submitted to *Acta Materialia* 2004.

(ii) In proceedings

1. P. K. Chakrabarti, B. K. Nath, P. K. Jal, S. Das, U. Kumar, P. K. Mukhopadhyay and D. Das, Preparation of nanocrystalline nickel-zinc-copper ferrite and its characterization by Mössbauer spectroscopy and ac susceptibility, presented in the *Condensed Matter Days*, 2003, Jadavpur University, Kolkata, 29-31 August 2003.
2. P. K. Chakrabarti, B. K. Nath, Uday Kumar, D. Das and P. K. Mukhopadhyay, Mössbauer and ac susceptibility studies on cobalt zinc ferrite nano particles prepared by coprecipitation method, Presented in *ICONSAT*, 2003, Kolkata, 17-20 December 2003.
3. B. K. Nath, P. K. Chakrabarti, T. Roy, S. K. Brahma, U. Kumar, P. K. Mukhopadhyay and D. Das, Mössbauer and ac susceptibility studies on $Co_{0.5}Zn_{0.5}Fe_2O_4$ nanoparticles, presented in the DAE *Solid State Physics Symposium*, 2003, Gwalior, India.

Conferences/symposia/workshop attended

1. *Condensed Matter Days*, 2003, Jadavpur University, Kolkata, 29-31 August 2003.
2. ICONSAT, 2003, Kolkata, 17-20 December 2003.
3. Workshop on *Biomedical Optics and Related Topics*, S. N. Bose Natinal Centre for Basic Sciences, Kolkata, 23-25 February 2004.

Manidipa Mitra

Publications

(i) In journals

P. A. Sreeram, Manidipa Mitra and Sushanta Dattagupta (2003), Quantum treatment of the Anderson-Hasegawa model in the presence of superexchange, *Pramana*, Vo1.61, 601.

(ii) In proceedings

P. A. Sreeram, Manidipa Mitra and Sushanta Dattagupta, Anderson Hasegawa model superexchange and polaronic heat capacity, to be published in *Proceedings of Condensed Matter 2003*.

Conferences/workshops/symposia attended

1. *Condensed Matter Days, 2003*, from 27-29 August 2003, at Jadavpur University, Kolkata.
2. Workshop on *Physics of Novel Materials: Electronic and Magnetic properties* at SNBNCBS, 5-10 January, 2004.

Talks given

Quantum treatment of the Anderson-Hasegawa model - Superexchange and polaronic heat capacity at Institute of Physics, Bhubaneswar on 14 January 2004.

Other scientific and educational activities

Poster Presentation

1. *Quantum treatment of the Anderson-Hasegawa model - Superexchange and polaronic heat capacity* at Condensed Matter Days 2003, at Jadavpur University, 27 August 2003.
2. *Orbital ordering in undoped manganites* at Condensed Matter Days 2003 at Jadavpur University, 27 August 2003.
3. *Orbital ordening in undoped manganites using Jahn Teller interaction* in the Workshop on Physics of Novel materials: Electronic and Magnetic properties at SNBNCBS, Kolkata, 7 January 2004.

Talks given

Orbital ordering in undoped manganites with Jahn Teller interaction, at In-house Meeting in SNBNCBS, on 27 January 2004.

Received a project from the SERC Division, DST, Government of India under the Fast Track Proposals for Young Scientists Scheme.

III. Students

Aftab Alam – *Jr. Research Fellow*

Supervisor : Prof. Abhijit Mookerjee

Publication

A. Alam and A. Mookerjee (2004), Vibrational properties of phonons in random alloys: An augmented space recursion technique in k-representation, *Phys. Rev. B*, 69, 024205.

Conferences/workshops/symposia attended

1. Attended the *Workshop and Conference on Physics of Novel Materials* 2004 held at SNBNCBS, 5-14 January 2004.
2. Attended the *Workshop on Biomedical Optics and Related Topics*, SNBNCBS, 23-25 February 2004.

Talks given

Gave a talk on the *Vibrational Properties of Phonons in Random Binary Alloys* at the In-house Meeting 2004 held at SNBNCBS.

Poster presentation

Poster presented in the Workshop and Conference on Physics of Novel Materials, 2004. Title: *Inelastic Neutron Scattering in Random Binary Alloys.*

Md. Manirul Ali – *Jr. Research Fellow*

Supervisor: Dr. Archan S. Majumdar

Publications

Md. Manirul Ali, Archan S. Majumdar, Dipankar Home and Shyamal Sengupta (2003), Spin dependent observable effect for free particles using the arrival time distribution, *Phys. Rev. A*, 68, 042105.

Conferences attended

Participated in SERC School on *Quantum Information and Quantum Optics* held at Physical Research Laboratory, Ahmedabad, 1-14 February 2004. Title: *Spin dependent observable effect for free particles using the arrival time distribution.*

Malay Bandopadhyay – *Jr. Research Fellow*

Supervisor: Dr. Surajit Sengupta & Prof. Sushanta Dattagupta

Conferences/workshops/symposia attended

Participated in *Workshop on Biomedical Optics and Related Topics*, held at SNBNCBS, 23-25 February 2004.

Talks Given

1. Presented a project talk at the end of the project titled *Kinetics of vacancy driven ordering in alloys* on 30 September 2003.
2. Presented a talk in the In-house meeting 2003 titled *Superparamagnetism : A brief review* on 28 January 2004.

Swarnali Bandopadhyay – *Sr. Research Fellow*

Supervisor : Dr. P. Singha Deo

Publications

i) In journals

1. Swarnali Bandopadhyay, Binayak Dutra Roy and H. S. Mani, Understanding

the Fano resonance through toy models, *arXive: cond mat* / 0310692(communicated to *American Journal of Physics*).

2. Swarnali Bandopadhyay, Raishma Krishnan and A. M. Jayannavar, Hartman-efffect in presence of Aharonov-Bohm flux, *arXive: cond-mat / 0312101* (communicated to *Solid State Communitation*).
3. Swarnali Bandopadhyay, P. Singha Deo and A. M. Jayannavar, Quantum current Magnification in a multi-channel mesoscopic ring, *arXive: cond-mat / 0312324* (communicated to *Physical Review B*).

Conferences / workshops / symposia attended

1. Participated in *Condensed Matter Days 2003* (CMDAYS 03), 27-29 August, 2003, held at Department of Physics, Jadavpur University.
2. Participated in *ICONSAT 2003*, 17-20 December 2003 at Hyatt Regency, Kolkata.
3. Workshop and Conference on *Physics of Novel Materials*, 5-14 January 2004 held at SNBNCBS, Kolkata.
4. In-house Meeting III of SNBNCBS, 27-30 January 2004 held at SNBNCBS, Kolkata.
5. Participated in *SERC School on Statistical Physics*, 16-28 February 2004 held at TIFR, Mumbai.

Talks/Poster presentation

1. Presented a talk on *Quantum current magnification in a multi-channel mesoscopic ring in the CMDAYS* '03 held at Department of Physics, Jadavpur University, Kolkata on 28 August 2003.
2. Presented a poster on *Quantum current magnification in a multi-channel mesoscopic ring* on 19 December 2003 in ICONSAT 2003, held in Hyatt Regency, Kolkata.
3. Presented a poster on .*Quantum current magnification in a multi-channel mesoscopic ring* in the Workshop and Conference on Physics of Novel Materials on 7 January 2004, at SNBNCBS.
4. Presented a talk on *Quantum current magnification in a multi-channel mesoscopic ring* in the In-house Meeting III at SNBNCBS, Kolkata on 28 January 2004.

Other scientific and educational activities

Visited Institute of Physics, Sachivalaya Marg, Bhubaneswar to work with Prof. Arun M. Jayannavar on different time concepts in Quantum Mechanics during 9 November – 13 December 2003.

Sumana Banerjee – *Sr. Research Fellow*

Supervisor : Dr. Gautam Gangopadhyay

Publications

1. Sumana Banerjee and Gautam Gangopadhyay (2003), Quantum beat in pump-probe signal of molecular system, *Journal of Physics B*, vol. 36, 1-19.
2. Sumana Banerjee and Gautam Gangopadhyay (2004), Radiative decay of nonstationary system, *Journal of Chemical Physics*, Vol. 120, 6152.

Mrinal Kanti Bera - *Jr. Research Fellow*

Supervisor: Dr. Kalyan Mandal

Conferences / workshops / symposia attended

1. Attended *International Conference on Nano-Science and Techonology*, organised by Saha Institute of Nuclear Physics during 17-21 December 2003.
2. Attended *SERC School on Statiltical Physics* hosted by Tata Institute of Fundamental Research during 15-29 February 2004.

Jayee Bhattacharya – *Sr. Research Fellow*

Supervisor: Dr. Surajit Sengupta & Dr. P. A. Sreeram

Conferences attended

Participated in the *Workshop on Biomedical Optics and Related Topics*, 23-25 February 2004, held at SNBNCBS, Kolkata.

Talks given

1. Presented a project report for the Post-M.Sc course titled *I sing Model in a Non-Uniform Field: A Monte-Carlo Study.*
2. Presented a talk in the In-house Meeting in 27-29 January 2004, held at SNBNCBS, Kolkata titled *Study of Interfacial Energy for an Ising Model with Field Induced Interfaces.*

Navin Chandra – *Jr. Research Fellow*

Supervisor : Prof. Siddhartha Roy & Dr. Jaydeb Chakrabarti

Conferences attended/Poster presentation

1. A Satellite Symposium on *Regulation of Gene Expression* held at IICB, Kolkata.
2. Symposium on *Bioinformatics for Genome Analysis* organised by Bose Institute.
3. *NMRS* organised by Bose Institute and SNBNCBS.
4. *Biomedical Optics and Related Topics* held at SNBNCBS.

