



“.... I Offer My Salutation”

Fortunately there are some few men among us who can claim fellowship with the aristocracy in the realm of science, and can be expected to make splendid this ceremony with the wealth of their thoughts. I can only bless this institution from that obscure distance where the multitude of the uncared-for generations of this country have helplessly drifted to the pitiless toil of primitive land-tilling. I offer my salutation to the illustrious founder of this institute, humbly sitting by those who are deprived of a sufficiency of that knowledge which only can save them from the desolating menace of scientific devilry and from the continual drainage of the resources of life, and I appeal to this institute to bring our call to science herself to rescue the world from the clutches of the marauders who betray her noble mission into an unmitigated savagery.”



**J. C. Bose Memorial address by Rabindra Nath Tagore,
30th Nov. 1938**

ANNUAL REPORT OF THE BOSE INSTITUTE

**FOR
2007-2008**



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Kolkata -700 009

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The Bose Institute

The Bose Institute was founded by Sir Jagadis Chandra Bose in 1917 for the advancement of science and dissemination of knowledge. The Institute has served the nation for the past 91 years through its pursuit of advancement of knowledge in science and technology and by developing highly competent and able scientific manpower for the country. The Institute has on its staff highly qualified and experienced scientists working in Biological, Biomedical and Physical Sciences, in the departments of Physics, Chemistry, Botany, Microbiology, Biochemistry and Biophysics, Division of Molecular Medicine and the research sections on Plant Molecular & Cellular Genetics, and Environmental Science. Besides, there are service centres like Sophisticated Analytical Instrument Facility, Bioinformatics Centre, Library, Workshop, etc. In addition, the Acharya J.C.Bose High Altitude Research Centre at Darjeeling and experimental field stations at Falta, Madhyamgram and Shyamnagar are parts of the Institute. The scientific facilities available in the institute are also used by scientists from several universities and research centres in the country.

91st Foundation Day Celebration



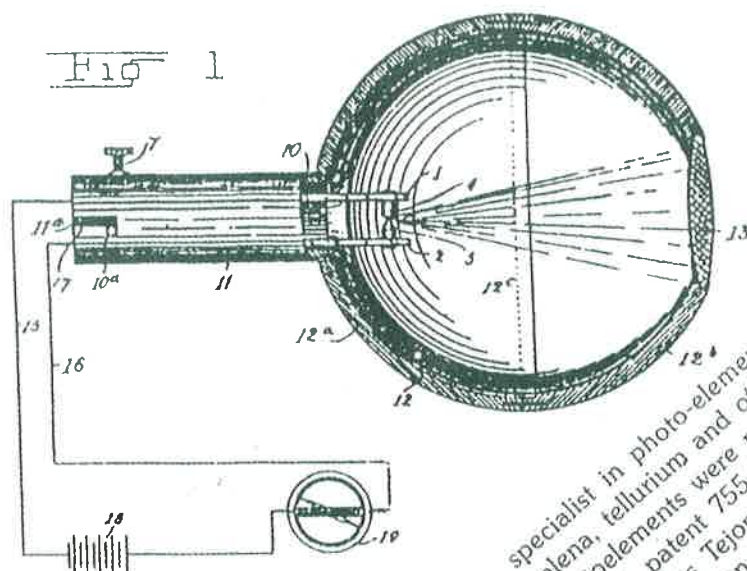
The 91st Foundation Day of Bose Institute was celebrated on 30th November 2007. Swami Jitatmananda, Secretary, Swami Vivekananda's Ancestral House and Culture Centre, Kolkata graced the occasion as Guest of Honour and delivered the 69th Acharya Jagadis Chandra Bose Memorial Lecture on **Matter, consciousness and the contribution of Acharya Jagadis Chandra Bose**. On this occasion **Sir Nilratan Sirkar Prize 2007** was awarded jointly to Mr. Surajit Basak, a senior research fellow (extended), Bioinformatics Centre and Ms. Nivedita Majumder, a senior research fellow, Department of Microbiology. **Prof. B.B. Biswas Outstanding Student Award 2007** Was presented jointly to Mr. Mainak Guha Roy, a senior research fellow, Department of Biochemistry and Mr. Sukhendu Mandal, a senior Research fellow, Department of Microbiology. The day's programme started with floral offering and garlanding of SAMADHI and BUST of Acharya J.C. Bose at both the campuses of the Institute. Prof. Sibaji Raha, Director, Bose Institute, delivered welcome address and presented Institute Report

No. 755,840.

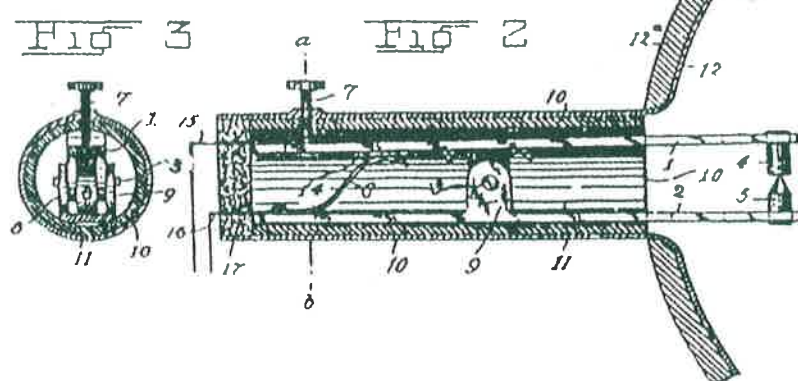
PATENTED MAR. 29, 1904

J.C. BOSE
DETECTOR FOR ELECTRICAL DISTURBANCES.
APPLICATION FILED SEPT. 30, 1901.

NO MODEL



According to Bruno Lange, specialist in photo-elements, the first observations on galena, tellurium and other detector minerals as crystal photoelements were made by J.C. Bose and described in U.S. patent 755,840 of 1904. Bose named his light detector for radiation 'tej'. In a review on a lead salt for radiators, Moss refers to Bose's use of galena photoconductors. Moss refers to Bose's use of galena crystal as a detector of light waves. J.C. Bose's galena detector is, in fact, considered today to be the most sensitive detector for near and middle infrared waves and laid the foundation of optical communication.



WITNESSES

Frederick White
Thomas Halladay

INVENTOR

Jugadish Chunder Bose,
By his attorney
William C. Orason

Management of the Institute

The Bose Institute is a grant-in-aid autonomous institution under the Department of Science and Technology (DST), Ministry of Science & Technology, Government of India. It has a Governing Body consisting twelve members including the Director. The management of the Institute is vested in the Bose Institute Council that has 19 members including the Secretary, DST, Govt. of India. The Institute also has a Finance Committee responsible for the financial policies and management.

Members of the Governing Body

1. Prof. R.N. Chakravarti (till 31st May 2007)
2. Prof. Debi Chakravarti
3. Prof. S.N. Chatterjee
4. Shri Somnath Sanyal
5. Prof. D. Banerjee
6. Dr. Anutosh Chatterjee
7. Dr. Manish Chakraborty
8. Mr. D. Mandal
9. Shri Dilip Bhattacharyya
10. Prof. Parul Chakrabarti
11. Prof. Bikash Sinha (w.e.f. 11.08.2007)
12. Director, Bose Institute - Secretary

Members of the Council

1. Dr. Manish Sekhar Chakraborty
2. Shri D.Mandal
3. Prof. R. N. Chakravarti (till 31st May 2007)
4. Prof. (Mrs.) Debi Chakravarti
5. Shri Somnath Sanyal
6. Prof. S.N. Chatterjee
7. Mr. Dilip Bhattacharyya

Nominees of the
Governing Body

8. Secretary, Department of Science & Technology, Government of India
or his nominee
9. Director General, C.S.I.R. or his nominee
10. Joint Secretary and Financial Adviser, Department of Science and Technology, Govt.
of India or his nominee

(iii)

11. A Representative of the Lok Sabha
12. Principal Accountant General (A & E), West Bengal
13. Secretary, Higher Education (Nominee of the Govt. of West Bengal)
14. Municipal Commissioner, Representative of the Calcutta Municipal Corporation
15. Director, Bose Institute – Ex-officio
16. Dy. Director, Bose Institute – Ex-officio

17. Dr. Amit Roy
 18. Prof. Aloke Bhattacharyya
- Two Scientists from outside West Bengal, nominated by DST. Govt. of India.

19. Registrar, Bose Institute - Secretary

20. Director, IACS, Kolkata – Permanent Invitee

21. Director, SNBNCBS, Kolkata – Permanent Invitee

w.e.f. 13-09-07

Members of the Finance Committee

1. Principal Secretary, Higher Education Department, Govt. of W.B. – Chairman
2. Shri D. Mandal – (Representative of the Governing Body)
3. Joint Secretary and Financial Adviser to the Department of Science and Technology, Govt. of India or his nominee
4. Principal Accountant General (A & E), West Bengal
5. Director, Bose Institute
6. Registrar, Bose Institute – Secretary.

Scientific Reports

Biochemistry

The department was created in 1974. Since its inception, the research activities of the department have been directed primarily towards an understanding of the process of gene expression in plants and bacteria. In the late eighties, these studies were continued using the recombinant DNA technology, and several new research programmes were initiated, including plant and animal biotechnology, cell cycle regulation in budding yeast and *Entamoeba histolytica*, structure-activity relationships of gene regulatory proteins. In recent years the elucidation of protein structures using X-ray crystallography and NMR spectroscopic methods, studies aimed at understanding protein conformation, folding, protein-protein association, binding of drugs to target proteins and theoretical modeling of protein structures and docking have been undertaken.

Chaperone-Mediated Inhibition of Tubulin Self-Assembly (Prof. B. Bhattacharyya)

Molecular chaperones are known to play an important role in facilitating the proper folding of many newly synthesized proteins. Here, we have shown that chaperone proteins exhibit another unique property to inhibit tubulin self-assembly efficiently. Chaperones tested include α -crystallin from bovine eye lenses, HSP16.3, HSP70 from *Mycobacterium tuberculosis* and α_s -casein from milk. All of them inhibit polymerization in a dose-dependent manner independent of assembly inducers used. The critical concentration of MTP polymerization increases with increasing concentration of HSP16.3. Increase in chaperone concentration lowers the extent of polymerization and increases the lag time of self-assembly reaction. Although the addition of a chaperone at the early stage of elongation phase shows no effect on polymerization, the same concentration of chaperone inhibits polymerization completely when added before the initiation of polymerization. Bindings of HSP16.3 and α_s -casein to tubulin have been confirmed using isothermal titration calorimetry (ITC). Affinity constants of tubulin are 5.3×10^4 and $9.8 \times 10^5 \text{ M}^{-1}$ for HSP16.3 and α_s -casein, respectively. Thermodynamic parameters indicate favourable entropy and enthalpy changes for both chaperones-tubulin interactions. Positive entropy change suggests that the interaction is hydrophobic in nature and desolvation occurring during formation of tubulin-chaperone complex. On the basis of thermodynamic data and observations made upon addition of chaperone at early elongation phase or before the initiation of polymerization, we hypothesize that chaperones bind tubulin at the protein-protein interaction site involved in the nucleation phase of self-assembly.

Chromosome replication and segregation in yeast (Prof. Pratima Sinha)

Work on the characterization of yeast (*S. cerevisiae*) *mcm* mutants, which cause loss in the fidelity of chromosome transmission, was continued. In particular, *Chl4*, *Iml3* and *Mcm21* proteins were found to be defective in recovery from spindle damage, in that there was a mitotic delay in the recovery of these mutants after microtubules were damaged with nocodazole. In the *chl4 iml3* double mutant, the delay was due to late retrieval of centromere by microtubules. In *mcm21* mutant, the recovery was associated with loss in viability. These observations are of significance as vertebrate homologs of these proteins have been identified whose depletion also causes mitotic arrest and loss in viability of host cells. In another work (in collaboration with Prof. S. Lahiri, SINP, Kolkata), yeast cells of *Saccharomyces cerevisiae* were found to accumulate ^{152,154}Eu radioisotopes selectively from a synthetic mixture of ^{152,154}Eu, ¹³⁷Cs, and ⁶⁰Co radiotracers. Unlike with Co, the yeast cells could grow upto 4.6mM (700 mg kg⁻¹) Eu concentration and 7.3mM (1 g kg⁻¹) Cs concentration irrespective of their histidine auxotrophy. Thus, the mechanism of uptake of the rare earth element, Eu, was found to follow a different pathway than the transition element Co. These results may encourage pilot experiments in preconcentration of rare earths using bioreagents at a commercial scale.

Patterns in protein structure and conformation (Prof. P. Chakrabarti)

We are involved in characterizing the native folds and protein-protein interactions based on various structural parameters calculated using known structures in Protein Data Bank. It has been shown that in inter-residue contacts the planar side chains have preferred geometries of interactions and these are maintained even when the residues are involved in protein-protein interactions.

Cloning, expression, purification and structural studies on proteins from *Vibrio cholerae* (Prof. P. Chakrabarti)

Vibrio cholerae is the causative agent of the diarrheal disease cholera, which is usually acquired by oral ingestion of the bacterium with contaminated water or food. The bacterium expresses virulence factors that allow it to colonize the human intestine and cause the disease. Regulation of virulence genes can involve the ToxR, Fur, or HlyU regulatory system. We have cloned, expressed, purified ToxR and carried out biophysical studies. The periplasmic and the cytoplasmic domains of the protein have been cloned separately, and a cysteine to alanine point mutation in the former has been found to convert the dimeric wild-type structure into a monomeric protein.

The cell cycle of *Entamoeba histolytica* (Prof. Anuradha Lohia)

Elucidation of molecular mechanisms regulating cytokinesis and genome segregation was the prime focus of research carried out last year in the lab. We have demonstrated- a) that *E. histolytica* encodes 8 formins of which 4 are unique in the eukaryotic kingdom. A subset of the remaining formins regulate genome content and cell division in amoeba; b) Of the six kinesin

proteins in *E. histolytica*, two N-type kinesins- Eh Klp5 and Eh Klp2- inversely regulate microtubular spindle frequency and genome segregation. Work in progress is directed towards- a) identifying proteins interacting with kinesins using the yeast two hybrid screen; b) the role of Eh CDC6 in regulating DNA synthesis and c) identifying the mechanisms regulating chromatin modification by SIR proteins in amoeba.

RecA-mediated cleavage of λ cI repressor (Dr. Rajagopal Chattopadhyaya)

The *cis-trans* peptidyl prolyl isomerase activity of RecA using a substrate peptide was directly tested at 10°C but no activity could be detected. HPLC profiles of RecA filament before and after modification by diethyl pyrocarbonate, maleic anhydride and complex formation with rapamycin were carried out as part of our studies on the mechanism of RecA-mediated cleavage of cI.

Stereo diagram of inactive RecA filament with six-fold axis (top, pitch 83Å) and active RecA filament with the six-fold axis (bottom, pitch 95Å), individual RecA molecules in red, green and light blue, with a molecule of cI dimer in magenta (bottom) inserted in the helical groove. The repressor molecule cannot insert itself in the groove of the inactive (top) ADP form of the filament, but can do so in that of the active ATP form (bottom) since the gap between the two loops joined by a dotted line increases from 19.7Å to 34.4Å. We prove from our biochemical experiments that His 163 from the light blue RecA molecule catalyses the cleavage of cI in magenta.

Structural Studies on proteins involved in the lysis-lysogeny switch of phage lambda (Dr. Pradeep Parrack)

Several host and viral proteins are involved in the lysis-lysogeny decision of bacteriophage lambda, and we are studying several proteins (four bacterial proteins and two viral proteins) of this system. Work was initiated to solve the structure of lambda CIII, by NMR studies. Several mutants of CII (L70D, V74Q, L78D, 7074, 7078, 7478 and 707478), carrying amino acid substitutions in the alpha4 helix of CII, were cloned and purified, in order to investigate subunit interactions in CII as envisaged from its crystal structure, and their effects on CII activity. None of the mutants showed clear plaques on E. coli BL21, or could activate the CII-dependent promoter p_E. Five of these proteins could be purified for further studies, and each was found to form a dimeric rather than tetrameric structure characteristic of CII. Thus, the tested mutations in the terminal alpha-4 helix of CII lacked the proper subunits for tetramerisation, which is necessary for its activity.

Characterization of bacteriophage proteins and construction of *S. aureus* reporter tool (Dr. Subrata Sau)

Repressor of temperate *S. aureus* phage Phi 11 was shown to bind to three 15 bp inverted repeats (carrying axes of partial twofold symmetry) in the ϕ 11 *cI* - *cro* intergenic region. These sites, located 18 bp away from each other, bear high sequence identity. Repressor has two domains, shows thermosensitivity, unfolds rapidly above 39°C and binds to operator DNA as a homodimer

Structure, function and stability of repressor (CI) of temperate mycobacteriophage L1 have been investigated in the presence of various ions. The data reveal that monovalent ions are better than divalent ions for the optimal binding of CI to cognate operator DNA. While monovalent ions maintain the conformation and stability of CI, some divalent ions severely affect the conformation and stability of CI.

A gene (designated *hlgI*) of temperate mycobacteriophage L1 was shown to affect the growth of both *M. smegmatis* and *E. coli* severely when overexpressed from a resident plasmid. HLG1 (the protein encoded by *hlgI*) in fact caused the growth retardation of *M. smegmatis* and the region encompassing its 57-114 C-terminal amino acid residues was found indispensable for its growth-retardation activity. Both nucleic acid and protein biosynthesis were severely impaired both in *M. smegmatis* and *E. coli* expressing HLG1. It is a delayed early lipoprotein and did not participate in the lytic growth of L1.

A reporter *S. aureus* strain CHANDA2, constructed by inserting the putative cold shock inducible promoter (P_c) - *lacZ* transcriptional fusion into *S. aureus* RN4220 genome, was found to express very low level of β -galactosidase after cold shock, indicating that low temperature induces P_c very weakly. Interestingly, transcription from P_c was induced very strongly by several antibiotics, hydrogen peroxide and arsenate salt. The data suggest that CHANDA2 could be utilized for screening and detecting not only the novel antistaphylococcal compounds but also different toxic chemicals.

Bioinformatics Centre

The Bioinformatics Centre of Bose institute was established in 1988 as one of the ten nodal centres under the programme, Biotechnology Information System (BTIS) of the Department of Biotechnology, Government of India, with genetic engineering and molecular modeling as the two major research areas. Based on the research work carried out by the Centre since its inception, in 2004 DBT recognized it as a "Centre of Excellence" in Bioinformatics to undertake research in the following areas: modeling of proteins structures; molecular interaction and docking; drug design; chromosomal dynamics; stress biology of plants; functional genomics and host-pathogen interactions.

Physicochemical features involving protein-protein interfaces (Prof. P. Chakrabarti)

The protein-protein interfaces have been characterized in terms of two types of segments – stretches of (nearly) contiguous residues along the polypeptide chain and those containing distinct secondary structural elements. Further, based on the composition of the secondary structural elements (α -helix, β -strand and non-regular regions) the interfaces have been grouped into α , β , $\alpha\beta$ and NR classes. A comparison between the protein and interface classes indicates that there may not be a direct correspondence between the two.

Analysis of surface pockets and cavities in protein structures (Prof. P. Chakrabarti)

A surface roughness index has been defined that has been used to classify protein structures. Moreover, work is in progress to locate the cavities in protein tertiary structures and protein-protein interfaces and compare their features.

Structure-based design of selective inhibitors of glyceraldehydes-3-phosphate dehydrogenase of human protozoan parasites (Dr. Debjani Roy)

The three-dimensional models of *Entamoeba histolytica* (Eh) and *Trichomonas vaginalis* (Tv) glyceraldehydes-3-phosphate dehydrogenase (GAPDH) have been studied. The binding modes of GAPDH inhibitors of these two parasites have also been predicted. In the absence of crystal structures our study provides an early insight into the structures of major drug targets EhGAPDH and TvGAPDH thus facilitating the inhibitor design.

Molecular dynamics simulation of the unfolding of antifreeze protein (Dr. Debjani Roy)

Molecular dynamics simulations of the temperature-induced unfolding reaction of a cold-adapted type III antifreeze protein (AFPIII) from the Antarctic eelpout *Lycodichthys dearborni* have been carried out for 10 ns each at five different temperatures. Plots of backbone root mean square deviation (RMSD) against radius of gyration (Rg) serve as phase space trajectories. These plots also indicate that the protein unfolds without many detectable intermediates suggestive of two-state unfolding kinetics. The transition state structures are identified from essential dynamics, which utilizes a principal component analysis (PCA) on the atomic fluctuations throughout the simulation. Our study provides insight into the structure-stability relationship of AFPIII, which may help to engineer AFPs with increased thermal stability that is more desirable than natural AFPs for some industrial and biomedical purposes.

On the origin of synonymous codon usage divergence between thermophilic and mesophilic prokaryotes (Dr. T. C. Ghosh)

Synonymous codon usage analysis between thermophilic and mesophilic prokaryotes has gained wide attention in recent years. Although it is known that thermophilic and mesophilic prokaryotes use different subset of synonymous codons, but no explanation has yet been provided for the difference in synonymous codon usage between thermophiles and mesophiles. By analyzing a large number of thermophilic and mesophilic prokaryotes we provided evidences that bias in the selection of synonymous codons between thermophilic and mesophilic prokaryotes are related to differential folding pattern of mRNA secondary structures. Moreover, we observed that error-minimizing property has significant influence in differentiating the synonymous codon usage between thermophilic and mesophilic prokaryotes.

Different functional classes of genes are characterized by different compositional properties (Dr. T. C. Ghosh)

A compositional analysis on a set of human genes classified in several functional classes was performed. We found out that the GC3, i.e. the GC level at the third codon positions, of the

genes involved in cellular metabolism was significantly higher than those involved in information storage and processing. Analyses of human/Xenopus orthologous genes showed that: (i) the GC3 increment of the genes involved in cellular metabolism was significantly higher than those involved in information storage and processing; and (ii) a strong correlation between the GC3 and the corresponding GCi, i.e. the GC level of introns, was found in each functional class. The non-randomness of the GC increments favors the selective hypothesis of gene/genome evolution.

Nature of selective constraints on synonymous codon usage of rice differs in GC-poor and GC-rich genes (Dr. T. C. Ghosh)

Synonymous codon usage and cellular tRNA abundance are thought to be co-evolved in optimizing translational efficiencies in highly expressed genes. By taking the advantage of publicly available gene expression data of rice and Arabidopsis we demonstrated that tRNA gene copy number is not the only driving force favoring translational selection in all highly expressed genes of rice. We found that forces favoring translational selection differ between GC-rich and GC-poor classes of genes. Supporting our results we also showed that, in highly expressed genes of GC-poor class there is a perfect correspondence between majority of preferred codons and tRNA gene copy number that confers translational efficiencies to this group of genes. However, tRNA gene copy number is not fully consistent with models of translational selection in GC-rich group of genes, where constraints on mRNA secondary structure play a role to optimize codon usage in highly expressed genes.

Synonymous codon usage in different protein secondary structural classes of human genes (Dr. T.C. Ghosh)

The relationship between the synonymous codon usage and different protein secondary structural classes were investigated using 401 Homo sapiens proteins extracted from Protein Data Bank (PDB). A simple Chi-square test was used to assess the significance of deviation of the observed and expected frequencies of 59 codons at the level of individual synonymous families in the four different protein secondary structural classes. It was observed that synonymous codon families show non-randomness in codon usage in four different secondary structural classes. However, when the genes were classified according to their GC3 levels there was an increase in non-randomness in high GC3 group of genes. The non-randomness in codon usage was further tested among the same protein secondary structures belonging to four different protein folding classes of high GC3 group of genes. The results show that in each of the protein secondary structural unit there exist some synonymous family that shows class specific codon-usage pattern. Moreover, there is an increased non-random behaviour of synonymous codons in sheet structure of all secondary structural classes in high GC3 group of genes.

Biophysics

The research focus in the Department of Biophysics is on Structural Biology. Projects in the area of Protein-nucleic acid interaction, bioinformatics, spectroscopy and protein engineering are in progress.

