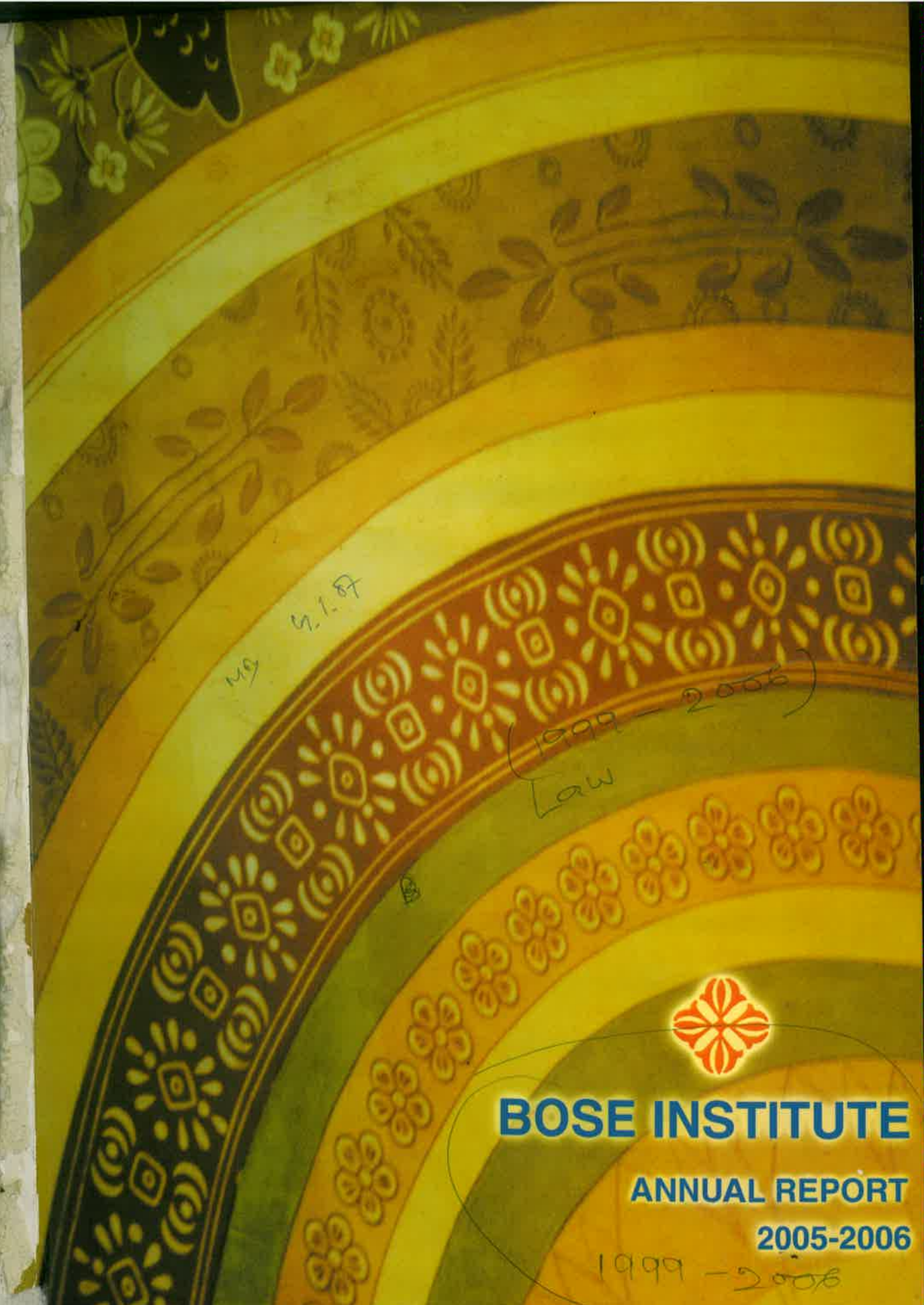
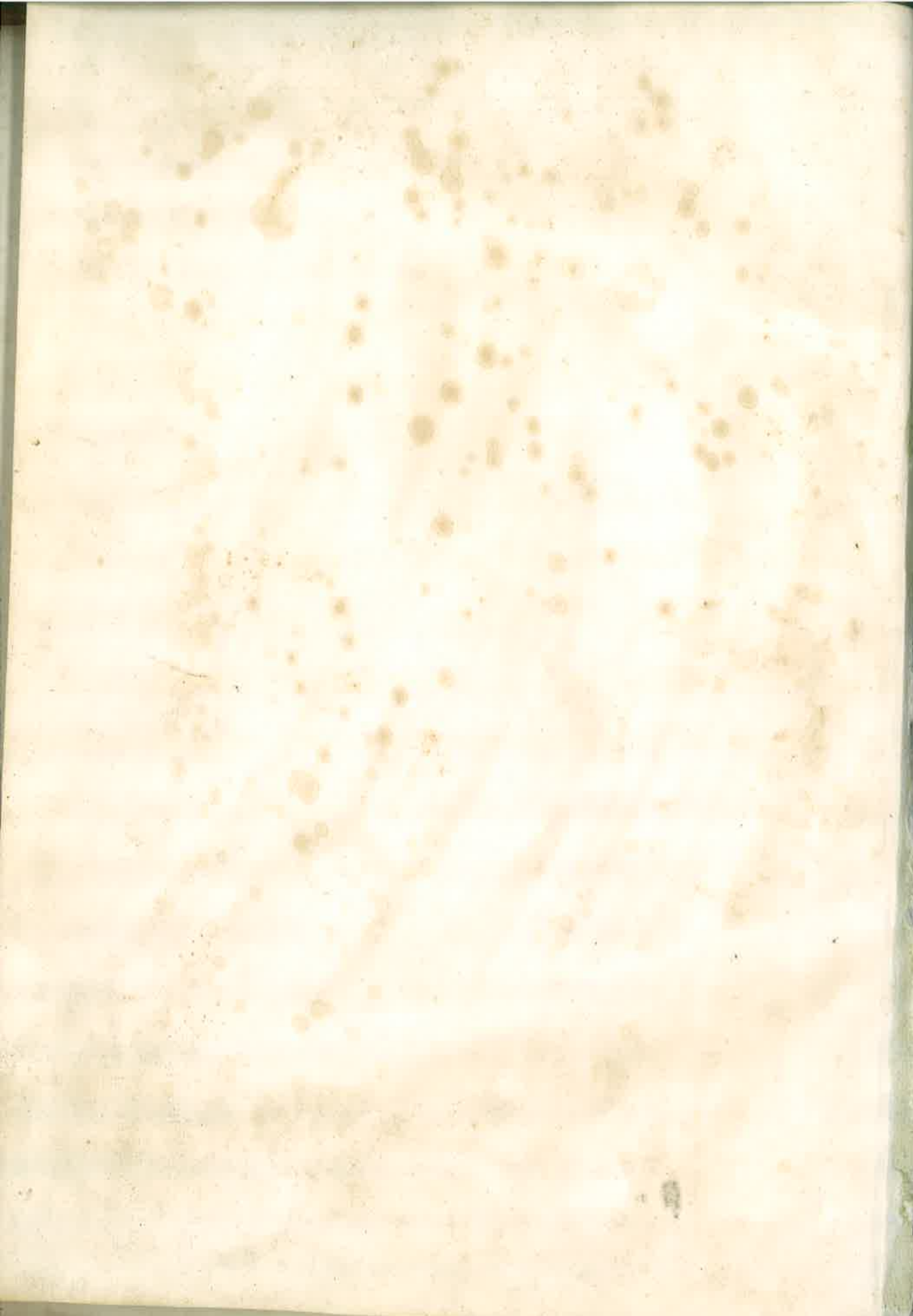




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BOSE INSTITUTE

ANNUAL REPORT

2005-2006

1999 - 2006



“.... I Offer My Salutation”

*F*ortunately 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
2005-2006



Bose Institute
93/1, Acharya Profulla Chandra Road
Kolkata-700 009

Compiled and edited by the Annual Report
Committee 2005-2006 consisting of the following members :

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89th Foundation Day



The 89th Foundation Day of Bose Institute was celebrated on 30th November 2005. **Dr. Rajesh Kochhar**, Former Director, National Institute of Science, Technology and Development Studies, New Delhi, graced the occasion as Guest of Honour and delivered 67th Acharya Jagadis Chandra Bose Memorial Lecture on **Modern Science in India : Colonial compulsions, nationalist aspirations and global circumventions**. On this occasion **Sri Nilratan Sikar Prize 2005** was awarded to Mr. Sushil Kumar Pathak, a Senior Research Fellow, Department of Chemistry. **Prof. B. B. Biswas Outstanding Student Award 2005** was presented to Ms. Mithu Banerjee a Senior Research Fellow, Department of Biochemistry. The day's celebration started with floral offerings and garlanding of SAMADHI and BUST of Acharya J.C. Bose at both the campuses of the Institute. Prof. Maqsood Siddiqi, Director, Bose Institute, delivered welcome address and presented the Institute Report.

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 with Prof. P. Chakrabarti as its secretary and eleven other members including the Director. The management of the Institute is vested in the Bose Institute Council that has 18 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
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 - Secretary
11. Director, Bose Institute
12. Shri Debabrata Bose

Members of the Council

- | | |
|---|--|
| <ol style="list-style-type: none">1. Dr. Manish Sekhar Chakraborty2. Shri D. Mandal3. Prof. R. N. Chakravarti4. Prof. (Mrs.) Debi Chakravarti5. Shri Somnath Sanyal6. Prof. S.N. Chatterjee7. Mr. Dilip Bhattacharyya | <div>Nominees of the
Governing Body</div> <ol style="list-style-type: none">8. Secretary, Department of Science & Technology, Government of India or his nominee9. Director General, C.S.I.R. or his nominee10. Joint Secretary and Financial Adviser, Department of Science and Technology, Govt. of India or his nominee11. A Representative of the Lok Sabha12. Principal Accountant General (A & E), West Bengal13. 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.

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
Registrar, Bose Institute – Secretary.

Scientific Report

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, yeast and parasite molecular biology, 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.