Abhishek Chaudhuri – *Sr. Research Fellow*

Supervisor : Dr. Surajit Sengupta

Publications

In proceedings

Abhishek Chaudhuri, P. A. Sreeram and Surajit Sengupta, A Kinetics driven commensurate -incommensurate transition, arXive: cond-mat/0403264 . submitted to *Phase Trans.* (2004).

2. Conferences/workshops/symposia attended

1. Workshop and Conference on *Physics of Novel Materials*, 5-14 January 2004 SNBNCBS, Kolkata.
2. In-house Meeting III of SNBNCBS, Kolkata. Oral presentation: *Forced solid-liquid interfaces*, 27-30 January 2004.
3. SERC school on Statistical Physics, 16-28 February 2004, TIFR, Mumbai.

Talks/Poster presentation

Presented a talk on *Forced solid-liquid interfaces* in the In-house Meeting III of SNBNCBS, Kolkata, on 28 January 2004.

Debasish Chaudhuri – *Sr. Research Fellow*

Supervisor: Dr. Surajit Sengupta

Publications

1. Debasish Chaudhuri and Surajit Sengupta, Constrained deformation of a confined solid: A strain induced crysta-smectic transition, arXive: cond-mat/0401121 (communicated to *Physical Review Letters*).
2. Debasish Chaudhuri and Surajit Sengupta, A numencal renormalization group study of laser induced freezing, arXive:cond-mat/0403319 (communicated to *Europhysics Letters*).

Conferences/workshops/symposia attended

1. Participated in the *In-house Meeting* III, 27-30 January 2004 at SNBNCBS, Kolkata.
2. Participated in the *SERC School on Statistical Physics*, 16-28 Febraury 2004, TIFR, Mumbai.

Talks given

Presented talk on *A numerical renormalization /group study of layer induced frœzing* in the In-house Meeting III held in SNBNCBS, on 28 January 2004.

Santabrata Das – *Sr. Research Fellow*

Supervisor: Prof. Sandip K. Chakrabarti

Publications

(i) In journals

1. Indranil Chattopadhyay, Santabrata Das and Sandip K. Chakrabarti (2004), Radiatively driven electron-positron jets from two-component accretion flows, *MNRAS*, 348, 846C.
2. Sandip K. Chakrabarti and Santabrata Das (2004), Properties of accretion shock waves in viscous flows around black holes, *MNRAS*, 349, 649C.

(ii) In conference proceedings

1. Santabrata Das and Sandip K. Chakrabarti (2003), Parameter space for accretion flow around black holes: Effects of energy dissipation, in *New Views on MICROQUASARS*, Ph. Durouchax, Y. Fuchs and J. Rodriguez (Eds.), (CSP:Kolkata), p. 123.
2. Santabrata Das and Sandip K. Chakrabarti (2003), Behaviour of standing shocks around black holes and determination of the outflow rates, in *Recent Trends in Astro and Plasma Physics in India*, Sandip K. Chakrabarti, Santabrata Das, B. Basu and M. KHan (Eds.), (CSP:Kolkata), p. 70.

(iii) Books Edited

Sandip K. Chakrabarti, Santabrata Das, B. Basu and M. Khan (Eds.), *Recent Trends in Astro and Plasma Physics in India*, (2003).

Conferences attended

1. Attended the Telescope Making Workshop, 1-8 June 2003, organised by CSP at B. D. Govt. High School, Salt Lake, Kolkata.
2. Visited University of Palmero, Palmero, Italy, 28 January-27 March 2004.

Seminar presented

The following seminars were presented during my visit at University of Palmero, Italy :

a. Shocks in Accretion Flows : 1 - Theoretical Study of Ideal Gas Case

b. Shocks in Accretion Flows : 2 - Theoretical Study of Viscous Gas Case

c. Shocks in Accretion Flows: Comparison with observations of black hole candidates

d. Explanation of the Quest Periodic Oscillations of the luminosity of black hole candidates in the framework of the shocked flow model

e. The Role of Viscocity in Shock Formation

Biplab Ghosh – *Jr. Research Fellow*

Supervisor : Dr. A. S. Majumdar & Dr. N. Nayak

Publications

Animesh Datta, Biplab Ghosh, A. S. Majumdar and N. Nayak (2004), Information transfer through a one-atom micromaser (quant-ph/0307207). *submitted for publication.*

Conferences/workshops/symposia attended

Participated in the *SERC School on Quantum Information and Quantum Optics* held at PRL, Ahmedabad, 1-14 February 2004.

Talks given

l. Presented a project titled *Quantum entanglement in Jqynes Cummings model* done under Dr. A. S. Majumdar and N. Nayak in SNBNCBS, September, 2003.

2. Presented a talk titled *Entanglement between nonoverlapping atomic wavejunctions* in the In-house Meeting III held in SNBNCBS ,28 January 2004.

Ain-ul Huda – *Sr. Research Fellow*

Supervisor : Prof. Abhijit Mookerjee

Publications

1. Ain-ul Huda and A. Mookerjee (2003), Magnetism on a rough surface, *Journal of Magnetism and Magnetic Materials*, 267, 97.

2. Ain-ul Huda (2003), Study of a pair of coupled continuum equations, *International Journal of Modern Physics B*, 17, 2981.

3. Ain-ul Huda (2004), Spin-orbit coupling: a recursion method approach, ICTP preprint No. IC 2003039 and accepted for publication in Physics B.

4. Ain-ul Huda (2004), Study of a pair of coupled continuum equations, accepted for publication in International Journal of Modern Physics B (2004)

5. Ain-ul Huda (2004), Formation, electronic and magnetic properties of rough overlayers, Ph. D. Thesis, Jadavpur University Kolkata.

Conference/workshop/symposia attended

1. Attended *2nd INFM-ICTP Spring School on Magnetic Properties of Condensed Matter* Investigated by Neutron Scattering and Synchrotron Radiation, Abdus Salam ICTP, Tneste, Italy, 18-29 May 2003.

2. Attended *Summer College and Conference on Physics and Chemistry of Rare-earth Manganites*, Abdus Salam ICTP, Trieste, Italy, 1-18 June 2003.
3. Attended and presented a poster entitled *Spin orbit coupling: A recursion method approach*, Workshop on Physics of Novel Materials: Electronic and Magnetic Properties, SNBNCBS, Kolkata, 5-10 January 2004.

Mukul Kabir – *Sr. Research Fellow*

Supervisor : Prof. Abhijit Mookerjee

Publications

Mukul Kabir, Abhijit Mookerjee and A. K. Bhattacharya (2004), Structure and stability of copper clusters: A tight-binding molecular dynamics study, *Physical Review A*, 69, 043203.

Conferences/workshops/symposia attended

Participated in *India and Abroad: Condensed Matter-III*, held in SNBNCBS, Kolkata on 24 January 2003.

Presentations in conferences

1. Presented a poster at *Indo-US Workshop on Nanoscale Materials: From Science and Technology*, Hotel Mayfair, Puri 5-8 April 2004.
2. Presented a lecture at *In-House Meeting* 2003, SNBNCBS, 27-29 January 2004.
3. Presented a lecture and a poster at *Workshop and Conference on Physics of Novel Materials: Electronic and Magnetic Properties*, SNBNCBS, 5-14 January 2004.
4. Presented a poster at *International Conference on NanoScience and Technology*, Hyatt Regency, Kolkata, 17-20 December 2003.

M. Venkata Kamalakar – *Jr. Research Fellow*

Supervisor: Prof. D. Chakravarty (IACS) & Prof. Abhijit Mookerjee (SNBNCBS)

Conferences/Workshops attended

Workshop and Conference on Physics of Novel Materials, January 2004 held at SNBNCBS.

Talks given

A talk titled *Effects of Highly Dielectric Dispersoids on the Growth of Metallic Nano Wires* was given in the In-house Meeting 2004 at SNBNCBS.

Rumani Karmakar – *Sr. Research Fellow*

Supervisor: Prof. S. S. Manna

Publication

R. Karmakar and S. S. Manna, Directed fixed energy sandpile model, cond-mat-0404526 and accepted for publication in *Phys. Rev. E*.

Conferences attended

1. *SERC School on Statistical Physics*, held at TIFR in February 2004.
2. Participated in the *In-house Meeting 2003*, held at S.N. Bose National Centre for Basic Sciences.

Talks/Poster presentations

Gave a talk on *Sandpile model on an optimized scale-free network on Euclidcan space* in the In-house Meeting 2003, held at S.N Bose National Centre for Basic Sciences.

Kuldeep Kumar – *Sr. Research Fellow*

Supervisor : Dr. Rabin Banerjee

Publications

Rabin Banerjee, Biswajit Chakraborty and **Kuldeep Kumar** (2003), Membrane and noncommutativity, *Nucl. Phys. B*, 668, 179(hep-th/0306122).

Conferences/workshops/symposia attended

Attended the *SERC Preparatory School in Theoretical High-Energy Physics* held at the University of Hyderabad , 18 November-7 December 2003.