Electrostatic aspects of tRNA and DNA protein interactions (Dr. Gautam Basu and Prof. Siddhartha Roy)

In order to understand the problem of target search (how a DNA binding protein searches and finds the correct DNA binding site) we have calculated electrostatic components of binding free energy, both salt independent and salt dependent on a series of protein-DNA and protein-RNA complexes. We have also calculated the empirical binding free energies of lambda repressor, a typical DNA-binding protein, to all possible 17 base pair sequences in the E. coli genome and show the existence of many semi-specific sites out of about 4.5 million on each strand. Together with the electrostatics results, this suggests that in the absence of strong non-specific electrostatic interaction energy between DNA and DNA-binding proteins, operator-like sequences scattered around the genome may provide semi-specific binding sites and aid target search.

Analysis of electrostatic interactions in protein-protein complexes (Dr. Gautam Basu)

To understand the driving forces behind protein-protein interactions, especially factors responsible for the observed orientations of protein pairs, we have finished calculating electrostatics interactions in protein-protein complexes including the effect of solvent. Analysis of data and preparation of manuscripts are in progress.

Steady State and time resolved Trp fluorescence in designed peptides (Dr. Gautam Basu)

Intrinsic Trp fluorescence is an important marker for protein structure and dynamics. Yet, the origin of fluorescence lifetimes of Trp in proteins is not clear. We have synthesized a series of short peptides with Trp and have started fluorescence experiments (both steady state and time resolved) along with NMR to understand subtleties of Trp fluorescence, especially how fluorescence lifetimes correlate with structure.

Mechanism of substrate recognition by truncated glutamyl-tRNA synthetase (Dr. Gautam Basu)

Glytaminyl tRNA synthetase is comprised of two domains. The C-terminal domain participates in recognizing the anti codon bases in the tRNA while the N-terminal domain is responsible for its catalytic function, i.e. aminoacylation. In order to understand the mechanism of amino acylation we have cloned, expressed and purified the C-terminal and the N-terminal domains of Glu-tRNA synthetase. A major result is that even in isolation the N-terminal domain retains the discriminatory (against tRNA Gln) property of the wild type protein.

Botany

The scientists of this department are engaged in several different aspects of plant science. Large-scale production of transgenic pineapple with a novel encapsulation based antibiotic selection; Varietal difference in seed vigour and viability, Aroma in tea of high altitude, DNA fingerprinting of *Curcuma* land races growing in Manipur, Development of Curcuminoid and antioxidant potential associated DNA marker; Resource survey analysis of wild gene pool with reference to seeds; The ddNTP sensitive DNA polymerase enzyme from plant system, Salinity Stress in rice Cultivars and Biochemical & Molecular Analysis of Fruit Ripening; Resource survey analysis of wild gene pool with reference to seeds; Studies on airborne allergenic pollen grains and spores; Biochemical, clinical and molecular approach; Resistance gene analogue (RGA) profiling of rice landraces of West Bengal; Differential profiling of genes induced on challenge with *Alternaria brassicicola* in resistant *Sinapis alba* and their comparative expression pattern in susceptible *Brassica juncea*. Many papers have been published in many different national and international journals.

Large scale production of transgenic pineapple with a novel encapsulation based antibiotic selection (Prof. K K Mukherjee)

A protocol for *Agrobacterium*-mediated transformation has been established in local 'elite' Indian variety of Pineapple [*Ananus comosus* (L.) Merr, family Bromeliaceae] with a standard vector (pCAMBIA 1304). Large scale production of transgenic pineapple avoiding false antibiotic positive regenerated shoots was attained with a novel encapsulation based antibiotic selection procedure. The microshoots derived from *Agrobacterium*-infected explants survived encapsulation in Ca-alginate beads containing high concentration of hygromycin ($60 \mu\text{g l}^{-1}$ and beyond), the selection antibiotic. The integration of the transgene was confirmed by histochemical GUS assay, PCR and Southern hybridization techniques.

Varietal difference in seed vigour and viability; Aroma in tea of high altitude; DNA fingerprinting of Curcuma land races growing in Manipur & Development of Curcuminoid and antioxidant potential associated DNA marker (Prof. S. Sen-Mandi)

Studies on biochemical parameters of seed vigour and cell protection during ageing of orthodox seed have led to the identification of a common gene associated with rapid embryonic growth and retention of cell molecular integrity and thus viability in rice seed. High expression of Acetyl Co A Carboxylase has been demonstrated in high vigour and high viability varieties; Acetyl Co A Carboxylase activity was found to be low in low vigour, low viability varieties.

In the final phase of this study enzyme activity assay of Phenylalanine Ammonia Lyase and β -D glucosidase indicate important roles of these enzymes that through up-regulation under high UV radiation could enhance flavour compounds in tea leaf.

Randomly Amplified Polymorphic DNA (RAPD) fingerprints of seven turmeric varieties were analyzed by seven random primer initiated polymerase chain reaction derived amplified fragments of genomic DNA. The Amplified DNA fragments revealed 95.74% polymorphism among the genomes thus establishing the suitability of using the RAPD method for genome analysis of these genotypes. Data on RAPD bands scored for presence or absence was used to calculate Jaccard's similarity index. Clustering based on similarity index was done following un-weighted pair group with arithmetic mean method (UPGMA) and a dendrogram for studying genetic relatedness was constructed using the NTSYS-pc programme.

A correlative study involving the DNA fingerprinting (RAPD) band scores as independent variables and chemical assay for antioxidant potential and curcuminoid content of each genotype as dependent variables led to the identification of 4 bands associated with curcuminoid content and 5 bands associated with antioxidant potential in the plants; of these, 1 band was found to be common for both the traits. Further studies to identify candidate gene(s) and to understand the mechanism of gene control for different aspects of the medicinal potential of *Curcuma* plants is underway.

Resource survey analysis of wild gene pool with reference to seeds (Prof. Prabir Kumar Saha)

(a) Sixty-three Indian varieties / accessions of *Sesamum indicum* along with three accessions of *Sesamum mulayanum*, a wild relative of cultivated sesame were procured from the germplasm collection of NBPGR (National Bureau of Plant Genetic Resources), India. Furthermore, seeds of six local cultivars were collected from farmers' plots of different districts of West Bengal i.e. Midnapore, Bankura, Bardwan, North 24 Paraganas and Nadia. The plants grown in MEF showed that sesame is an erect annual (or occasionally a perennial) plant that grows to a height of 50 to 192 cm, some varieties is highly branched, while others are unbranched. Leaves are variable in shape and size and may be opposite or alternate. The bell shaped white to pale-rose flowers begin to develop in the leaf axils 6 to 8 weeks after planting and this continues for several weeks. Multiple flowering is favoured by opposite leaves.

Sesame is normally self-pollinated, although cross pollination by insects is common. The fruit is a deeply grooved capsule (2 to 8 cm in length; 0.5 to 2 cm in width) that contains 50 to 100 or more seeds. The seeds mature 4 to 6 weeks after fertilization. The growth of sesame is indeterminate; the plant continues to produce leaves, flowers and capsules as long as the weather permits. Sesame seeds are small and vary in colour. One thousand seeds weigh about one ounce. The lighter coloured seeds are considered higher quality.

(b) Application of SEM for identification of allied species of safed musli – The identification of two closely related medicinally important and endangered species of *Chlorophytum borivilianum* and *C. tuberosum* by SEM analysis was carried out for ultrastructural variation of seeds and tubers. SEM aided characterisation is possible to identify the target species of the two material.

(c) *Analysis of agro-morphological data of all C. capsularis and C. olitorius* - genotypes using published descriptors: The agro-morphological descriptors were released by CRIJAF after the initiation of the present project and cluster analysis was performed using these descriptors for both *Corchorus capsularis* and *C. olitorius*. (In collaboration with Prof. K.K. Mukherjee and Dr. D. Basu).

The ddNTP sensitive DNA polymerase enzyme from plant system, Salinity Stress in rice Cultivars and Biochemical & Molecular Analysis of Fruit Ripening (Dibyendu Naryan Sengupta)

Salinity stress for longer periods affect the nuclear genomic DNA in salt sensitive rice cultivars and ddNTP sensitive DNA polymerase beta's activity was found to be enhanced. We are going to find out to what extent the nuclear DNA is affected and how and why the ddNTP sensitive DNA polymerase activity is increased.

The cDNA for AKT, HKT (K^+ channel through which the Na^+ enters into cells); SOS1, SOS2 and SOS3 (Signal transduction proteins) and Nhxl (the protein present on the tonoplast membrane) have been generated from salt tolerant indica rice cv Pokkali. To monitor their expression from leaves and roots of salt sensitive and salt tolerant rice varieties have been started.

Fruit ripening was studied by monitoring the expression of trans-acting factor from ripe banana fruits, that binds to the upstream of sucrose phosphate synthase and Lycopene β -cyclase gene from different fruits including both climacteric and non climacteric fruit. Gel mobility shift assay was repeated and factor (s) from the ripe banana or other fruits was detected.

Application of Biotechnology in medicinal plant studies (Dr. Sabita Bhattacharya)

The problem in preserving germplasms by storage of naturally borne zygotic seeds of *Rauvolfia serpentina*, *Eclipta alba* and *Boerhaavia repens* were solved to some extent by preserving artificial seeds of the respective species at 20°C under light. The offsprings, derived from such seeds maintained genetic uniformity as observed by analyzing their DNA profile using PCR-based RAPD technique. Transformed nature of hairy roots from *Plumago indica* was confirmed by RT-PCR and by Southern blot analysis. 'Plumbagin' production in hairy roots was enhanced when cultured under stress condition (biotic and abiotic). The pathogen, responsible for causing root rot disease of *Coleus forskohlii* in cultivated fields of south West Bengal districts were identified as *Fusarium solani*. This is a different fungus from the others detected earlier from diseased *C. forskohlii* in other states of India.

Studies on airborne allergenic pollen grains and spores: Biochemical, clinical and molecular approach (Dr. Swati Gupta-Bhattacharya)

Peltophorum pterocarpum and *Delonix regia* pollen grains are dominant in the atmosphere of south Kolkata and they are influenced by temperature. The pollen grains release proteins that are responsible for immediate hypersensitivity reactions in sensitive patients. Structural bio-informatic approach has been taken to analyze the properties of protein T1, the non-allergenic member of the Bet v 1 allergen family in relation to allergenicity and cross-reactivity. Total viable and nonviable airborne fungal spore types in the air of a suburban agricultural field (Madhyamgram) have been monitored throughout the year. Detail studies have been performed with *Rhizopus nigricans* and *Trichoderma herzeanum*, which are dominant types of fungal spores in the studied area and highly allergenic too. IgE specific Immunoblotting of *R. nigricans* showed one allergenic protein band of 45.5 kDa, and *T. herzeanum* showed two allergenic protein bands of 35.5 kDa and 15.5 kDa.

Resistance gene analogue (RGA) profiling of rice landraces of West bengal (Dr. T. K. Ghose)

Resistance gene profiling using RGAs is continuing on a set of rice landraces of West Bengal. Quality and nutritional quality assessment of the rice genotypes are progressing.

Differential profiling of genes induced on challenge with *Alternaria brassicicola* in resistant *Sinapis alba* and their comparative expression pattern in susceptible *Brassica juncea* (Dr. Debabrata Basu)

cDNA AFLP based functional genomics approach was used to identify the differentially expressed genes from non-host resistant plant *Sinapis alba* on infection. The highly reproducible bands were further subjected to comparative reverse northern analysis in the incompatible white mustard (*S. alba*) and compatible India mustard (*Brassica juncea* L.) plants. The genes were characterized by sequence analysis and the expressions of few of these genes were further confirmed by semi-quantitative RT PCR. The overall impressions based on the expression pattern of the gene in two different genetic backgrounds are : (a) Suppression of high percentage of genes in compatible background (*B. juncea*), which were induced in *S. alba* on infection with *A. brassicicola*, indicate for the first time that at the molecular level, the interaction of *S. alba* with *A. brassicicola* is an incompatible interaction. (b) Up-regulation of number of receptor like protein kinases as well as genes involved with calcium mediated signalling in *S. alba* compared to *B. juncea* suggested that the presence of early signal perception may be the missing link for activation of defense responsive genes. (c) Classification of the genes on the basis of their induction pattern in *Arabidopsis* indicates that preferential / steady state expression of salicylic acid (SA) dependent genes in *S. alba* compared to *B. juncea*. Although, in *Arabidopsis* jasmonic acid (JA) is involved with resistance and SA is not directly involved with resistance.

Considering all the probable possibilities, it appears that, up-regulation of different classes of genes together enlightens involvement of multiple factors for the expression of the resistant phenotype.

Chemistry

One of the oldest Departments of the Institute, the Department of Chemistry has evolved over the years to engage in research in multidisciplinary areas. Electrooptical experiments are under way to understand ferroelectric smectic liquid crystals and their application potential. Green syntheses are being developed and condensed heterocycles are being evaluated for their bioactive potential. Biophysical studies have elucidated how chaperones such as α -crystallin function. State-of-the-art techniques of biochemistry, biophysics and systems biology are being used to understand diseases caused by the bacterial pathogens *Mycobacterium tuberculosis* and *Helicobacter pylori* with special reference to how these pathogens interact with their host and how they respond to stress.

Synthesis of condensed heterocycles and development of green chemistry (Prof. Manas Chakrabarty in collaboration with Prof. Y. Harigaya, Kitasato University, Tokyo, Japan, Prof. G. Pilet, Universite Claude Bernard Lyon, France and Dr. S. Chatterjee, Bioorganic Division, School of Chemistry, BARC, Mumbai)

Two green syntheses of potentially bioactive 1-substituted 2-arylbenzimidazoles have been developed from *N*-substituted *ortho*-phenylenediamines and aryl aldehydes using separately silicotungstic acid in a non-halogenated solvent and cetylpyridinium bromide in water as the environment-friendly catalysts. Since Knoevenagel condensates are useful synthons for complex heterocycles, the reactions separately of substituted isatins and diethyl mesoxalate on neutral alumina and of ninhydrin on montmorillonite K10 clay were studied. As a result, a diverse array of mechanistically interesting products, including the desired Knoevenagel condensates, were obtained. Additionally, a highly efficient synthesis of thiazolo [4,5-*g*]indazoles was developed starting from commercially available 6-nitroindazoles. An assortment of both thiazolo [5,4-*e*]indazoles, synthesised earlier by us, and thiazolo[4,5-*g*]indazoles were tested for antitumour activity against human lung carcinoma A549 cell line. One of the [4,5-*g*]-products showed moderate antitumour activity.

Role of N-terminal region in chaperone activity of α -crystallin (Prof. K.P. Das).

We showed that rate of subunit exchange in α -crystallin decreased significantly when the N-terminal region (residues 1-60) was deleted. The substrate could still bind to the truncated protein. This suggested that the chaperoning mechanism involves dynamic interaction of short residence time. The static binding interaction is unfavourable for keeping the substrate in soluble, folding-competent state.

Search for Zn^{2+} binding residues on α -crystallin (Prof. K.P. Das)

Through site-directed mutations we have been able to identify arginine at position 119 as one of the residues through which Zn^{2+} attaches to α -A-crystallin.

Drug targets and drug resistance mechanisms in mycobacteria

The overall objective in this area has been to understand the biology of *Mycobacterium tuberculosis* with a view to identifying potential targets for therapeutic intervention. Continuing on our earlier work, we have concentrated on cell division and stress response pathways.

A. Wag31, a chaperone-like protein that protects mycobacteria under oxidative stress (Prof. Joyoti Basu, Prof. K.P. Das and Prof. Manikuntala Kundu)

The *wag31* gene (Rv2145c) of *M. tuberculosis* is located close to a cluster of proteins known to play essential roles in cell division. Mass spectrometric analysis demonstrates that one of its interacting partners is penicillin-binding protein (PBP3) (or FtsI) [encoded by Rv2163c], a protein conserved across a wide spectrum of bacteria and essential by virtue of its transpeptidation activity that is required for the synthesis of septal peptidoglycan. We demonstrate that Wag31 protects PBP3 from heat-induced aggregation in vitro. PBP3 is the target of an intramembrane protease (encoded by Rv2869c) in cells under oxidative stress. In vivo, Wag31 protects PBP3 from Rv2869c-mediated proteolysis under oxidative stress, whereas a Wag31 mutant that is incapable of interacting with PBP3 fails to do so.

B. Activation of the stringent response regulator Rel in mycobacteria by positive feedback and gene expression noise (Prof. Manikuntala Kundu and Prof. Joyoti Basu in collaboration with Prof. Indrani Bose, Department of Physics)

Long-term survival of *M. tuberculosis* under nutritionally starved conditions poses a problem in the treatment of tuberculosis and underscores the need to understand the biology of the organism with reference to its ability to adapt to nutritional limitation.

We show that the expression of the stringent response regulator *rel* in a growing population of mycobacteria is bimodal with two distinct peaks corresponding to low (L) and high (H) expression states. This bimodal distribution could be attributed to positive feedback of the two-component system *mprAB* along with noise in gene expression. Combining single cell analysis by flow cytometry with theoretical modeling, we observe that adaptation to nutrient depletion is associated with noise-driven transitions that take a subpopulation of cells from the L to the H state within a "window of opportunity" in time preceding the stationary phase. These results provide, for the first time, evidence that bistability and stochastic gene expression could be important for the development of "heterogeneity with an advantage" in mycobacteria and suggest strategies for tackling tuberculosis like targeting transitions from the low to the high *rel* expression state.

Modulation of host cell signaling by bacterial pathogens

- A. Early secreted antigen-6 (ESAT-6) of *M. tuberculosis* modulates interleukin-12 release from macrophages by suppression of NF-kappa B activation (Prof. Joyoti Basu and Prof. Manikuntala Kundu)

Early secreted antigen-6 (ESAT-6) has been identified as an effector which *M. tuberculosis* uses to subvert the host innate immune response. We show that ESAT-6 inhibits activation of transcription factor NF-kappaB and interferon regulatory factors (IRFs) after binding to Toll-like receptor (TLR)2. Direct binding of ESAT-6 to TLR2 activates the serine/threonine kinase Akt and prevents interaction between the adaptor MyD88 and 'downstream' kinase IRAK-4, thus abrogating NF-kappaB activation. The six C-terminal amino acid residues of ESAT-6 are sufficient for the TLR2-mediated inhibitory effect. Targeting the ESAT-6-TLR2 interaction emerges as an option for enhancing the host innate immune response when challenged with *M. tuberculosis*.

- B. *Helicobacter pylori* antigen, HP0175 activates epidermal growth factor receptor (EGFR) in gastric epithelial cells in a Toll-like receptor 4-dependent manner (Prof. Manikuntala Kundu and Prof. Joyoti Basu)

Helicobacter pylori infection is associated with continuous remodeling of the gastric epithelium in which there is interplay between tissue-damaging effects induced by the pathogen and the response of the host towards offsetting these effects. Vascular endothelial growth factor (VEGF), an angiogenesis-promoting molecule, is a major player in these processes. Our study had earlier shown for the first time that a secreted peptidyl prolyl *cis*-, *trans*- isomerase (PPIase), HP0175 regulates (*veg*f) gene expression in a TLR4- and EGFR-dependent manner. We have now worked out a novel mechanism of activation of EGFR that is ligand-independent but requires HP0175-driven translocation of TLR4 to lipid rafts, its phosphorylation by Lyn kinase and subsequent activation of EGFR.

Induced Mesomorphism in Cholesterol Ester Mixtures (Dr. Pradip Das)

Pretransitional Ordering in Isotropic and fluid smectic phases have been observed using X-ray diffraction covering 0.8 to 60° scattering angle ranges, in cholesteryl oleate/ cholesteryl oleyl carbonate mixtures. The links between weakly first-order transitions and associated pretransitional events have been found. The powder X-ray reflections of oleyl carbonate has been satisfactorily indexed with a least squares programme known as "Crysfire". The crystal class is monoclinic, space group P2/c. Work under way includes comparison of observed and calculated structure factors with a Rietveld procedure. Electrooptic and electroclinic experiments are in progress to clarify the ferroelectric/ antiferroelectric nature of the induced phases and assess application potential.

Division of Molecular Medicine

Molecular Medicine Division of Bose Institute has been started functioning since January 2008 following the recommendation of the Scientific Advisory Committee, which was subsequently approved by Bose Institute Council. The Division has been created with the merger of scientists from Animal Physiology, Chemistry, Immuno-technology and Microbiology with a broad but specific objectives of studying molecules related to health and diseases and manipulating those molecules to improve diagnosis, prevention and treatment of diseases like Cancer, Diabetes, Cardiovascular problems, Leishmaniasis, Tuberculosis etc.

Endocrine manipulation for better production of commercially important small animals (Prof. Arun K Ray)

Presence of steroid molecules in insects is a very common phenomenon, but existence of Estradiol-17 beta (E2) in different insects including silkworm, *Bombyx mori* L, raises questions regarding biological significance of presence of this vertebrate female steroid hormone in this commercially important insect. Past studies in this laboratory have indicated profound metabolic role of this hormonal steroid in silkworm and identified presence of specific radioactive estradiol-17beta binding sites in different organs of silkworm. The question arises whether this E2 binding sites are common to the ecdysone (another insect steroid hormone) binding sites. Competitive saturation-replacement binding studies have shown that the E2-specific binding cannot be replaced by cold ecdysone in silkgland cytosol. Therefore, it appears that the E2-receptor binding sites are very specific for the vertebrate female sex steroid in silkworm. The triploid catfish, *Heteropneustes fossilis*, prepared in this laboratory by environmental temperature shock to the newly fertilized diploid variety, have indicated reproductive failure. Recent studies have shown inadequate incorporation of vitellogenin molecules along with thyroid hormone uptake in the growing oocytes. This may be one of several causes of reproductive failure in triploid catfish.

Thyroid hormone action in adult mammalian brain (Prof. Arun K. Ray)

Peripheral hypothyroidism in adult mammalian species allows brain to maintain its normal thyroid concentration for some period; it is about 18-20 days in rat. The "on" signal starts at day 2 and off signal at "20" of initiation of peripheral hypothyroidism. Present studies show that brain dopaminergic and adrenergic influence along with the glial cell deiodinase II (D2) activities are involved in a concert to maintain the "Central Homeostasis for Thyroid Hormone" for the short period.

Structural and functional characterization and physiological significance of a stimulator protein of Mg²⁺-independent Ca²⁺-ATPase isolated from goat spermatozoa (Prof. Parimal C. Sen)

Recently a low-molecular-mass protein purified from goat testes cytosol has been reported from our laboratory, which is found to stimulate Mg²⁺-independent Ca²⁺-ATPase without any significant

effect on Mg^{2+} -dependent Ca^{2+} -ATPase. In the present study, detail structural and functional characterization as well as the physiological significance of the protein has been described. The stimulatory effect is found to be inhibited by known inhibitors of P-type ATPases, vanadate and lanthanum chloride. Monitoring of the phosphoenzyme intermediate by autoradiography has shown that the stimulation of the ATPase is due to the enhancement in the rate of dephosphorylation of the overall reaction step. Along with the stimulation of the enzyme activity, the protein is found to enhance the calcium uptake. Amino acid analysis data show that the stimulator contains about 26% non-polar amino acid facilitating easy penetration to the hydrophobic core of the membrane bound ATPase. Circular dichroism analysis of the protein suggested the presence of all secondary structural elements. The Western blotting experiment shows its expression level is the highest in goat testes. Peptide fragments obtained in MALDI-MS analysis when subjected to MSDB database search by MASCOT search engine reveals that the proteins of close similarity with the protein under study are actin related protein 2/3 complex subunit, peptidyl-prolyl cis-trans isomerase and gastrin releasing peptide precursor. Besides, the protein under study is also shown to decrease the forward motility of goat sperm without having any significant effect on the total motility indicating its possible role in fertility regulation.