The biphasic kinetics of Colchicine-Tubulin interaction (Prof. B. Bhattacharyya)

The kinetics of colchicine binding to purified (unfractionated) brain tubulin have been reported to be biphasic under pseudo-first order conditions. Experiments with individual isotypes established that the presence of β_{III} in the purified tubulin is responsible for the biphasic kinetics. Since the isotypes mainly differ at the C-termini, the colchicine binding kinetics of unfractionated tubulin and the β_{III} isotype, cleaved at the C-termini, have been tested under pseudo-first order conditions. Removal of the C-termini made no difference to the nature of the kinetics. Sequence alignment of different β isotypes of tubulin showed that besides the C-terminal region, there are differences in the main body as well. In order to establish whether these differences lie at the colchicine binding site or not, homology modeling of all β tubulin isotypes was done. We found that the isotypes differed from each other in the amino acids located near the A-ring of colchicine at the colchicine-binding site on β -tubulin. While the β_{III} isotype has two hydrophilic residues (Serine³⁴² and Threonine³¹⁷) both β_{II} and β_{IV} have two hydrophobic residues (Leucine³⁴² and Alanine³¹⁷). β_{II} has Isoleucine at position 318, while β_{III} and β_{IV} have Valine at that position. Thus these alterations in the nature of the amino acids surrounding the colchicine site could be responsible for the different colchicine binding kinetics of the different isotypes of tubulin.

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

Work on the characterization of yeast (*S. cerevisiae*) mutants, which cause loss in the fidelity of chromosome transmission, was continued. The Iml3/Mcm19 protein was shown to affect

kinetochore function even when not localized at the kinetochore, suggesting that its absence can destabilize kinetochore structure. High copies of Sum1p (a protein that combines with histone deacetylases to silence chromatin) suppress *tub1*, a mutation in alpha tubulin. We are currently studying if this protein acts by changing the acetylation status of microtubules. A spindle pole body protein, Bbp1, has been localized to the centromere via its interactions with kinetochore protein Chl4/Mcm17. Chl1p/Mcm12 protein has been further characterized as required for MMS- and UV-induced DNA damage.

Protein conformation (Prof. P. Chakrabarti)

Does the amino acid use at the terminal positions of an α -helix become altered depending on the context? This issue has been addressed from an analysis of α -3₁₀ and 3₁₀- α composite helices in Protein Data Bank. It has been found that there is a definite angular relationship between the axes of the two types of helices in the composites.

Hydration features and residue-conservation in protein-protein interfaces (Prof. P. Chakrabarti)

As in tertiary structures, protein-protein interfaces also contain immobilized water molecules. It is found that the water molecules may form a ring around interfaces that remain "dry", or they may permeate "wet" interfaces. A majority of the specific interfaces are dry and most of the crystal packing (nonspecific) interfaces are wet.

X-ray crystal structure of CII (Dr. P. Parrack and Prof. P. Chakrabarti)

The structure of CII, an important transcriptional activator protein from lambda phage, has been solved using multiple anomalous dispersion data. The mode of interaction between the individual subunits in the tetrameric structures is unprecedented and is useful for interpreting a vast amount of biochemical data, and also provides a model for the recognition of direct tetra-nucleotide repeat sequences in DNA.

The cell cycle of *Entamoeba histolytica* (Anuradha U Lohia)

Analysis of the genome sequence showed that five kinesin like proteins were encoded in *E. histolytica*. Phylogenetic analyses suggests that Eh Kinesin like proteins are structurally divergent from other kinesin proteins and therefore their function in *E. histolytica* could not be predicted from sequence analysis. Using RNAi methodology we have characterized the role of the Eh Klp5 and demonstrated that it is required for bipolar spindle assembly and regulating genome content. Our results also suggest that Eh Klp4 is structurally similar to Eh Klp5 and regulates nuclear genome content. Together these two kinesin like proteins may be key regulators of genome partitioning in *E. histolytica*.

Protease and RecA-mediated cleavage of λ cI repressor (Dr. R. Chattopadhyaya)

Several protease digestion sites in cI were determined by Edman sequencing of product C-terminal fragments and ESI-Mass Spectrometry. RecA-mediated cleavage of cI occurred at similar rates in the presence or in the absence of operator DNA, thus showing that dimeric cI

(monomer concentration becomes negligible with excess DNA) can be a substrate for such cleavage, instead of a requirement for monomers as previously believed. Further novel experiments were performed to delineate the mechanism of RecA-mediated cleavage.

Three-dimensional models of NB-ARC domains (Dr. R. Chattopadhyaya)

The nucleotide binding domains in several disease resistant plants are designated as NB-ARC domains that include regulators of cell death factors like Ced-4 in nematode and Apaf-1 in humans. In collaboration with Prof. Amita Pal, three dimensional models of NB-ARC domains in five different proteins have been constructed, two being for tomato species (PDB codes 2B84, 2FT4), one each for flax (2B85), *Arabidopsis* (2FT5) and nematode (2G2M), based on the recently published crystal structure of Apaf-1 (1Z6T). This is a first endeavor of its kind, compressed unix (.Z) PDB coordinate files available at www.rcsb.org/pdb/search/searchModels.do by the above codes. The models may enable us to understand the molecular mechanisms of such resistance.

Studies on proteins involved in the λ lysis-lysogeny switch (Dr. Pradeep Parrack)

Various proteins from the λ host bacterium *Escherichia coli* are involved in the lysis-lysogeny decision of the virus. Five such host proteins, viz. HflB, HflD, HflK, HflC and HflX have been purified and protein-protein interactions between them as well as between host factors and the phage proteins CII and CIII have been studied by pulldown assays.

Cyclic AMP dependent transcription activation by CRP in non-*E. coli* systems (Dr. Pradeep Parrack)

The cyclic AMP receptor protein (CRP) was purified from *Vibrio cholerae* and from *Agrobacterium tumefaciens*. Biochemical experiments including *in vitro* transcription activation revealed that like *E. coli* CRP, there is a cAMP-dependent change of conformation and activity of CRP from these systems. At high cAMP concentrations, the cAMP-CRP complex behaves like apo-CRP, while at low cAMP concentrations the complex assumes a conformation competent to activate transcription.

Phage repressor, antibacterial screening tools and viral genomics (Dr. S. Sau and Dr. T. C. Ghosh [Bioinformatics Centre])

To study the structure-function relationship of mycobacteriophage L1 repressor, both the native and his-tagged version of L1 repressor were purified and characterized by some *in vitro* techniques. For screening antistaphylococcal compounds, a fluorescent *S. aureus* strain was constructed. In order to construct antimycobacterial screening tools, one of two mycobacteriophage L1-specific genes arresting growth of mycobacteria have been characterized to an extent. Besides, to understand about the architecture, evolution, and therapeutic potentials of viruses, codon and amino acid usage biases in some viruses have been analyzed.

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)

Analysis of electrostatic components of binding free energy, both salt independent and salt dependent on a series of protein-DNA and protein-RNA complexes have yielded important insights into specific and non-specific interactions between protein and nucleic acids.

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 started looking at electrostatics interactions in protein-protein complexes. We have already calculated orientations of protein macro-dipoles in a large number of protein-protein complexes and currently developing more sophisticated methodologies to calculate macro electrostatic properties of proteins.

Deciphering interactions responsible for Pro-Pro cis peptide bonds in proteins (Dr. Gautam Basu, Prof. Pinak Chakrabarti)

The canonical conformation of the peptide bond in proteins is the trans conformer. However, due to special sterical properties of the proline residue, its peptide bond can assume the cis conformation more often than other residues in Xxx-Pro fragments. We have shown, from NMR and protein database studies, that a local interaction is responsible for cis peptide bonds in Pro-Pro fragments. The interaction is between the first Pro residue and an aromatic residue following the second Pro.

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 started a project where interactions of the isolated N-terminal domain and tRNA/substrate will be studied. The N-terminal domain has already been cloned, over expressed and purified.

Botany

Scientists are engaged in research in the following areas, such as molecular marker behind sex expression; acetyl CoA carboxylase gene expression, AFLP pattern in tea; genotype and physiological studies in seeds of some species of Fabaceae; DNA pol β from *Vigna radiata*.

salinity stress in rice cultivars, fruit ripening in different fruit plants; biochemical, clinical and molecular approach to study airborne allergenic pollen grains and spores; biotechnology in medicinal plants; QTL mapping for grain and kernel dimension traits and studies on the differentially expressed genes from *Sinapis alba* on infection with fungal pathogen. One patent application has been granted and one submitted.

Towards identification of molecular factor(s) behind sex expression in *Carica papaya* and *Cycas circinalis* (Prof. K K Mukherjee)

To identify the molecular determining factor behind sex expression in the seed plants. *Carica papaya*, an angiosperm where sex is patterned in three possible forms, viz. hermaphrodite, male and female and *Cycas circinalis*, a dioecious gymnosperm were studied. One female-specific band generated from ISSR profile using primer (GACA)₄ was detected in papaya, which seems to have importance from agricultural point of view. The sequencing of a male-specific RAPD band (PCR with primer OPB 01) in *Cycas circinalis* revealed homology with putative retro elements of diverse plants probably indicating its use in detection of male *Cycas circinalis* in future.

Studies on structural and functional Genomics focusing on Biodiversity (Prof. Swati Sen-Mandi)

In rice Having established differential potential for ACCase activity in different rice varieties exhibiting high and low storability trait, studies are now focused on an Acetyl CoA Carboxylase gene expression during early germination in high and low vigour seeds. In tea : AFLP pattern of genomes of 500 tea clones using a single primer pair combination has been completed. Such genome analysis using another primer pair for the same 500 clones as in progress. This work is part of a DBT sponsored National Network Programme for characterizing all indigenous tea germplasm. Studies on an earlier identified DNA Fragment associated with drought tolerance in tea is being used to establish a diagnostic kit for Germplasm Screening endeavours.

Phenotypic, genotypic and physiological studies with some species of family Fabaceae (Prof. Prabir K. Saha)

S. cannabina seeds, obtained from a naturally occurring single population contained both dormant and nondormant seeds. The water uptake pattern indicated that non-dormant seeds absorbed sufficient water to allow them to germinate whereas dormant seeds failed to germinate due to restricted water entry. Using a scanning electron microscopy testa ultrastructural studies revealed that the closed micropyle and limited opening of the hilar groove restricts water from entering dormant seeds whereas an open type micropyle allows large amounts water uptake and successful germination in non-dormant seeds. So, variability with respect to germinability and testa ultrastructure exists within a single seed lot of *S. cannabina*. In this case micropyle acts as the determining factor for dimorphism and influences the germinability.