Soumen Mondal – *Sr. Research Fellow*

Supervisor : Dr. Sandip K. Chakrabarti

1. Attended the Telescope Making Workshop, 1-8 June, 2003, organized by CSP at B. D. Govt. High School, Salt Lake, Kolkata.
2. Presented a talk at In-house Meeting - III entitled *General Relativistic Fluid Dynamics around a Rotating Black Hole*.
3. Conducted the poster session at *District-wise Space Science Symposium* on 29 February 2004, Coochbehar, West Bengal.

Subarna Mitra - *Jr. Research Fellow*

Supervisor : Dr. Kalyan Mandal

Publications

A paper on *Positron annihilation life time spectroscopic study of* $NiFe_2O_4$ *in* SiO_2 *matrix* is ready for submission.

Talks given

1. *Theoretical study of Mossbauer spectroscopy and relaxation time*, Post-M.Sc. project talk in September 2003 at SNBNCBS.
2. *Positron annihilation spectroscopic study of polycrystalline* $NiFe_2O_4$ *in* SiO_2 *matrix* , In-house Meeting-2003 at SNBNCBS on 27 December 2003.

Nupur Mukherjee – *Jr. Research Fellow*

Supervisor : Dr. Archan Majumdar

Publications

Nupur Mukherjee, A. S. Majumdar (2004), Weak gravitational lensing by braneworld black holes (astro-ph/0403405), *communicated for publication.*

Conferences/workshops/symposia attended

1. Participated in the *Workshop on High Energy Astrophysics* (HEAP-O4) held on 23-25 February 2004.
2. Participated in the *National Conference on Neutrinos in Nuclear, Particle and Astrophysics* (NUPA-04) held on 26-28 February 2004 at IIT, Kharagpur.

Talks given

1. Presented a project talk titled *Bending of light in general theory of relativity and gravitational lensing* under Dr. A. S. Majumdar in SNBNCBS on September 2003.
2. Presented a talk titled *Gravitational lensing by brane world black holes* in the In-house Meeting-III held in SNBNCBS, on 28 January 2004.

Anuj Nandi – *Sr. Research Fellow*

Supervisor : Prof. Sandip K. Chakrabarti

Publications

i) In journals

Sandip K. Chakrabarti, S. Pal, Anuj Nandi, B. G. Anandarao and Soumen Mondal (2003), Possible photometric evidence of ejection of bullet-like features in the relativistic jet sources S5433, *Astrophysical Journal*, 595, 45L.

ii) In conference proceedings

1. Anuj Nandi and Sandip K. Chakrabarti (2002), The outflows and jets in microquasars: the TCAF paradigm in *Proceeding: New Views on MICROQUASARS, the Fourth Microquasars Workshop*, Institut d'Etudes Scientifiques de Cargese, Corsica, France, May 27-June 1, 2002. Edited by Ph. Durouchoux, Y. Fuchs, and J. Rodriguez. Published by the Center for Space Physics: Kolkata (India), p. 97.
2. Anuj Nandi and Sandip K. Chakrabarti, (2002), Ejection of inner accretion disk in microquasars: magnetised TCAF (MTCAF) model, in *Proceeding: New Views on MICROQUASARS, the Fourth Microquasars Workshop*, Institut d'Etudes Scientifiques de Cargese, Corsica, France, 27 May – 1 June 2002. Edited by Ph. Durouchoux, Y. Fuchs, and J. Rodriguez. Published by the Centre for Space Physics: Kolkata (India), p. 112.
3. Anuj Nandi and Sandip K. Chakrabarti, (2003), GRS1915+ 105: A galactic black hole candidate, in *Proceedings : Recent trends in Astro and Plasma Physics in India*, published by the Centre for Space Physics: Kolkata (India), p.103.

Visits/conferences/symposia attended

1. Attended the Telescope making Workshop, 1-8 June, 2003, organized by CSP at B. D. Govt. High School, Salt Lake, Kolkata.
2. Presented a talk at In-house Meeting - III entitled *Diagnosis of Iron-Line in X-ray spectrum of SS433*, 29 January 2004.
3. Presented a talk at *District-wise Space Science Symposium* on 29 February 2004, Coochbehar, West Bengal.

Durga Paudyal – *Sr. Research Fellow*

Supervisor : Prof. Abhijit Mookerjee & Dr. Tanusri Saha Dasgupta

Publications

1. Durga Paudyal and Abhjit Mookerjee (2003), Electronic structure and ground state properties of non-magnetic NiPt systems, *International Journal of Physics E*, 11, 4447-4456.
2. Durga Pandyal, Tanusri Saha Dasgupta and Abhijit Mookerjee (2004), Magnetic properties of X-Pt (X=Fe,Co,Ni) alloy systems, *J. Phys: Condens. Matter*, 16, 2317-2334.
3. Ain-ul-Huda, Durga Paudyal, Abhijit Mookerjee and Mesbahuddin Ahmed Spin-orbit coupling: a recursion method approach, *ICTP Publication No. IC/2003/039*.

Oral presentations

1. Paper entitled *Magnetic properties of X-Pt (Fe, Co, Nt) alloys* in In-house Meeting

2003 at SNBNCBS, Kolkata, India during 27-29 January 2004.

2. Paper entitled *Phase stability in NiPt alloys in Nepal Physical Society* Conference at Central Department of Physics, Tribhuvan University, Kathmandu, Nepal during 27-29 June 2003.

Poster presentations

Poster on *Study of phase stability in NiPt alloys* in Workshop and Conference on Physics of Novel Materials: Electronic and Magnetic Properties at S. N. Bose National Centre for Basic Sciences, Kolkata during 5-14 January 2004.

Attended workshop

Euroconference on Ab initio Many-body Theory for Correlated Electron Systems at ICTP, Trieste, Italy during 25–29 August 2003.

Kamal K. Saha – *Sr. Research Fellow*

Supervisor: Professor Abhijit Mookerjee

Publications

1. Kamal Krishna Saha, Tanusri Saha Dasgupta, Abhijit Mookerjee and Indra Dasgupta (2004), Symmetry reduction in the augmented space recursion formalism for random binary alloys, *J. Phys: Condens. Matter*, 16, 1409-1423.
2. Biplab Ganguli, Kamal Krishna Saha, Tanusri Saha-Dasgupta, Abhijit Mookerjee, A. K. Bhattacharya (2004), Electronic and optical properties of $ZnIn_2Te_4$, *Physica B: Condensed*, 348, 382-390.
3. Kamal Krishna Saha and Abhijit Mookerjee, Optical properties of random alloys: A formulation, in press of *Phys. Rev. B* 70 (2004) (cond-mat/0312714)
4. Kamal Krishna Saha and Abhijit Mookejee, Electronic structure of random alloys : An augmented space formulation in reciprocal space (to be submitted to *Phys. Rev. B*).

Seminar/poster presentation

1. Presented a talk and a poster at the Workshop on *Physics of Novel of Materials : Electronic and Magnetic Properties,* S. N. Bose National Centre for Basic Sciences, Kolkata, 5-10 January 2004, entitled *Symmetry reduction in the augmented space recursion formalism for random binary alloys.*
2. Presented a talk at In-house Meeting 2003 of S. N. Bose National Centre for Basic Sciences, Kolkata 27-29 January 2004, entitled *Electronic structure of random binary alloys : A k-space formulation.*

Sudeshna Samanta – *Jr. Research Fellow*

Supervisor: Dr. Sandip C. Chakrabarti

Conferences/workshops/symposia attended

Telescope Making Workshop at Bidhannagar Government High School, Salt Lake, Kolkata from 1-8 June 2003.

Talks given

Presented a talk at In-house Meeting III entitled *Particles and fluid dynamics around Kerr black holes* on 29 January 2004 at SNBNCBS.

Tomy Scaria – *Sr. Research Fellow*

Supervisor : Dr. Rabin Banerjee

Publications

Tomy Scaria (2003), Translational groups as generators of gauge transformations, *Physical Review D,* vol.68, 10513.

Ankush Sengupta – *Jr. Research Fellow*

Supervisors : Dr. Surajit Sengupta & Prof. Abhijit Mookerjee

Conferences/workshops/symposia attended

Participated in the *Workshop on Biomedical Optics and Related Topics* held at S. N. Bose National Centre for Basic Sciences, Kolkata from 23-25 February 2004.

Talks given

1. Presented the SRF evaluation talk on *Simulation results - related to behaviour of term under quenched di-order.*
2. Presented a talk on E*ffect of disorder on frœzing transition in a two dimensional system of particles* in the In-house Meeting 2003, SNBNCBS, Kolkata.

Other academic activities

1. Promoted to SRF
2. Invited to Institute of Mathematical Sciences, Chennai for discussions and collaborative work related to physics of disordered systems, 12-26 April 2004.

Suman Sinha – *Jr. Research Fellow*

Supervisor: Dr. Kalyan Mandal

Conferences attended/Poster presented

1. Presented a poster in the *Workshop on Physics of Novel Materials: Electronic and Magnetic Properties*, 5-10 January 2004, held at SNBNCBS, Kolkata.
2. Participated in the *Workshop on Biomedical Optics and Related Topics*, 23-25 February 2004, held at SNBNCBS, Kolkata.