Characterization of a low molecular mass stimulator protein of Mg^{2+} -independent Ca^{2+} -ATPase: effect on phosphorylation-dephosphorylation, calcium transport and sperm cell motility (Prof. Parimal C. Sen)

A 14 kDa cytosolic protein purified from bovine brain homogenate has been recently reported as a stimulator of goat spermatozoa Mg^{2+} -independent Ca^{2+} -ATPase. Here we demonstrate the formation of the [γ - ^{32}P]-ATP labeled phosphoenzyme as the 110-kDa phosphoprotein and its rapid decomposition in presence of the stimulator. Together with crossreactivity of this 110-kDa protein with anti-SERCA2a antibody, the ATPase can now be conclusively said to belong to the SERCA family, which is activated by the stimulator. The ability of the stimulator to enhance the Ca^{2+} -transport has been elucidated from $^{45}Ca^{2+}$ uptake studies, which is found to be sensitive to Ca^{2+} channel blockers. Circular dichroism study reveals α -helical structure of the stimulator. The amino acid analysis suggests that it constitutes primarily hydrophobic and some acidic amino acid residues. The pI of 5.1 has been reconfirmed from 2-D electrophoresis. Immunocrossreactivity studies indicate that the stimulator or similar proteins are present in cytosolic fractions of liver, kidney or testes in different species but brain is the richest source. Proteomic analyses of its trypsinized fragments suggest its similarity with bovine thyroid hormone responsive protein (THRP). The physiological significance of the stimulator has been suggested from its ability to activate sperm cell motility.

Studies on the mechanism(s) of naturally occurring bio-active molecules in pathophysiology (Dr. Parames C. Sil)

Studies in our laboratory mainly focus in understanding the mechanism of the beneficial (preventive/curative) role of naturally occurring bio-active molecules in drug and environmental toxin-induced

organ pathophysiology. Our investigations led us to isolate bioactive molecules from *Cajanus indicus*, *Phyllanthus niruri* and *Terminalia arjuna* that possesses considerable protective role against various organ pathophysiology. Although these molecules do not belong to the same class, they possess in vitro free radical scavenging activity and in vivo antioxidant power. Investigating cell signaling pathways we found that the mode of protection afforded by the active principle from *Cajanus indicus* mediated via the activation of $pNF-\kappa B$ STAT-1 and pAkt without any involvement of ERK1/2. Studies also showed that the defensive action of this active principle is due to its anticytotoxic and antioxidant property in necrotic cell death (as suggested from increased cell viability and reduced cellular ROS and serum NO formation). Studies are going on for further characterization of these protective biomolecules.

Curcumin restores tumor-induced loss of T-effector cells and normalizes T-regulatory cells via down-regulation of TGF- β in tumor cell (Dr. Gaurisankar Sa)

Immune dysfunction is well documented in cancer patients, and likely contributes to tumor evasion. $CD8^+$ cytotoxic T lymphocytes (CTL) are major effector cells involved in immunologically specific tumor destruction and $CD4^+$ T cells are essential for "helping" this $CD8^+$ T cell-dependent tumor eradication. Often tumor targets and impairs T cell function to escape from immune-surveillance. This dysfunction includes loss of effector T cells, type-2 bias and T-regulatory (T_{reg}) cell expansion. Curcumin (the major pigment of *Curcuma longa*) has previously been shown to have anti-tumor activity. Here we studied the role of this compound in prevention of tumor-induced dysfunction of effector T cell-based immune system. We observed severe loss of effector T cell population, decreased type-1 cytokine response in spleen and peripheral circulation of the animals bearing mammary carcinoma. Administration of curcumin prevented the loss of storage and circulating T cell population in tumor bearer. Further investigation revealed that tumor bearer showed increased proportion of T_{reg} cells. Curcumin blocked T_{reg} cell augmentation and effector T cell depletion both in tumor-bearing animals via down-regulation of TGF- β in tumor cells. Curcumin also blocked T_{reg} cell augmentation and effector T cell depletion *in vitro* when co-cultured with primary human breast cancer cells through the down-regulation of TGF- β in cancer cells. The increase in type-1 response may be partly related to modulation of T_{reg} cells. Overall our observation suggests that curcumin prevents tumor-induced suppression of cell-mediated defense system.

Cancer management by dietary phytochemicals: A mechanistic approach (Dr. Tanya Das)

i. *Inhibition of cancer metastasis*: Currently, there is no effective therapy for metastatic breast cancer. Recent studies from our laboratory demonstrated that plant polyphenols like theaflavins and curcumin increased expression of cell-to-cell adhesion protein E-cadherine but inhibited expression as well as membrane localization of pro-migratory focal adhesion kinase thereby delaying migration of human breast and lung cancer cells.

ii. *Rejuvenation of apoptotic program in resistant cancer cells*: Resistance to chemotherapy represents a major problem in cancer management. We have found that plant polyphenols, e.g., curcumin restores back the apoptotic program in highly resistant non-small cell lung carcinoma

line, A549, by activation of caspase 3 via induction of p53-Bax-AIF pathway-mediated mitochondrial signaling. Studies are in progress to delineate the detail mechanisms of curcumin-induced multi drug-resistant cancer cell apoptosis.

Targetted immunoregulation of host to ameliorate tumor-induced immunosuppression (Dr. Tanya Das)

Our results showed that tumors cause immunosuppression by secreting (i) Cox-2-induced PGE-2 that disrupts IL-2-R γ -dependant Jak3/Stat5 signaling, down-regulates Bcl-2/Bax ratio and activates caspase to induce T cell apoptosis, (ii) TGF- β and IL-10, while repressing IL-2 and IFN- γ , thereby inducing a general Th2 dominance dampening the Tc1 population, and (iii) gangliosides that synergise with TNF α to induce T cell apoptosis through receptor-dependent and -independent pathways. Interestingly, black tea and theaflavins significantly inhibited all these pro-apoptotic signalings thereby rejuvenating cancer immunosurveillance.

Marine Biotechnology research (Dr. Nripendranath Mandal)

Shrimp aquaculture industry is the most promising for hard currency and employment generating industries for both rural and urban development all over the world including India. White spot disease caused by White Spot Syndrome Virus (WSSV) is the major problems in this industry and continuing the loss of multimillion dollars each year. Despite of serious efforts it is failure most cases to control the disease caused by viruses and continue huge economic losses. So it is a big challenge to identify disease resistant brooders for generating disease free seeds and finally to develop disease free shrimp aquaculture industry.

For the first time we have developed a microsatellite DNA marker and RAPD marker to identify disease resistant (white spot disease) population of *Penaeus monodon* (Giant Black Tiger Shrimp). These will be very useful tool to develop disease resistant brood-stock for marker-assisted selection (MAS) of breeding program for shrimp hatcheries and disease resistant seeds will be supplied to the rural shrimp farmer. Thus these will be very useful to produce disease free shrimp aquaculture Industry. Finally, that can reduce socio-economic damages due to viral diseases in shrimp aquaculture industries thereby causing rural development, socio-economic upliftment and improvement of both rural and urban population.

Medical Biotechnology research (Dr. Nripendranath Mandal)

We have constructed a synthetic plasmid DNA that will be useful to quantify expressed mRNA specific for as many as 18 different cytokine genes in human. Based on this measurement we could able to diagnose what type and status of any disease from a drop of blood sample from individual human being. We are also developing predictor biomarkers of coronary heart disease among Asian Indian population in the Eastern part of India. We are developing novel herbal drugs to combat nearly non-curable diseases such as thalassemia, viral, cancer and other autoimmune diseases in human.

Microbiology

The 'Department of Microbiology' which was the first department of its kind in India was established in 1942. Since its inception work was done on production of important metabolites of microbes including antibiotics, utilization of waste, control of pathogenic microorganisms and on biofertilizer production.

At present the research activities of this department address the problems in the areas of parasitic and bacterial infections of human, drug design and detoxification, plant-microbe and mineral microbe interactions and degradation of environmental pollutants.

Immunomodulatory roles of novel Triterpenoid compounds during experimental visceral leishmaniasis (Dr. Subrata Majumdar)

We are studying the immunomodulatory effects of novel triterpenoid compounds isolated from different herbal source. We found that these triterpenoids compounds significantly upregulates the antigen presentation capability of macrophages as well of splenocytes which is evidenced by increased MHC-II expression, T-cell proliferative response. We confirm its antileishmanial property during host pathogen interaction. Impaired signaling caused by *L. donovani* infection are restored on treatment with the triterpenoid compounds.

Anti-leishmanial role of Ara-LAM from non-pathogenic strain of mycobacteria (Dr. Subrata Majumdar)

We are studying the modulation of TLR mediated signaling in *L. donovani* infected macrophage by Ara-LAM, a cell wall glycolipid isolated from non-pathogenic mycobacterium species. Interestingly we found that, Ara-LAM could up-regulate the TLR-2 mediated signaling and downregulate the CCR5 expression. This down-regulation of CCR5 expression by Ara-LAM treatment was found to be TLR-2 dependent.

Nucleotide metabolism-related genes of mycobacteriophage of the L5 family (Dr. Sujoy K. Das Gupta)

The genomes of Mycobacteriophages of the L5 family, which includes the lytic phage D29 contain several genes linked to nucleotide metabolism. Two such genes, 48 and 50 have been characterized. Gene 48 was found to code for a Flavin dependent Thymidylate synthase and gene 50 a Class II Ribonucleotide reductase. These proteins are synthesized immediately following infection and they were found to be a part of a multiprotein complex apparently similar to the phage T4 Thymidylate Synthase Complex. Thymidylate synthase assays revealed that during phage growth, synthesis of host Thymidylate synthase decreased and this decrease was compensated by an increase in the activity of the corresponding viral enzyme. Taken together the results suggest that phage encoded nucleotide metabolism related enzymes play a crucial role in the early stages of Phage infection.

Modulation of DNA-binding activity of a *M. tuberculosis* Heat shock response regulator by chaperones (Dr. Sujoy K. Das Gupta)

In *Mycobacterium tuberculosis*, *hspR* is the last gene of the *dnakje* operon. It encodes the repressor HspR, which regulates the expression from this operon and also several other genes some of which encode virulence factors. In this investigation it has been shown that the DNA binding activity of HspR is modulated by the chaperons DnaK, DnaJ, GrpE and GroEL. The results of this study suggest that protein folding plays a substantial role in the activation of HspR and that DnaK may be involved in two ways – first as chaperon acting in concert with GroEL and second as a corepressor bound to HspR.

Complete degradation of phthalate ester by a bacterial consortium (Dr. Tapan K. Dutta)

Enrichment techniques led to the isolation of a consortium consisted of two bacterial isolates, which could utilize butyl benzyl phthalate (BBP) as sole carbon source. The isolates were identified as *Arthrobacter* sp. strain WY and *Acinetobacter* sp. strain FW. In the degradation of BBP, various metabolites isolated and identified by a combination of chromatographic and spectrophotometric analyses revealed complete assimilation pathway, ultimately leading to the TCA cycle. This is the first report on the complete degradation of BBP by a defined consortium describing the role of individual isolates in the assimilation pathway.

Kinetics of phenanthrene degradation by a *Staphylococcus* sp. (Dr. Tapan K. Dutta)

Unlike other phenanthrene degraders, *Staphylococcus* sp. PN/Y degraded phenanthrene by a novel pathway involving 2-hydroxy-1-naphthoic acid, which was further metabolized by unique *meta*-cleavage dioxygenase, ultimately leading to TCA cycle intermediates. In the present study, kinetics of phenanthrene degradation and the dynamic fate of the key intermediate, 2-hydroxy-1-naphthoic acid (2H1NA) was demonstrated. Growth was found to be inhibited at initial higher concentration of 2H1NA, which may be attributed due to concentration-dependent toxicity of 2H1NA and/or the toxicity of its decarboxylated metabolite, 2-naphthol.

Physics

The Department of Physics is one of the oldest Departments in Bose Institute and has contributed both to fundamental knowledge as well as applications relevant to industry and society in general. The Department's current research activities are in the areas of Radiation Physics; Interdisciplinary Physics; Foundations of Quantum Mechanics and Quantum Entanglement; Astrophysics of Strongly Interacting Matter; Characterization of Detector Materials for Heavy Ions; Preparation and Characterization of Dielectric Materials.

Studying the physics of superheated liquids using superheated drop detectors (Prof. Barun K. Chatterjee, Rupa Sarkar and Prasanna K. Mondal)

The nucleation of the R12 and R114 droplets by Am-Be neutrons has been studied as a function of temperature. The observed data is fitted to a two-state model and the nucleation efficiency of the normal metastable state is obtained.

A volumetric system to study the nucleation (active bubbler) and record them directly on the computer has been fabricated. Here the volume of vapour bubbles created upon nucleation is directly measured. The droplet nucleation of an R114 sample is studied both by the active bubbler and by the active device method (where the number of droplets nucleated is measured). This gives us the distribution of the droplet sizes in the sample.

Investigations on theoretical aspects of Compton scattering (Prof. Barun K. Chatterjee)

Calculations of the double differential Compton cross section (DDCS) was studied in the non-relativistic regime and the difference between those computed by the A^2 approximation (A^2) and the Impulse Approximation (IA) was studied for both double and triple differential cross sections (TDCS). It has been found that IA is more valid for DDCS than TDCS even in situations when TDCS is bad (when compared with respect to S-Matrix calculations). TDCS is good when $a/k \rightarrow 0$, but DDCS is good even when $a/k < 1$.

Interdisciplinary Physics/Systems Biology (Prof. Indrani Bose)

Single cell experiments show that gene expression noise, i.e., fluctuations in mRNA/protein levels may give rise to phenotypic heterogeneity in cell populations even if the cells have identical genetic content and are kept in the same environment. In specific circumstances, the heterogeneity is in the form of two distinct subpopulations. Such variability is advantageous for microorganisms like bacteria as it enables a fraction of the bacterial population to survive under stress. As part of our Systems Biology Programme, we, in collaboration with Prof. Joyoti Basu and Prof. Manikuntala Kundu, have established the role of positive feedback and noise in activating the stringent response regulator *Rel* in mycobacteria. The stringent response pathway is activated under stresses like nutrient and oxygen deprivation. Combining flow-cytometry based single cell analysis with theoretical modeling, we show that the distribution of *rel* expression levels in a growing population of mycobacteria (nutrient depletion serves as the source of stress) is bimodal with two distinct peaks corresponding to low (L) and high (H) Expression states. The subpopulation with high *rel* expression level adapts to nutrient depletion in the stationary phase by initiating the stringent response. We establish that positive feedback along with gene expression noise give rise to two distinct subpopulations. Our results provide evidence, for the first time, that bistability and stochastic gene expression could be important for the development of "heterogeneity with an advantage" in mycobacteria and suggest strategies for tackling tuberculosis like targeting transitions from the low to the high *rel* expression state.

Work has been initiated on the theoretical modeling of two component systems prevalent in bacteria and also the genetic disorder, maturity onset of diabetes in the young (MODY), brought about by a reduced gene copy number.

Quantum Phase Transitions and Entanglement (Prof. Indrani Bose)

We use tools from Quantum Information Theory to probe quantum phase transitions in spin liquid models. We specifically consider a spin ladder model which has two critical point transitions. The entanglement measures used to probe the transitions are: the single site von Neumann entropy and the two-body entanglement. We further determine the ground state fidelity F and a quantity $\ln|D|$ related to the second derivative of F and show that these quantities calculated for finite-sized systems are good indicators of QPTs occurring in the infinite system.

Foundations of Quantum Mechanics and Quantum Entanglement (Prof. D. Home)

The possibility of empirically testable differences existing between the semiclassical time of flight distribution for cold trapped atoms and that corresponding to an appropriate quantum distribution is a topic of considerable interest. It has been shown that the existing approaches are based on a semiclassical treatment having restricted applicability for a particular trapping potential. Thus this does not preclude, in general, the possibility of testable differences between the semiclassical calculations and the fully quantum results for the arrival time distribution of freely falling atoms.

The quantum-mechanical modelling of a measurement process using the Stern–Gerlach (SG) setup in the most general context has been critically examined, probing in particular for the ‘nonideal’ situations, the subtleties involved in the connection between the notion of ‘distinguishability’ of apparatus states defined in terms of the inner product and the spatial separation between the wave packets emerging from the SG setup. It has been demonstrated how some interesting effects arising from departures from the ‘idealness’ can be empirically tested for different values of the relevant parameters.

Study of Cosmic Rays with passive detectors (Dr. S K Saha and Prof. S Raha)

We have been working to characterize and calibrate a particular PET which we intend to use as a SSNTD to look for exotic particles in Cosmic rays. As part of that effort we have been to Sandakphu (Alt. 3600 m) and have chosen a site where we intend to set up our detector array. We have also been to the Inter University Accelerator Centre, New Delhi. The Pelletron accelerator available there was used to expose our detectors to high energy ^{56}Fe & ^{32}S beams as part of the efforts to calibrate those detectors. We are currently involved in analyzing the data from that experiment. We are also involved in analyzing the data that we got from our detectors placed at Darjeeling and Ooty. We carried out a work to determine the ideal etching conditions of PET and have established the optimum etching conditions. We also searched for the origin

of multi-prong tracks seen in PET. We exposed Al, Cu, Ag, Au and Pb coated PET and CR39 plates to the alpha and fission fragments from a ^{252}Cf source. Etching of the plates is complete and currently we are scanning the plates.

Study of Cosmic Ray showers and γ -rays with active detectors (Dr. S K Saha and Prof. S Raha)

We are in the process of setting up an active detector array system at Darjeeling in collaboration with TIFR, Mumbai for Air Shower studies. We plan to use this detector system in coincidence with the GRAPES-3 shower array of TIFR at Ooty in Tamil Nadu to detect extended showers. Initially we are setting up an array of seven detectors each consisting of 1m^2 plastic scintillator attached with a photomultiplier tube, which will later be extended to 50 detectors. During the last year we have acquired the necessary detectors and the associated electronics. All equipments were tested, assembled and setting up of the electronics for measuring coincident events was done.

Ac conductivity and scaling behaviour in complex perovskite oxides (Dr. T. P. Sinha)

Dielectric materials $\text{BaFe}_{1/2}\text{Sb}_{1/2}\text{O}_3$, $\text{Ba}(\text{Zn}_{1/2}\text{W}_{1/2})\text{O}_3$, $\text{CaMg}_{1/3}\text{Nb}_{2/3}\text{O}_3$ etc. having perovskite structure for their uses in microelectronics such as capacitors and memory devices have been widely investigated. The frequency dependence of ac conductivity of the materials at various temperatures is used for analysing the electrical data. The scaling behaviour of various dielectric parameters (dielectric constant, loss tangent, electric modulus, conductivity etc.) indicates that the conduction describes the same mechanism at different temperatures.

Electronic structure and ground state property of perovskites (Dr. T. P. Sinha)

The electrical properties of perovskite oxides containing transition metal are dominated by the interaction between transition metal cations and oxygen anions. The study of electronic structure of $\text{Ca}(\text{Fe}_{1/2}\text{Sb}_{1/2})\text{O}_3$ in terms of spectral density function and density of states is performed by full potential linearized augmented plane wave (FLAPW) method based on density function theory under generalized gradient approximation. An attempt has been made to clarify the electronic structure of the system as it emerges from a combined spectroscopic study and first principles calculations.

Physics & Astrophysics of strongly interacting matter (Dr. Sanjay K. Ghosh, Ritam Mallick and Prof. Sibaji Raha)

We have investigated the General Relativistic effects on the conversion from nuclear to two-flavour quark matter in compact stars, both static as well as rotating. We find that GR effects lead to qualitative differences in rotating stars, indicating the inadequacy of non-relativistic or even Special Relativistic treatments for these cases.

Effective Model study of Signatures of phase transition (Dr. Sanjay K. Ghosh and Tamal K. Mukherjee)

We have studied the Taylor expansion coefficients of the pressure in quark number chemical potential for the strongly interacting matter as described by the PNJL model for two light degenerate flavours of quarks u and d . The expansion has been done upto eighth order in chemical potential, and the results are consistent with recent estimates from Lattice. We have further obtained the specific heat, squared speed of sound and the conformal measure.

Astroparticle Physics & Space Science

Centre for Astroparticle Physics & Space Science has taken up many projects which are under progress.

IRHPA project:

Under this project, at Darjeeling a national facility for research in the areas of astroparticle physics & space science has been established. Several instruments for atmospheric measurements and analysis, such as, Ozone analyzer, monitors for respirable dust, fine particles and PM_{2.5}, weather monitoring system, different gas analyzers and gas chromatograph have already been installed.

The data obtained from different instruments are being analyzed. One of the interesting finding at Darjeeling is that though the higher tourist influx and human activities during summer season (tourist season) enhances the loading of aerosol in the atmosphere, several evidences help us to establish the fact that during summer season the high loading of PM_{2.5}, PM₁₀ along with all major water soluble ionic species is not only from the local sources but long range transport of aerosol reaching at Darjeeling from various continental regions is also important. A paper containing these findings has been submitted to the journal.

Interesting features have been observed in rain rates at Kolkata and Darjeeling. The standard ITU (International Telecommunication Union) models fail to explain the rain rates observed at Kolkata. Break point due to change from stratiform to convective rain has also been observed. These findings will be reported shortly.

Radiometric measurements are under progress. The rain rate measurements at both Darjeeling and Kolkata, as obtained from optical rain gauge are being analysed in connection with the Ku band satellite signal.

More precise calibration of the passive detectors is under progress. Arrangements are being made to install active detectors at Darjeeling.

Considerable progress has been made in the Numerical Simulation of Cosmic ray air shower. Comparison of the simulation results with the different experimental air shower measurements are under progress.

PROBE Project:

Under this project, 20 meteorological instruments would be installed at different schools around Darjeeling. Most of the installation is complete. Data from some of the schools have been collected. These data will give us valuable information on the orography of the region. Regular interaction with the school students, to train them in the data collection and motivate them for science career is being arranged.

NESST-BASE programme:

The north-east students' summer training programme on Basic sciences has been taken up. During May-June 2007, 15 students each from Arunachal and Nagaland were given extensive lectures and training on hands on experiments. It has been decided that such programmes will be arranged on regular basis every year.

M.Sc Course in Physics with special emphasis on Astrophysics & Space Science:

The postgraduate course in physics has entered its second year. The classes for second new batch will commence in the month of August 2008.

Environmental Science Section

The Environmental Science section is playing a major role in monitoring and analyzing various environmental pollutants.

Activities

The study is being carried out on the deposition flux and chemical characterization of free falling particles.

Rain water samples are being collected at every event and analysis is being done for different chemical constituents.

The aerosol is being chemical characterized in terms of water soluble ionic constituents and water insoluble trace metals using different analytical instrument like AAS, Ion Chromatograph etc.

The loading of black carbon in the atmosphere of Darjeeling is also being recorded on daily basis with the help of an online analyzer.

A sunphotometric measurement is being done for the understanding of Aerosol Optical Thickness in the atmosphere and to correlate with the mass loading.

Plant Molecular & Cellular Genetics

Plant Tissue Culture Section was established in the year 1976 by late Dr. V. N. Gadgil and renamed as PMCG Section in the year 1989 with specific focus on researches on the plant genetic engineering towards improvement of plant productivity. In the last few years the major emphasis has been given to identify the key proteins and genomic components coding for desir-

able phenotypes through genetical and molecular approaches. The effective use of these novel genes in crop improvement programme by functional genomic approach has also been undertaken.

Search for salt-tolerance genes/proteins from *Porteresia* (Prof. A. N. Lahiri Majumder)

Bioprospecting of salt-tolerance genes and proteins from the wild halophytic rice, *Porteresia coarctata* has been a major focus. Following a proteomic approach, proteins from stressed and control *in vitro* grown *Porteresia* and *Oryza* plantlets were separated on 2-D PAGE. Individual upregulated or new protein(s) were identified through MALDI-TOF analysis of the peptide fragments obtained by trypsin digestion. One such identified genes, inositol methyl transferase (*Imt1*), characteristically absent in *Oryza* genome, has been shown to be uniquely upregulated in *Porteresia* coordinately with the Inositol synthase (*PcIno1*) gene. The *PcImt1* gene has been cloned, bacterially expressed and completely characterized.