DNA beta type in *Vigna radiata*, Salinity stress in Rice Cultivars and Fruit Ripening in Different Fruit Plants (Prof. Dibyendu Narayan Sengupta)

The ddNTP sensitive and aphidicoline resistant DNA polymerase β similar to mammalian DNA polymerase β has been purified during the development of seeds in *Vigna radiata*, var B1 (mungbean). The purified enzyme showed processive mode of DNA synthesis and expression of the protein in developing mungbean seeds indicates its probable involvement in endoduplication of genomic DNA in mungbean seeds. From the developing grain of *Vigna radiata*, a cDNA expression library was made in λ -Triplex 2 vector and screened with Anti-rat pol β antibody and 4 putative clones have been obtained. Sequencing is going on.

The rab gene, ABA and salt inducible gene in rice, expresses in growing panicle and also in leaves during salt stress, when over-expressed were found to protect the transgenic tobacco plants from 300mM NaCl. The motif I of the gene which is actually an ABRE, was found to be the binding site of OSBZ8 factor. A cDNA library was made from leaves of Nonabokra salt tolerant rice cultivar and screened with 32p – labeled motif II, the cis – acting element next to the motif I cis – acting element, present on the upstream of Rab 16A gene. The positive clones are now under characterization.

The expression of the gene for sucrose phosphate synthase was checked in four different cultivars of banana e.g. Cavendish, Rasthali, Kanthali, Poovan, and accumulation of the mRNA during ripening stage was noticed by northern blot analysis. The induction of the gene was maximum in the variety Dwarf Cavendish. Therefore, the upstream of this gene will be explored. To clone the genes expressed only in the ripe mango fruit, an expression cDNA library was made from the ripe mango fruit of variety Himsagar and several clones were picked up. After sequencing one of them was found to be β -1-3- glucanase and the northern blot analysis showed that the gene is expressed only during fruit ripening. The cDNA for the transcription factor that regulates developmental programme is Le – MADS – Rin, has been amplified by RT-PCR. Transcript analysis showed the appearance of mRNA for Le – MADS – Rin in ripe tomato fruits.

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

A pollen calendar of southern Calcutta for the season 2004-2005 has been prepared. Clinical and biochemical studies have revealed the allergic potential of the avenue trees *Delonix* sp., *Peltophorum* sp. and *Cassia siamea*. IgE specific immunoblotting (*Peltophorum* sp.) with individual patient sera revealed several reactivity profiles, with a common band at the region of 28 kD. Other allergenic bands are of 85, 76, and 56 kD. Identification of major allergens (35.48 KDa & 15.49 KDa) from *Trichoderma harzianum*, an allergenic mould, has been done by SDS-PAGE and Immunoblotting technique. In a study on the genetic association analysis of asthmatic population from Kolkata city, DNA samples had been isolated from the serum of asthmatic subjects and their family members.

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

A computerized database on 40 nationally prioritized medicinal plants, 'PlatCon' has been developed. Easy and effective protocols for mass scale production of three commercially important medicinal plants, *Eclipta alba* (Bhringaraj), *Boerhaavia diffusa* (Punarnava) and *Rauvolfia serpentina* (Sarpagandha), have been standardized. Encapsulated plant parts (the artificial germplasms) are found suitable for in vitro storage under illumination at 4°C. Current information on these 3 plant species have been collected and compiled in the form of a digitalised database.

Induction of hairy roots using *Agrobacterium rhizogenes* and establishment of hairy root culture have been done from *Plumbago indica* (Raktachita), a rare medicinal plant. Plumbagin, the active principle of the plant has been detected in the fast growing hairy root clone.

The fungal pathogen(s) causing wilt disease of *Coleus forskohlii*, has / have been isolated from the infected plant parts and cultured for isolating pure colony of the fungus, specific for the disease.

Improvement of aromatic rice: QTL mapping for grain and kernel dimension traits. (Dr. Tapas Kumar Ghose)

Using 11 polymorphic SSLP markers and a permanent mapping population, one major QTL each was identified for grain length (GL), grain length/breadth ratio (G-L/B), kernel length (KL), and kernel length/breadth ratio (K-L/B). A number of minor QTLs were identified for these four traits and for grain breadth (GB) and kernel breadth (KB). In addition, minor QTLs were identified for flag leaf length (FLL), days to flowering (DTF) and for hundred grain weight (HGW).

The most informative SSR markers were RM 112, RM 250 and RM 505; these three SSLP markers were linked with all six grain and kernel dimension traits. The phenotypic variation explained by the three SSLP markers was 61.9% for GL, 18.7 % for GB, 54.2% for G-L/B, 41.5% for KL, 20% for KB and 38.5% for K-L/B.

Identification of differentially expressed genes from *Sinapis alba* on infection with fungal pathogen *Alternaria brassicicola*. (Dr. Debabrata Basu)

Functional genomic approach like cDNA-AFLP has been successfully executed to identify the differentially expressed genes from *S. alba* for understanding of resistance mechanism against fungal pathogen *A. brassicicola*. About 290 differentially expressed cDNA AFLP fragments have been isolated. Further screening of these fragments through differential hybridization using labeled first strand cDNA resulted about 90 fragments those are over-expressed upon infection in *S. alba* but not in *Brassica*. Some of these fragments have been already sequenced after cloning in pGEM T vector and rest of them are in process of sequencing. BLAST X search of already sequenced fragments shows high degree of homology with the stress related genes of different plants at the amino acid level and some of the genes information are unique.

Chemistry

Research in the Department of Chemistry have crossed the boundaries of pure chemical science into the realms of multidisciplinary areas encompassing biophysical chemistry, chemical physics, natural products, synthetic organic chemistry, lipids, enzymes, diseases and drug targeting and developments. In keeping with the pace of modern developments, department is venturing into newer areas of research. At present both basic and applied aspects of various systems are being studied. Among the basic aspects are molecular mechanism in drug resistance in mycobacterium tuberculosis and cholera, regulation of enzymatic functions by modulators, chaperone function of α -crystallin, molecular interactions in thermotropic liquid crystals, mechanism of hepatoprotective action of herbal protein. Among applied studies are: eco-friendly synthetic routes to bioactive heterocycles, therapeutic use of fatty acids from fish oil.

Stimulation of Mg^{2+} -independent form of Ca^{2+} -ATPase by a low molecular mass protein purified from goat testes cytosol (Prof. Parimal C. Sen)

A low-molecular-mass protein purified from goat testes cytosol following gel filtration and anion exchange chromatographic separation is found to stimulate Mg^{2+} -independent Ca^{2+} -ATPase without any significant effect on Mg^{2+} -dependent Ca^{2+} -ATPase. Stimulation of the ATPase has been shown to be due to increase in the rate of dephosphorylation of the overall reaction step of the enzyme. Binding of the stimulator increases the affinity of Ca^{2+} -ATPase for Ca^{2+} . An analysis of enzyme kinetics reveals a reversible type of binding of the stimulator to the ATPase and non-competitive type of stimulation with respect to the substrate. Stimulation seems due to binding of the protein at a single site following Michaelis-Menten model. The protein can also counter the effect of the calcium antagonists exerted on the ATPase. The pI of the protein is found to be 6.2 and its molecular mass has been determined to be 13.961 kDa from Q-TOF-MS.

Pharmacological importance of eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids isolated from fish oil (Prof. Parimal C. Sen in collaboration with Dr. R. Bhadra, IICB).

The cell culture and the animal model for the testing of the highly enriched EPA and DHA were developed. The pig kidney epithelium cell, LLC-PK1 was taken as the *in vitro* model for kidney damage recovery and anti-diabetes activity testing. The Rat is the model animal for the *in vivo* kidney damage, diabetes development and cataract formation along with untreated control. Mercuric chloride was used as the kidney damage and streptozotocin was used for the diabetes development, cataract was induced with chloroquine phosphate. The effect of EPA and DHA were tested at different stages of above impairment to monitor their effect in controlling the damage. Effects are found to be encouraging to counter the damage.

Protein kinase catalytic subunit (PKAcat) from bovine lens: Purification, characterization and phosphorylation of lens crystallins (Prof. Parimal C. Sen and Prof. K.P. Das)

The purification and functional characterization of protein kinase A catalytic subunit (PKAcat) from bovine lens cytosol was done. Purification was achieved by using 100kDa cut-off membrane

filtration followed by Sephacryl S-300 and High Q anion exchange column chromatography. The purified protein migrated as a single band of molecular mass ~41kDa on SDS-PAGE. Proteomic data from ion trap LC-MS when analyzed through NCBI blast program reveals significant homology (52%) with bovine zeta-crystallin and also some homology with pig casein kinase I alpha chain (38%) and SLA-DR1 beta 1 domain (38%). The search does not indicate homology with any known catalytic subunit of PKA. In spite of the significant homology with the zeta-crystallin, our protein is different from it in terms of molecular mass, pI value of the kinase (5.3) obtained from 2D analysis is also different from zeta-crystallin (8.5). The protein is found to contain 17% α -helix, 26.5% β -sheet, 21.4% turn and 34.7% random coil. The active catalytic subunit of the bovine lens cAMP-dependent kinase belongs to Type I Ca subtype. The kinase shows broad substrate specificity. It prefers Ser over Thr as phosphorylating residue. The kinase is sensitive to specific inhibitors for mammalian protein kinase A, H-89, protein kinase inhibitor from porcine heart and protein kinase inhibitor fragment 5-24 amide trifluoroacetate salt. Phosphorylation of crystallin proteins by the kinase suggests that it plays some crucial role in regulation of chaperone function within lens.