Talks given

1. Presented a project report for the Post-M.Sc course titled *Bond Length and Particle Size in Nanostructured Materials: Experiment and Theory.*
2. Presented a talk in the In-house Meeting in 27-29 January 2004, held at SNBNCBS, Kolkata titled *Grain size dependent structural and magnetic study of non-interacting nanoclusters.*

Faculty Publications

i) In journals

1. R. Banerjee (2003), A note on duality symmetry in non-linear gauge theories, *Phys. Lett B*, 576, 237.
2. R. Banerjee, B. Chakraborty and K. Kumar (2003), Membrane and noncommutativity, *Nucl. Phys. B*., 668, 179.
3. Y. Abe, R. Banerjee and I. Tsutsui (2003), Duality symmetry and plane waves in noncommutative electro-dynamics, *Phys. Lett. B.*, 573, 248.
4. R. Banerjee (2004), Anomalies in nocommutative gauge theories, Seiberg Witten transformation and Ramond couplings, *IJMP A*, 19, 613.
5. R. Banerjee (2004), Gauge theories on sphere and killing vectors, *Annals of Phys.* (NY), 311, 245.
6. Kevin Dahl, Ranjit Biswas, and Mark Maroncelli (2003), The photophysics and dynamics of diphenylbutadiene in alkaline and Perfluoro alkane solvents, *Journal of Physical Chemistry B*, 7838, 107.
7. J. A. Ingram, R. S. Moog, N. Ita, Ranjit Biswas and M. Maroncelli (2003), Solute rotation and solvation dynamics in a room temperature ionic liquid, *Journal of Physical Chemistry B*, 5926, 107.
8. Ranjit Biswas and Samir Kumar Pal (2004), Caging enzyme function: α-Chymotrypsin in Reverse Micelle, *Chemical Physics Letters*, 221, 387.
9. J. Chakrabarti and S. Roy (2004), Simulation of the kinetics of a sphere attached to a fluctuating polymer: Implications for target search by DNA binding proteins, *Phys. Rev. E*, 69, 021904, also appeared in March 1, 2004 issue of *Virtual Journal of Biological Physics Research.*
10. S. K. Chakrabarti, S. Pal, A. Nandi, B. G. Anandarao, S. Mondal (2003), Photometric evidence of ejection of bullets in the black hole candidate SS433, *Astrophys. J. Lett.*, 595, L45.
11. I. Chattopadhyay, S. Das and S. K. Chakrabarti (2003), Radiatively driven electropositron jets from two component accretion flows, *MNRAS*, 348, 846.
12. S. K. Chakrabarti, K. Acharya, B. Bose, S. Mandal, A. Chatterjee, N. M. Nandi, S. Pal, R. Khan (2003), Monitoring of sudden ionospheric disturbances (SID) from Kolkata, *Ind. J. Phys.* 77B, 173.
13. S. K. Chakrabarti and S. Das (2004), Properties of accretion shock waves in viscous flows around black holes, *MNRAS*, 349, 649.
14. K. Acharya, S. Chakrabarti and S. K. Chakrabarti (2004), Formation of simple bio-molecules during collapse of a intersteller cloud - A preliminary analysis, *Ind. J. Phys.* 78(B), 7.
15. B. Chakraborty, S. Gangopadhyay and A. Saha, Quantum hall effect on noncommutative plane through Seiberg-Witten map, hep-th/0312292.

16. R. Chaudhury, A. Som, S. Sahoo, I. Mukhopadhyay, J. Chakrabarti (2003), Scaling violations in coding DNA, *Europhys. Lett.*, 62(2), 271.

17. R. Chaudhury (2003), Dynamical spin susceptibility in the t-J model in the superconducting phase, *Theoretical and Mathematical Physics*, 136(1), 1022.

18. Varsha Banerjee and S. Dattagupta (2003), Dielectric permittivity of a duteron glass, *Phsy. Rev. B*, 68, 54202.

19. P. A. Sreeram, Manidipa Mitra and S. Dattagupta, (2003), Exact quantum treatment of the Anderson-Hasegawa double-exchange model in the presence of superexchange, *Pramana.*, 61, 601.

20. S. Dattagupta (2003), Dissipation, *Current Science*, 85, 961.

21. S. Dattagupta, (2004), Generalized spin Boson analysis of C-axis transport in layered superconductors, *Special Issue of Chemical Physics*, 296, 267.

22. R. Bhattacharyya and D. Gangopadhyay (2003), Vacuum expectation value of the Higgs field and Dyon charge quantisation from spacetime dependent Lagrangian, *Mod. Phys. Lett. A*, 18, 2207.

23. S. Banerjee and G. Gangopadhyay (2003), Quantum beat in pump-probe signal of a molecular system, *J. Phys. B.*, 36, 2967-2985.

24. S. Paul and G. Gangopadhyay (2003), Power lax relaxation kinetics in reversible enzymcatalyzed reaction due to diffusion, *J. Chem. Phys.*, 119, 3501-3508.

25. M. R. Nath, S. Sen and G. Gangopadhyay (2003), Dynamics of cascade three level system interacting with the classical and quantized field, *Pramana-J. Phys.*, 61, 1089-1100.

26. G. Gangopadhyay and B. Dutta Ray (2004), Born-Oppenheimer approximation: A toy version, *Am. J. Phys.*, 72, 389-392.

27. P. Guha (2003), Integrable Geodesic flows and super polytropic gas equations, *Journal of Geometry and Physics*, 46, 243.

28. P. Guha (2003), Projective and affine connections of S^1 and integrable systems, *Journal of Geometry and Physics*, 46, 231.

29. P. Guha (2003), A note on asymptotic Helix and quantum mechanical structure, *International Journal of Mathematics and Mathematical Sciences*, 48, 3031-3039.

30. P. Guha (2003), Geometry of Chen-Lee-Liu type Derivative Nonlinear Schrodinger flow, *Regular and Chaotic Dynamics*, Vol. 8, 213-224.

31. P. Guha (2003), Moyal deformation of 2D Euler equation and discretization, *Journal of Nonlinear Mathematical Physics*, Vol. 10, Supplement 2, p. 69-79.

32. P. Guha (2004), A note on bidifferential calculi and Bihamiltonian system, *Archvum Mathematicum*, 40, No.1, 17-22.

33. P. Guha (2004), Transvectant, integrability and the Born-Infeld equation, *Modern Physics Letters A*, Vol. 19, No. l0, 775-782.

34. P. Guha (2004), A remark on transformations of time-dependent Hamiltonians, *Mathematicala and Computer Modelling*, Vo1.39, 505-509.

35. Md. Manirul Ali, **A. S. Majumdar**, D. Home and Shyamal Sengupta (2003), Spin dependent observable effect for free particles using arrival time distribution, *Phys. Rew. A*., 68, 042105.
36. **A. S. Majumdar** (2004), Primodal braneworld black holes: Significant enhancement of lifetimes through accretion, *Pramana J. Phys*. 62, 737.
37. **R. P. Malik** (2003), Cohomological aspects of gauge theories: Superfield Formalism, *Ann. Phys.*, (NY)., 307, 1-40.
38. **R. P. Malik** (2003), Abelian 2-form gauge theory: Special features, *J. Phys. A: Math Gen.* 36, 5095-5114.
39. **R. P. Malik** (2003), Hamiltonian and Lagrangian dynamics in a noncommutative space, *Mod. Phys. Lett. A*, 18, 2795-2806.
40. **R. P. Malik** (2004), Superfield approach to (non-)local symmetries for one-form Abelian gauge theory, *J. Phys. A: Math Gen*., 37, 1059-1078.
41. **R. P. Malik** (2004), Nilpotent symmetries for QED in superfield formalism, *Phys. Lett. B.* 584, 210-219.
42. **K. Mandal**, S. Pan Mandal, M. Vazquez (2003), Annealing effect on the giant magnetoimpedance of amorphous microwire, *Indian Journal of Physics*, 77A, 599-602.
43. S. Chakraverty, **K. Mandal**, S. Chatterjee, S. Kumar (2004), The magnetic properties of $NiFe_2O_4$-SiO_2 nanocomposite, *Indian Journal of Physics*, 78A, 177-183.
44. Amab Chatterjee, Bikas K Chakrabarti and **S. S. Manna** (2003), Money in gas-like markets: Gibbs and Pareto Laws, *Physica Scripta* T106, 36-38.
45. M. Balesi and **S. S. Manna**, (2003), Scalefree networks from a Hamiltonian dynamics, *Phys. Rev. E*, 68, 047103.
46. **S. S. Manna** (2003), Diffusion limited friendship network: A model for six degrees of separation, *Phy. Rev. E*., 68, 027104.
47. **S. S. Manna** and A. Kabakcioglu (2003), Scale-free network on Euclidean space optimized by rewiring of links, *J. Phy. A*, 36, L279.
48. Parongama Sen and **S. S. Manna** (2003), Clustering properties of a generalised critical Euclidean network, *Phys. Rev. E*. 68., 26104.
49. **S. S. Manna**, G. Mukherjee and Parongama Sen (2004), Scale-free networks on a vertical plane, *Phys. Rev. E*., 69, 017102.
50. Arnab Chatterjee, Bikas C. Chakrabarti and **S. S. Manna** (2004), Pareto Law in a kinetic model of market with random saving propensity, *Physica A*, 335, p.155-163.
51. **Anita Mehta** and J. M. Luck (2003), Why shape matters in granular compaction, *J. Phys. A. Math. Gen*., 36, (June 2003), L365-L372.
52. J. M. Luck and **Anita Mehta** (2003), A column of grains in the jamming limit: Glassy dynamics in the compactation process, *European Journal of Physics B*, 35, 399-411.
53. Durga Paudyal and **Abhijit Mookerjee** (2003), Electronic structure and ground

state properties of non-magnetic NiPt systems, *Int. J. Mod. Phys. B*, 17, 4447-4456.