Towards search for MYMIV- resistance genes/proteins in *Vigna mungo* (Prof. Amita Pal)

Differentially expressed transcripts were isolated and cloned from the recombinant inbred lines of *Vigna mungo* showing resistance against mungbean yellow mosaic India virus. An investigation on 250 NB-ARC domains of *in silico* translated disease resistance (R) proteins in members of Family Fabaceae showed presence of eight new conserved motifs; two of these, bearing signatures of geminiviral coat proteins (GVCP), encoded precisely within the R genes. The probable mechanism of integration of GVCP signatures only within the host genomes of Geminivirus during plant pathogen interaction and probable mechanisms of their maintenance within the favoured allele were predicted. Biological significance of GVCP sequences in rendering viral resistance to the host species has been analyzed.

Development of antibiotic resistant marker free insect resistant plants (Prof. Sampa Das)

Unique binary expression vectors containing the insecticidal gene *Allium sativum* leaf agglutinin (ASAL), and selectable *nptII* / *hpt* marker gene cassette(s) flanked by *lox* sites in one hand and *cre* gene cassette on the other hand were developed. A Cre-lox mediated recombination strategy is being applied to develop antibiotic resistant marker gene free insect resistant transgenic rice and mustard plants for eliminating biosafety related risks and increasing the societal acceptability. Receptor proteins of *Allium sativum* leaf lectin purified from homopteran insect, whitefly were identified as GroEL homolog and Ca dependent ATPase. They are being characterized further biochemically and at molecular level.

Few differentially expressed gene/ gene fragments related to *Fusarium* wilt resistance were isolated from wild chickpea varieties.

Production of stable population of "*Rorippobrassica*" lines (Dr. Samir R. Sikdar)

Uniform population of "*Rorippobrassica*" somatic hybrid lines (somatic hybrid between *Rorippa indica* and *Brassica juncea*) were obtained in BC1S3 generation. Chromosome number of all the five original BC1S1 lines having five different chromosome numbers (2n=24, 40, 48, 54 and 60) stabilized to 2n=20 through chromosome elimination in the natural course. Descendants of all the five lines were dwarf, highly branched and 10-15 days early in maturity than *B. juncea* parent. Aphid tolerance was moderate in all the lines.



The 2005 Acharya J. C. Bose Triennial Gold Medal lecture on **The Role of Facilitated Variation in Evolution** was delivered by Prof. Marc W. Kirschner, Professor of System Biology, Department of Systems Biology, Harvard Medical School, Boston, USA on January 7, 2008. Prof. Birendra Bijoy Biswas, Former Director, Bose Institute graced the occasion as president and presented the gold medal to Prof. Kirschner.



The 2008 Acharya J. C. Bose Triennial Gold Medal lecture on **Organic Synthesis : Harnessing Synergy with Nature for Human Wellbeing** was delivered by Prof. G. Mehta, FNA, FRS, Department of Organic Chemistry, Indian Institute of Science, Bangalore on March 7, 2008. Prof. Debashis Mukherjee, Director, Indian Association for the Cultivation of Science, Jadavpur graced the occasion as president and presented the gold medal to Prof. Mehta.

"Just one hundred years ago, J.C. Bose described to the Royal Institution in London his research carried out in Calcutta at millimeter wavelengths. He used waveguides, horn antennas, dielectric lenses, various polarizers and even semiconductors at frequencies as high as 60 GHz; much of his original equipment is still in existence now at the Bose Institute in Calcutta. Some concepts from his original 1897's paper have been incorporated into a new 1.3-mm multi-beam receiver now in use on the NRAO 12 Meter Telescope".

Darrel T. Emerson
The National Radio Astronomy Observatory
Arizona, USA.



AT THE ROYAL INSTITUTION, LONDON, 1897
FIRST FRIDAY EVENING DISCOURSE

1997 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM
DENVER, COLORADO  JUNE 8-13, 1997

We are thankful to the Bose Institute for extending this cooperation by providing the display instruments and the capable services of Shri Dibakar Sen to operate and describe their function.

Best Regards,

David H. Russell
Historical Exhibit Chairman
1997 IEEE MTT-S International Microwave Symposium

PUBLICATIONS

BIOCHEMISTRY DEPARTMENT

1. Das A, Sinha S, Acharya BR, Paul P, Bhattacharyya B, Chakrabarti G. (2008) Deuterium oxide stabilizes conformation of tubulin: a biophysical and biochemical study. *BMB Rep.*; 41(1):62-67.
2. Banerjee M, Roy D, Bhattacharyya B, Basu G. (2007) Differential colchicine-binding across eukaryotic families: the role of highly conserved Pro268beta and Ala248beta residues in animal tubulin. *FEBS Lett.*; 581(26):5019-5023.
3. Bhattacharyya B, Panda D, Gupta S, Banerjee M. (2008) Anti-mitotic activity of colchicine and the structural basis for its interaction with tubulin. *Med Res Rev.*; 28(1):155-183.
4. Mitra G, Saha A, Gupta T D, Poddar A, Das K P, Das Gupta S K, Bhattacharyya B (2007) Chaperone-mediated inhibition of tubulin self-assembly. *Proteins*; 67(1):112-120.
5. Roy K, Sinha P, Lahiri S (2008) Immobilization of long-lived radionuclides $^{152,154}\text{Eu}$ by selective bioaccumulation in *Saccharomyces cerevisiae* from a synthetic mixture of $^{152,154}\text{Eu}$, ^{137}Cs and ^{60}Co . *Biochemical Engineering Journal*, 40: 363-367.
6. Chatterjee T, Saha R P and Chakrabarti P (2007) Structural studies on *Vibrio cholerae* ToxR periplasmic and cytoplasmic domains; *Biochim. Biophys. Acta* 1774, 1331-1338.
7. Dasgupta B, Chakrabarti P and Basu G (2007) Enhanced stability of *cis* Pro-Pro peptide bond in Pro-Pro-Phe sequence motif; *FEBS Letters*, 581, 4529-4532.
8. Guharoy M and Chakrabarti P (2007) Secondary structure based analysis and classification of biological interfaces: identification of binding motifs in protein-protein interactions; *Bioinformatics*, 23, 1909-1918.
9. Chakrabarti P and Bhattacharyya R (2007) Geometry of nonbonded interactions involving planar groups in proteins; *Prog. Biophys. Mol. Biol.* 95, 83-137.
10. (2007) BioSuite: a comprehensive bioinformatics software package (A unique industry-academia collaboration). The NMITLI-BioSuite Team (Vidyasagar et al.) *Curr. Sci.* 92, 29-38.
11. Janin J, Rodier F, Chakrabarti P and Bahadur R (2007) Macromolecular recognition in the Protein Data Bank; *Acta Crystallogr.* D63, 1-8.
12. Pal A, Chakrabarti P, Bahadur R, Rodier F and Janin J (2007) Peptide segments in protein-protein interfaces; *J. Biosci.* 32, 101-111.
13. Saha R P, Bhattacharyya R and Chakrabarti P (2007) Interaction geometry involving planar groups in protein-protein interfaces. *Proteins*, 67, 84-97.
14. Singha S, Lahiri T, Dasgupta A K and Chakrabarti P (2006) Structural classification of protein using surface roughness index. *Online Journal of Bioinformatics*, 7(2), 74-84.
15. Lohia A, Mukherjee C, Majumder C and Ghosh Dastidar P (2007) Genome re-duplication and irregular segregation occur during the cell cycle of *Entamoeba histolytica*. *Bioscience Reports* 27:373-384.
16. Majumder S and Lohia A (2008) *Entamoeba histolytica* encodes unique formins- a subset of which regulates DNA content and cell division. *Infect Immun*, March 17, epub ahead of print.

17. Dastidar P G and Lohia A (2008) Bipolar spindle frequency and genome content are inversely regulated by the activity of two N-type kinesins in *Entamoeba histolytica*. *Cell Microbiol* Apr 9, epub ahead of print.
18. Chattopadhyaya R and Pal A (2008) Three-dimensional Models of NB-ARC Domains of Disease Resistance Proteins in Tomato, Arabidopsis, and Flax. *Journal of Biomolecular Structure and Dynamics*, 25, 357-372.
19. Halder S, Datta A B and Parrack P (2007) Probing the antiprotease activity of λ CIII, an inhibitor of the *Escherichia coli* metalloprotease HflB (FtsH). *J. Bacteriol.* 189: 8130-8138.
20. Ganguly Tridib, Bandhu Amitava, Chanda Palas K, Chatteraj Partho, Das Malabika, Mandal Nitai C and Sau Subrata (2007). Purification and characterization of repressor of temperate mycobacteriophage L1. *Virology* 4:64.
21. Das Malabika, Ganguly Tridib, Chatteraj Partho, Chanda Palas K, Bandhu Amitava, Lee Chia Y and Sau Subrata (2007) Overexpression, purification and characterization of repressor of temperate *S. aureus* phage ϕ 11. *J Biochem Mol Biol* 40(5): 740-8.
22. Chanda Palas K, Ganguly T, Das Malabika, Lee Chia Y, Luong Thanh T and Sau S (2007) Detection of antistaphylococcal and toxic chemicals by biological assay systems developed with a reporter *Staphylococcus aureus* strain harboring a heat shock promoter – lacZ fusion. *J Biochem Mol Biol* 40(6):936-43.

BIOPHYSICS DEPARTMENT

1. Banerjee M, Roy D, Bhattacharyya B, Basu G. (2007) Differential colchicine-binding across eukaryotic families: the role of highly conserved Pro268beta and Ala248beta residues in animal tubulin. *FEBS Lett.*, 581, 5019-5023.
2. Dasgupta B, Chakrabarti P, Basu G. (2007) Enhanced stability of cis Pro-Pro peptide bond in Pro-Pro-Phe sequence motif. *FEBS Lett.*, 581, 4529-4532

BIOINFORMATICS CENTRE

1. Chatterjee T, Saha R P and Chakrabarti P (2007). Structural studies on *Vibrio cholerae* ToxR periplasmic and cytoplasmic domains. *Biochim. Biophys. Acta* 1774, 1331-1338.
2. Chakrabarti P and Bhattacharyya R (2007) Geometry of nonbonded interactions involving planar groups in proteins; *Prog. Biophys. Mol. Biol.* 95, 83-137.
3. (2007) BioSuite: a comprehensive bioinformatics software package (A unique industry-academia collaboration). The NMITLI-BioSuite Team (Vidyasagar et al.). *Curr. Sci.* 92, 29-38.
4. Saha R P, Bhattacharyya R and Chakrabarti P (2007) Interaction geometry involving planar groups in protein-protein interfaces. *Proteins*, 67, 84-97.
5. Chakrabarti P (2007) Protein-protein interactions – how to know if it is intimate, fickle or having shades in between. *Biobytes*, Vol. 2, (Open access newsletter, <http://biobytes.bicmku.in/bbv2proteininteraction.html>).
6. Kundu S and Roy D (2007) Computational study of glyceraldehyde-3-phosphate dehydrogenase of *Entamoeba histolytica*: implications for structure-based drug design. *J Biomol Struct Dyn.*, 25, 25-33.

7. Banerjee M, Roy D, Bhattacharyya B and Basu G (2007) Differential colchicine-binding across eukaryotic families: the role of highly conserved Pro268beta and Ala248beta residues in animal tubulin. *FEBS Lett.*, 581, 5019-5023.
8. Kundu S and Roy D (2007) Structural considerations for designing adenosine analogs as selective inhibitors of *Trichomonas* sp. glyceraldehyde-3-phosphate dehydrogenase. *In Silico Biol.*, 7, 583-593.
9. D'Onofrio G, Ghosh T C and Saccone S (2007) Different functional classes of genes are characterized by different compositional properties. *FEBS Letters*, 581, 5819-5824.
10. Basak S, Roy S and Ghosh T C (2007) On the origin of synonymous codon usage divergence between thermophilic and mesophilic prokaryotes, *FEBS Letters* 581, 5825-5830.
11. Bagchi A and Ghosh T C (2007) Homology modeling and molecular dynamics study of the interactions of SoxY and SoxZ: The central player of biochemical oxidation of sulfur anions in *Pseudomonas aeruginosa* *salicylatoxidans*, *Res. J. Microbiol.* 2, 569-576.
12. Bagchi A and Ghosh T C (2007) Structural insight into the functionality of the transcriptional regulator SoxR from *Paracoccus pantotrophus* in sulfur oxidation operon. *Res. J. of Microbiol.* 2, 735-741.
13. Mukhopadhyay P, Basak S, and Ghosh T C (2007) Synonymous codon usage in different protein secondary structural classes of human genes: Implication for increased non-randomness of GC₃ rich genes towards protein stability, *J Biosciences* 32, 947-963.
14. Mukhopadhyay P, Basak S and Ghosh T C (2007) Nature of selective constraints on synonymous codon usage of rice differs in GC-poor and GC-rich genes. *Gene*, 400, 71-81.

BOTANY DEPARTMENT

1. Roy S K, Gangopadhyay G, Ghose K, Dey S, Basu D and Mukherjee K K (2008) A cDNA-AFLP approach to look for differentially expressed gene fragments in dioecious pointed gourd (*Trichosanthes dioica* Roxb.) for understanding sex expression. *Current Science* 94(3): 381 - 385.
2. Datta S, Basu D and Mukherjee K K (2008) PTC-1: A homologue of TFL/CEN involved in the control of shoot architecture in *Beta palanga*. *Current Science* 94(1): 89-96.
3. Das S, Bhattacharjee A and Saha P K (2007) Maintenance of seed vigour and viability of sunflower by some plant extracts under stressful storage environment: *J. Botan. Soc. of Bengal*. 61 (187-191).
4. Roy Choudhury Aryadeep, Roy Chaitali, Sengupta D N (2007) Transgenic tobacco plants overexpressing the heterologous lea gene Rab16A from rice during high salt and water deficit display enhanced tolerance to salinity stress, *Plant Cell Rep.* Vol 26, 1839-1859.
5. Roy Sujit, Roy Choudhury Swarup, Mukherjee S and Sengupta D N (2007) Tobacco proliferating cell nuclear antigen binds directly and stimulates both activity and processivity of ddNTP- sensitive mungbean DNA polymerase. *Archives of Biochemistry and Biophysics*. Vol 468, 22-31.
6. Roy Choudhury A, Gupta B, and Sengupta D N (2008) Trans acting factor designated SBZ8 interacts with both typical abscisic acid responsive element as well as abscisic acid responsive element like sequences in the vegetative tissue of India rice cultivars, Accepted for publication in *Plant Cell Reports*. Vol 27, 779-794.
7. Ray Avik and Bhattacharya Sabita: "An improved micropropagation of *Eclipta alba* by in vitro priming with chlorocholin chloride". *Plant Cell Tissue and Organ Culture*

8. Gangopadhyay Moumita, Sircar D, Mitra A P and Bhattacharya Sabita: "Hairy root culture of *Plumbago indica* as a potential source for harvesting plumbagin". *Biologia Plantarum*
9. Bhattacharyya R, Ray A, Gangopadhyay M and Bhattacharya S: "In vitro conservation of *Plumbago indica* - a rare medicinal plant". *Plant Cell Biotechnology and Molecular Biology*.
10. Ghosh D and Gupta-Bhattacharya S (2008) Structural insight into protein T1, the non-allergenic member of the Bet v 1 allergen family - an in silico analysis. *Molecular Immunology*, **45**, 456-462.
11. Mandal J, Roy I, Chatterjee S and Gupta-Bhattacharya S (2008) Aerobiological and in-vitro studies on pollen grains of two dominant avenue trees from Kolkata (Calcutta), India. *J Investig Allergol Clin Immunol*, **18** (1), 22-30.
12. Ghosh D, Roy I, Chanda S, Gupta-Bhattacharya S (2007) Allergy to Periwinkle pollen (*Catharanthus roseus* G. Don.). *Ann. Agric. Environ. Med.*, **14**, 39-43.
13. Das S and Gupta-Bhattacharya S (2007) Airborne culturable fungal flora of an agricultural farm in West Bengal and its relationship with meteorological factors. *Indian Journal of Aerobiology*, **20**(1&2):1-8.
14. Bag A K, Singh S K, Gupta-Bhattacharya S (2007) *Riccia* of West Bengal. *Bull. Bot. Surv. India*; **49**(1-4):173-186.

CHEMISTRY DEPARTMENT

1. Chakrabarty M, Mukherji A, Mukherjee R, Arima S and Harigaya Y (2007) A Keggin heteropolyacid as an efficient catalyst for an expeditious, one-pot synthesis of 1-methyl-2-(hetero)arylbenzimidazoles. *Tetrahedron Lett.* **48**: 5239-5242.
2. Chakrabarty M, Karmakar S, Arima S and Harigaya Y (2007) One-pot formation of functionalised 2-piperidinones from arylidenecyanoacetates and methanolic ammonia via tandem reactions. *Heterocycles* **73** (Prof. Ugi's Memorial Issue): 795-804.
3. Chakrabarty M, Mukherjee R, Karmakar S and Harigaya Y (2007) Tonic acid-on-silica gel: A cheap and eco-friendly catalyst for a convenient one-pot synthesis of substituted benzimidazoles. *Monatsh. Chem.* **138**: 1279-1282.
4. Karmakar S and Chakrabarty M (2008) Reaction of diethyl mesoxalate with active methylene compounds: an interesting outcome. *J. Indian Chem. Soc.* **85**: 224-227.
5. Saha S and Das KP (2007) Unfolding and refolding of bovine alpha crystallin in urea and its chaperone activity. *Protein J.* **26**, 315-324.
6. Kundu M, Sen PC and Das KP (2007) Structure, stability and chaperone function of alpha-crystallin: role of N-terminal region. *Biopolymers* **86**, 177-192.
7. Biswas A and Das KP (2007) α -Crystallin assisted refolding of enzyme substrates: optimization of external parameters. *Protein J.* **26**, 247-255.
8. Biswas A and Das KP (2008) Zn^{+2} enhances the molecular chaperone function and stability of alpha-crystallin. *Biochemistry* **47**, 804-816.
9. Mukhopadhyay S, Sen S, Majhi B, Das KP and Kar M (2007) Methyl glyoxal elevation is associated with oxidative stress in rheumatoid arthritis. *Free Radical Res.* **41**, 507-514.

10. Mitra G, Saha A, Das Gupta T, Poddar A, Das KP, Das Gupta SK and Bhattacharyya B (2007) Chaperone mediated inhibition of tubulin self-assembly. *Proteins*, **67**, 112-120.
11. Sureka K, Ghosh B, Dasgupta A, Basu J, Kundu M and Bose I (2008) Positive feedback and noise activate the stringent response regulator Rel in mycobacteria. *PLoS One* **3**: e1771.
12. Pathak S K, Basu S, Basu K K, Banerjee A, Pathak S, Bhattacharyya A, Kaisho T, Kundu M, and Basu J (2007) Direct extracellular interaction between the early secreted antigen ESAT-6 of *Mycobacterium tuberculosis* and TLR2 inhibits TLR signaling in macrophages. *Nat Immunol.* **8**, 610-618.
13. Basu S, Pathak S, Pathak SK, Bhattacharyya A, Banerjee A, Kundu M and Basu J (2007) *Mycobacterium avium*-induced matrix metalloproteinase-9 expression occurs in a cyclooxygenase-2-dependent manner and involves phosphorylation- and acetylation-dependent chromatin modification. *Cellular Microbiology* **9**, 2804-2816.
14. Chakrabarti N and Das P (2007) Isotropic to Nematic Phase Transition in F-actin. *J. Surface Science and Technology* **23**, 177-194.

MICROBIOLOGY DEPARTMENT

1. Dey R, Majumder N, Bhattacharjee S, Majumdar-Bhattacharyya S, Banerjee R, Ganguly S, Das P and Majumdar S (2007). *Leishmania donovani* induced ceramide as the key mediator of Akt dephosphorylation in murine macrophages: Role of PKC- ζ and phosphatase. *Infection and Immunity*, **75** (5), 2136-2142.
2. Bhattacharjee S, Majumder N, Bhattacharyya P, Bhattacharyya (Majumdar) S and Majumdar S (2007) Immunomodulatory role of arabinosylated lipoarabinomannan on *Leishmania donovani* infected murine macrophages. *Ind Journal of Biochem & Biophys*, **44**, 366-372.
3. Dey R, Majumder N, Majumdar-Bhattacharyya S, Bhattacharjee S, Roychoudhury K, Banerjee S, Roy S and Majumdar S (2007). Induction of host protective Th1 immune response by chemokines in *leishmania donovani* infected BALB/c mice. *Scan. J. Immuno.* **66**, 671-683.
4. Dam B, Mandal S, Ghosh W, Das Gupta SK, Roy P (2007). The S4-intermediate pathway for the oxidation of thiosulfate by the chemolithoautotroph *Tetrathiodibacter kashmirensis* and inhibition of tetrathionate oxidation by sulfite. *Res Microbiol.* **158**(4), 330-8.
5. Chatterjee S, Basu A, Basu A, Das Gupta SK (2007). DNA bending in the mycobacterial plasmid pAL5000 origin-RepB complex. *J Bacteriol.* **189**(23), 8584-92.
6. Das Gupta T, Bandyopadhyay B, Das Gupta SK (2008). Modulation of DNA-binding activity of *Mycobacterium tuberculosis* HspR by chaperones. *Microbiology*, **154**(Pt 2), 484-90.
7. Bhattacharya B, Giri N, Mitra M, Gupta SK (2008). Cloning, characterization and expression analysis of nucleotide metabolism-related genes of mycobacteriophage L5. *FEMS Microbiol Lett*, **280**(1), 64-72.
8. Mitra G, Saha A, Gupta TD, Poddar A, Das KP, Das Gupta SK, Bhattacharyya B (2007). Chaperone-mediated inhibition of tubulin self-assembly. *Proteins*, **67**(1), 112-20.
9. Chatterjee S and Dutta T K (2008) Complete degradation of butyl benzyl phthalate by a defined bacterial consortium: Role of individual isolates in the assimilation pathway. *Chemosphere*, **70**, 933-941.
10. Mallick S, Chatterjee S and Dutta T K (2007) A novel degradation pathway in the assimilation of phenanthrene by *Staphylococcus* sp. strain PN/Y via meta-cleavage of 2-hydroxy-1-naphthoic acid: Formation of trans-2,3-dioxo-5-(2'-hydroxyphenyl)-pent-4-enoic acid. *Microbiology*, **153**, 2104-2115.