Synthesis of heterocycles and pursuit of green chemistry (Prof. Manas Chakrabarty)

2-Substituted thiazolo[5,4-*e*]indazoles, a new class of heterocycles with bioactive potential, have been synthesised for the first time in excellent overall yields by a four-step, regio-selective route starting from commercially available 5-nitroindazole. In the field of green chemistry, a hitherto unused, eco-friendly acidic solid, orthophosphoric acid-on-silica gel (TLC-grade), has been developed and demonstrated to be a highly efficient reagent for the one-step synthesis of symmetrical bis(indolyl)alkanes from indoles and mainly aryl aldehydes. Also, three new useful reactions have been initiated, one each for the formation of olefins, 2-piperidones and 1-methyl-2-arylbenzimidazoles – all in a solvent-free manner on acidic or basic solids. Professor Y. Harigaya of Kitasato University, Tokyo, Japan collaborated with us.

Chaperone activity of α -crystallin (Prof. K.P. Das)

The role of N-terminal region in the structure and function of α -crystallin is being explored. Several mutants were raised by systematically deleting various lengths from the N-terminal region. It was found that deletion of first 20 residues had little effect on the oligomeric size and chaperone activity of α -crystallin. But the stability of the protein was somewhat reduced. However, when the first 50 residues are deleted, the oligomeric size, stability and chaperone activity decreased drastically. Significant drop in surface exposed hydrophobicity and subunit exchange was also noted on N-terminal deletion. These results are now being analyzed in terms of their inter-relationship among the various parameters and their relative importance in determining the function of α -crystallin.

Drug resistance mechanisms in *Vibrio cholerae* (Prof. Manikuntala Kundu)

Analysis of the topology of NorM of *Vibrio cholerae* and identification of amino acid residues involved in norfloxacin resistance

NorM, a putative efflux pump of *Vibrio cholerae*, is a member of the multidrug and toxic compound extrusion (MATE) family of transporters. We demonstrate that inactivation of *norM* rendered *V. cholerae* hypersensitive towards these fluoroquinolones highlighting its importance in fluoroquinolone resistance.

Drug targets and drug resistance mechanisms in mycobacteria

We have continued our exploration into understanding the functions of the ABC transporters of *Mycobacterium tuberculosis*, polyphosphate metabolism and regulation of cell wall biosynthesis and cell division in mycobacteria.

ABC Transporters in *Mycobacterium tuberculosis* (Dr. Joyoti Basu and Prof. Manikuntala Kundu, in collaboration with Prof. Parul Chakrabarti, and Prof. Brigitte Gicquel/Dr. Mary Jackson, Institut Pasteur, Paris)

The *drr* operon, is present on a 50 kb virulence fragment of the genome of *M. tuberculosis* which contains genes involved in phthiocerol dimycocerosate biosynthesis. We have, in collaboration with the Institut Pasteur, Paris, knocked out the gene of the *drrA* in *M. tuberculosis*. The knockout strain is being used as a tool for understanding DrrAB function. Oligopeptides are taken up by the oligopeptide (Opp) transport system, a member of the ABC transporter family. We have inactivated the oppABCD operon in *M. tuberculosis*. The consequences of this on the virulence of *M. tuberculosis* are being studied.

The serine/threonine kinase PknB of *Mycobacterium tuberculosis* phosphorylates PBPA, a penicillin-binding protein required for cell division (Dr. Joyoti Basu and Prof. Manikuntala Kundu)

A cluster of genes encoded by open reading frames Rv0014c to Rv0018c in *Mycobacterium tuberculosis* encodes candidate cell division proteins RodA and PBPA, a pair of serine/threonine kinases (STPKs), PknA and PknB, and a phosphatase, PstP. We demonstrate for the first time that PBPA belongs to a subclass of class B high molecular mass transpeptidases, plays an important role in cell division and cell shape maintenance, and its positioning at the septum is regulated by signal transduction mediated by PknB and PstP.

Polyphosphate kinase is required for adaptation to nutritional stress, biofilm development and rel-mediated stringency of mycobacteria (Prof. Manikuntala Kundu and Dr. Joyoti Basu)

Long-term survival of *Mycobacterium 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 report that the polyphosphate kinase I (PPK1) regulates the stringent response regulator ppGpp and biofilm formation.

Mannosylated lipoarabinomannan of *M. tuberculosis* modulates interleukin-12 release from macrophages by suppression of NF- κ B activation (Dr. Joyoti Basu and Prof. Manikuntala Kundu)

Mannose-capped lipoarabinomannans (Man-LAMs) are members of the repertoire of *Mycobacterium tuberculosis* modulins which the bacillus uses to subvert the host innate immune

response. Interleukin-12 (IL-12) production is critical for mounting an effective immune response by the host against *M. tuberculosis*. We demonstrate that Man-LAM inhibits IL-12 p40 production mediated by subsequent challenge with lipopolysaccharide (LPS) by inducing the expression of IRAK-M, a negative regulator of TLR signaling.

Helicobacter pylori antigen, HP0175 regulates interleukine-6 release from macrophages (Prof. Manikuntala Kundu and Dr. Joyoti Basu)

Helicobacter pylori (*H. pylori*) infection is associated with the local production of chemokines and cytokines of which interleukin-6 (IL-6) is overexpressed at the margin of gastric ulcer in *H. pylori*-positive gastritis. Our study shows for the first time that a secreted peptidyl prolyl *cis*-, *trans*- isomerase (PPIase), HP0175 regulates IL-6 gene expression through chromatin modification at the IL-6 promoter.

Studies on Hepatoprotective Active principles from Herbal Sources (Dr. Parames C. Sil)

In order to determine the cytoprotective, antioxidative as well as hepatoprotective roles of the active principles of two herbs, both *in vivo* and *in vitro* studies have been carried out against various potent toxins and drugs. Partial amino acid sequence of one of the active principles from one herbal source has been determined. From the sequence data, it appeared that this particular active principle is a unique protein. Although other active principles are not well characterised yet, it appears that they behave similarly in most of their preventive and curative activities. Further studies are needed to determine the mechanism(s) of action of these active principles and currently in progress.

Charge Transfer Interaction stabilizing Liquid Crystal States (Dr. Pradip Das)

Electron-phonon interaction has been investigated in specific liquid crystal phases using infrared and UV-VIS spectroscopy techniques in an effort to understand the thermodynamic stability/instability correlation with molecular structure of thermotropic mesogens like cholesterol esters. The Holstein molecular crystal model is currently being scrutinized, being the simplest model for the study of the interaction of a single tight-binding electron coupled to an optical local phonon mode. The signature of other interactions in these systems occurs in the UV, being mainly of the Lifshitz-van der Waals type.

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, plant-microbe and mineral microbe interactions and degradation of environmental pollutants.

Genetics of high-affinity iron acquisition system of *Mesorhizobium ciceri* (Prof. Pran K. Chakrabartty)

Using primers designed from sequences of enterobactin genes, *entB*, *entC* and *entA*, of *E. coli*, *Mesorhizobium ciceri* gene homologues were amplified by PCR and sequenced. The sequences were 97, 99 and 99% homologous to that of *E. coli*. Using appropriate primers the enterobactin homologues B and A were found to be contiguous in *Mesorhizobium ciceri*. Tn5 mutagenesis yielded 21 siderophore non-producing and 8 siderophore over-producing mutants. Of the latter 4 could be further grouped as regulatory and the rest 4 as transport mutants based on their growth and siderophore production on high concentration of iron.

Understanding the mechanism of expression of the Sox (Sulfur oxidation) operon of *Pseudaminobacter salicylatoxidans* (Dr. Pradosh Roy)

Oxidation of thiosulfate and tetrathionate in the sulfur chemolithotrophic bacterium *Pseudaminobacter salicylatoxidans* strain KCT001 was found to be governed by a gene cluster *soxSRT-VWXYZABCD*. Through theoretical studies it was possible to assign regulatory role to the cluster *soxSRT* in general and the predicted putative product of the *soxR* gene in particular. The theoretical prediction was subsequently confirmed using *soxR* mutant of KCT001 showed active thiosulfate oxidation. SoxR, belonging to the SmtB/ArsR family, was overexpressed, purified from *E. coli*. Binding of SoxR to the intergenic region between *soxS* and *soxV* as well as between *soxW* and *soxX* was demonstrated by gel retardation assays, and the binding site precisely localized by DnaseI footprinting.

Isolation of novel Sulfur Chemolithotropic bacteria from Rhizospheric soil (Dr. Pradosh Roy)

The rhizospheres of a wide variety of tropical plants were surveyed and it was found that mesophilic, neutrophilic and facultative sulfur oxidizing bacteria were ubiquitous, abundant and active in soils immediately adjacent to the roots. The rhizospheric strains were found to have a plant growth promoting effect. A number of bacterial strains were enriched and isolated including the strains SJT, a new species of *Mesorhizobium*; *Paracoccus bengalensis*, a *Paracoccus versutus*-like isolate, both isolated from the rhizosphere of *Clitoria ternatea* and *Tetrathionobacter kashmirensis*, a betaproteobacterium which could oxidize tetrathionate via the tetrathionate intermediate pathway in addition to thiosulfate. In *T. kashmirensis*, under conditions of impaired sulfite dehydrogenase activity effected by a mutation in the molybdopterin cofactor biosynthetic gene locus the intermediate product sulfite rendered concentration-dependent inhibition of its own formation from tetrathionate by suspending further oxidation of tetrathionate.

Small interfering RNA (siRNA) mediated CCR5 receptor blocking regulates *Leishmania donovani* entry in murine macrophages (Dr. Subrata Majumdar)

C-C chemokine receptor (CCR5) plays a major role as co-receptor during *L. donovani* entry inside the macrophages during visceral Leishmaniasis. siRNA mediated gene silencing is currently

being used as a therapeutic approach to combat visceral leishmaniasis. In this study we aim to restrict the *Leishmania* entry in murine macrophages utilizing siRNA mediated gene silencing approach by knocking down CCR5 gene. After siRNA transfection at 6 h, 12 h and 24 h of infection the CCR5 siRNA markedly reduces the expression of CCR5 receptor protein, increases the release of Th1 cytokines and suppressed the release of Th2 cytokine IL-10. The parasitic burden in siRNA treated macrophages was significantly decreased. Our findings clearly suggests that CCR5 siRNA significantly and specifically knock-down the expression CCR5 mRNA and protein in vitro during early hours of infection thus can efficiently control the entry of the parasite.