54. K. K. Saha, T. Saha-Dasgupta, A. Mookerjee and I. Dasgupta (2004), Symmetry reduction in the augmented space recursion formalism for random binary alloys, *J. Phys.: Condens. Matter*, 16, 1409.

55. A. Alam and A. Mookerjee (2004), Vibrational properties of phonons in random alloys: An augmented space recursion technique in k-representation, *Phys. Rev. B*, 69, 024205.

56. Biplab Ganguli, K. K. Saha, T. Saha-Dasgupta, A. Mookerjee and A. K. Bhattacharya (2004), Electronic and optical studies of $ZnIn_2Te_4$, *Physica B: Condensed Matter*, 348, 352.

57. M. Chakraborty, A. Mookerjee and A. K. Bhattacharya (2004), Electronic structure and magnetism of nickel thin films, *Int. J. Mod. Phys.* C, 17.

58. M. Kabir, A. Mookerjee and A. K. Bhattacharya (2004), Structure and stability of Cu-clusters: a molecular dynamics study, *Phys. Rev. A*, 69, 043203.

59. Durga Paudyal, Tanusri Saha-Dasgupta and Abhijit Mookerjee (2004), Magnetic properties of X-Pt (X=Fe,Co,Ni) alloy systems, *J. Phys.: Condens. Matter*, 16, 2317-2334.

60. A. Dantan, M. Pinard, V. Josse, N. Nayak and P. R. Berman (2003), Atomic spin squeezing in a Lamda-system, *Phys. Rev. A*, 67, 045801.

61. Y. V. Rostovtsev, A. B. Matsko, N. Nayak, M.S. Zubairy and M. O. Scully (2003), Improving engine efficiency by extracting laser energy from hot exhaust gas, *Phys. Rev. A.*, 67, 053811.

62. S. K. Pal and A. H. Zewail (2004), Dynamics of water in biological recognition, *Chemical Reviews*, 104 , 2099.

63. A. Kamal, T. Xia, S. K. Pal, L. Zhao and A. H. Zewail (2004), Enzyme functionality and solvation of subtilisin Carlsberg: From Hours to Femtoseconds, *Chem. Phys. Lett.* 387, 209.

64. L. Zhao, S. K. Pal, T. Xia and A. H. Zewail (2004), Dynamics of ordered water in interfacial enzyme recognition: Bovine pancreatic phospholipase A2, *Angew. Chem. Int.* Ed., 43, 59.

65. H. Meskine, T. Saha-Dasgupta and S. Satpathy (2004), Is the self-trapped magnetic polaron energetically stable in the electron doped manganites?, *Phys. Rev. Lett.*, 92, 056401.

66. I. S. Elfimoy, T. Saha-Dasgupta and M. A. Korotin (2003), Role of c-axis In V_2O_3, from the band-structure point of view, *Phys. Rev. B*, 68, 113105.

67. Roser Valenti, T. Saha-Dasgupta and F. Mila (2003), Ab initio investigation of $VOSeO_3$, a spin gap system with coupled spin dimers, *Phys. Rev. B*, 68, 024411.

68. Roser Valenti, T. Saha-Dasgupta, Claudius Gros and H. Rosner (2003), Halogen-mediated exchange in the coupled-tetrahedra quantum spin systems $Cu_2Te_2O_5X_2$, *Phys. Rev. B*, 67, 245110.

69. M. Rao and S. Sengupta (2003), Nucleation of solids in solids: Ferrites and Martensites, *Phys. Rev. Lett.*, 91, 045502 and *Phys. Rev. Lett.*, 91, 209901.
70. K. Zahn, A. Wille, G. Maret, S. Sengupta and P. Nielaba (2003), Elastic properties of 2D colloidal crystals from video microscopy, *Phys. Rev. Lett.*, 90, 155506., *081104 (R)*.
71. S. K. Sharma and Srilekha Banerjee (2003), Role of approximate phase functions in Monte Carlo simulations of light propagation in tissues, *Opt. A: Pure Appl. Opt.* 5, 294302.
72. Swarnali Bandopadhyay and P. Singha Deo (2003), Friedel sum rule for a single-channel quantum wire, *Phys. Rev. B*, 68, 113301.
73. P. Singha Deo, P. Koskinen, M. Koskinen, M. Manninen (2003), Fractional periodicity of persistant currents: A signature of broken internal symmetry , *Europhys. Lett*., 63, 846.
74. S. Viefers, P. Koskinen, P. Singha Deo, M. Manninen (2004), Quantum rings for beginners: Energy spectra and persistent currents, *Physica E*, 21, 1-35. external periodic potentials: A Monte Carlo study, *Phys. Rev. E*, 66, 056109.

ii) In proceedings

1. S. K. Chakrabarti (2003), Accretion process on stars and compact objects in *Recent Trends in Astro and Plasma Physics in India*, Eds. S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), (Review).
2. S. K. Chakravarti (2003), Plasma astrophysics around black holes, in *Recent Trends in Astro and Plasma Physics in India*, Ed. S. K. Chakrabarti, S. Das, M. Khan and B. Basu (eds.), p.146 (Review).
3. A. Nandi and S. K. Chakrabarti (2003), Ejection of inner accretion disk in microquasars: Magnetized TCAF (MTCAF) model, in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 120.
4. S. Das and S. K. Chakrabarti (2003), Parameter space for accretion flows around black holes: Effects of energy dissipition, in *New Views on Microquasars*,. Eds. P. Dourouchaux, Y. Fuchs and J. Rodnguez, p. 120.
5. I. Chattopadhyay and S. K. Chakrabarti (2003), Radiatively driven jets around black holes, in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodnguez, p.126
6. S. K. Chakrabarti (2003), Two component advective flow paradigm, in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p.101.
7. S. K. Chakrabarti and S.Mandal, Spectral properties of two temperature advective flows in *New Views on Microquasars*, Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 117.
8. A. Nandi and S. K. Chakrabarti, The outflows and jets in microquasars: The TCAF paradigm, in *New Views on Microquasars*. Eds. P. Dourouchaux, Y. Fuchs and J. Rodriguez, p. 105.
9. S. Das and S. Chakrabarti (2003), Behaviour of standing shocks around black holes and the outflow rates, in

Recent Trends in Astro and Plasma Physics in India, S.K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.70 .

10. I. Chattopadhyay, S. Das, S. MandaI & S. K. Chakrabarti (2003), Behavior of standing shocks around black holes and the outflow rates, in *Recent Trends in Astro and Plasma Physics in India*, S.K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.76.
11. M. M. Samanta, D. Ryu & S. K. Chakrabarti (2003), Consequences of radial shock oscillations in two dimensional advective flows, in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.81.
12. A. Nandi & S. K. Chakrabarti (2003), GRS 1915+105: A galactic black hole candidate, in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.103.
13. S. Pal & S. K. Chakrabarti (2003), SS433 - A puzzling cosmic gun, in *Recent Trends in Astro and Plasma Physics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.108.
14. K. Acharyya, S. Chakrabarti & S. K. Chakrabarti (2003), Formation of bio-molecules during star formation in *Recent Trends in Astro and Plasmaphysics in India*, S. K. Chakrabarti, S. Das, M. Khan and B. Basu (Eds.), p.259.
15. K. Mandal, A Yan, O. Gutfleisch, A. Handstein and K. H. Muller (2004), Magnetocaloric effect in iron rich alloys, in Proceedings of the *National Seminar and Conference on Cryogenics and its Frontier Applications*, Ed. S. K. Saha, A. K. Das, p. 110-112.
16. K. Mandal, P. Kerschl, A. Yan, O. Gutflelsch, A. Handstein and K.H. Muller (2004), Phase transition and magnetocaloric effect, in *Proceedings of the Winter School 2004* of IFW Dresden, p. 8.
17. S. K. Pal, L. Zhao, T. Xia, and A. H. Zewail, Site and sequence selective ultrafast hydration of DNA, *Proceedings of the National Academy of Sciences* (PNAS, USA) 100 (2003) 13746.
18. S. K. Pal, L. Zhao and A. H. Zewail, Water at DNA surfaces: Ultrafast dynamics in minor groove recognition, *Proceedings of the National Academy of Sciences* (PNAS, USA) 100 (2003) 8113.16.

iii) Books

S. Dattagupta and S. Puri (2004), *Dissipative Phenomena in Condensed Matter Physics*, Springer Verlag, Heidelberg.

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2. Anita Mehta and J. M. Luck, on *'Shaken, not stirred: Why gravel packs better than bricks'*, in *Unifying Concepts in Granular Media and Glasses* edited by A. Coniglio, A. Fierro, H. J. Herrmann and M. Nicodemi. *Challenges in Granular Physics*, editors Thomas C. Halsey and Anita Mehta World Scientific, 2002.