DIVISION OF MOLECULAR MEDICINE

1. Biswas A, Roy Sumedha, De Jhuma, Kundu Samita, Pramanik Mitali, Ray Arun K (2007): Variations in hepatic estradiol-17beta receptor concentrations during the annual reproductive cycle of diploid and triploid female catfish, *Heteropneustes fossilis* (Bloch). *Life Sciences* (Elsevier, U.S.A.), 80, 1777-1783.
2. Kundu S, Pramanik M, Roy S, De J, Biswas A and Ray Arun K (2007): Maintenance of homeostasis for thyroid hormone in adult rat brain: Possible involvement of nuclear-mediated phenomenon. *Neuroendocrinology*, 86, 94-103.
3. Bhattacharyya D, Basu A and Sen P C (2007): Purification of protein from a crude mixture through SDS-PAGE transfer method. *Ind.J.Biochem.Biophys.* 44, 122-125.
4. Kundu M, Sen P C and Das K P (2007): Structure, Stability and Chaperone Function of α -crystallin Crystallin: Role of the N-Terminal Region. *Biopolymers* 86, 177-192.
5. Samanta, Nagdas S K, Das K P and Sen P C (2007): Protein kinase catalytic subunit (PKAcet) from bovine lens: Purification, characterization and phosphorylation of lens crystallins. *Mol.Cell.Biochem.* 304, 155-165.
6. Manna P, Sinha M and Sil P C (2008): Arsenic induced oxidative myocardial injury: Protective role of arjunolic acid. *Arch Toxicol.* 82, 137-149.
7. Manna P, Sinha M and Sil P C (2008): Protection of arsenic-induced testicular oxidative stress by arjunolic acid. *Redox Report.* 13, 67-77.
8. Sinha M, Manna P and Sil P C (2008): Protective Effect of Arjunolic Acid Against Arsenic-Induced Oxidative Stress in Mouse Brain. *J Biochem Mol Toxicol.* 22, 15-26.
9. Sarkar MK and Sil P C (2007): Hepatocytes are protected by herb *Phyllanthus niruri* protein isolate against thioacetamide toxicity. *Pathophysiology.* 14, 113-120.
10. Manna P, Sinha M, Pal P and Sil P C (2007): Arjunolic acid, a triterpenoid saponin, ameliorates arsenic-induced cyto-toxicity in hepatocytes. *Chem Biol Interact.* 170, 187-200.
11. Ghosh A and Sil P C (2007): Anti-oxidative effect of a protein from *Cajanus indicus* L against acetaminophen-induced hepato-nephro toxicity. *J Biochem Mol Biol.* 40, 1039-1049.
12. Sinha M, Manna P and Sil P C (2007): Taurine, a conditionally essential amino acid, ameliorates arsenic-induced cytotoxicity in murine hepatocytes. *Toxicol In Vitro.* 21, 1419-1428.
13. Sinha M, Manna P and Sil P C (2007): Attenuation of cadmium chloride induced cytotoxicity in murine hepatocytes by a protein isolated from the leaves of the herb *Cajanus indicus* L. *Arch Toxicol.* 81, 397-406.
14. Manna P, Sinha M and Sil P C (2007): Phytochemical activity of *Terminalia arjuna* against carbon tetrachloride induced cardiac oxidative stress. *Pathophysiology.* 14, 71-78.
15. Sarkar K and Sil P C (2007): Attenuation of acetaminophen-induced hepatotoxicity in vivo and in vitro by a 43-kD protein isolated from the herb *Cajanus indicus* L. *Toxicol Mech Methods.* 17, 305-315.
16. Manna P, Sinha M and Sil P C (2007): A 43 kD protein isolated from the herb *Cajanus indicus* L attenuates sodium fluoride-induced hepatic and renal disorders in vivo. *J Biochem Mol Biol.* 40, 382-395.
17. Manna P, Sinha M and Sil P C (2007): Protection of arsenic-induced hepatic disorder by arjunolic Acid. *Basic Clin Pharmacol Toxicol.* 101, 333-338.
18. Sinha M, Manna P and Sil P C (2007): Amelioration of galactosamine-induced nephrotoxicity by a protein isolated from the leaves of the herb, *Cajanus indicus* L. *BMC Complement and Altern Med.* 7, 11.

19. Sinha M, Manna P and Sil P C (2007): A 43 kD protein from the herb, *Cajanus indicus* L, plays protective role against sodium fluoride induced oxidative stress in mice erythrocytes. *Pathophysiology.* 14, 47-54.
20. Sinha M, Manna P and Sil P C (2007): Aqueous extract of the bark of *Terminalia arjuna* plays protective role against sodium fluoride induced hepatic and renal oxidative stress. *J Nat Med.* 61, 251-260.
21. Das T, Sa G, Paszkiewicz-Kozik E, Hilston C, Molto L, Rayman P, Biswas K, Kudo D, Bukowski RM, Finke JH and Tannenbaum C. (2008): Tumors Induce T Cell Apoptosis Through Receptor-Dependent and Receptor-Independent Pathways. *J. Immunol.* 180:4687-96.
22. Das T, Sa G, Hilston C, Kudo D, Rayman P, Biswas K, Molto L, Bukowski R, Rini B, Finke JH and Tannenbaum C. (2008): GM1 and TNF α , overexpressed in renal cell carcinoma, synergize to induce T cell apoptosis. *Cancer Research* 68:2014-23.
23. Bhattacharyya A, Mandal D, Lahiry L, Bhattacharyya S, Chattopadhyay S, Ghosh UK, Sa G and Das T. (2007): Black Tea-Induced Amelioration of Hepatic Oxidative Stress through Antioxidative Activity in EAC-Bearing Mice. *J Environ Pathol Toxicol Oncol.* 26:245-54.
24. Bhattacharyya S, Mandal D, Saha B, Sen GS, Das T and Sa G. (2007): Curcumin prevents tumor-induced T cell apoptosis through Stat-5a-mediated Bcl-2 induction. *J Biol Chem.* 282:15954-64.
25. Mandal D, Bhattacharyya S, Lahiry L, Chattopadhyay S, Sa G and Das T. (2007): Black tea-induced decrease in IL-10 and TGF- β of tumor cells promotes Th1/Tc1 response in tumor-bearer. *Nutrition Cancer*, 58:213-21.
26. Raval G, Biswas S, Rayman P, Biswas K, Sa G, Ghosh S, Thornton M, Hilston C, Das T, Bukowski R, Finke J and Tannenbaum CS. (2007): TNF- α Induction of GM2 Expression on Renal Cell Carcinomas Promotes T cell Dysfunction. *J Immunol.* 178:6642-522.
27. Bhattacharyya S, Mandal D, Sen GS, Pal S, Banerjee S, Lahiry L, Finke JH, Tannenbaum CS, Das T and Sa G. (2007): Tumor-induced oxidative stress perturbs nuclear factor-kappaB activity-augmenting tumor necrosis factor-alpha-mediated T-cell death: protection by curcumin. *Cancer Res.* 67:362-70.
28. Chattopadhyay S, Saha B, Mandal D, Sa G & Das T. (2007): Black tea: A Review. In: *Economic Crisis in Tea Industry: Strategies for Scientific Management*. (Ed: Dr. F. Rahman and Dr. Peter Baker). ISTS Book 3 of the Book series *Global Advances in Tea Science*. Studium Press LLC, Houston Texas, USA. Chapter 34.

PHYSICS DEPARTMENT

1. Pratt R H, LaJohn L A, Suric T, Chatterjee B K, Roy S C (2007) Limitations on the validity of impulse approximation in Compton scattering, *Nucl. Instr. Methods B* 261, 175-179.
2. Chatterjee B K, Roy S C, Suric T, LaJohn L A, Pratt R H (2007) Asymmetry and the shift of the Compton profile, *Nucl. Instr. Methods A* 580, 22-24.
3. Mondal P K, Sarkar R, Das M, Ray D K, Chatterjee B K, Roy B, Roy S C (2007) Response of Superheated Droplets to Electrons, *Sci. & Cult.* 73, 253-255.
4. Iceman C, Rue C, Moision R M, Chatterjee B K, Armentrout P B (2007) Ion Mobility Studies of Electronically Excited States of Atomic Transition Metal Cations: Development of an Ion Mobility Source for Guided Ion Beam Experiments *J. Am. Soc. Mass Spectrom.* 18, 1196-1205.
5. Tribedi A and Bose I (2007) Quantum critical point and entanglement in a matrix-product ground state, *Phys. Rev. A* 75, 042304-8.

6. Bose I (2007) Gene expression is noisy, *Science and Culture (Invited Review)* **73**, 75-81.
7. Bose I and Ghosh B (2007) The p53-MDM2 network: from oscillations to apoptosis, *J. Biosci.* **32**, 991-997.
8. Tribedi A and Bose I (2008) Entanglement and Fidelity Signatures of Quantum Phase Transitions in Spin Liquid Models, *Phys. Rev. A* **77**, 032307-8.
9. Sureka K, Ghosh B, Dasgupta A, Basu J, Kundu M and Bose I (2008) Positive feedback and noise activate the stringent response regulator Rel in mycobacteria, *PLoS One* **3**, e1771-9.
10. Pan Alok Kumar, Ali M, Majumdar A S and Home D (2007) Aspects of nonideal Stern - Gerlach experiment and testable ramifications *J. Phys. A: Math. Theor.* **40**, 13975.
11. Ali M, Majumdar A S, Pan Alok Kumar and Home D (2008) Reply to "Comment on 'Quantum time-of-flight distribution for cold trapped atoms' *Phys. Rev. A* **77**, 026101.
12. Prakash Ved, Choudhary S N and Sinha T P (2008). "Dielectric relaxation in complex perovskite oxide $BaCo_{1/2}W_{1/2}O_3$ ", *Physica B*, **403**, pp.103-108.
13. Dutta Alo and Sinha T P (2007) "Dielectric relaxation in complex perovskite $BaFe_{1/2}Sb_{1/2}O_3$ ", *International Journal of Modern Physics B*, **21**, pp.2965-2978.
14. Ved Prakash, Dutta Alo, Choudhary S N and Sinha T. P. (2007). "Dielectric relaxation in perovskite $Ba(Zn_{1/2}W_{1/2})O_3$ ", *Materials Science and Engineering B*, **142**, pp.98-105.
15. Ray D K, Himanshu A K and Sinha T P (2007) "Structural and low frequency studies of conducting polymer nanocomposites", *Indian Journal of Pure and Applied Physics*, **45**, pp.692-699.
16. Dutta Alo, Sinha T P and Shannigrahi Santiranjan. (2007) "Dielectric relaxation and electronic structure of $Ca(Fe_{1/2}Sb_{1/2})O_3$ ", *Physical Review B*, **76**, pp.155113-1-7.
17. Dutta Alo, Bharti Chandras and Sinha T. P. (2008) "AC conductivity and dielectric relaxation in $CaMg_{1/3}Nb_{2/3}O_3$ ", *Materials Research Bulletin*, **43**, pp.1246-1254.
18. Ghosh S K, Bhattacharyya Abhijit ((2007) Rotating quark star in Colour Dielectric Model, *Mod. Phys. Lett. A* **22**, 1019.
19. Ghosh S K, Bhattacharyya Abhijit, Mallick Ritam and Raha Sibaji (2007) General Relativistic effects on the conversion of nuclear to two flavour quark matter in compact stars, *Phys. Rev. C* **76**, 052801.

Book Chapters/Conference Proceedings:

1. Mondal P K, Sarkar R, Chatterjee B K and Roy S C (2007) Energy Dependence of Gamma Detection Efficiency of R-12, *Proc. of Seventeenth National Symposium on Radiation Physics (Kolkata)*, **126**.
2. Prof. Dipankar Home published the book "Einstein's Struggles with Quantum Theory: A Reappraisal"; with Andrew Whitaker (Springer, New York, 2007).

PLANT MOLECULAR & CELLULAR GENETICS

1. Patra B, Ghosh Dastidar K, Maitra S, Bhattacharyya J and Lahiri Majumder A (2007) Functional identification of sl11383 from *Synechocystis* sp PCC 6803 as L-myo-inositol 1-phosphate phosphatase (EC 3.1.3.25): Molecular cloning, expression and characterization. *Planta*, **225**:1547-1558.

2. Pal A, Chakrabarti A and Basak J (2007). New motifs within the NB-ARC domain of R proteins: Probable mechanisms of integration of geminiviral signatures within the host species of Fabaceae family and implications in conferring disease resistance. *J. Theoretical Biology*, **246**:564-573.
3. Das M, Bhattacharya S, Basak J and Pal A (2007) Phylogenetic relationships among the bamboo species as revealed by morphological characters and polymorphism analyses. *Biologia Plantarum*, **51** (4): 667-672.
4. Saha P, Chakraborti D, Sarkar A, Dutta I, Basu D and Das S (2007) Characterization of vascular-specific *RSs* and *rolC* promoters for their utilization in engineering plants to develop resistance against hemipteran insect pests *Planta*, **226**: 429-442.
5. Chaudhuri R K, Pal A and Jha T B (2007) Production of Genetically Uniform Plants from Nodal explants of *Swertia chirata* Buch.-Ham. ex Wall.-A Critically Endangered Medicinal Herb. *In vitro Cell. Dev. Biol.* **43**, 467-472.
6. Chattopadhyaya R and Pal A (2008) Three-dimensional Models of NB-ARC Domains of Disease Resistance Proteins in Tomato, Arabidopsis, and Flax. *Journal of Biomolecular Structure & Dynamics*, **25** (4): 357-372.

Book Chapters/Conference Proceedings:

1. Pal A (2008) Chapter 13. Arabinogalactan Protein and Arabinogalactan: Biomolecules with Biotechnological and Therapeutic Potentials. In: Bioactive Molecules and Medicinal Plants, Eds. K. G. Ramawat and J. M. Merillon, Springer, Germany, pp. 255-270.
2. Mitra A and Pal A (2008) Chapter 9. Establishment of an *in vitro* clonal propagation method for commercial exploitation from a high biomass yielding *Aloe vera* (L.) germplasm. In: Recent Advances in Plant Biotechnology, Eds. Ashwini Kumar and Sudhir Sopory pgs. 132-138.
3. Saha P, Dutta I, Banerjee S and Das S (2008) Chapter 29. *Allium sativum* leaf lectin: A potent sap feeding insect control protein expressed in rice and mustard (chapter 29) in Recent Advances in Plant Biotechnology and its Applications Eds. Ashwini Kumar and Sudhir Sopory.
4. Chakraborti D, Sarkar A, Majumder P, Mondal H A, Gupta S and Das S (2007) Mannose binding *Allium sativum* leaf lectin expression in chickpea for sap sucking insect pest resistance. In Proceeding of The Fourth International Food Legumes Research Conference (IFLRC-IV), ISGPB, New Delhi, Edited by M.C. Kharkwal.

MADHYAMGRAM EXPERIMENTAL FARM

1. Mitra S, Chakrabartty P K and Biswas S R (2007): Production of nisin Z by *Lactococcus lactis* isolated from dahi. *Appl Biochem Biotechnol.* **143**, 41-53.
2. Gautam U S, Jajoo A, Singh A, Chakrabartty P K, and Das SK (2007): Characterization of an *rpoN* mutant of *Mesorhizobium ciceri*. *J Appl Microbiol.* **103**, 1798-1807.
3. Das S K, Gautam U S, Chakrabartty P K and Singh A (2006): Characterization of symbiotically defective serine auxotroph of *Mesorhizobium ciceri*. *FEMS Microbiol. Letts.* **263**, 244-251.

LIBRARY

1. Chakraborty A.K and Others (2007) Edited the Seminar Volume – "Digital Media and Library & Information Services 26th National Conference of IASLIC, Special Publication No. 47.
2. Chakraborty AK, Majumdar K P (2007) Role of ICT in Digital Information Era with Special Reference to Research Library 26th National Conference of IASLIC, Special Publication No. 47, p.79-88.
3. Chakraborty A K (2007) Role of Libraries Towards Knowledge Society (Paper presented and published in the National Seminar held at North Bengal University, p.8-12.
4. Chakraborty A K (2007) Library and Information Centre :Technology Trends. (Rabindra Bharati University : Journal of Library and Information Science, Vol.10, p. 15-22.
5. Chakraborty A K and Satpathi J N (2007) Role of Social Science Information for R&D. Seminar held in Vidyasagar University. (Paper presented in the National Seminar on Access to Social Science Information jointly organized by the Vidyasagar University and NASDOC, New Delhi on 20-02-2007 held at Vidyasagar University.

STUDENTS AWARDED WITH A PH.D. DEGREE

Name of the Student (University, Year)	Department/Title of Thesis	Supervisor
Biochemistry Department		
Gopa Mitra (JU)	Studies on chaperone-like activities of microtubular proteins.	Prof. B.Bhattacharyya
Mithu Banerjee (JU)	Antimitotic drugs binding to tubulin: A Calorimetric and spectroscopic study.	Prof. B.Bhattacharyya
Rudra P. Saha (JU, 2007)	Analysis of interactions in proteins and structural studies on a few proteins from <i>Vibrio cholerae</i> .	Prof. P. Chakrabarti
Atasi Pal (JU, 2007)	Autodigestion, Proteolysis and Structural Studies of the Lambda cI Repressor and Investigation of its RecA-mediated cleavage	Dr.R. Chattopadhyaya
Rima Chattopadhyay (JU, 2007)	Studies on the cyclic AMP dependent properties of cyclic AMP receptor protein from <i>Escherichia coli</i> and other systems.	Dr. P.K. Parrack
Dipak Dutta (JU, 2007)	Studies on the protein HflX from <i>Escherichia coli</i> : Searching for its function.	Dr. P.K. Parrack
Tridib Ganguly (JU, 2007)	Studies on the structure- function relationship of the repressor of temperate mycobacteriophage L1.	Dr. S. Sau
Bioinformatics Centre		
Surajit Basak (JU, 2007)	Tracing the evolutionary forces for temperature adaptation of DNA, RNA and protein molecules of different organisms.	Dr. T.C. Ghosh

Angshuman
Bagchi
(JU, 2007)

Structural biology and bioinformatics approach on sox gene clusters towards the understanding of sulphur lithotrophy in proteobacteria.

Dr. T.C. Ghosh

Keya Sau
(JU, 2007)

Studies on the codon and amino acid usage bias in bacteriophage

Dr. T.C. Ghosh

Botany Department

Siraj Datta
(JU, 2007)

Characterization of a terminal flower mutant phenotype of Beta palonga;

Prof. K.K Mukherjee

Sujit Roy
(JU)

Studies on Single polypeptide DNA polymerase sensitive to dideoxynucleoside triphosphate from *Vigna radiata* cv. B1. (L.)

Prof. D.N. Sengupta

Aryadeep
Roy Chowdhury
(JU)

Comparative analysis of Rab16 A gene expression in salt tolerant and salt sensitive rice cultivar and their promoter efficiency to develop an abiotic stress inducible promoter.

Prof. D.N. Sengupta

Ms. Sanjukta Dey
(CU)

Understanding of molecular factors associated with the resistance of tomato (*Lycopersicon esculentum*) to *Fusarium oxysporum* f.sp. *lycopersici*.

Dr. D. Basu

Chemistry Department

Anil Kumar Singh
(J.U., 2007)

Drug resistance in enteric bacteria

Prof. Manikuntala Kundu

Pratik Datta
(J.U., 2008)

Proteins of the cell division machinery of mycobacteria

Prof. Joyoti Basu

Aniruddha Aich
(J.U., 2007)

Studies on the developmental regulation of glycerolipid fatty acid composition in seeds and other tissues of non-traditional oil seed plants

Prof. Prantosh
Bhattacharyya

Microbiology Department

Ranadhir Dey
J. U. (2007)

Host parasite interaction in visceral leishmaniasis: The role of chemokines in regulating the elevated level of ceramide and other signaling parameters in *L. donovani* infected murine macrophages

Dr. Subrata
Majumdar

Sukhendu Mondal
J.U. (2007)

Studies on the expression of sulfur oxidation (Sox) genes associated with chemolithotrophy in *Pseudomonas salicylatoxidans* KCT001

Dr. Sujoy K.
Dasgupta

Sujoy Chatterjee
J.U. (2007)

Structure – function relationship of a mycobacterial plasmid (pAL5000) replication protein RepB.

Dr. Sujoy K.
Dasgupta

Subhankar Chatterjee
J.U. (2007)

Microbial fate of estrogenic phthalate esters in the environment: Biochemical and molecular analysis

Dr. Tapan K. Dutta

Somnath Mallik
J.U. (2007)

Biochemical and molecular characterization of pathway(s) involved in the microbial degradation of polycyclic aromatic hydrocarbons (PAHs)

Dr. Tapan K. Dutta

Division of Molecular Medicine

Sm. Jhuma Dey
J.U. (2007)

Search for biological responses of estradiol-17beta in pupal life of silkworm *Bombyx mori* L.

Prof. A.K. Ray

Sm. Samita Kundu
J.U. (2007)

Maintenance of central homeostasis for thyroid hormone in adult brain

Prof. A.K. Ray

Sm. Sumedha Roy
J.U. (2007)

Subcellular action of estradiol-17beta in fifth instar larvae of silkworm, *Bombyx mori* L.

Prof. A.K. Ray

Sm. Srabasti Ghoshal J.U. (2008)	Interaction of Mg^{+2} -independent Ca^{+2} -ATPase with a low molecular mass protein purified from bovine brain cytosol	Prof. P.C.Sen
Sri Rajesh Bhattacharjee J.U. (2007)	Studies on a hepatoprotective protein from a herbal source.	Prof. P.C.Sil
Dr. Sankar Bhattacharyya J.U. (2007)	Amelioration of tumor-induced immunosuppression by curcumin	Dr. G.Sa
Dr. Debaprasad Mandal J.U. (2007)	Mechanisms of immunomodulation by black tea in tumor beare	Dr. T. Das
Dr. Lakshmishri Lahiry J.U. (2007)	Molecular mechanisms of human breast cancer cell apoptosis by black tea theaflavins	Dr. T. Das

Physics Department

Dilip Kumar Ray (J.U. 2008)	Structural, Ultrasonic and Transport Properties of Composite Conducting Polymer	Dr. T. P. Sinha
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Plant Molecular & Cellular Genetics Section

Krishnarup Ghosh Dastidar (J.U., 2007)	Molecular studies on eukaryotic L- <i>myo</i> -inositol 1-phosphate synthase with reference to catalytic and salt-tolerant properties	Prof. A.N. Lahiri Majumder
Susmita Maitra (J.U., 2007)	Comparative analysis of inositol synthase(s) from cultivated and wild halophytic rice: <i>In vitro</i> and <i>in vivo</i> studies of regulatory elements	Prof. A.N. Lahiri Majumder
Lily Goswami (J.U., 2007)	Studies on L- <i>myo</i> -inositol 1-phosphate synthase(s) with special reference to salinity stress and its expression in transgenic crop plants	Prof. A.N. Lahiri Majumder

Prasenjit Saha (J.U., 2007)	Development of insect resistance in <i>indica</i> rice cultivars: A crop management strategy	Prof. Sampa Das
Dipankar Chakraborty (J.U., 2007)	Expression of mannose binding garlic lectin in chickpea to protect from the attack of sucking insect pest	Prof. Sampa Das
Anindya Sarkar (J.U., 2008)	Development of transgenic insect resistant chickpea (<i>Cicer arietinum</i> L.) plants with <i>Bacillus thuringiensis</i> endotoxin gene	Prof. Sampa Das
Uttara Chakraborty (J.U., 2008)	Development and molecular characterization of somatic hybrids developed through protoplast fusion between edible mushroom strains	Dr. S. R. Sikdar
Sruti Dutta (J.U., 2008)	Development and characterization of aphid tolerant <i>Brassica juncea</i> chromosome addition lines from " <i>Rorippobrassica</i> " somatic hybrid (<i>Rorippa indica</i> + <i>Brassica juncea</i>) through plant breeding approach	Dr. S. R. Sikdar

GRANTS-IN-AID SCHEMES

Investigator/ Co-Investigator	Title of the Scheme	Name of the Dept./Section
Schemes funded by CSIR		
Prof. B. Bhattacharyya	Unusual binding properties of colchicines-tubulin Interactions (up to 31.12.2008).	Biochemistry
Prof. P. Chakrabarti Co-PI: Dr. G. Basu Biophys. Dept.	Theoretical and Crystallographic studies on protein-Protein Interactions.	Biochemistry
Dr. Subrata Sau	Studies on the structure-function relationship of the Repressor of the temperate Mycobacteriophage L1.	Biochemistry
Dr. Gautam Basu	Mechanism of substrate recognition by truncated glutamyl tRNA synthetase	Biophysics
Prof. D. N. Sengupta	Upstream analysis of the gene for expression of the Sucrose phosphate synthase in Banana fruits.	Botany
Prof. K.P. Das	Role of N-terminal region of α -crystallin in its structure, function and stability- a biophysical and site directed truncation study (Nov.2005-Sept.2009)	Chemistry
Prof. J. Basu (PI)	Functional analysis of the interplay between the gene products encoded by an operon harboring serine/threonine kinase and phosphatase and its 'implications in mycobacterial physiology (1.1.2008-31.1.2011)	Chemistry
Dr. Subrata Majumdar	Anti-leishmanial effect of mycobacterial glycolipids through immunomodulation: Strategies involving modulation of chemokine receptors (2007-2010)	Microbiology