DNA protein interactions at the replication origin of a mycobacterial plasmid (Dr. Sujoy Kr. Das Gupta)

The objective of this ongoing investigation is to understand the mechanism of replication of plasmid pAL5000 - an useful model to study DNA replication in mycobacteria. Replication of this plasmid requires binding of RepB, a plasmid encoded replication protein to its origin. We have demonstrated that the histone like protein HU stimulates the origin binding of RepB and thereby assists in the formation of an origin complex. This stimulation occurs due to the DNA chaperon activity of HU, and also protein-protein interaction between RepB and HU.

Project on mycobacteriophage genomics (Dr. Sujoy Kr. Das Gupta)

Mycobacteriophages are known to inactivate host cells during infection. In this project the possibility of using Mycobacteriophages to identify new drug targets is being explored. To achieve this objective, the expression pattern of phage genes following infection has been investigated. Western blotting, Immuno-precipitation and 2D gel based techniques have been used to identify early expressed genes. The results indicate that following Mycobacteriophage infection the genes encoding enzymes responsible for deoxy-ribonucleotide synthesis, are among the earliest to be synthesized.

Peptide mimotopes of mycobacterial antigens and their applications (Dr. Sujoy Kr. Das Gupta in collaboration with Dr. S. Majumder)

Peptide mimotopes against mycobacterial antigens have been raised using the phage display technique. One of these was found to mimic the Mycobacterial non-protein antigen lipoarabinomannan LAM in its antigenic properties. A dot blot assay based on these peptides has been developed. Preliminary investigations revealed that this assay can be used for diagnosis of TB. The mimotopes were also found to stimulate the release of Pro-inflammatory cytokines from a mouse macrophage cell line indicating that these peptides could be used as potential immuno-modulators

Bacterial degradation of long side-chain alkyl compounds (Dr. Tapan K. Dutta)

Long side-chain alkylmonocycloalkanes, alkylbenzenes, and alkyl organic sulfur compounds are largely found in fossil fuels while long side-chain alkylbenzene sulfonates and alkylphenols are released into environment primarily due to domestic activities. Advances that have occurred in

this field in terms of the identity, abundance, possible origin, significance, susceptibility to biodegradation and the fate of these chemicals in the environment have been reviewed. In this context, strain P2 isolated from a municipal waste-contaminated soil sample was identified as *Pseudomonas* sp. based on its morphological, nutritional and biochemical characteristics and 16S rDNA sequence analysis could utilize phenol as the sole source of carbon and energy and 2-ketoadipate pathway was found to be involved in phenol degradation. When induced with phenol, the strain P2 could also utilize different isomers of the endocrine-disruptor, 4-nonylphenol, which accounts for its novel biodegradation potential. Gas chromatography-mass spectrometric analysis indicated degradation of various major isomers of 4-nonylphenol in the range of 29-50%. While selected ion monitoring mode of analysis of biodegraded products of 4-nonylphenol along with the few biochemical characteristics of the test organism indicated that the degradation of 4-nonylphenol is possibly initiated from the phenolic moiety of the molecule and not from the alkyl side-chain.

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 '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.

Superheated drop detector (Prof. Suprakash C. Roy and Prof. Barun K. Chatterjee)

To study the physics of liquid-vapour nucleation of superheated drop detector a more model which takes into account of the polydisperse nature of the super heated droplets as well as accounts for the multiple metastable states was developed. This model allows one to study the lifetime of two metastable states identified in superheated droplets and also allows one to understand the rate of interstate transition.

A heat bath for the pressure scanning system is being constructed. This system has been tested for a large range of pressures and will be used to obtain the energy spectrum of neutrons. A bubble counting system for computerized data acquisition is being fabricated.

A model to predict the limit of superheat of liquids has been constructed. Experiments will be performed to study the limit of superheat of liquids and compare them with this model and other existing models.

Investigations on aspects of Compton scattering (Prof. Barun K. Chatterjee and Prof. Suprakash C. Roy)

The double differential Compton scattering cross sections for K-shell and in certain cases L-shell electrons of various elements were computed using the S-Matrix code of the University of Pittsburgh.

The Compton profile can be symmetrized by shifting it by an amount, called the *profile defect* along p_z . The profile defect has been computed from the effective Compton profile, which has been obtained from the double differential Compton scattering cross section calculated using the S-Matrix code. The *profile defect* was studied for Beryllium and Sodium at various incident photon energies and photon scattering angles.

Interdisciplinary physics (Prof. Indrani Bose)

We have proposed a mathematical model of the DNA damage checkpoint in the G2 phase of the cell division cycle. On DNA damage, the tumour suppressor protein p53 is activated which further initiates processes resulting in the arrest of the cell cycle. Once the DNA damage is repaired, the cell cycle can progress once more and enters the mitotic phase in which cell division occurs. Recent experiments suggest that the mutation of one of the two copies of the p53 gene is in many cases sufficient for the formation and growth of tumours. The key result of our work is to show that the cell cycle is not arrested on DNA damage when the gene copy number is reduced from two to one. The prediction provides the basis for the design of new experiments.

We have studied a stochastic model of transcription factor (TF)-regulated gene expression using an analytical formalism. Several recent single cell experiments highlight the non-trivial effect of TF fluctuations on the distribution of the protein levels of the target gene. Our model explains the origin of some of the experimentally observed phenomena like binary expression (low and high protein levels) of the target gene. We further show that the output protein level may fall below the threshold for protein activity due to enhanced fluctuations when the copy number of the gene synthesizing the TFs is reduced from two to one.

Quantum Entanglement (Prof. Indrani Bose)

We have studied some special features of entangled spin clusters which include a study of the effect of inhomogeneous exchange coupling strengths on the entanglement properties of the $S = 1/2$ antiferromagnetic linear chain tetramer compound NaCuAsO_4 , determining the variation of the entanglement gap temperature T_E as a function of the spin magnitude S for a spin dimer, a trimer and a tetrahedron and an illustration of the quantum complementarity relation with respect to a spin-1 dimer compound. The temperature T_E is found to increase as a function of S but the scaled entanglement gap temperature goes to zero as S becomes large indicating a quantum-to-classical crossover. In the last case, magnetization and entanglement plateaus appear simultaneously at low temperatures as a function of the magnetic field in an experimentally accessible parameter region.

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

An experimentally realizable scheme is formulated which can test any postulated quantum mechanical approach for calculating the arrival time distribution. This is specifically illustrated by using the modulus of the probability current density for calculating the arrival/transit time distribution of spin-1/2 neutral particles at the exit point of a spin-rotator (SR) which contains a constant magnetic field. Such a calculated time distribution is then used for evaluating the distribution of spin orientations along different directions for these particles emerging from the SR. Based on this, the result of spin measurement along any arbitrary direction for such an ensemble is predicted.

Physics & Astrophysics of Strongly Interacting Matter (Prof. Sibaji Raha and Dr. Sanjay K. Ghosh)

The quark-hadron phase transition inside a rotating compact star may have some interesting consequences. The interactions producing the strange quark matter occur along with the generation of large number of neutrino and energy. The energy so produced is of the order of the energy found in Gamma-ray bursters. On the other hand, due to the rotation of the star, the neutrinos produced may become directional. In that case, detection of such directionality of neutrino flux from a compact star can be a good signature of phase transition in the compact stars.

Signatures of Phase Transition - Susceptibilities and Speed of Sound (Dr. Sanjay K. Ghosh)

Taylor expansion coefficients of the pressure are computed 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 up to 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.

A thermodynamically consistent density dependent quark mass model has been used to study the velocity of sound in a hot quark-gluon plasma. The results are compared with the recent lattice data.

Astrophysics & Cosmology (Dr. Swapan K. Saha)

We have established that OHP film, which is polyethylene terephthalate is a suitable Solid State Nuclear Track Detector (SSNTD) for setting up a large area array of detectors, for the search of cosmic ray particles at mountain altitude. An unusual event has been found while analyzing the SSNTD placed at Darjeeling. We worked to understand the nature of this event.

Dielectric Relaxation in Perovskite Oxides (Dr. Tripurari P. Sinha)

Various complex perovskite oxides of chemical formula $A(B'B'')O_3$ (where $A = Ba$, $B' = Fe, Al, Zn$, $B'' = Nb, Sb$) are synthesized by a solid state reaction technique. Impedance spectroscopy study of these oxides shows frequency dependent dielectric relaxation behaviour in these materials. The scaling behaviour of frequency dependent dielectric loss spectra at various temperatures confirms the temperature independent nature of dielectric relaxation time.

Animal Physiology

Animal Physiology was established as a separate entity as early as 1930 by the eminent naturalist Sri Gopal Chandra Bhattacharya. Sri Gopal Chandra was actively engaged in the study of natural behavior of some insects and fish, the research findings of which were published in Royal Society Journal and Journal of Natural History. Thereafter, during 1970s research in Animal Physiology were conducted in various fundamental and applied fields in piscine Physiology, Amphibian Physiology, Gerontology, Insect Physiology, etc. From 1990 onwards the research programs were further modified and focused in applied and medical oriented themes with fundamental touch. At present Animal Physiology Section is mainly engaged in both basic and applied researches in the fields of (a) animal biotechnology (aquaculture and sericulture) and (b) medical biotechnology (cancer chemoprevention, immuno-editing and thyroid hormone-brain relationship) and (c) cell biotechnology (targeted alteration in cell cycle regulatory and signaling molecules).

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

Although estradiol-17 β (E2) has been identified in body fluids of silkworm the biological role of this vertebrate female steroid in this insect has not been properly investigated. To find out whether E2 has metabolic or hormonal role in silkworm studies are being undertaken for establishment of its biological significance. Our search in this regard has provided encouraging data to reveal E2 as a metabolic enhancer and excellent stimulator for improvement of silk production. Further we have identified specific low capacity high affinity binding sites (putative receptors) for E2 in different organs of silkworm. Graded saturation of the receptor sites with E2 corroborated with the parallel stimulation of the various metabolic parameters studied, up to certain limit. The fact has strengthened our views about E2 acting as a potent metabolic stimulator in silkworm. The triploid catfish (*H. fossilis*) prepared earlier in our laboratory showed about twice higher growth rate than the diploid counterpart and as usually showed sterility. Further studies showed presence of estradiol receptors with half the maximum binding capacity in liver cell nuclei of triploid fish in comparison to the diploid fishes. This was accompanied with lower level of plasma estradiol. Failure of proper functioning of the estradiol receptors appears to be one of the causes for reproductive failure in female triploid fish.