English

P A R T - B

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

BUDGET SUMMARY 2003-2004

Figure in Lakhs (Rs)

	Actuals 2002-2003	Budget estimate 2003-2004	Revised Estimate 203-2004
Non-Plan	51.95	60.46	* 58.12
Plan	442.59	833.49	* 705.19
Total	494.54	893.95	763.31

* Sanctioned by DST Plan Rs. 770 lakhs, Non-Plan Rs. 48 lakhs and released as under :

Non-Plan

1.	Sanction Letter No. AI/SNB/003/2003 dated 09.04.03	Rs. 8.00 lakhs
2.	Sanction Letter No. AI/SNB/003/2003 dated 03.06.03	Rs. 17.00 lakhs
3.	Sanction Letter No. AI/SNB/003/2004 dated 06.01.04	Rs. 15.00 lakhs
4.	Sanction Letter No. AI/SNB/003/2004 dated 03.02.04	Rs. 8.00 lakhs
		Rs. 48.00 lakhs

Plan

1.	Sanction Letter No. AI/SNB/003/2003 dated 09.04.03	Rs. 116.00 lakhs
2.	Sanction Letter No. AI/SNB/003/2003 dated 03.06.03	Rs. 234.00 lakhs
3.	Sanction Letter No. AI/SNB/003/2004 dated 03.02.04	Rs. 350.00 lakhs
4.	Sanction Letter No. AI/SNB/003/2004 dated 25.03.04	Rs. 70.00 lakhs
		Rs. 770.00 lakhs

Total	Rs. 818.00 lakhs

AUDITORS' REPORT TO THE GOVERNING BODY OF SATYENDRA NATH BOSE NATIONAL CENTRE FOR BASIC SCIENCES

1. We have audited the attached BALANCE SHEET of Satyendra Nath Bose National Centre for Basic Sciences, as at 31st March, 2004 and also the INCOME AND EXPENDITURE ACCOUNT for the year ended on that date annexed thereto. These financial statements are the responsibility of the Centre's management. Our responsibility is to express an opinion on these financial statements based on our audit.

2. We conducted our audit in accordance with auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

3. (i) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.

   (ii) In our opinion, proper books of account as required by law have been kept by the Centre so far as appears from our examination of those books.

   (iii) The Balance Sheet and the Income and Expenditure Account dealt with by this report are in agreement with the books of account.

   (iv) In our opinion, the Balance Sheet and the Income and Expenditure Account dealt with by this report comply with the applicable accounting standards.

4. In our opinion and to the best of our information and according to the explanations given to us, the said accounts give a true and fair view in conformity with the accounting principles generally accepted in India

   (i) in the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2004; and

   (ii) in the case of the Income and Expenditure Account, of the deficit for the year ended on that date.

For ROY & BAGCHI
Chartered Accountants
Sd/-
U. ROYCHOUDHURI
Partner

Kolkata
Dated: 12.08.2004

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

BALANCE SHEET AS AT 31ST MARCH, 2004

Amount (Rs.)

	Schedule	Current Year	Previous Year
FUNDS AND LIABILITIES			
Corpus/Capital Fund	1	228077573	176996231
Reserves and Surplus	2	-25656691	-19357452
Earmarked / Endowment Funds	3	12107871	9143408
Secured Loans and Borrowings	4		
Unsecured Loans and Borrowings	5		
Deferred Credit Liabilities	6		
Current Liabilities and Provisions	7	3571048	1999762
TOTAL		218099801	168781949
ASSETS			
Fixed Assets	8	136379327	125913540
Investments-from Earmarked / Endowment Funds	9	7901322	2229850
Investments – Others	10	29106686	16225074
Current Assets, Loans, Advances etc.	11	44712466	24413485
Miscellaneous Expenditure (to the extent not written off or adjusted)			
TOTAL		218099801	168781949
Significant Accounting Policies	24		
Contingent Liabilities and Notes on Accounts	25		

Per our report of even date

Sd/-
S. Dattagupta
Director
S. N. Bose National Centre for Basic Sciences

Sd/-
S. Mallick
Administrative Officer
S. N. Bose National Centre for Basic Sciences

Kolkata
12.08.2004

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2004

Amount (Rs.)

	Schedule	Current Year	Previous Year
INCOME			
Income from Sales/Services	12	680063	266623
Grants/Subsidies	13	35718658	34105522
Fees/Subscriptions	14		
Income from Investments (Income on investment from Earmarked/Endowment Funds transferred to Funds)	15		
Income from Royalty, Publication etc.	16		
Interest Earned	17	1801316	2084053
Other Income	18	198114	184288
Increase/(decrease) in stock of finished goods and works-in-progress	19		
TOTAL (A)		38398151	36640486
EXPENDITURE			
Establishment Expenses	20	19780431	17207773
Other Administrative Expenses etc.	21	18143217	13327102
Expenditure on Grants, Subsidies etc.	22		
Interest	23		
Depreciation (Net total at the year-end-corresponding to Schedule 8)		7299288	5611040
TOTAL (B)		45222936	36145915
Balance being excess/deficit(–) of Income over Expenditure (A-B)		-6824785	494571
Prior period adjustments		525546	41319
Transfer to/from General Reserve			
BALANCE BEING SURPLUS DEFICIT (–) CARRIED TO GENERAL RESERVE		-6299239	535890
Significant Accounting Policies	24		
Contingent Liabilities and Notes on Accounts	25		

Per our report of even date

Sd/-
S. Dattagupta
Director
S. N. Bose National Centre for Basic Sciences

Sd/-
S. Mallick
Administrative Officer
S. N. Bose National Centre for Basic Sciences

Kolkata
12.08.2004

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U. ROYCHOUDHURI
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For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 1
CORPUS/CAPITAL FUND :

Amount (Rs.)

	Current Year		Previous Year	
Balance as at the beginning of the year	176996231		144001753	
Add: Contributions towards Corpus/Capital Fund	51081342		12994478	
Add: Grant-in-aid in transit		228077573	20000000	176996231
BALANCE AS AT THE YEAR - END		228077573		176996231

SCHEDULE 2
RESERVES AND SURPLUS :

Amount (Rs.)

	Current Year		Previous Year	
1. *Capital Reserve*				
As per last Account				
Addition during the year				
Less: Deductions during the year				
2. *Revaluation Reserve :*				
As per last Account				
Addition during the year				
Less: Deductions during the year				
3. *Special Reserves :*				
As per last Account				
Addition during the year				
Less: Deductions during the year				
4. *General Reserve :*				
As per last Account	-19357452		-15445234	
Less:Accumulated Depreciation				
Less Leave Salary(Accumulated)			-4448108	
Add : Surplus during the year	-6299239	-25656691	535890	-19357452
TOTAL		-25656691		-19357452

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 3
EARMARKED/ENDOWMENT FUNDS

Amount (Rs.)

	FUND-WISE BREAK UP				TOTAL	
	Project Fund	Medical Fund	Leave Salary Fund	Gratuity Fund	Current Year	Previous Year
a) Opening balance of the funds	1381506		5106031	2655870	9143407	2975963
b) Additions to the Funds						
i) Donations/grants/ contributions	4238497	54458			4292955	
ii) Income from investments made on account of funds			22523	323415	345938	3276308
iii) Other additions (specify nature)-Provision during the year			781151	470262	1251413	5463811
TOTAL (a + b)	5620003	54458	5909705	3449547	15033713	11716082
c) Utilisation/Expenditure towards objectives of funds						
I) *Capital Expenditure*						
Fixed Assets	839197				839197	767869
Others						
Total						
ii) *Revenue Expenditure*						
Salaries, wages and allowances etc.	614924				614924	1451860
Rent						
Other administrative expenses	1471721				1471721	311681
Refund of Grant-in-aid against CSIR						41264
TOTAL (c)	2925842				2925842	2572674
NET BALANCE AS AT THE YEAR-END (a+b–c)	2694161	54458	5909705	3449547	12107871	9143408

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
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SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 4

SECURED LOANS AND BORROWINGS:

Amount (Rs.)

	Current Year		Previous Year	
1. Central Government				
2. State Government (Specify)				
3. Financial institutions				
a) Term Loans				
b) Interest accrued and due				
4. Banks:				
a) Term Loans				
Interest accrued and due				
b) Other Loans (Specify)				
Interest accrued and due				
5. Other Institutions and Agencies				
6. Debentures and Bonds				
7. Others (Specify)				
TOTAL	Nil	Nil	Nil	Nil

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 5

UNSECURED LOANS AND BORROWINGS

Amount (Rs.)

	Current Year		Previous Year	
1. Central Government				
2. State Government (Specify)				
3. Financial Institutions				
4. Banks:				
a) Term Loans				
b) Other Loans (Specify)				
5. Other Institutions and Agencies				
6. Debentures and Bonds				
7. Fixed Deposits				
8. Others (Specify)				
TOTAL	Nil	Nil	Nil	Nil

SCHEDULE 6

DEFERRED CREDIT LIABIILTIES

Amount (Rs.)

	Current Year		Previous Year	
a) Acceptances secured by hypothecation of capital equipment and other assets				
b) Others				
TOTAL	Nil	Nil	Nil	Nil

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 7

CURRENT LIABILITIES AND PROVISIONS

Amount (Rs.)

	Current Year	Previous Year
A. CURRENT LIABILITIES		
1. Acceptances		
2. Sundry Creditors:		
a) For Capital expenditure (Including Project Rs.30000)	1369503	30000
b) Others - Revenue expend. (Including Project Rs.41660)	1181970	488507
3. Advances Received		
4. Interest accrued but not due on:		
a) Secured Loans/borrowings		
b) Unsecured Loans/borrowings		
5. Statutory Liabilities:		
a) Overdue		
b) Others		
6. Other Current Liabilities	949909	1411589
TOTAL (A)	3501382	1930096
B. PROVISIONS		
1. For Taxation		
2. Gratuity		
3. Superannuation/Pension		
4. Accumulated Leave Encashment		
5. Trade Warranties/Claims		
6. Others (Specify) - Adhoc Bonus	69666	69666
TOTAL (B)	69666	69666
TOTAL (A + B)	3571048	1999762

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 8
FIXED ASSETS

Amount (Rs.)