Dr. Sujoy K. Das Gupta	Investigating DNA trajectories in DNA-Protein Complexes of prokaryotic origin (Nov. 2007 to Nov. 2010)	Microbiology
Dr. Tapan K. Dutta	Microbial management of environmental carcinogens: High molecular weight polycyclic aromatic hydrocarbons (terminated on 30.04. 2007)	Microbiology
Prof. Arun K. Ray	Studies on the specificity of eltradiol-17beta binding protein (putative receptor) in different organs of silkworm, <i>Bombyx mor</i> IL. (race Nistari)	Division of Molecular Medicine
Prof. Parimal C. Sen	Structural and Functional Characterization of a Bi-Functional Protein from Goat Spermatozoa (Rs. 13.5 lakhs approx.)	Division of Molecular Medicine
Prof. Anita Pal	DNA fingerprinting for identification of bamboo species and genotypes for IPR protection and Conservation (Completed on 31.01.2008).	PMCG
Schemes funded by DBT		
Prof. Anuradha Lohia	Development of a product from <i>Oxalis corniculata</i> for <i>E. histolytica</i> .	Biochemistry
Prof. P. Chakrabarti	Analysis of protein structures and soft-computing in Functional annotation, chemogenomics and docking.	Biochemistry
Dr. Subrata Sau	Molecular characterization of two putative host Lethal Genes of temperate mycobacteriophage L1.	Biochemistry
Prof. Swati Sen Mandi	"Characterization and Improvement of Tea through Biotechnological Tools" (a National Network Programme) (From 2001 – April 2007)	Botany
Prof. D. N. Sengupta	Analysis of ABRE-based promoter and cloning of cDNAs for ABRE binding factors from Rice. (Final Year of 5 th Year Project)	Botany
Prof. J. Basu (PI) Prof. M. Kundu	Mechanisms of modulation of host cell signaling by RDI-encoded proteins of Mycobacteria (16.11.2005-15.11.2008)	Chemistry
Prof. J. Basu (PI) Prof. I. Bose Prof. K.P. Das Prof. M. Kundu	Multifaceted approaches towards characterizing potential drug targets in the cell division and stress response pathways in <i>Mycobacterium tuberculosis</i> (27.10.2006-26.10.2009)	Chemistry

Prof. M. Kundu (PI) Prof. J. Basu	Polyphosphate kinase, polyphosphate metabolism and its implications in mycobacteria (12.3.2004-11.3.2008)	Chemistry
Dr. Subrata Majumdar	Effect of gene silencing on the modulation of cell Signaling mechanisms during the early phase of <i>Leishmania donovani</i> infection. (2006-2009)	Microbiology
Dr. Subrata Majumdar	CD40 and Toll like receptors (TLR) at the interface of <i>Mycobacterium w</i> (<i>M. w</i>) and macrophage interaction: Probing the mechanism of action of <i>M. w</i> using (2006-2009)	Microbiology
Dr. Tapan K. Dutta	Molecular characterization of novel catabolic genes and enzymes involved in a distinct metabolic pathway in the assimilation of phenanthrene (31.01.2008 – 30.01.2011)	Microbiology
Prof. A. N. Lahiri Majumder	Engineering inositol metabolic pathway for raising salt tolerant rice plants	PMCG
Prof. A. N. Lahiri Majumder	Identification and characterization of genes/proteins regulated in abiotic stress in <i>Porteresia</i> (Completed on 31.01.2008)	PMCG
Prof. A. N. Lahiri Majumder (PI) Prof. D. N. Sengupta (Co-PI)	Novel genes and their regulatory elements for salt tolerance from the wild halophytic rice <i>Porteresia coarctata</i> : Introgression into cultivated rice (Started from 25.01.2008).	PMCG/ Botany
Prof. Amita Pal	Phylogeny of NBS-LRR protein motifs in the family Fabaceae, identification of new conserved motifs and their implications in Geminivirus resistance.	PMCG
Prof. Sampa Das (Coordinator & PI) Dr. S. R. Sikdar (Co-P.I.)	Programme Support on 'Biotic stress in Plants: A concerted approach based on functional genomic, proteomic and transgenic techniques'.	PMCG
Prof. Amita Pal, P.I. Prof. K. P. Das (Co-P.I.) Prof. Sampa Das (Programme Coordinator)	Identification of effector gene/proteins implicated in resistance for yellow mosaic disease through genomic and proteomic approaches.	PMCG/ Chemistry
Dr. Sampa Das (PI) Dr. S. R. Sikdar (Co-I)	A transgenic approach to develop aphid resistant <i>Brassica juncea</i> plant types and their field evaluation.	PMCG

Schemes funded by DST

Prof. Anuradha Lohia PI / Coordinator	'Facility for genomics and proteomics at Bose Institute' IRHPA Scheme from DST, 2005-1010.	Biochemistry
Prof. P. Chakrabarti Co-PI: Dr. P. Parrack	Structural studies on Protein-DNA interaction.	Biochemistry
Prof. P. Chakrabarti	J.C. Bose National Fellowship (started on 8-5-2007)	Biochemistry
Prof. Anuradha Lohia	A genomic and proteomic analysis of nuclear matrix components to identify their role in regulation of gene expression in the human Pathogen <i>Entamoeba histolytica</i> under India-Israel S & T Cooperation Programme.	Biochemistry
Prof. J. Basu (PI) Prof. M. Kundu	Understanding mycobacteria-induced death signaling in the host macrophage (20.04.2005-19.4.2008)	Chemistry
Prof. M. Kundu (PI) Prof. J. Basu	Understanding mechanisms of drug resistance in <i>Vibrio cholerae</i> (17.10.2004-17.05.2008)	Chemistry
Dr. G. Sa/ Dr. T. Das (Co-PI)	Targeted inhibition of cell cycle phase Specific signaling molecules to induce selective apoptosis in cancer cells (01.05.2005-31.04.2008) (Rs. 22,77,000.00)	Division of Molecular Medicine
Dr. T. Das/ Dr. G. Sa (Co-PI)	Evaluation of p53-dependent and -independent signalings in theaflavin-induced human breast cancer cells (18.01.2008-17.01.2011) (Rs. 23,64,360.00)	Division of Molecular Medicine
Prof. Amita Pal, P.I. Prof. K. P. Das (Co-P.I.)	A proteomic approach to identify the proteins involved in <i>in vitro</i> differentiation of <i>Vigna radiata</i>	PMCG/ Chemistry

Scheme funded by DAE

Dr. Subrata Sau	Studies on the repressor and its cognate operators/ promoters of temperate <i>Staphylococcus aureus</i> phage Φ 11 and development of a high expression vector for staphylococcal systems (started on 22.02.08)	Biochemistry
Prof. J. Basu (PI) Prof. M. Kundu	Molecular analysis of mycobacteria-induced MMP9 production in macrophages (07.08.2006-06.08.2009)	Chemistry

Prof. M. Kundu (PI)
Prof. J. Basu

Regulation of cytokine/chemokine release from host cells by secreted antigens of *Helicobacter pylori* (14.3.2005-13.3.2008)

Chemistry

Dr. S. R. Sikdar

Development and characterization of somatic hybrid between *Brassica campestris* and *Rorippa indica* and raising of selfed backcross progeny lines.

PMCG

Schemes funded by ICMR

Prof. Swati Sen-Mandi
(Co-coordinator)
Dr. Tapas Ghose
(Co-PI)

A Centre for Advanced Research in DNA Fingerprinting and Diagnostics of Medicinal Potential in Plants from Eastern and North Eastern India has been established at Bose Institute. In collaboration with Manipur University (MU) and Botanical Survey of India (BSI)

Botany

Prof. J. Basu (PI)
Prof. M. Kundu

Molecular identification of potential drug targets of *Mycobacterium tuberculosis* (25.6.2007-24.6.2010)

Chemistry

Prof. M. Kundu (PI)
Prof. J. Basu

Mechanism of activation of the transcription factor Sp1 and modulation of Sp1-regulated genes by the gastric pathogen *Helicobacter pylori* (1.1.2007-31.12.2010)

Chemistry

Dr. Subrata Majumdar

An approach to immunotherapy against Visceral leishmaniasis (2005-2008)

Microbiology

Dr. G. Sa/ Dr. T. Das (Co-PI)

Molecular Regulation of cell growth and cell death: An approach to control cancer/aging by cellular engineering (01.04.2006-31.03.2009)
(Rs. 22,87,710.00)

Division of
Molecular
Medicine

Dr. Nripendranath Mandal

Quantification of the cytokines mRNA based on competitive RT-PCR

Division of
Molecular
Medicine

Scheme funded by FIRCA

Prof. Anuradha Lohia

Replication control in *E. histolytica*
FIRCA Grant from Fogarty International Centre, NIH. 2005-2008.

Biochemistry

Prof. Anuradha Lohia

Identifying cell cycle gene networks in *E. histolytica*
FIRCA, NIH, USA 2006-2009.

Biochemistry

Schemes funded by ICAR/NAIP

Dr. D. Basu (PI)
Prof. S. Das (Co-PI)
Dr. S. R. Sikdar (Co-PI)

Molecular tools for exploitation of heterosis, yield and oil quality in sesame.
(January 2008 to March 2012)

Botany/PMCG

Schemes funded by Ministry of Environment & Forests (MOEF)

Dr. Tapan K. Dutta

Molecular characterization of novel catabolic genes and enzymes involved in a distinct metabolic pathway in the assimilation of phenanthrene
(31.01.2008-30.01.2011)

Microbiology

Scheme funded by Indo Swiss Collaboration in Biotechnology

Prof. Sampa Das (PI)

Expression of insecticidal protein in chickpea (*Cicer arietinum* L.) in order to develop resistance to important pests, *Aphis craccivora* and *Helicoverpa armigera*.

PMCG

Participation in Conferences/Symposia/Workshops

Prof. P. Chakrabarti (Biochemistry) presented papers/talked at (i) INPEC (International Network of Protein Engineering Centres) Meeting, Jaca, Spain, June 13-16, 2007; (ii) Seminar on Pattern Recognition in Bioinformatics, organized by St. Xavier's College, 28.9.2007; (iii) 2nd IAPR Workshop on Pattern Recognition in Bioinformatics (PRIB 2007), Singapore, October 1-2, 2007; (iv) Workshop on Structural Bioinformatics, Vidyasagar University, 8.10.2007; (v) National Workshop on Bioinformatics: Genomics & Proteomics Plexus, Presidency College, December 8-9, 2007; (vi) GRC-2007, Sundarban, December 18-22, 2007; (vii) the 10th CRSI National Symposium in Chemistry, Bangalore, February 1-3, 2008; (viii) National Seminar in Crystallography, Jadavpur University, February 6-8, 2008; (ix) the INSA sponsored symposium, Present Scenario of Chemical and Biochemical Research in Kolkata, Presidency College, 18.3.2008; (x) Seminar on Molecular Dynamics, WB University of Technology, 28.3.2008. Attended (xi) BITS Annual Coordinators' Meeting, Mysore, February 3-4, 2007. Was a speaker (xii) at the National Science Day Programme at NEHU, Shillong, 28.2.2007. Was a resource person for (xiii) the Refresher Course in Biotechnology, University of Calcutta, February 25-March 15, 2008; (xiv) the Indian Academy sponsored workshop on Foundations in Chemistry at Govt. V.Y.T.P.G. Autonomous College, Durg, Chattisgarh, March 7-9, 2008.

Dr. P. K. Parrack (Biochemistry) delivered an invited lecture entitled "Structure and interactions of host and phage proteins implicated in the lysis-lysogeny decision of phage lambda" in the International Conference on Emerging and Re-emerging Viral Diseases of Tropics and Sub-tropics, held by Indian Virology Society, at the Indian Agricultural Research Institute, New Delhi, December 11-14, 2007. Attended the Tenth Asian Conference on Transcription, held at IISc. NCBS and JNCASR, Bangalore, January 13-16, 2008.

Dr. S. Sau (Biochemistry) attended the 12th Annual conference of Gwalior Academy of Mathematical Sciences & All India Symposium on Computational Biology on 'Computational Biology', organized by Department of Mathematics, MANIT, Bhopal during April 6-8, 2007.

Participation by Dr. S. Sau' group member :

Mr. Palas K Chanda attended the 48th Annual Conference on 'Microbes: Biofactories of the future' organized by the Association of Microbiologists of India and presented a poster entitled 'Detection of antistaphylococcal and toxic chemicals by biological assay systems developed with a reporter *Staphylococcus aureus* strain harboring a heat shock promoter - *lacZ* transcriptional fusion' during December 18-21, 2007 at IIT Madras, Chennai.

Participation by Prof. P. Chakrabarti's group member (BIC) S. Sonavane attended the DST sponsored SERC School on Machine Learning and Pattern Evolution Methods in Chemo and Bioinformatics, organized by NCL and C-DAC, Pune, June 26-29, 2007.

Dr. P.K. Saha (Botany) (i) Participated in the Fifth NIAS-DST training programme on 'Multidisciplinary perspectives on science & Technology' sponsored by the Department of Science and Technology, Govt. of India held during August 19 to 31, 2007 and awarded certificate for successful participation, by National Institute of Advanced Studies, Bangaluru. (ii) participated and presented a paper in the National Seminar on Medicinal Plants: Aspects and Prospects held at Department of Botany, University of Burdwan, W.B. during March 15-16, 2008.

Dr. Sabita Bhattacharya (Botany) Participated (i) with an oral presentation in National seminar on 'Medicinal plants: Aspects and Prospects' organized by Department of Botany, Burdwan University, held on 15-16 March, 2008. (ii) International Conference on 'Biodiversity: Issues and concerns' held on 21-23 November, 2007 at Biological Science Division, Indian Statistical Institute, Kolkata (a poster was presented by Avik Ray).

Avik Ray (Botany) participated (i) a four-week certificate course (Sept 3 - Oct 1, 2007) in 'Spatial data management for PURA related development initiatives' organized by SPCMF and National Atlas & Thematic Mapping Organization, Kolkata. (ii) Joint Workshop on 'Forecasting : An Indo-US Initiatives' organized by National Chemical Laboratory, Pune and the University of Kansas, Lawrence, Kansas, USA held on 27-29 August, 2007 at Pune, India. (iii) 'International Conference on Biodiversity Issues and Concerns' held on 21-23 Nov, 2007 at Biological Science Division, Indian Statistical Institute, Kolkata and presented a poster 'Initiatives in documenting commercially important medicinal plants in India'

Moumita Gangopadhyay (Botany) participated (i) Orally presented a topic in the National seminar-cum-workshop-cum-exhibition on 'Bioprospecting and application of medicinal plants in common ailments' held on 24-25th December, 2007 at Norendrapore Ramkrishna Mission Ashrama, Narendrapur, South 24-Parganas. (ii) International Symposium on 'Jute and Allied Fibres Production, Utilization and Marketing' held on 10-12th January, 2008 organised by, Indian Fibre Society, Kolkata. at National Library, Kolkata and was selected for the 'Best poster award' for the poster presentation titled 'Free radical scavenging activities in jute, a potential low cost dietary supplement'.

Dr. Swati Gupta-Bhattacharya (Botany) (i) participated and chaired a session at the State level seminar on Awareness in Science-Solar system to natural resource & Antarctica at Haldia Government College on 25th-26th March, 2008. She participated in the National seminar on Environment and Development, (Organized by the West Bengal Academy of Science and Technology) held at Central Glass & Ceramic Research Institute, Kolkata, India on 22nd-23rd February, 2008. She chaired a session in the National Seminar on Medicinal plants: Aspects and Prospects, held at the Center for Advanced Study, Department of Botany, University of Burdwan, on 15th-16th March 2008. (ii) participated at the 41st Annual Conference of the Indian College of Allergy, Asthma and Applied Immunology, held at V.P Chest Unit, Delhi from 9th to 12th December 2007. She participated at the International Conference on Biodiversity: Issues and Concerns at The Indian Statistical Institute, Kolkata, India from 21st to 23rd November, 2007.

She also participated in a one day seminar on Global warming: Myth or Reality (Organized by the British council & West Bengal Academy of Science and Technology) held at Central Glass & Ceramic Research Institute, Kolkata, India on 9th October 2007.

Miss Jyotshna Mandal and Mr. Himadri Shekhar Chakrabarti (Botany) participated (i) presented a poster at the State level seminar on Awareness in Science-Solar system to natural resource & Antarctica at Haldia Government College on 25th -26th March, 2008. (ii) National seminar on Environment and Development, (Organized by the West Bengal Academy of Science and Technology) held at Central Glass & Ceramic Research Institute, Kolkata, India on 22nd-23rd February, 2008. (iii) presented a poster and delivered an oral presentation at the International Conference on Biodiversity: Issues and Concerns at The Indian Statistical Institute, Kolkata, India from 21st to 23rd November, 2007. (iv) delivered an oral presentation and presented a poster at the XX World Allergy Congress including the 10th West Pacific Allergy Symposium (WPAS) in conjunction with the 7th Asia Pacific Congress of Allergology, Asthma and Clinical Immunology, (APAAACI) at Bangkok, Thailand from 2nd to 6th December 2007. (v) participated in a one day seminar on Global warming: Myth or Reality (Organized by the British council & West Bengal Academy of Science and Technology) held at Central Glass & Ceramic Research Institute, Kolkata, India on 9th October 2007. (vi) delivered oral presentation at the 41st Annual Conference of the Indian College of Allergy, Asthma and Applied Immunology, held at V.P Chest Unit, Delhi from 9th to 12th December 2007.

Miss Jyotshna Mandal (Botany) delivered an oral presentation at the National Seminar on Medicinal plants: Aspects and Prospects, held at Center for Advanced Study, Department of Botany, University of Burdwan, on 15th -16th March 2008.

Prof. Manas Chakrabarty (Chemistry) participated, along with his students Miss Sulakshana Karmakar, Miss Ajanta Mukherji and Miss Ratna Mukherjee and Technical Officer, Dr. Aniruddha Aich, and chaired two sessions on the presentation of Contributory Papers (Award) in the Symposium on "Acharya Prafulla Chandra Ray and Chemistry Today (2007)", organised jointly by the Indian Chemical Society and the Department of Chemistry, University of Calcutta and held during August 02-03, 2007.

Prof. K.P. Das (Chemistry) (i) presented an invited talk at the 44th Annual Convention of Chemists held at Jaipur during Dec. 22-26, 2007; (ii) acted as a co-convenor of International Conference on Soft Systems (ICSS-2008) organized by Indian Society for Surface Science, Jadavpur University held during February 12-15, 2008; (iii) attended CSIR project monitoring committee meeting at CSIR, New Delhi on February 16, 2008; (iv) delivered an invited lecture at the Bioinformatics workshop on Protein Folding, held during March 4-5, 2008; (v) gave an invited talk at Vidyasagar College during a two day symposium held on March 18-19, 2008.

Prof. Joyoti Basu (Chemistry) delivered a lecture in the 13th International Congress of Immunology held in Rio de Janeiro, Brazil in August, 2007. She delivered invited lectures in the following symposia (i) Lessons from the Microbial World" held in the KIIT School of Biotechnology, Bhubaneswar from November 23 to 24, 2007; (ii) New Horizons in Biotechnology" organized by the Biotech Research Society and National Institute for Interdisciplinary Science and Technology, Trivandrum from November 26 to 29, 2007; (iii) Recent trends in cancer research and treatment" organized by Chittaranjan National Cancer Institute from November 1 to 3, 2007.

Prof. Joyoti Basu (Chemistry) visited the Institut Pasteur, Paris in April, 2007 in connection with a collaborative Indo-French project.

Prof. Manikuntala Kundu (Chemistry) delivered an invited talk in the symposium on "Recent trends in cancer research and treatment" organized by Chittaranjan Cancer Institute from November 1 to 3, 2007.

Miss S. Karmakar, Miss A. Mukherji and Miss R. Mukherjee (Chemistry) participated in a Seminar on "Recent Topics in Organic Chemistry" organised by CAS on Natural Products, Department of Chemistry, University of Calcutta and held at Bose Institute, Main Building on the 28th March, 2007.

Sri Sushil Kumar Pathak, SRF (Chemistry) visited the Karolinska Institute, Stockholm for one month in connection with a collaborative Indo-Swedish project in January, 2008.

Dr. Subrata Majumdar (Microbiology) presented an invited talk at the 95th Indian Science Congress Meeting at Visakhapatnam, AP from Jan 3-7, 2008; presented an invited talk at the AICCG International conference on Infectious diseases at Hyderabad from Dec 27-29, 2007; attended an international gastroenterology conference on 'Immunoprophylactic and Immunotherapeutic approach' at Bangalore from 25-28th Nov, 2007.

Prof. Parimal C. Sen (Division of Molecular Medicine) chaired a Session in the Symposium on "Acharya Prafulla Chandra Ray and Chemistry Today, 2007" organized by Indian Chemical Society and Department of Chemistry, Calcutta University during August 2-3, 2007.

Dr. Parames C. Sil (Division of Molecular Medicine) delivered an invited talk in the Symposium on "Acharya Prafulla Chandra Ray and Chemistry Today, 2007" organized by Indian Chemical Society and Department of Chemistry, Calcutta University during August 2-3, 2007.

Prof. Barun K. Chatterjee (Physics) attended and presented a poster on "Energy Dependence of Gamma Detection Efficiency of R-12" at *Proc. of Seventeenth National Symposium on Radiation Physics* (Kolkata), November 14-16 2007.

Rupa Sarkar (Physics) attended and presented a poster on "Energy Dependence of Gamma Detection Efficiency of R-12" at *Proc. of Seventeenth National Symposium on Radiation Physics* (Kolkata), November 14-16 2007.

Prof. Indrani Bose (Physics) delivered an invited talk on Physics in Biology in Meeting on Current Trends in Scientific Research organized by Centre for Agri-based Science and Knowledge Transfer (CASKT) at Bose Institute, Kolkata (August 3, 2007); delivered an invited talk on Biology Inspired Physics at One Day seminar in Physics to celebrate 60 years of Indian Independence at I.A.C.S., Calcutta (August 17, 2007); delivered an invited talk on "Microbial Dynamics and Heterogeneity: A Statistical Physics Perspective" at Workshop on "Structure and Dynamics of Biomolecules -2007" held in SNBNCBS, Kolkata (December 4, 2007); delivered an invited talk on "Gene Expression Bistability and Noise-induced Transitions" at the International Workshop on Physics in Biology: A Synergy, University of Hyderabad (December 12-14, 2007); delivered two invited talks on Physics in Biology at International Workshop and Conference on Statistical Physics Approaches to Multi-disciplinary Problems held in I.I.T., Guwahati (January 7-13, 2008); delivered two invited talks on "Physics in Biology: A Search for Principles" in Meeting on Recent Trends in Condensed Matter, SINP, Calcutta (8/3/08); delivered an invited talk on "Bistability in Bacteria: A Physical Perspective" in Workshop on Undergraduate Science Education: An Interdisciplinary Approach organized by Vidyasagar College, Kolkata (March 18-19, 2008); delivered an invited talk on "Motifs of regulation and gene circuit analysis" at Workshop on System Biology, Department of Molecular Biology and Biophysics, Calcutta University (24-27.3.08); delivered an invited talk on "How Microbial Cell Populations Cope with Stress in A Workshop on Complex Systems with special emphasis on "Complexity of Living systems", Indian Statistical Institute, Kolkata (March 17-28, 2008).

Dr. Swapan Saha (Physics) served as a member of the Organizing Committee of the North East Children's Training Programme (NESST-BASE) held at Bose Institute, Darjeeling - May 20-June 3 and June 15-29, 2007. Dr. Swapan Saha Served as a member of the Organizing Committee of an Workshop on Astroparticle Physics held at Bose Institute, Darjeeling - December 17-18, 2007. Dr. Swapan Saha Served as a member of the Organizing Committee of the 2nd Winter school on Astroparticle Physics (WAPP-07) held at Bose Institute, Darjeeling - December 20-28, 2007. Dr. Swapan Saha Presented a poster at Quark Matter 2008 - 20th International Conference on Ultra-Relativistic Nucleus Nucleus Collisions at Jaipur - February 4-10, 2008.