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

Despite alterations in the peripheral thyroidal states brain maintains a normal level of thyroid hormone for some duration; the phenomenon is termed as "Central Thyroid Hormone Homeostasis". The mechanism of such homeostasis, its duration, onset and off-reactions remained unclear. Our recent study in this matter has revealed for the first time that the homeostatic mechanism starts from 1-2 days of peripheral hypothyroidism, lasts for 18 days and declines between 18-20 days. Further studies in this aspect have indicated involvement of two important neuronal enzymes like,

sodium-potassium-ATPase and acetylcholinesterase. Use of protein synthesis blockers has indicated that the physiology of Central Homeostasis for Thyroid Hormone is related to neuronal nuclear-mediated phenomenon.

Molecular regulation of cell growth and death (Dr. Gaurisankar Sa)

Progression through several major checkpoints in the cell cycle is controlled by sequential waves of different cyclin/cyclin-dependent kinase (Cdk) activities. The activity of Cdks is regulated by the expression level of each component, its phosphorylation status, and the presence of Cdk inhibitory proteins. It is becoming clear that many external signals including both that stimulates growth, such as growth factors, and those stimulates apoptosis, such as DNA damaging agents, control cell proliferation/apoptosis through regulating the cell cycle. Curcumin (diferuloylmethane) is known to induce apoptosis in tumor cells. In asynchronous cultures, with time-lapse video-micrography in combination with quantitative fluorescence microscopy, we have demonstrated that curcumin induces apoptosis at G2 phase of cell cycle in deregulated cyclin D1 expressed mammary epithelial carcinoma cells leaving its normal counterpart unaffected. These results were further supported, from the results of wild-type and degradation-defective mutant cyclin D1 transfected cells. In our search towards delineating the molecular mechanisms behind such differential activities of curcumin, we found that it selectively increases p53 expression at G2 phase of carcinoma cells and releases cytochrome c from mitochondria, which is essential requirement for apoptosis. Further experiments using p53-null as well as dominant negative and wild-type p53-transfected cells have established that curcumin induces apoptosis in carcinoma cells via p53-dependent pathway. On the other hand, curcumin reversibly inhibits normal mammary epithelial cell cycle progression by down regulating cyclin D1 expression and blocking its association with Cdk4/ Cdk6 as well as by inhibiting phosphorylation and inactivation of retinoblastoma protein. In addition, curcumin significantly up-regulates cell cycle inhibitory protein (p21 *Waf-1*) in normal cells and arrests them in G0 phase of cell cycle. Therefore, these cells escape from curcumin-induced apoptosis at G2 phase. Interestingly, these processes remain unaffected by curcumin in carcinoma cells where cyclin D1 expression is high. Similarly, in ectopically over-expressed system, curcumin cannot down-regulate cyclin D1 and thus block cell cycle progression. Hence these cells progress into G2 phase and undergo apoptosis. These observations together suggest that curcumin may have a possible therapeutic potential in breast cancer patients.

Tumor-induced oxidative stress perturbs NF κ B activity augmenting TNF α -mediated T cell death: Protection by curcumin (Dr. Gaurisankar Sa)

Cancer patients often exhibit loss of proper cell-mediated immunity and reduced effector T cell population in the circulation. Thymus is major site of T cell maturation and tumors induce thymic atrophy to evade cellular immune response. We demonstrated severe thymic hypocellularity along with decreased thymic integrity in tumor-bearer. In an effort to delineate the mechanisms behind such thymic atrophy, we observed that tumor-induced oxidative stress played critical role, as it perturbed NF κ B activity. Tumor-induced oxidative stress increased cytosolic I κ B α retention and

inhibited NF κ B nuclear translocation in thymocytes. These NF κ B-perturbed cells became vulnerable to tumor-secreted TNF α -mediated apoptosis through the activation of TRADD-associated caspase 8. Interestingly, TNF α -depleted tumor supernatants, either by antibody-neutralization or by TNF α -siRNA transfection of tumor cells, were unable to kill thymocytes effectively. When T cells were over-expressed with NF κ B, the cells became resistant to tumor-induced apoptosis. In contrast, when degradation-defective I κ B α (I κ B α super-repressor) were introduced into T cells, the cells became more vulnerable indicating that inhibition of NF κ B is the reason behind such tumor/TNF α -mediated apoptosis. Curcumin could prevent tumor-induced thymic atrophy by restoring the activity of NF κ B. Further investigations suggest that neutralization of tumor-induced oxidative stress and restoration of NF κ B activity along with the reeducation of the TNF α -signaling pathway can be the mechanism behind curcumin-mediated thymic protection. Thus, our results suggest that unlike many other anti-cancer agents, curcumin is not only devoid of immunosuppressive effects but also acts as immuno-restorer in tumor-bearing host.

Induction of apoptotic response to theaflavins by p53-mediated transcription-dependent pathway in cancer cells (Dr. Tanya Das)

Previous year we have reported that theaflavins induce apoptosis in breast cancer cells in hormone-independent but p53-dependent manner. Next we explored whether p53 mediates theaflavin-induced apoptosis in cancer cells via transcription-dependent and/or -independent pathway(s). To gain detail insights into the mechanisms, different cancer cell lines with varying status of p53, i.e., p53 null, wild type, mutated and tetracycline-regulated p53 over expressed human cancer cell lines as well as Bax or Bcl-2 over-expressed p53 null/ tetracycline-regulated p53 over expressed human cancer cell lines were used. We observed that p53 activation by theaflavins initiated transactivation of cell cycle arresting oncoproteins, p21. However, growth-arresting activity of p21 was overpowered by p53-mediated transcription-dependent apoptosis via Bax trans-activation. Down-stream pathway included Bax translocation to mitochondria, mitochondrial membrane permeabilization, cytochrome c release into cytosol and activation of caspase cascade. Interestingly, these flavonoids failed to induced significant apoptosis in human cancer cells through transcription-independent pathways i.e., direct p53 translocation to mitochondria and/or caspase 8 activation, which directly induce mitochondrial death cascade. Thus, theaflavins induce apoptosis in cancer cells in p53-mediated transcription-dependent manner. Importantly, these phytochemicals were also effective against drug resistant cancer cells.

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

It is recognized that during cancer, the disease causes severe immunosuppression as the mechanism of inhibiting anti-tumor activity. Our results demonstrated a progressive thymic involution paralleling tumor growth in tumor-bearing mice model due to 1) disruption of normal thymic maturation and inhibition of CD4⁺8⁺ differentiation to functional isotypes, 2) increased apoptosis of immune cells, 3) alteration in levels of pro- and anti-apoptotic oncoproteins, and 4) shift in cytokine balance

from Th1 to Th2. Such immunosuppression was reflected in spleen and peripheral blood. Importantly, anti-tumor dose of black tea shifted the balance between pro- and anti-apoptotic proteins towards survival in thymocytes and splenic lymphocytes and activated repressed IL-10 and TGF- β secretion from tumor cells, thereby promoting Th1/Tc1 response in tumor-bearing host. As a result, immunocytes are protected from tumor-induced apoptosis and are directed towards differentiation.

Environmental Science Section

The section was created in 1992. During last few years this section played a major role in monitoring and Physico Chemical analysis of various environmental pollutants.

Studies of environmental pollution samples (Prof. Sibaji Raha)

Environmental Sciences Section has carried out consultancy work regarding Quality Control, Monitoring and Control of Environmental Pollution at the local and national level. The section also carried out quality controls of different industrial products. Measurement of toxicants from patients coming from different Hospitals of West Bengal and analysis of different samples from different Academic Institute and Universities were performed.

This section has also carried out Atmospheric measurements, monitoring, sampling and analysis of Environmental parameters, and set up a wet chemistry laboratory for the *Astroparticle Physics and Space Science programme* at Mayapuri, Bose Institute, Darjeeling.

Immunotechnology Section

The section was created in 1992. Aim of this section is to develop modern technologies in the field of Immunology and Molecular Biology. How the basic research is useful for the betterment of mankind is the main goal of the research from this section. Research programs in the section have been initiated in the field of **Medical Biotechnology** and **Marine Biotechnology**.

Study on identification of papilloma virus (Prof. M Siddiqi)

At the IMT section, a study has been undertaken to identify the particular strain of papilloma virus present, if any, in cervical swab specimens. DNA is extracted from the specimens followed by a PCR that amplifies the common L1 region of the virus so that any strain can be detected successfully. DNA from the positive samples are being used once more for a nested PCR, using sets of degenerate primers according to the sequence alignment in the genome of different strains

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of the virus. The product of the genotyping PCR is hybridized to specific fluorescent oligonucleotide probes and scanned subsequently to identify the genotype. A total of 32 types of strain can be detectable by this assay method. It is also possible to identify presence of a co-infection. So far a variety of strains has been identified in the specimens. This approach, coupled with a retrospective follow-up, may eventually assist the designing of an effective vaccine against the most common strain(s) occurring in India.

Medical Biotechnology (Dr. Nripendranath Mandal)

The theme of research programs in this area was to develop a very sensitive method for quantification of very low levels of mRNA from various immunologically important genes during immune response for various diseases. We have synthesized two fragments of DNA of 420bp each. These will be useful to construct a plasmid and will be used to quantify expressed mRNA of 18 different cytokines. This will be very useful for diagnosis and prognosis of various diseases from few drops of blood samples and also be useful to develop a novel immunomodulator from both terrestrial and marine resources of herbal medicine.

Another goal of this research program is to develop economically favorable herbal medicine from natural resources without any side effect to treat nearly noncurable diseases such as viral, cancer and other autoimmune diseases. Currently we have developed some formulae of herbal medicines. These are all made from very useful herbal products either from terrestrial or marine resources. At the very basic level by *in vitro* experiment using cell culture we found some have selectively induced apoptosis in Ehrlich's Ascites Carcinoma (EAC) and all are very good natural immunomodulators. Hence these would be very useful to treat cancer especially Arsenic induced cancer, viral diseases, and various autoimmune diseases such as arthritis, psoriasis and diabetes.