DESCRIPTION	GROSS BLOCK				DEPRECIATION				NET BLOCK	
	Cost/valuation As at begin. of the year	Additions during the year	Deductions during the year	Cost/valuation at the year-end	As at the beginning of the year	Additions during the year	Ded. during the year	Total up to the Year-end	Current year-end	Previous year-end
A. FIXED ASSETS:										
1. Land :										
a) Freehold										
b) Leasehold	12339432	25578	1414316	10950694					10950694	12339432
2. Buildings :										
a) On Freehold Land										
b) On Leasehold Land	80041213	1011582		81052795	7695280	1314518		9009798	72042997	72345933
c) Ownership Flats/Premises										
d) Superstructures on Land not belonging to the entity										
3. Plant Machinery & Equipment	1842750	3506410		5349160	465993	205855		671848	4677312	1376758
4. Vehicles	363026			363026	203971	34487		238458	124568	159055
5. Furniture, Fixtures	9986196	1735436		11721632	4449651	1062018		5511669	6209963	5536544
6. Office Equipment	1039898			1039898	326328	49395		375723	664175	713570
7. Computer / Peripherals	16759168	2847189		19606357	10997634	3018569		14016203	5590154	5761534
8. Electric Installations	1744882			1744882	266264	82882		349146	1395736	1478618
9. Library Books	30409747	10011647		40421394	4249369	1529482		5778851	34642543	26160378
10. Tubewells & Water Supply										
11. Other Fixed Assets	42675	41550		84225	958	2082		3040	81185	41718
TOTAL OF CURRENT YEAR	154568987	19179392	1414316	172334063	28655448	7299288		35954736	136379327	125913540
PREVIOUS YEAR	139320784	15248203		154568987	23044408	5611040		28655448	125913540	
B. CAPITAL WORK-IN-PROGRESS										
TOTAL	154568987	19179392	1414316	172334063	28655448	7299288		35954736	136379327	

Sd/-
U. ROYCHOUDHURI
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For ROY & BAGCHI
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Satyendra Nath Bose National Centre for Basic Sciences
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SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 9

INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS

Amount (Rs.)

		Current Year	Previous Year
1.	In Government Securities		
2.	Other approved Securities		
3.	Shares		
4.	Debentures and Bonds		
5.	Subsidiaries and Joint Ventures		
6.	Others (to be specified) - Fixed Deposit with Nationalised Banks	7901322	2229850
	TOTAL	7901322	2229850

SCHEDULE 10

INVESTMENTS - OTHERS

Amount (Rs.)

		Current Year	Previous Year
1.	In Government Securities		
2.	Other approved Securities		
3.	Shares		
4.	Debentures and Bonds		
5.	Subsidiaries and Joint Ventures		
6.	Others (to be specified)- Fixed Deposit with Nationalised Banks	29106686	16225074
	TOTAL	29106686	16225074

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 11
CURRENT ASSETS, LOANS, ADVANCES ETC.

Amount (Rs.)

	Current Year	Previous Year
A. CURRENT ASSETS:		
1. Inventories:		
a) Stores and Spares	537591	166530
b) Loose Tools		
c) Stock-in-trade		
Finished Goods		
Work-in-progress		
Raw Materials		
Stock of Books		
2. Sundry Debtors:		
a) Debts Outstanding for a period exceeding six months		
b) Others		
3. Cash balances in hand (including cheques/drafts and imprest)	4198	4410
4. Bank Balances:		
a) *With Scheduled Banks:*		
On Current Accoutns(including Project A/C)	3666937	1631481
On Deposit Accounts (includes margin money)		
On Savings Accounts		
b) *With non-Scheduled Banks:*		
On Current Accounts		
On Deposit Accounts		
On Savings Accounts		
5. Remittance in Transit		20000000
6. Post Office-Savings Accounts		
TOTAL (A)	4208726	21802421

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEUDLES FORMING PART OF BALANCE SHEET AS AT 31.03.2004

SCHEDULE 11
CURRENT ASSETS, LOANS, ADVANCES ETC. (Contd.)

Amount (Rs.)

	Current Year	Previous Year
B. LOANS, ADVANCES AND OTHER ASSETS		
1. *Loans:*		
a) Staff including HBA ,Vehicle &PC Advance	2233931	1696469
b) Other Entitites engaged in activities/objectives similar to that of the Entity		
c) Other (Specify)	561661	
2. *Advances and other amounts recoverable in cash or in kind or for value to be received:*		
a) On Capital Account - CPWD Deposit Account	30000000	
b) Prepayments	23140	260769
c) Others (Security Deposits)	84218	196052
d) Contractors & Suppliers(including Project A/C)	58979	35500
3. *Income Accrued:*		
a) On Investments from Earmarked/Endowment Funds	288789	143281
b) On investmetns - Others	193022	218993
c) On Loans and Advances		
d) Others (includes income due unrealised - Rs.....)		
4. Claims Receivable - Grant -in- Aid Receivable	7060000	60000
TOTAL (B)	40503740	2611064
TOTAL (A + B)	44712466	24413485

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 12

INCOME FROM SALES/SERVICES

Amount (Rs.)

	Current Year	Previous Year
1) Income from Sales		
a) Sale of Finished Goods		
b) Sale of Raw Material		
c) Sale of Scraps		
2) Income from Services		
a) Labour and Processing Charges		
b) Professional/Consultancy Services		
c) Agency Commission and Brokerage		
d) Maintenance Services (Equipment/Property)		
e) Others (Specify) - Guest House	680063	266623
TOTAL	680063	266623

SCHEDULE 13

GRANTS/SUBSIDIES

(Irrevocable Grants & Subsidies Received) Amount (Rs.)

	Current Year	Previous Year
1) Central Government	35718658	34105522
2) State Government(s)		
3) Government Agencies		
4) Institutions/Welfare Bodies		
5) International Organsations		
6) Others (Specify)		
TOTAL	35718658	34105522

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 14
FEES/SUBSCRIPTIONS

Amount (Rs.)

	Current Year	Previous Year
1) Entrace Fees		
2) Annual Fees/Subscriptions		
3) Seminar/Program Fees		
4) Consultancy Fees		
5) Others (Specify)		
TOTAL	Nil	Nil

Note: Accounting Policies towards each item are to be disclosed

SCHEDULE 15
INCOME FROM INVESTMENTS
(Income on Investments from Earmarked/Endowment Funds transferred to Funds)

Amount (Rs.)

	Investment from Earmarked Fund		Investment-Others	
	Current Year	Previous Year	Current Year	Previous Year
1) Interest				
a) On Govt. Securities				
b) Other Bonds/Debentures				
2) Dividents:				
a) On Shares				
b) On Mutual Fund Securities				
3) Rents				
4) Others (Specify)				
TOTAL	Nil	Nil	Nil	Nil
TRANSFERRED TO EARMARKED/ ENDOWMENT FUNDS	Nil	Nil	Nil	Nil

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 16
INCOME FROM ROYALTY, PUBLICATION ETC.

Amount (Rs.)

	Current Year	Previous year
1. Income from Royalty		
2. Income from Publications		
3. Others (specify)		
TOTAL	Nil	Nil

SCHEDULE 17
INTEREST EARNED

Amount (Rs.)

	Current Year	Previous year
1) On Term Deposits:		
a) With Scheduled Banks	1801316	2084053
b) With Non-Scheduled Banks		
c) With Institutions		
d) Others		
2) On Savings Accounts:		
a) With Scheduled Banks		
b) With Non-Scheduled Banks		
c) Post Office Savings Accounts		
d) Others		
3) On Loans:		
a) Employees/Staff		
b) Others		
4) Interest on Debtors and Other Receivables		
TOTAL	1801316	2084053

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 18

OTHER INCOME

Amount (Rs.)

	Current Year	Previous Year
1) Profit on sale/disposal of assets:		
a) Owned assets		
b) Assets acquired out of grants, or received free of cost		
2) Export Incentives realized		
3) Fees for Miscellaneous Services		
4) Miscellaneous Income	198114	184288
TOTAL	198114	184288

SCHEDULE 19

INCREASE/(DECREASE) IN STOCK OF FINISHED GOODS & WORK IN PROGRESS

Amount (Rs.)

	Current Year	Previous Year
a) Closing stock		
Finished Goods		
Work-in-progress		
b) Less: Opening Stock		
Finished Goods		
Work-in-progress		
NET INCREASE/(DECREASE) [a-b]	Nil	Nil

SCHEDULE 20

ESTABLISHMENT EXPENSES

Amount (Rs.)

	Current Year	Previous Year
a) Salaries and Wages	16969439	14620463
b) Allowances and Bonus	106453	95706
c) Contribution to Provident Fund	745546	612929
d) Contribution to Other Fund (specify) - Gratuity Fund & Leave Salary Fund	1251413	1015703
e) Staff Welfare Expenses (Medical)	536218	450512
f) Expenses on Employees' Retirement and Terminal Benefits		
g) Others (specify)	171362	412460
TOTAL	19780431	17207773

Sd/-
U. ROYCHOUDHURI
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Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 21
OTHER ADMINISTRATIVE EXPENSES ETC.

Amount (Rs.)