Dr. T. P. Sinha (Physics) presented six papers in the National Conference on Condensed Matter Days held at NIT, Rourkela during August 29-31, 2007; presented a paper in the International Conference on Advanced Materials held at Bangalore during October 8-13, 2007; presented a paper in the National Seminar on Electroceramics held at GVM Girls College, Sonapat during November 5-6, 2007; presented a paper in the International Conference on Condensed Matter Physics held at University of Rajasthan, Jaipur during November 25-28, 2007; presented three papers in the DAE Solid State Physics Symposium held at University of Mysore, Mysore during December 27-31, 2007; participated in the Indo-Japan Conference on Ferroics and Multiferroics held at IACS and SNBoseNCBS, Kolkata during February 4-6, 2008.

Prof. A. N. Lahiri Majumder (PMCG) delivered an invited talk on "Organization of cytosolic and chloroplastic L-myo-inositol 1-phosphate synthase (MIPS) coding gene(s) in *Oryza*: comparison with *Porteresia* gene(s)" in the International Conference at the Jawaharlal Nehru University, Delhi during January 5-6, 2008. He has delivered key-note address in the workshop on "Cloning and identification of abiotic stress- induced genes" organized by the Institute of Life Sciences, Bhubaneswar during March 11-15, 2008. He also delivered an invited talk in the National Symposium on "Frontiers in Biocomplexity and Biodiversity of Plants" organized by the Centre for Advanced Studies in Botany, School of Life Sciences, North-Eastern Hill University, Shillong during March 14 - 15, 2008. Prof. Lahiri Majumder has delivered a Special Lecture on "Abiotic stress tolerance in plants: adaptational features and strategies for biotechnological manipulation" in the National Seminar organized by the Centre for Advanced Studies in Botany, Burdwan University, during March 15- 16, 2008.

Prof. Amita Pal (PMCG) has delivered an invited talk on "Bamboo Systematics: Use of Molecular Techniques and Markers" in the National Workshop on Bamboo Taxonomy- 2007, organized by AICOPTAX, Botanical Survey of India, Kolkata, April 27-28, 2007. She has presented a lead lecture on 'Biotechnological applications in bamboo research' in the National Seminar on Conservation and Management of Bamboo resources', held on 29th and 30th November 2007, organized by Institute of Forest Productivity, Ranchi and NMBA. She had presented a paper on "Molecular characterization of a marker associated with elite genotype of *Bambusa balcooa* with respect to the fiber quality" in the National Symposium on Biotechnology for Conservation, Characterization and Crop Improvement held in Udaipur from 8th to 10th February, 2008. She has participated in the National Conference on "Showcasing Cutting Edge Science & Technology by Women", organised by Task Force for Women in Science Department of Science & Technology & Confederation of Indian Industry on 8th and 9th March, 2008 at the Vigyan Bhavan, New Delhi. She delivered an invited talk on "Role of plant biotechnology in bioactive compound production: A step towards drug discovery" in the National Seminar on Medicinal Plants: Aspects and Prospects; organized by the Centre of Advanced Study, Department of Botany, University of Burdwan, Burdwan on 15th March, 2008.

Participation by Prof. Amita Pal's Group members:

Samik Bhattacharya, SRF (PMCG) participated and delivered an invited talk on "Evaluation of phylogenetic relationships among 25 bamboo species as revealed by DNA fingerprinting" in the National Seminar on Conservation and Management of Bamboo Resources, held at the Institute of Forest Productivity, Ranchi. He also delivered another invited talk on "In search of elite genetic resources of *Bambusa balcooa*" in the National Conference on Bamboos: Management, Conservation, Value addition and Promotion, held at the Tropical Forest Research Institute (ICFRE), Jabalpur, 12th to 14th March, 2008.

Jayadri Shekhar Ghosh, SRF (PMCG) participated and delivered an invited talk on "Towards identification of an elite genotype of *Bambusa balcooa* for the production of paper pulp: Analysis of physico-chemical properties of fibers in different accessions" in the National Seminar on Conservation and Management of Bamboo Resources, held at the Institute of Forest Productivity, Ranchi

Dr. Dipjyoti Chakraborty, RA (PMCG) participated and presented a paper on "Characterization of crude extracts from *Quassia amara* L. callus and bark tissue for quassinoids using HPLC and its antileishmanial activity" in the National Symposium on Biotechnology for Conservation, Characterization and Crop Improvement held in Udaipur from 8th to 10th February, 2008.

Prof. Sampa Das (PMCG) participated and presented in a Brain storming meeting held at India Habitat Centre, Max Muller Marg, New Delhi on 28th July, 2007. She also delivered a talk in a National Seminar organized by Association for Advancement in Plant Protection at BCKV, Kalyani during 28th -29th December, 2007. She has participated and presented the progress report in Indo Swiss Collaboration in Biotechnology, Pulse Network meeting at ICRISAT, Hyderabad during 14th -15th February, 2008.

Dr. S.R. Sikdar (PMCG) participated in the "International Workshop on Germplasm resource collection, utilization and research and development of Indian Bamboos" organized by Bamboo Mission at Institute of Himalayan Bioresource Technology, Palampur (HP) during April 18-20, 2007.

(Environmental Science Section) An oral presentation has been made on aerosol characterization on Darjeeling at IASTA (Indian Aerosol Science and Technology Association) on 14-17 Nov, 2007 at NPL, New Delhi.

Dr. Arun Kumar Chakraborty (Librarian) presented paper in the XXVI IASLIC All India Conference held at Jamia Millia Islamia, New Delhi during 26-29th December, 2007. The theme of the Seminar "Digital Media Library and Library / Information Services. One of the Editors of the Seminar Volume. General Secretary address was delivered during inauguration programme and concluding session; presented two papers in the 26th National Conference of IASLIC held at Jamia Millia, New Delhi during 26-29th December, 2007.

Dr. Rukmini Mitra (Library) participated in the "National Workshop on Preserving our Scientific Heritage" at Indian Institute of Astrophysics (IIA), Bangalore during 21-22 Jan, 2008; participated in the "International Workshop on Digital Preservation of Heritage: Research Issues in Archiving and Retrieval", organized by ISI, Kolkata, during 29 - 31 October 2007.

Invited talks delivered at various Organizations

Dr. S. Sau (Biochemistry) delivered a talk on 'Studies on the structure- function relationship of repressor of temperate mycobacteriophage L1' in the International Conference on 'Emerging and Re-emerging Viral Diseases of Tropics and Sub-tropics', organized by Indian Virological Society at IARI, New Delhi during December 11-14, 2007.

Gautam Basu (Biophysics) delivered a talk on Title : Electrostatic Recognition and Discrimination of Cognate and Non-cognate Partner Molecules in Biology; Conference / Workshop: **Indo-US Workshop on Spatial Kinematics and Protein Conformation**; Date and Venue: December 10-11, 2007, IISc Bangalore.

Title: The colchicine-binding site of tubulin: Origin of differential binding affinities across eukaryotic families and the biological role of the binding site; Conference / Workshop: **Structure and Dynamics of Biomolecules**, 3rd-8th Dec 2007, S. N. Bose National Centre for Basic Sciences, Kolkata.

Title: Electrostatic Potential of Nucleotide-free Protein is Sufficient for Discrimination Between Adenine- and Guanine-specific Binding Sites. Conference / Workshop: **AOPCS07: Assembly, Organization and Propulsion in Complex Systems**; Date and Venue: 22-24 Feb, 2007, IIT, Madras.

Prof. Swati Sen-Mandi (Botany) delivered Invited lecture on (i) "Molecular profiling of genomes and evaluation of Medicinal Potential in some elite varieties of *Curcuma longa* of Manipur" at 3rd Global summit on Medicinal and Aromatic Plants (GOSMAP-3), at Chiang Mai University International Centre and Century foundation, Thailand (Lecture), November 2007 (ii) lecture as a resource person for the Refresher Workshop on "Environmental Science" Kalyani University, January 2007.

Prof. P.K. Saha (Botany) delivered invited lecture in the 'Entrepreneurship Training Programme on Herbs and Plant Products during March 8-15, 2008 held at Rammohan Library Seminar Hall; Organised by Centre for Applied Science & Technology and Institute of Post Graduate Ayurvedic Education and Research.

Dr. Sabita Bhattacharya (Botany) delivered Invited lecture on (i) 'Application of bioinformatics in medicinal plant conservation'. in the International Conference "1st World Conference on Life Sciences and Traditional Medicines" held at Espoo, Finland on 22 - 24 Aug, 2007. (ii) 'Plant biodiversity conservation : the role of plant tissue culture' in the seminar organized by the Department of Botany, Sree Chaitanya College, Habra, N. 24 - Parganas on 24 Dec, 2007. (iii) 'Biotechnology for enhanced production of medicinal roots - a new frontier in 21st century', organized by Department of Botany, Burdwan University, held on 15-16 March, 2008.

Dr. T.K. Ghose (Botany) delivered invited lecture on (i) DNA Markers: Genetic Mapping in Rice, Scottish Church College, March, 2008. (ii) Rice Biodiversity, Berhampur Women's College, March, 2008.

Prof. Manas Chakrabarty (Chemistry) (i) delivered as a Resource Person, two lectures entitled "Mass Spectrometry and its Applications" in the UGC-sponsored Refresher Course in Chemistry in the Academic Staff College, University of Calcutta, Kolkata, held during November 14-December 05, 2007, (ii) delivered as a Resource Person, a lecture entitled "Mass Spectrometry in Organic Chemistry" in the UGC-Academic Staff College-sponsored Refresher Course on "Chemistry: Trends and Perspectives", held in the Department of Chemistry, Jadavpur University, Jadavpur during January 02-22, 2008 and (iii) delivered as a Visiting Fellow, a series of lectures on the Spectroscopic Identification of Secondary Metabolites of Terrestrial Plant Origin in the Workshop on "Techniques in Biological Sciences" organised under UGC-SAP, Department of Life Science at Assam University, Silchar during February 25-29, 2008.

Prof. K.P. Das (Chemistry) delivered an invited talk at the refreshers course organized by the Department of Chemistry, Jadavpur University on January 18, 2008.

Dr. Gaurisankar Sa (Division of Molecular Medicine) was invited to chair scientific session of the *International symposium of Physiology*, and delivered lecture at Faridabad in 2007. He delivered Special Invited Lecture on the occasion of Golden Jubilee Celebration of CNCI, Kolkata at Science City in 2007. Dr. Sa was invited to deliver invited lecture at the scientific session in the *Medical Science and Physiology* section of the 95th Indian Science Congress, at Visakhapatnam, in 2008. Dr. Sa visited and deliver special lecture at the Department of Immunology, the Cleveland Clinic, Ohio, USA in 2007. Dr. Sa was invited to deliver lecture at NCCS, Pune, in 2008.

Dr. Tanya Das (Division of Molecular Medicine) visited Cleveland Clinic, Ohio, USA, in 2007 for a collaborative work; chaired a scientific session and delivered Invited lecture in the *International symposium of Physiology* in December 2007, held in Faridabad; delivered special invited lecture on the occasion of *Golden Jubilee Celebration of CNCI*, Kolkata, at Science City in 2007; delivered invited lecture in the *Medical Sciences and Physiology* section of 95th meeting of Indian Science Congress held at Visakhapatnam in January 2008.

Prof. Indrani Bose (Physics) delivered three lectures on Physics in Biology at the Summer School on Condensed Matter Physics and Materials Science at HRI, Allahabad (May 28-June 5, 2007); delivered a lecture on Systems Biology for Advanced Level Course Work Students, Indian Institute of Chemical Biology, Kolkata (August 21, 2007); delivered four lectures on Statistical Mechanics of Biological Systems at 15th Refresher Course in Physics, Calcutta University (September 17-21, 2007); delivered two lectures on Biologically Inspired Physics in the Refresher Course "Frontiers and Fundamentals of Physics" at Physics Department, Jadavpur University (December 1, 2007); delivered Keynote Address in UGC Sponsored State Level Seminar on Understanding the Fundamentals of Physical and Chemical Sciences at Dum Dum Motijheel College, Calcutta (March 28, 2008);

Dr. T. P. Sinha (Physics) delivered an invited talk on Dielectric Relaxation in Complex Perovskite Oxides in the National Conference on Condensed Matter Days held at NIT, Rourkela during August 29-31, 2007; delivered an invited talk on Mossbauer Studies of α -Fe₂O₃ in Silica and

Titania Matrix in the National Conference on Nanomaterials and Nanotechnology held at University of Lucknow, Lucknow during December 8-10, 2007.

Dr. Sanjay K. Ghosh (Physics) delivered an invited talk at 20th International Conference on Ultra-Relativistic Nucleus Nucleus Collisions. February 4-10, 2008: Jaipur India, "The Astrophysics of Strange matter". Delivered talk at Workshop on Astroparticle Physics held at Darjeelin, Dec. 17-18, 2007, "Astroparticle Physics and Space Science". Delivered set of lectures given at Winter School on Astroparticle Physics (WAPP07), "Astroparticle Physics I & II"

Prof. A. N. Lahiri Majumder (PMCG) delivered an invited talk in Calcutta University on "Plant Genomics and Proteomics" during February, 2008.

Prof. Sampa Das (PMCG) has delivered a talk entitled "Isolation and characterization of defense response related genes and tissue specific promoters for plant biotechnological applications" in a work shop on "Cloning and identification of stress-induced genes" March 12, 2008 in Institute of Life Science at Bhubneswar. She has also delivered a talk entitled "Unraveling Plant Defense Response Mechanisms: Its Implications in Crop Biotechnology" in Academic Staff College, Department of Biochemistry, University of Calcutta in March, 2008.

Dr. S.R. Sikdar (PMCG) delivered an invited talk on 13th March 2008 in the "Entrepreneurship Training Programme on Herbs and Plant Products" organized by Centre for Applied Science & Technology, Kolkata. The title of the talk was "Micropropagation – A potential technique for mass propagation of economically important medicinal plants".

Dr. Arun Kumar Chakraborty (Library) invited to deliver lecture on inaugural programme of the 49th Bengal Library Conference on Problems and Prospects of Computer in Public Library on 14th December, 2007 in Hemchandra Pathagar, Khidirpore, Kolkata; invited to deliver lecture as a panel member in the seminar on 'e-Books: the Changing Dimensions in e-Learning' held on 3rd November, 2007 at Hotel Hyatt Regency, Kolkata; invited to deliver lecture in the National Seminar organized by the North Bengal University and the National Library, Kolkata on "Linkage between Academic Library and the National Library on 10th August, 2007; delivered lecture on Usage of E-Resources in Scientific Library in the One day Seminar on "Usage of E-resources for faculty members/ scholars of Bose Institute, Kolkata on 24th July, 2007; invited for Round Table Workshop on "Evaluation of LIS Curricula of Rabindra Bharati University", Kolkata held on 9th March, 2007; invited for the Workshop on "Consortia for E-resources at ISI Kolkata" held on 30th March, 2007; invited to deliver lecture on "Social Science Information Resources and its impact on Institutional Repository" for the IASLIC-JU Workshop sponsored by NASSDOC, New Delhi on March, 20, 2007 in the Jadavpur University, Kolkata; Academic Counselor for Post Graduate Diploma in Library Automation and Networking (PGDLAN) in IGNOU; guest faculty in the Rabindra Bharati University, Kolkata for MLISc. and BLISc, guest faculty for Kalyani University and external examiner of different universities in Kolkata.

Awards / Honours Received

Dr. R. Bhattacharyya (BIC) has been awarded the JBS Haldane Memorial Prize 2006 by the Indian Statistical Institute, Kolkata.

Prof. Swati Sen-Mandi (Botany) (i) Fellow of Scientific Organization: Fellow of the Indian Biological Society (ii) International Society for Seed Science (ISSS) - nominated Indian Representative since inception in 1999—continuing. (iii) Editorial Assignments: (a) Assigned referee for reviewing publications in Proceedings of National Academy of Sciences, India. (b) Assigned referee for reviewing publications in Indian Journal of Biotechnology, India. (c) Selected for inclusion in the International Review Board Page of Annals of Botany, UK.

Miss Jyotshna Mandal (Botany) received the M. Sundaramma Young Scientist Award (from the Indian College of Allergy, Asthma and Applied Immunology), for the best research paper at the 41st Annual Conference of the Indian College of Allergy, Asthma and Applied Immunology, held at V.P. Chest Unit, Delhi from 9th to 12th December 2007.

Prof. Manas Chakrabarty (Chemistry) acted as the UGC-nominated Member of the Advisory Committee of SAP of the Department of Chemistry, North Bengal University, Siliguri in a Meeting held on the 29th March, 2008.

Prof. Manikuntala Kundu (Chemistry) was awarded the Stree Shakti Science Samman for 2007.

Dr. Gaurisankar Sa (Division of Molecular Medicine) received "**Seva Samman**" award from Dakshin Kolkata Krira O Sanskriti Parishad for his contribution in the fields of Science and Social service in 2007.

Dr. Tanya Das (Division of Molecular Medicine) received **Rupa Chakrabarty Memorial Award** from Bethune College, Kolkata, in 2008.

Ms. Lily Goswami (PMCG) received the NASI-Young Scientist Award -2007 from the National Academy of Sciences (Allahabad).

Dr. Arun Kr. Chakraborty (Library) elected General Secretary of Indian Association of Special Libraries and Information Centre (IASLIC) from 1st September, 2007 and reelected for 2008-2010.

Pradip Kr. Sarkar (Library) elected Governing Body member of Indian Association of Special Libraries & Information Centres (IASLIC) for 2008 – 2010.

Patents

BOTANY

National: A Patent on "A marker DNA fragment capable of enhancing storability of seeds and a process therefore", Swati Sen-Mandi, (#253/KOL/2004) has been granted. **Intimation of Grant of Patent is no. PO/KOL/2007-08/292 dated 14.2.08**

Symposia and Seminar Organized

The Bioinformatics Centre organized a National Workshop on Protein folding and Bioinformatics (March 4-5, 2008).

Library Organized Seminar

Seminar on "Library e-Resources and Software — for Managing References" and hands-on training 'SCIE' and ENDNOTE of ISI Thompson of USA on 24th July, 2007 for faculty / research scholars of BI. More than 90 faculty members and research scholars attended the day-long programme.

Service Departments

Bioinformatics Centre

Since its inception in 1988 the Bioinformatics Centre at Bose Institute has fulfilled multiple tasks for the service of the scientific community in Eastern India. Meeting the objective of the BTIS program, the Centre is involved in distributing information on various aspects of biology, providing access to different databases through internet, as well as purchasing some specialized databases, softwares and journals. Crossing the boundaries of the host institute, the service has been provided to the whole of the eastern region. In 1997 the Centre established a Local-Area-Network in both the campuses of Bose Institute and subsequently linked the two through Wide-Area-Network. A 1 mbps (that has been upgraded to 2mbps in 2006-07) internet connectivity is used for the activities of the Centre and also serves as a backup resource to the ERNET connectivity used by the scientists in the Institute. Since 2004 it is functioning as the Centre of Excellence in Bioinformatics carrying out research in different areas of bioinformatics and computational biology.

Library

The Institute Library system is one of the best Science Reference Libraries in Eastern India, set up in the main campus in 1917 and a wing at the Centenary building opened in 1983. In the year 2007 a small library is being set-up in the Salt Lake Campus of the Institute. Library provides latest information to the BI faculty, researchers and staff in their day-to-day research and development work and also to extend its facilities to other Institutions / universities in and around Kolkata and as well as West Bengal. Faculty / researchers from Eastern India use the library extensively for reference. The library has total collection of 38,841 reading materials out of which 26251 Bound journals, 12186 Books, 404 Theses as on 31.03.2008. During this year library subscribed to 300 numbers of foreign and Indian periodicals out of which print only 25 numbers. Library has subscribed to more than 2200 online journals in different packages. Library also subscribed to online-only full-text journals / databases of different academic societies such as ASM, ACS, Life Sciences Reviews, Cell Press journals of Elsevier etc. This year Library has added the following subscription: (1). 20 number of New Foreign Journals. (2). Century of Science, Science Citation Index Expanded and ENDNOTE Web of ISI Web of Science, Thompson, USA. (3). Blackwell / John Wiley Journal's Premier Online. (4). Current Protocols (Online) of John Wiley / Blackwell. (5). Annual Reviews Online (Back volume). (6). Methods in Enzymology (Online back volume) and Current Year Trial Access (7). E-Books of E-brary (2400 e-books), (8). E-Books – of Cambridge University Physics E-Books package (8). E-Books package of Elsevier: (a) Agricultural and Biological Sciences (202); (b). Biochemistry,

Genetics and Molecular Biology (260); (3). Environmental Science (113). (9). Current Protocols package of Springer (20225 e-books). (10). Knovel E-Book Collections : Biochemistry, Biology & Biotechnology.

The library has also full-text databases of H. W. WILSON and SCOPUS : the largest abstract and citation database of research literature and quality web sources of Elsevier; subscribed to Science@direct of Elsevier and all Nature Group Journals online. All these journals access is from 1997 onwards. BI Library has gone for Open Access membership of Nucleic Acid Research of Oxford University Press, Biomed Central (BMC) and Public Library of Science (PLOS). This membership allows discount for paper handling charges for our faculty members and research scholars.

During the year, 1427 readers used the Library (both campuses) for their reference work. 20 permission cards were issued to the outside readers. Under Inter Library Loan system book / journals were issued to other institutions and also books / journals were taken on loan. Library has provided scanning service to users for research work—more than 37000 documents were scanned for faculty members as well as research scholars and more than 3527 hours computer / internet used for accessing in full-text subscribed / free journals by the scholar from the Library itself. Library also provided article services to its faculty members from different institutions in India and abroad. Library also provided citation services to its faculty members. Library Computer are used by researchers for accessing full-text subscribed / free journals by the faculty / research scholars apart from their laboratory / department computers.

Photocopy services are provided to outside users. A total 88,849 pages of photocopying (Xerox) services were given to our faculty and outside users. Some 547 bound volumes of book / journals and 165 loose periodicals were issued by our research scholars and faculty members throughout the year for their reference work.

Library has joined with consortia Forum for Resources Sharing in Astronomy and Astrophysics (FORSA), Bangalore. Through consortia library has subscribed online Nature journal. It is expected to have more journal purchase through consortia from next year.

Madhyamgram Experimental Farm

Since January, 2006, activities of the Madhyamgram Experimental Farm are being supervised by a duly appointed Management Committee. With the inauguration of the "Transgenic Plant Research Facility" on November 30, 2006 by Dr V.S. Ramamurthy, former Secretary, DST, facilities for such activities in the Farm Laboratory are initiated. Apart from the ongoing routine cultivation and maintenance of the experimental crop in the field(s), work towards establishment of the

proposed "Acharya J C Bose Biotechnology Innovation Centre" is being carried out in full swing. To ensure round-the-clock power supply high power transformer and generator have been installed. Among other infrastructural facilities provided are new boundary wall, high capacity water pump & tank, several green houses and insectry house. Scientific activities in the Farm Laboratory have been initiated with the joining of Scientists and other research personnel.

Laboratory scale production of biofertilizers for improvement of plant growth (Prof. P.K.Chakrabartty)

Efficiency of the rhizobial strains BICC 651, TAL 620 and ATCC 51585 as biofertilizers for improvement of growth and yield of chickpea (*Cicer arietinum*) were monitored through inoculation of the strains to the host plant seeds and their subsequent planting either directly in the field or in sand pots. In sand culture the inoculated plants were found to have better nodulation in comparison to the control ones. Other physiological parameters of such plants have also been under investigation.

Dehydration of flowers, foliage and floral craft and their commercialization (Dr S.K.Datta)

Naturally growing seasonal wild flowers and leaves were collected from local places and were dehydrated. For dehydration, methods were standardized to ensure retention of the original flower and leaf colour. The press drying method seems to work best for this purpose along with dehydration at room temperature or in hot air oven under controlled condition. The flowers and foliage are preserved for use in floral crafts for embedding in Greetings Cards.

Publishation

Since its inception in 1980 the Publication Section has been doing all sorts of publication, i.e. Annual Report (both English & Hindi Versions); BI news; Memorial Lecture, Director's; folders; Posters and leaflets of different Symposia, Seminars and Training Programmes and works of Sir J.C. Bose. Soft copy of Annual Report and BI News are available in the net (boseinst@ernet.in). Photocopy Service are Provided to faculty members, research scholar's and staff members throughout the year.