Next theme of our research program is genetic and immuno-genetic studies of predispose coronary heart disease risk among Asian Indian population in eastern part of India. The prevalence of coronary heart disease (CHD) is known to be high among people of Indian origin. Indians those settled in the US having a 4 fold higher prevalence of CHD than Caucasian Americans and 6 fold higher hospitalization than Chinese Americans. In India also rates are rising and CHD has been predicted to rank first among the causes of death in Indian population by 2015. Genetic factors of CHD in general appear to be mediated by elevated plasma level of apolipoprotein A1 or ApoA1, apolipoprotein B or Apo B and apolipoprotein E or Apo E. The level of ApoA1, Apo B and Apo E are said to be associated with the polymorphism of three genes namely *ApoA1*, *Apo B* and *Apo E*. Therefore, it seems reasonable to consider that genetic factors such as *ApoA1*, *Apo B* and *Apo E* gene polymorphism are important determinants of premature CHD in Indians. Aside that immuno-genetic factors of CHD appear to be mediated by changes in plasma cytokines level namely Interleukin 6 (IL-6), 10 (IL-10), IL-1 β and tumor necrosis factor alpha (TNF- α) etc. In our research program we are also studying the effect of single nucleotide polymorphisms (SNPs) in the promoter of the cytokines gene (both Th1 & Th2) to explain coronary heart disease (CHD) among the people living in Eastern India. In view of the above

consideration we want to study functional SNPs, genetic polymorphism and its relationship with metabolic risk factors among Asian Indians in Eastern part of India.

Marine Biotechnology (Dr. Nripendranath Mandal)

Shrimp aquaculture is one of the most promising and job generating industries all over the world including India. Viral diseases are the major problems in this industry and continuing the loss of multimillion dollars each year. The theme of research programs in this area was to develop disease free shrimp aquaculture industry from structural and functional genomic studies of marine invertebrate, Giant Black Tiger shrimp (*Penaeus monodon*) and its viruses. We have developed a microsatellite DNA marker and RAPD marker to identify disease resistant population of *Penaeus monodon*.

Plant Molecular & Cellular Genetics Section

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 basic genomic components coding for desirable phenotypes through genetical and molecular approaches and their subsequent applications using genetic engineering technology.

Abiotic stress tolerance in plants : Molecular mechanism of salt-tolerance of *PcINO1* (Prof. A.N.Lahiri Majumder)

The molecular basis of salt-tolerance of L-myo-inositol 1-phosphate synthase, (MIPS) from *Porteresia coarctata* (*PcINO1*), has been analyzed by *in vitro* mutant and hybrid generation and subsequent biochemical and biophysical studies of the recombinant proteins. A 37 amino acid stretch between Trp-174 and Ser-210 has been confirmed as the "salt-tolerance determinant" domain in *PcINO1* by either deletion or by addition to salt-sensitive MIPS(s) of *Oryza* (*OsINO1*) and *Brassica juncea* (*BjINO1*). This was further verified by growth analysis of *Schizosaccharomyces pombe* transformed with the various gene constructs, differential behavior of mutant and wild proteins by tryptophan fluorescence, aggregation and CD spectra in presence of salt, bis-ANS binding, thermodynamic stability analysis in high salt, and modeling studies. It is conceivable that salt-tolerant MIPS proteins may be designed out of the salt-sensitive plant MIPS proteins by replacement of the corresponding amino acid stretch by the designated 37 aa stretch of *PcINO1*.

Structural organization of NB-ARC domain in grain-legumes (Prof. Amita Pal)

Molecular marker, *VMYRI*, linked with mungbean yellow mosaic India virus (MYMIV) resistance of *Vigna mungo* (urdbean) has high homology with the NB-ARC domain of other plant disease

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resistance proteins encoded by resistant (*R*) genes. Incidentally, orthologues of *VMYRI* have also been identified in MYMIV resistant lines of mungbean, PUSA 9072 and urdbean WBU 108 (AY301990, AY301991). While, *VMYRI* was not found in the MYMIV-susceptible varieties/lines of urdbean and mungbean tested so far. Circumstantial evidences suggest that perhaps the locus confers defense related response against MYMIV in *Vigna*. NB-ARC domain encoded by 221 *R*-genes of grain-legumes was extracted from GenBank and the divergent structural organization was analyzed.

Development of insect resistant plants: A crop management strategy (Dr. Sampa Das)

After establishing the efficacy of potent insect control agent, *Allium sativum* leaf lectin (ASAL) gene, has been expressed in mustard, tobacco, rice and chickpea. The molecular analyses using Southern, northern, western blot and C-PRINS techniques confirmed the integration and expression of transgene in host plants. The bioassay conducted with transgenic plant parts also established the efficacy of T_1 and T_2 plants to control respective insects. To unravel the mechanism of action of ASAL and cryIAC, receptor proteins of chickpea aphid (~ 38kDa) and pod borer (~ 68kDa) were purified and identified as homologues of *E.coli* outer membrane protein A and alkaline phosphatase of *Bombyx mori*, respectively.

Development of aphid tolerant *Brassica juncea* lines and new hybrid mushroom strains (Dr. Samir R. Sikdar)

Five aphid tolerant somatic hybrid progeny lines (BC1S1) have been developed through protoplast fusion between *Rorippa indica* (a wild crucifer) and *Brassica juncea* followed by back crossing of the somatic hybrid (?) with *B. juncea* (?) and subsequent selfing of the backcross progeny line. Other important agronomic characters besides aphid tolerance like early maturity, long pod with increased seed number, short to moderate height, and highly branched bushy habit have been noted in individual lines.

Six somatic hybrid lines between two edible mushroom strains *Volvariella volvacea* and *Pleurotus florida* have been raised through protoplast fusion. Fruit bodies have been raised from two out of 6 somatic hybrid lines.

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2. Pal L, Dasgupta B and Chakrabarti P. (2005) 3_{10} -Helix adjoining α -helix and β -strand: sequence and structural features and their conservation. *Biopolymers* 78, 147-162.
3. Banerjee T, Gupta S.K, Ghosh T.C. (2005) Towards a resolution on the inherent methodological weakness of the "effective number of codons used by a gene". *Biochem. Biophys. Res. Commun* 330, 1015-1018.
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7. Sahu K, Gupta S.K, Sau S and Ghosh T.C. (2005) Synonymous codon usage bias in 16 *Staphylococcus aureus* phages: Implication in phage therapy. *Virus Res* 113, 123-131.
8. Gupta S.K. Banerjee T, Basak S, Sahu K, Sau S. and Ghosh T.C. (2005) Studies on codon usage in *Thermoplasma acidophilum* and its possible implications on the occurrences of lateral gene transfer. *J Basic Microbiol* 45, 344-354.
9. Sahu K, Sau S, Mandal S.C, Ghosh T.C. (2005) Factors influencing the synonymous codon and amino acid usage bias in an AT-rich *P. aeruginosa* phage PhiKZ. *Acta Biochim Biophys Sin* 37, 625-633.
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11. Bagchi A and Ghosh T.C. (2006) Structural insight into the interactions of SoxV, SoxW and SoxS in the process of transport of reductants during sulfur oxidation by the novel global sulfur oxidation reaction cycle. *Biochem Chem* 119, 7-13.
12. Bagchi A and Ghosh T.C. (2005) Structural identification of a novel thioredoxin SoxS: prediction of the function in the process of transport of reductants during sulfur oxidation by the novel global sulfur oxidation reaction cycle. *Journal of Molecular Structure – Theochem* 758, 113-118.
13. Banerjee T, Gupta S.K and Ghosh T.C (2005) Compositional transitions between *Oryza sativa* and *Arabidopsis thaliana* genes are linked to the functional change of encoded proteins. *Plant Science* 170, 267-273.
14. Gupta S, Banerjee M, Poddar A, Banerjee A, Basu G, Roy D, Bhattacharyya B. (2005) Biphasic kinetics of the colchicine-tubulin interaction: role of amino acids surrounding the A ring of bound colchicine molecule. *Biochemistry* 44, 10181-10188.
15. Bagchi A, Roy D and Roy P. (2005) Homology modeling of a transcriptional regulator SoxR of the Lithotrophic sulfur oxidation (Sox) operon in alpha-proteobacteria. *J Biomol Struct Dyn* 22, 571-577.
16. Dastidar KG, Maitra S, Goswami L, Roy D, Das KP, and Majumder AL (2006) An insight into the molecular basis of salt-tolerance of L-myo-inositol 1-phosphate synthase (PcINO1) from *Porteresia coarctata* (Roxb.) Tateoka, a halophytic wild rice. *Plant Physiol* 140, 1279-1296.

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1. Sarkar, Pradip Kumar (2005). Electronic journal collection and its impact. (paper published in the XXV All India IASLIC Conference, 26-29 December, 2005, IIT Chennai, P.307-308).

SOPHISTICATED ANALYTICAL INSTRUMENT CENTRE

1. Dr. S.Chaudhuri, Nickel (II) and copper (II) complexes of tetradentate unsymmetrical Schiff base ligands; First evidence of positional isomerism in such systems.
2. S.Chattopadhyay, M. Sinha Ray, S.Chaudhuri, G.Mukhopadhyay, G.Bocelli, A.Cantoni, A.Ghosh. Inorg. Chim. Acta, 359 (2006) 1367-1375.
3. Arup Kr. Sen, PC Based Transistor Lead Identifier, Electronics For You, 38, 52-60 2006, February.
4. Arup Kr. Sen, Integrated Datasheet-cum-Documnet Archive, Electronics For You, 38, 108-114, 2006.
5. Arup Kr. Sen, RF Resonant Digital Micrometer, Proceedings of the Second National Control Instrumentation System Conference (CISCON 2005), Manipal, Karnataka, 114-117, 2005, November 11-12.