	Current Year	Previous Year
a) Visiting Scientist - Professors	418671	422539
b) Academic Staff Research Expenses	7450	13945
c) Library General Expenses	60810	94916
d) Electricity and Power	2634378	2008284
e) Water Charges		
f) Insurance	8517	9812
g) Repairs and Maintenance	7971078	4429084
h) Excise Duty		
i) Rent, Rates and Taxes	284580	275363
j) Vehicles Running and Maintenance including hire charges	696379	483977
k) Postage, Telephone and Communication Charges	964974	958516
l) Printing and Stationary	262555	228835
m) Travelling and Conveyance Expenses including TPSC	881462	980050
n) Expenses on Seminar/Workshops	1023233	770473
o) Subscription Expenses		
p) Expenses on Fees		
q) Auditors' Remuneration	18360	18360
r) Hospitality Expenses	18266	37504
s) Professional Charges (Contract Services & Legal Charges etc.)	956850	539309
t) Provision for Bad and Doubtful Debts/Advances		
u) Irrecoverable Balances Written-off		
v) Integrated Ph.D. and Education Programme	1005585	641606
w) Import Clearing Expenses	226445	47709
x) Distribution of Books		749960
y) Advertisement and Publicity	33015	65809
z) Others (specify)	670609	551051
TOTAL	18143217	13327102

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE YEAR ENDED 31.03.2004

SCHEDULE 22

EXPENDITURE ON GRANTS, SUBSIDIES ETC.

Amount (Rs.)

	Current Year	Previous Year
a) Grants given to Institutions/Organisations		
b) Subsidies given to Institutions/Organisations		
TOTAL	Nil	Nil

SCHEDULE 23

INTEREST

Amount (Rs.)

	Current Year	Previous Year
a) On Fixed Loans		
b) On Other Loans (including Bank Charges)		
c) Others (specify)		
TOTAL	Nil	Nil

Sd/-
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SCHEDULE 24

SIGNIFICANT ACCOUNTING POLICIES (2003-2004)

1. ACCOUNTING CONVENTION

The financial statements are prepared on the basis of historical cost convention, unless otherwise stated and on the accrual method of accounting. Interest on housing and conveyance loans granted are accounted on cash basis. Grants from Government of India is accounted on cash basis.

2. INVENTORY VALUATION

2.1 Stores and Spares (including machinery spares) are valued at cost.

3. INVESTMENTS

3.1 Investments are valued at cost.

4. FIXED ASSETS

4.1 Fixed assets are stated at cost of acquisition inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisition, if material.

4.2 Fixed Assets received by way of non-monetary grants (other than towards the Corpus Fund), are capitalized at value stated / agreed by corresponding credit to Capital Fund. Incomplete work is shown as Capital-Work- in Progress to be capitalized on completion.

5. DEPRECIATION

5.1 Depreciation is provided on straight-line method as per rates specified in the Companies Act, 1956.

5.2 In respect of additions to / deletion from fixed assets during the year, depreciation is considered on pro-rata basis.

6. GOVERNMENT GRANTS/SUBSIDIES

6.1 Government grants of the nature of contribution towards capital costs of setting up projects are treated as Capital Reserve.

7. FOREIGN CURRENCY TRANSACTIONS

7.1 Transactions denominated in foreign currency are accounted at the exchange rate prevailing at the date of transaction.

8. RETIREMENT BENEFITS

8.1 Liability towards gratuity payable on death/retirement of employees is computed on the assumption that employees are entitled to receive the benefit as at each year end.

8.2 Provision for accumulated leave encashment benefit to the employees is accrued and computed on the assumption that employees are entitled to receive the benefit as at each year end.

8.3 Liabilities under above accounts are invested in separate bank accounts of the Institute in fixed deposit and other accounts.

Sd/-
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Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULE 25

CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS (2003-04)

1. CONTINGENT LIABILITIES

1.1 Claims against the Centre not acknowledged as debts – Rs. Nil (Previous year Rs.Nil).

1.2 In respect of

- Bank guarantees given by/on behalf of the Centre – Rs.7,73,397.00 against 100% margin money by way of fixed deposit (Previous year Rs.7,73,397.00).
- Letters of Credit opened by Bank on behalf of the Centre – Rs. Nil (Previous year Rs.Nil)
- Bills discounted with banks – Rs. Nil (Previous year Rs.Nil).

1.3 Disputed demands in respect of:

Income-tax	Rs. Nil (Previous year Rs.Nil)
Sales-tax	Rs. Nil (Previous year Rs.Nil)
Municipal Tax	Rs. Nil (Previous year Rs.Nil)

1.4 In respect of claims from parties for non-execution of orders, but contested by the Centre – Rs. Nil (Previous year Rs.Nil).

2. NOTES ON ACCOUNTS

2.1 Capital Commitments

Estimated value of contracts remaining to be executed on capital account and not provided for (net of advances) Rs. 3.53 crores (Previous year Rs.Nil).

2.2 Current Assets, Loans and Advances

In the opinion of the Management, the current assets, loans and advances have a value on realization in the ordinary course of business, equal at least to the aggregate amount shown in the Balance Sheet.

2.3 Taxation

In view of there being no taxable income under Income-tax Act 1961, no provision for Income tax has been considered necessary.

Satyendra Nath Bose National Centre for Basic Sciences
Block JD, Sector-III, Salt Lake, Kolkata-700 098

SCHEDULE 25 (Contd...) (2003-04)

2.4 Foreign Currency Transactions

i) Expenditure in foreign currency :

a) Travel : Nil

b) Remittances and Interest payment to Financial Institutions/Banks in Foreign Currency : Nil

c) Other expenditure: Nil

- Commission on Sales
- Legal and Professional Expenses
- Miscellaneous Expenses
- Bank Charges

ii) Earnings :

Value of Exports on FOB basis: Nil

2.5 Physical Verification of Fixed Assets was not conducted during the year.

2.6 The following advances are considered doubtful of recovering.

(a)	Excess refund of Earnest Money	Rs. 5000.00
(b)	Staff Advance	Rs. 2000.00

2.7 Transfer of Fixed Assets from project to general fund upon completion of project has not been done pending approval from DST,Govt. of India.

2.8 In absence of any specific directions from Appropriate Authority contributions to Medical Fund Rs.54,458.00 by the employees are appearing under Earmarked & Endowment Fund.

2.9 Excess contribution by Institute made in earlier years to provident fund account, Rs.4,80,983.08 has been shown under Loans & Advances Recoverable from P.F. Account.

2.10 Corresponding figures for the previous year have been regrouped/rearranged, wherever necessary.

Sd/-
S. Dattagupta
Director
S. N. Bose National Centre for Basic Sciences

Sd/-
S. Mallick
Administrative Officer
S. N. Bose National Centre for Basic Sciences

Kolkata
12.08.2004

Sd/-
U. ROYCHOUDHURI
Partner
For ROY & BAGCHI
Chartered Accountants

Satyendra Nath Bose National Centre for Basic Sciences

RECEIPTS AND PAYMENTS ACCOUNTS

For the year ended 31st March 2004

RECEIPTS	Current Year	Previous Year	PAYMENTS	Current Year	Previous Year
I. Opening Balances			I. Expenses :		
a) Cash in hand	4410	4731	a) Establishment Expenses	19800865	17374826
b) Bank Balances :			b) Administrative Expenses	15653924	12282518
i. In current accounts	1631481	2834868	II. Payments made against funds for various Projects		
ii. In deposit accounts	16225074	9563401			
iii. Savings accounts			III. Investments and deposits made		
II. Grants Received			a) Out of Earmarked/ Endowment funds	5532051	283117
a) From Government of India			b) Out of Own Funds		
-For the year	84038497	49537464	(Investment-Others)	11647485	41529148
-For the previous year	20000000		c) CPWD Deposit	30000000	
b) From State Government			IV. Expenditure on Fixed Assets & Capital Work-in-Progress		
c) From Other sources (details)		496095			
(Grants for capital & revenue exp. To be shown separately)			a) Purchase of Fixed Assets	18458524	15025810
III. Income on Investments from			b) Expenditure on Capital Work-in-Progress		
a) Earmarked/Endow Funds					
b) Own Funds (Oth. Investment)	1234127	1529148	V. Refund of surplus money/Loans		
			a) To the Government of India		41264
IV. Interest Received			b) To the State Government		
a) On Bank deposits	593160	462973	c) To other providers of funds		
			VI. Finance Charges (Interest)		
V. Other Income (Specify)	931173	75438	VII. Other Payments (Specify)	3084854	2849246
VI. Amount Borrowed			VIII. Closing Balances		
VII. Any other receipts (give details)	650117	1213628	a) Cash in hand	4198	4410
			b) Bank Balances :		
VIII. Amount transferred to Current		41529148	i. In current accounts	3666937	1631481
Account from Deposit Account	11647485		ii. In deposit accounts	29106686	16225074
			iii. Savings accounts		
	136955524	107246894		136955524	107246894

Per our report of even date
Kolkata
12.08.2004

Sd/-
S. Dattagupta
Director
S. N. Bose National Centre for Basic Sciences

Sd/-
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Chartered Accountants

Actions Taken on Auditors' Comments

a) Physical verification of fixed assets – A professional firm has been engaged to verify physically the assets acquired since inception. The work will be completed within the current financial year.

b) Advance considered doubtful – (1) Excess refund of earnest money – The firm was wound up; recommended by the Finance Committee for write-off. (2) Staff advance – matter *sub judice;* to be recovered from the staff after the final judgment.

c) Transfer of fixed assets on completion of collaborative Projects with fraternal institutes – The matter is under consideration at DST, Govt. of India.

d) Medical Fund – The matter is under consideration by the Medical Committee. A decision would be taken soon as a policy.

e) Excess PF contribution by the Centre – The matter will be regularized within the current financial year.