The following publications are now available for sale : J. C. Bose and Microwaves – A collection : Rs.200.00; Science and Society – Reflections : Rs.1050.00; J.C. Bose A Scientist and A dreamer – Vol. I : Rs.1250.00; Vol. II : Rs.1250.00; Vol. III : Rs.600.00; Vol. IV : 1500.00; Vol. V : Rs.550.00; Patrabali (Bengali) Rs.150.00; Acharya Jagadis Chandra Bose (Bengali) Rs.12.00; Abyakta (Bengali book written by Sir J.C. Bose) Rs.50.00; Picture Post Cards (five sets) Rs.125.00.

Sophisticated Analytical Instrument Facility (SAIF)

In the current financial year, a few new instruments like SEM, FPLC, and HPLC & RT-PCR have been installed and commissioned satisfactorily. The process for procurement of LS-COUNTER etc. is in progress and is expected to be commissioned shortly. The funds for all the aforesaid instruments have been provided by the Bose Institute authority.

Earnings for the existing instruments for the financial year 2007-08 are given below.

Instrument Utilisation

Name of instrument	<u>No. of Samples</u>		Revenue earned Rs.
	Extn.	Int.	
SEM	78	281	1,21,600/-
Atomic Absorption Spectrometer	379	79	36,000/-
HPLC	1	56	14,500/-
TEM	2	4	5,300/-
Gas Liquid Chromatograph	17	16	5,200/-
*Single Crystal X-ray Diffractometer	23	Nil	3,700/-
(*only unit cell determination charge) Spectrofluorimeter	43	Nil	2,150/-
FPLC	3	1	1,000/-
RT-PCR	357 (No. of wells)		
			Total Rs. : 1,89,450/-

Workshop

The Workshop of Bose Institute consisting the following units of maintenance, repair and fabrication of different instruments as needed. The units are as follows.

UNITS RECEIPTS	REQUISITION JOB DISCHARGED	CONTINUING JOB	
ELECTRICAL	710 (M.C. & N.C.)	95%	5%
MECHANICAL	80	95%	5%
CARPENTRY	44	95%	5%
REFRIGERATION	50	95%	5%
DRAFTING	40	100%	Nil
LECTURE, SEMINARS & course work class attended	Above 350 (M.C & N.C.)	100%	Nil
EPABX UNIT	120	100%	Nil

Sri Pachugopal Karak, Sr. carpenter has been fabricated Ornamental Podium at lecture hall for delivering the speeches by the Eminent Scientists/ speakers.

In 2007-08 the major electrical jobs were done at Kankurgachi campus, Main campus, Madhyamgram Experimental Farm, CAPSS at Saltlake & Mayapuri campus at Darjeeling. At Kankurgachi campus one 500 KVA transformer, 4 panel VCB and one no 62.5 KVA Jackson make Generator has been installed to augment the electrical power system. Beside this Fire Alarm System for the total building has been installed.

At main campus one 30 KVA Jackson make Diesel Generator has been installed in energize important instruments during load shedding period. Oil of one no 400 KVA transformer has been changed; Fire Alarm System also has been installed to protect the important instruments.

At MEF one no 315 KVA Dry type transformer, one no VCB & one no 100 KVA Diesel generator set has been installed. The main high-tension line which was crossing over the campus has been shifted with the help of WBSEB.

At CAPSS, Saltlake one no 315 KVA Dry type transformer, one no VCB & one no 63 KVA Diesel generator set has been installed with total modification of LT lines.

In Mayapuri campus one no 45 KVA Diesel generator also has been installed.

All the Electrical sub-station work, Generator work, Transformer & VCB installation work has been carried out by PWD Electrical, Circle-IV, Govt. of W.B. Salt lake, Purta Bhawan, Kolkata.

SOCIALLY RELEVANT

Prof. Swati Sen-Mandi (Botany) Research undertaken in this laboratory includes: (i) Molecular Documentation through development of appropriate DNA fingerprinting patterns of Molecular Markers as an aid to Establishing Proprietary Rights / sovereignty Rights over valuable crops of commercial and medicinal value viz. rice, tea and Curcuma. (ii) Seed vigour and viability of seed that is a trait of immense agronomic importance, even after years of research has remained largely illusive. Our research over the years have led to the identification of a common gene viz. Accetyl Co A Carboxylase that could confer vigour potential and viability protection to embryonic axis of orthodox seed. This findings has important implication in incorporating high viogur and high viability potential into otherwise elite varieties. (iii) *Curcuma longa* is an important natural source of antioxidant. DNA markers associated with such medicinal potential have been established in our laboratory. This should help in screening of medicinal plant germplasm for use by pharmaceutical industry.

Prof. D. N. Sengupta (Botany) The research that is going on in this laboratory are highly relevant as salinity stress is a major problem in Paddy cultivation as modern day high yielding paddy plants can not tolerate salt. We have detected polyamines particularly cationic spermidine is a good protector of plasmamembrane from the deleterious effect during salt stress. Addition of spermidine and spermine to plants exposed to salinity stress were found to be protect salinity stress induced damage to plasmamembrane. The transgenic approach in rice plants to overproduce SAMdC and Rab16A are definitely a very good plan as overexpression of these genes in transgenic tobacco enhances their salt tolerance. Fruit ripening is a change in physiological, biochemical and molecular Biology and since no such works have been done in the fruit ripening of banana, mango and other fruits, we have done very extensive work on the synthesis of sucrose-phosphate-synthase in banana fruit ripening. Biochemical estionation and molecular analysis of Lycopene β -cyclase gene showed very high level of expression in green tomato, papaya, capsicum and watermelon fruits. In all these three fruits β -carotene concentration was very high which a precursor of vitA is.

Other Activities of Plant Scientists of Bose Institute:

An integrated M.Sc., Ph.D. programme in Plant Molecular Biology and Biotechnology has been started from 13th September, 2007. **Prof. Sampa Das (PMCG)** and **Prof. D. N. Sen Gupta (Botany)** are the joint course co-ordinators.

List of Personnel

Administration

Prof. Sibaji Raha (**Director**)

Sri Tushar Kanti Ghorui (**Registrar**)

Dr. Utpal Sadhu (**Deputy Registrar**)

Kazal Chaudhuri (Asstt. Registrar-I), Ram Krishna Kundu (Asstt. Registrar II), Debidas Saha (Asstt. Registrar III), Satyananda Pal (Accounts Officer), Parimal Ch. Das (Audit & Finance Officer).

Supporting Staff: Centenary Campus: PAs to Director: Arup Kr. Sengupta, Sankar Nath Sinha, Sukumar Moitra; **Accountants:** Subir Sen, Ashis Chakraborty, Sisir Chakraborty, Bidyut Kr. Mandal, Manick Ch. Das, **Cashier:** Tapan Chakraborty, **Office Superintendents:** Ankur Dutta, Nikhilesh Roy Ghatak, Madhusudan Mitra, Amit Kr. Ghosh, Baldeb Goswami; **Others:** Rina Roy, Ram Raj Pandey, Elizabeth Pal, Swapan Kr. Sinha, Dhrubajyoti Sen, Rubi Sarkar, Sudam Jana, Bably Marick, Rina Das, Somnath Das, Prodip Kr. Mullick, Sanjoy Krishna Chaki, Debasis Koley, Angshuman Bhowmik, Sanjib Kr. Das, Biplab Malakar, Satya Chatterjee, Ramesh Chandra Sarkar, Dipak Dutta, Chotelal Rangwa, Kamalendu Sur, Tapan Kr. Banerjee, Jubaraj Paul, Krishna Turi, Sudhir Turi, Khoirul Basar Malla, Nagnarayan Yadav, Kuddush Ansari, Kanai Hazra, Prafulla Bhunya, Kanak Baran Hazra, Duryodhan Nayak, Bablu Mandal, Sukanta Chakraborty, Subrata Banerjee, Amarnath Hela, Ranjit Das, Sarada Devi, Sukumar Mandal, Bulaki Das, Jagabandhu Nayak, Jagannath Das.

Supporting Staff: Main Campus: Office Superintendent: Arun Kumar Das Gupta (upto 30.11.2007), Alakananda Sarkar, **Others:** Rabindra Nath Karmakar, Tarun Kumar Maji, Chandra Kanta Sasmal, Tarun Chakraborty, Sanat Kr. Dey, Mahendra Nath Shee, Madhusudhan Marick, Sanat Kr. Dhara, Harekrishna Thoyal, Fulchanda Sardar, Kalicharan Turi, Kissan Das, Munna Turi, Kodan Das, Sk. Mohammad Illias, Manju Turi, Nagaswar Das, Rajbrat Ram, Rajkumari Balmiki, Tapas Chakraborty, Prabir Halder (I).

Biochemistry Department

Faculty : Prof. B. Bhattacharyya, Prof. Pratima Sinha, Prof. Pinakpani Chakrabarti, Prof. Anuradha Lohia, Chairperson (upto 10.07.2008), Dr. Rajagopal Chattopadhyaya, Dr. Pradeep Kumar Parrack, Dr. Subrata Sau.

Students : Atasi Pal (upto 10.05.07), Mainak GuhaRoy, Palas Kumar Chanda, Ms. Suparna Laha, Soumitra Sau (upto 30.09.07), Somasri Pal, Sankar P. Das (upto 31.12.07), Sumit Biswas (upto 31.01.08), Lalita Das, Sabyasachi Halder upto 31.01.08), Partho Chatteraj upto 01.05.07), Malabika Das, Mr. Tridib Ganguly, Pabitra K. Parua, Sourav Sarkar, Kaustav Bondyapadhyay, Debadrita Mukherjee, Chandrama Mukherjee, Dipak Manna, Amitava Bandhu, Arumoy Pal, Subhra Majumdar, Prabal Chakraborty, Tanusree Bhattacharyya, Biswanath Jana (17.05.07), Jaspreet Singh Grewal (upto 24.07.07), Abinit Saha (from 18.02.08), Himal Kanti Ganguly (from 03.10.07 to 21.01.08), Dr. Suvroma Gupta (upto 28.02.07), Dr. Tanaya Chatterjee.

Supporting Staff : Subhash Chandra Debroy (upto 31.12.08), Durga Charan Das, Swapan Kumar Das, Ashim Kumar Banerjee, Narayan Chandra Dutta, Susanta Kumar Das (upto 08.08.07), Subhash Chakraborty, Asim Kumar Poddar, Debarati Kanjilal, Asraf Ali Molla, Sudhangsu S. Maity, Basudeb Ghorui, Dulal Chandra Mandal, Ranubala Das,

Bioinformatics Centre

Faculty: Prof. P. Chakrabarti (*Scientist-in-Charge*), Dr. Tapash Chandra Ghosh

Research Scientist: Dr. Debjani Roy.

Students: Dr. Rajasri Bhattacharya, Dr. Surajit Basak, Mr. Shrihari Sonavane, Ms. Pamela Mukhopadhyay, Ms. Madhurima Das, Ms. Sangeeta Kundu, Ms. Bratati Kahali, Mr. Bhaskar DasGupta, Mr. Rudra Prasad Saha, Ms. Soumita Poddar, Ms. Baisali Manna, Ms. Sucharita Dey, Mr. Sumit Biswas.

Supporting Staff: Mr. Tushar K. Bhattacharya, Ms. Sujata Roy, Mr. Sanjib Kumar Gupta, Mr. Jibananda Mandal.

Biophysics Department

Faculty: Dr. Gautam Basu

Supporting Staff: Amitava Bhattacharyay, Basudeb Marick, Barun Majumder, Bijoy Munshi, Swapan Jogsharma

Students: Soumya Dasgupta, Himal Ganguly, Abhisek Mandal, Madhurima Das, Sarbani Chattopadhyay, Dr. Sumana Banerjee, Dr. Chiranjeeb Dey

Botany Department

Faculty : Prof. Kalyan Kr. Mukherjee, Prof. Swati Sen-Mandi (Chairperson from 18.12.07), Prof. Prabir Kr.Saha, Prof. Dibeyendu Narayan Sengupta (Chairman up to 17.12.07), Dr. Sabita Bhattacharya, Dr. Swati Gupta-Bhattacharya, Dr. Tapas Ghose, Dr. Debabrata Basu.

Students: Dr. Gaurab Gangopadhyay (up to 03.03.08), Dr. Subhash Kanti Roy, Dr. Kakali Mukherjee (up to 31.07.07), Mr. Annanda Mohan Sau, Mr. Swarup Roy Chaudhury, Ms. Progya Paromita Saha (09.01.08), Mr. Sanjay K. Singh, Mr. Supratim Basu, Mr. Kaushik Ghose, Ms Madhuvanti Chatterjee, Ms. Sanjukta Dey, Mr. Avik Ray, Ms. Moumita Gangopadhyay, Mr. Anirban Bhattacharya, Miss Jyotshna Mandal, Mr. Himadri Shekhar Chakrabarti, Mr. Mrinmoy Majumder, Ms Basabdatta Das, Ms Suranjana Roy.

Supporting staffs: Dr. Romit Poddar, Mr. Sukumar Majumder, Mr. Shymal Kr. Ghosh (up to 17.12.2007), Mr. Chanchal Chakraborty, Ms.Chaitali Roy, Sri Binoy K Modak, Mr. Jadab Kr. Ghosh, Ms Kaberi Ghosh, Mr. Sasanka sekar Bera, Mr. Siddhartha Roy, Mr. Bipul Kr. Nag, Mr. Sambhu Debnath, Mrs. Sarama Pradhan, Ms. Moumita Basu Roy.

Central Instrumentation Facility

Faculty : Prof. B. Bhattacharyya (Chairman)

Supporting Staff : Jaganmoy Guyin, Ranjan Dutta, Smriti Ranjan Mahi, Mrinal Das, Alpana Bhattacharyya.

Chemistry Department

Faculty : Prof. Parimal C. Sen (upto 11.02.2008), Prof. Manas Chakrabarty, Prof. K.P. Das (Chairman till 29.02.2008), Prof. Joyoti Basu (Chairperson from 01.03.2008), Prof. Manikuntala Kundu, Dr. Parames C. Sil (upto 11.02.2008) and Dr. Pradip Das.

Students : Randhir Kr. Sinha, Mrinal Kr. Sarkar (upto 11.02.2008), Taraknath Kundu, Tanusree Sengupta, Srabasti Ghoshal, Ayantika Ghosh (upto 11.02.2008), Partha Mukherjee, Tushar K. Dhara (upto 11.02.2008), Sulakshana Karmakar, Ajanta Mukherji, Ratna Mukherjee, Sanchita Basu, Prasenjit Manna (upto 11.02.2008), Tofajjen Hosain, Srabani Karmakar, Kamakshi Sureka, Sushil K. Pathak, Kunal Kr. Basu, Pinki Nandi (upto 11.02.2008), Kuldeep Kamawat, Dr. Suroopa Chakrabarty, Soumik Basu Ray, Gargi Chatterjee, Sourav Sanyal, Subhasis Barik, Dr. Sujit Roy.

Supporting staff : Prasanta Kumar Pal (upto 11.02.2008), Dr. Aniruddha Aich, Pranab Kumar Dey, Bhabani Prasad Banerjee, Debdas Nandy, Rama Chatterjee, Amarnath Bhatta, Tapas Ghosh, Arindam Basu (upto 11.02.2008), Dipak Chandra Konar, Subhas Chandra Paul, Ashoke Kumar Maity, Sachchidanand Ram, Kalyan Das (upto 11.02.2008).

Division of Molecular Medicine

Faculty: Prof. Arun K. Ray, Prof. Parimal C. Sen (Head), Dr. Parames C.Sil, Dr. Gaurisankar Sa, Dr. Tanya Das and Dr. Nripendranath Mandal.

Students: Dr. Baisakhi Saha, Dr. Sreya Chattopadhyay, Dr. Kaushik Das (from 31.07.2007), Mr. Sankar Bhattacharya (upto 24.01.2008), Ms. Ayantika Ghosh (Upto 31.03. 2008), Ms. Juni Chakraborty, Mr. Pallab Ray, Mr. Shuvomoy Banerjee, Mr. Argha Adhikary, Ms. Suchismita Mohanty, Ms. Pinki Nandi, Mr. Dewan M.S. Hossain (from 16.07.2007), Mr. Bibhabasu Hazra (from 1.08.2007), Ms. Swatilekha Ghosh (from 02.01.2008), Mr. Samik Chakraborty (from 18.01.2008), Mr. Santanu Biswas, Mr. T.K. Dhara (from 01.03.2008), Mr. Krishnendu Ghosh (from 24.01.2008), Mr. Prasenjit Manna, Ms. Mahua Sinha, Mr. Mrinal Kr. Sarkar, Mr. Joydeep Das, Mr. Jyotirmoy Ghosh, Ms. Tanusree Sengupta (upto 31.10.2007) and Ms. Srabasti Ghosal (upto 31.10.2007).

Supporting Staff: Mr. Prasanta Pal, Mr. Indrajit Ray, Mr. Sujit Kumar Ghosh, Mr. Arindam Basu, Mr. Uttam Kumar Ghosh, Mr. Amartya Sen, Mr. Ranjit Das, Mr. Kalyan Das and Ms. Kanan Singh.

Library

Dr. Arun Kumar Chakraborty (Librarian)

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Microbiology Department

Faculty: Prof. Parimal C. Sen (Chairman), Dr. Subrata Majumdar, Dr. Sujoy K. Dasgupta, Dr. Tapan K. Dutta

Students : Sujoy Chatterjee (upto 17.01.08), Subhankar Chatterjee (upto 17.07.07), Nivedita Majumdar (upto 31.01.08), Bejoy Sekhar Datta (upto 11.10.07), Twishasri Das Gupta, Sukhendu Mandal (30.10.07), Bomba Dam, Bidisha Bhattacharya (upto 31.12.07), Nabanita Giri, Suchandra Majumdar, Joydeep Chakrabarty, Arnab Basu.

Sm. Madhumita Roy, Sm. Parna Bhattacharya, Sri Boudhyan Bandhopadhyay, Sm. Joyita Sarkar, Sri Anupam Adhikari, Sri Surajit Bhattacharya, Sri Gourav Gupta, Sri Debajyoti Ghosal, Sm. Priyanka Bhowmick.

Supporting Staff: Biswanath De Sarkar, Barindranath Mandal, Provat K. Chattopadhyay, Prabal Gupta, Saifullah Gazi, Debashis Sarkar, Babli Marrick (transfer to Administration w.e.f. 20.08.07) , Prabir Halder, Debashis Mazumder, Nityananda Patra (retired on 31.01.08), Jamuna Prasad, Dilip Bhattacharyya, Ramesh Prasad, Robin Paul, Sankar Bari, Purnendu Manna, Narayan Patali.

Physics Department

Faculty: Prof. Barun K. Chatterjee (Chairman upto October 2007) Prof. Sibaji Raha (on lien ; joined as Director on 27.2.2006 and Chairman from November 2007 for the tenure of 2 years); Prof. Indrani Bose; Prof. Dipankar Home; Dr. Swapan K Saha; Dr. Tripurai P. Sinha; Dr. Sanjay K Ghosh.

Students: Dr. Basudhara Basu Nandi (Women Scientist Scheme of DST), Dr. Sandhya Dey (Mondal) (RA, IRHPA Project), Tamal K. Mukherjee, Alok K Pan, Bhaswar Ghosh, Rupa Sarkar, Alo Dutta, Amit Tribedi, Ritam Mallick, Prasanna K Mondal, Atanu Maulik (JRF/SRF since 5/10/08, IRHPA Project), Sumana Das (Technical Assistant, IRHPA Project)

Supporting Staff: Amit K. Ganguli, Sankar P Singha, Shyamsundar Mallick, Subhasis Banerjee, Manas Dutta, Subrata Das, Tarun K Maji (redeployed to Administration (Main Campus) from 22.11.2007) Bharat P Ram, Bansi Dutta, Dayakant Thakur, Sujit K. Basu, Rajkumar Mourya, Prabir Halder (redeployed to the Director's Office from 25.1.2008), Rita Chakraborty (redeployed to the Physics Office from 22.11.2007).

Environmental Sciences Section

Incharge/Head : Prof. Sibaji Raha, Director, Bose Institute

Research Fellow: Abhijit Chatterjee (SRF), CSIR, Govt of India

Supporting Staff : Anandamay Adak, Sujata Roy, Saral Chandra Das, Bhaskar Roy (IRHPA Project, DST, Govt of India)

Plant Molecular & Cellular Genetics Section

Faculty: Prof. A. N. Lahiri Majumder, Prof. Amita Pal, Prof. Sampa Das (Head), Dr. Samir Ranjan Sikdar.

Students: Dr. Aparajita Mitra, Dr. Paramita Nandy, Dr. Dipjyoti Chakraborty, Mr. Anindya Sarkar, Mr. Dipankar Chakraborty, Ms. Lily Goswami, Ms. Uttara Bhattacharya, Sudipta Ray, Mr. Samik Bhattacharya, Mr. Barunava Patra, Mr. Hossain Ali Mondal, Ms. Sonali Sengupta, Ms. Nilanjana Banerjee, Mr. Soumitra Maiti, Ms. Sumanti Gupta, Ms. Subhra Mondal, Dr. Jolly Chatterjee, Mr. Arnab Ganguli, Mr. Jayadri Sekhar Ghosh, Mr. Arunava Chakraborty, Ms. Subhodipa Sengupta, Ms. Lekha Bandopadhyay, Ms. Nutal Pal, Mr. Subrata Kundu, Mr. Anirban Kundu, Ms. Rumdeep Kaur Rang, Ms. Anindita Sengupta, Ms. Suparna Ghosh, Ms. Arpita Bala, Dr. Sanjukta Dey.

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Madhyamgram Experimental Farm

Scientists & Research Personnel : Prof. P.K.Chakrabartty (Consultant), Dr. S.K.Datta (Emeritus Scientist- CSIR) , Dr. Supriya Roy (Research Associate).

Publication

In-Charge : Mr. Arun Kumar Das Gupta (upto 30.11.2007)

Supporting Staff : Mr. Tarun Kumar Maji, Sri Chandra Kanta Sasmol.

Sophisticated Analytical Instrument Facility (SAIF)

Incharge/Head : Prof. P. C. Sen (Head)

Supporting Staff : Mr. Tapan Datta, Mr. Shyam Sundar Kundu, Mr. Gobinda Das, Mr. Amir Kumar Mahinder, Mr. Jaideb Kumar Chattopadhyay, Mr. Pathik Ranjan Ray, Mr. Alokanda Sarkar, Mr. Arup Kumar Sen, Mr. Samir Kumar Mukherjee, Mr. Pradip Kumar Karmakar, Mr. Subhas Chandra Maikap, Ms. Tanima Modak (Dhar), Ms. Manisha Banerjee, Mr. Ranjit Kumar Ghosh, Mr. Debabrata Polley, Mr. Sankar Santra, Ms. Saraswati Sarkar Sen.

Workshop

A.K. Mukherjee – Workshop Supdt.

Supporting Staff : MAIN CAMPUS : Ashutosh Sarkar, Samar Dutta, Sisir Ghosal, Tarapada Das, Dipen Sen, Bankim Dutta, Sk. Md. Ebia Hossain, Basanta Kr. Shit, Bholanath Saren, Abdul Rahaman Molla, Panchanan Santra, Panchugopal Karak, Goplal Ch. Das, Sk. Md. Farruck, Kishori Mohan Saha, W.D. Rozario, Kalachand Sen, Rajkumar Das, Pranab Banerjee, Brahmdeo Prasad, Subrata Basak, Sanjoy Santra. NEW CAMPUS : Alok Kundu, Anil Sengupta, Jogendra Nath Das, Tapan Mondal, Ashit Bsnrejee, Md. Raffick, Murari Mohan Shee, Baidya Nath Murmu.



THE REVEALER
The invisible waxing and waning of the life revealed by the moving trail of light
By the courtesy of the artist, Gaganendranath Tagore