STUDENTS AWARDED WITH A PH.D. DEGREE

Name of Student (University, Year)	Department / Title of Thesis	Name of Supervisor
Biochemistry Department		
Rajashree Bhattacharya (JU)	Analysis of nonbonded interactions in protein structures	Prof. P. Chakrabarti
Suvroma Gupta (JU)	Tubulin-antimitotic drugs interactions: A mechanistic study	Prof. B. Bhattacharyya
Botany Department		
Debajyoti Ghosh (JU, 2005)	Aerobiology in relation to allergy with special reference to immunological and biochemical studies on pollen allergens	Dr. Swati Gupta-Bhattacharya
Sudarsana Biswas (JU, 2005)	Analysis of quality traits in rice with special reference to cooked kernel elongation.	Dr. T.K.Ghose
Tathagata Ray Chaudhuri	Development of aroma linked DNA markers in rice.	Dr. T.K.Ghose
Jolly Basak (PMCG).	Genetic analysis of YMV-tolerance in <i>Vigna mungo</i>	Dr. T.K.Ghose (Co-supervisor)
Chemistry Department		
Bhaswati Samanta (J.U., 2005)	Purification and Functional Characterization of Protein Kinase (PK-A) from Bovine Eye Lens	Prof. P.C.Sen Prof. K.P.Das
Ramkrishna Basak (J. U., 2005)	Studies on Indolic Substances – Synthesis and Reactions	Prof. Manas Chakrabarty

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Sandipan Sarkar (J. U., 2005)	Reactions and Synthesis of Condensed Heterocycles	Prof. Manas Chakrabarty
Kasturi Sarkar (C.U., 2005)	Studies on a hepatoprotective protein from a herbal source	Dr. P. C. Sil
Sudipa Saha (J.U., 2005)	A biophysical study on the molecular chaperone function of lens α -crystallin	Prof. K.P. Das
Asima Bhattacharyya (J.U., 2005)	Host cell signalling influenced by <i>Helicobacter pylori</i> and <i>Mycobacterium avium</i>	Prof. Manikuntala Kundu
Arunava Dasgupta (J.U., 2006)	Protein of the cell wall biosynthesizing machinery of <i>Mycobacterium avium</i>	Dr. Joyoti Basu

Microbiology Department

Anasuya Ray (JU, 2005)	Studies on biological control of bacterial wilt of tomato by introduction of antagonistic bacteria in the rhizosphere	Prof.P.K. Chakrabartty
Chandrajit Lahiri (JU, 2005)	Studies on a thiosulfate oxidation (Sox) gene locus in a sulfur lithotrophic bacterium	Prof. P.K. Chakrabartty

Plant Molecular and Cellular Genetics Section

Jolly Basak (J.U., 2005)	Genetical analysis of YMV-tolerance in <i>Vigna mungo</i> .	Prof. Amita Pal Dr. T.K.Ghosh
Malay Das (J.U., 2005)	Biotechnological approaches for clonal propagation and molecular characterization of few commercially important bamboo species	Prof. Amita Pal

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Indrajit Dutta (J.U, 2005)	Attempts to develop resistance in <i>Brassica juncea</i> (oil seed mustard) against <i>Lipaphis erysimi</i> (aphid) with <i>Allium sativum</i> (garlic) leaf lectin	Dr. Sampa Das
Pralay Majumder (J.U, 2005)	Comparative studies of the insecticidal activities of Alliaceae and Araceae lectins and determination of their mechanism of action on homopteran insect pests	Dr. Sampa Das
Anirban Chatterjee (JU, 2005)	Studies on cyanobacterial myo-inositol 1-phosphate synthase and its relationship with other myo-inositol 1-phosphate synthase(s)	Prof A.N.Lahiri Majumder

GRANTS-IN-AID SCHEMES

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Schemes Funded by CSIR		
Prof. B. Bhattacharyya	Biochemical & Biophysical Studies to establish tubulin as a molecular chaperon (terminated on 31.8.05)	Biochemistry
Prof. B. Bhattacharyya	Unusual binding properties of colchicines-tubulin interactions (Started on 02/12/05)	Biochemistry
Prof. Pratima Sinha	Identification of novel components of the budding yeast kinetochore and determination of the roles of MCM mitotic kinetochore proteins in meiosis	Biochemistry
Dr. R. Chattopadhyaya	Autodigestion & proteolysis studies of the lambda cI repressor & investigation of its RecA-mediated cleavage	Biochemistry
Prof. P. Chakrabarti Dr. G. Basu Co-PI, Biophys. Dept.	Theoretical and Crystallographic studies on protein-protein Interactions from 05/3/05)	Biochemistry
Dr. Subrata Sau	Studies on the structure-function relationship of the Repressor of the temperate mycobacteriophage L1 (Started on 01/06/05).	Biochemistry
Prof. K.P. Das	Role of N-terminal region of α -crystallin for its structure, stability and chaperone function – a biophysical and site directed truncation study (Started in November 2005).	Chemistry
Dr. Parames C. Sil	Purification and Characterization of a hepatoprotective protein from the Herb <i>Phyllanthus niruri</i> . (Terminated on 31.10.2005).	Chemistry
Dr. S. K. Das Gupta (2004-2007)	Investigation into the stimulatory effect of host factors on the origin binding activity of a mycobacterial plasmid replication protein.	Microbiology

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Investigator /
Co-investigator

Dr. Tapan K. Dutta

Title of scheme

Name of the
Dept./Section

Dr. Tapan K. Dutta	Microbial management of environmental Carcinogens : High molecular weight Polycyclic aromatic hydrocarbons.	Microbiology
Prof. Arun K. Ray	Studies on the specificity of estradiol-17beta binding protein (putative receptor) in different organs of silkworm, <i>Bombyx mori</i> L. (race Nistari).	Animal Physiology
Prof. Amita Pal Sp	DNA fingerprinting for identification of bamboo species and genotypes for IPR protection and conservation.	PMCG
Schemes funded by DBT		
Prof. Anuradha Lohia	Using bacterial toxins to arrest proliferation and Differentiation of the human pathogen <i>Entamoeba histolytica</i> . DBT, Indo-German Collaborative Project, 2004-07.	Biochemistry
Prof. Anuradha Lohia	Development of a product from <i>oxalis corniculata</i> for <i>E. histolytica</i> (Started on 06/12/05)	Biochemistry
Dr. Subrata Sau	Molecular cloning & Characterization of the antibiotic Inducible cisacting gene regulatory elements of <i>Staphylococcus aureus</i> and development of biological Assay systems.	Biochemistry
Prof. P. Chakrabarti	Analysis of protein structures and soft-computing in Functional annotation, chemogenomics and docking. (Started on 6-7-05).	Biochemistry
Prof. K.K. Mukherjee Prof. P.K. Saha Dr. D. Basu	Genotyping of cultivated jute and their wild relatives available at CRIJAF for cataloguing.	Botany
Prof. Swati Sen Mandi	Characterization and Improvement of Tea through Biotechnological Tools (a) National network Programmes) From 2001still continuing	Botany
Prof. D.N. Sengupta	Post harvest Biotechnology for Shelf Life of Tomato	Botany

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Prof. D.N. Sengupta	Analysis of ABRE-Based promoters activity and cloning of cDNA of ABRE-binding Transcription factor expressed in response To Salinity stress (a NETWORK project)	Botany
Prof. Parimal C.Sen in-collaboration with Dr. R.Bhadra (IICB)	Development of highly unsaturated marine lipids and ester and specific bioactive analogues for the treatment of some prevailing chronic disorder	Chemistry
Dr. Joyoti Basu	Role of lipoarabinomannan of <i>Mycobacterium tuberculosis</i> as a modulator of macrophage cell signaling (8.7.2003-7.7.2006)	Chemistry
Dr. Joyoti Basu (PI) Chemistry	Mechanisms of modulation of host cell signaling by RDI-encoded proteins of <i>Mycobacteria</i> (16.11.2005-15.11.2008)	Chemistry
Prof. M. Kundu (PI)	Polyphosphate kinase polyphosphate metabolism and its implication in mycobacteria And its implication in mycobacteria (15.3.2004-14.3.2007)	Chemistry
Prof. P.K. Chakrabartty Dr. Sujoy K. Dasgupta	Genetic organization of <i>Mesorhizobium ciceri</i> operon encoding components of iron acquisition system and possibility of development of improved biofertilizer increased symbiotic efficiency.	Microbiology
Dr.S.K.DasGupta (2005-2008)	Discovering mycobacterial drug targets through mycobacteriophage genomics.	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> .	PMCG
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
Schemes funded by DST		
Prof. Pratima Sinha	Cloning of yeast minichromosome maintenance genes MCM11, MCM12 and MCM13 and a Characterization of their roles in high fidelity chromosome transmission.	Biochemistry

Annual Report Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Prof. Anuradha Lohia PI / Coordinator	'Facility for genomics and proteomics at Bose Institute' IRHPA Scheme. from DST, 2005-1010 (Starting date May, 2005).	Biochemistry
Prof. M. Kundu Chemistry Dr. Joyoti Basu	Understanding mycobacteria- induced death signaling in the host macrophage (25.5.2005-24.5.2008).	Chemistry
Dr. G. Sa/ Dr. T. Das	Targeted inhibition of cell cycle phase specific signaling molecules to induce selective apoptosis in cancer cells	Animal Physiology
Dr. M. Roy (CNCI) Dr. T. Das/Prof. M. Siddiqi/ Prof. R.K. Bhattacharyya (CNCI)	Introduction of tumor cell apoptosis via modulation of protein kinase C and suppression of telomerase by natural polyphenols and isothiocyanates.	Animal Physiology
Prof.A.N.Lahiri Majumder	Comparative transcript analysis of <i>Oryza</i> & <i>Porteresia</i> during salinity stress through Microarray (DST/NSF)	PMCG
Prof. Amita Pal / Dr. D.N.Sengupta	Molecular analysis of differentiation in two cotyledons of <i>Vigna radiata</i> (31.12.2005).	PMCG
Scheme funded by FIRCA		
Prof. Anuradha Lohia	Replication control in <i>E. histolytica</i> FIRCA Grant from Fogarty International Centre, NIH.2005-2008 (Started on 1.7.05)	Biochemistry
Prof. Anuradha Lohia	Identifying cell cycle gene networks in <i>E. histolytica</i> FIRCA, NIH, USA 2006-2009 (Starting date 1.2.06)	Biochemistry
Schemes funded by ICMR		
Prof. M. Kundu (PI) Dr. Joyoti Basu Prof. Parul Chakrabarti Dr. Subrata Majumdar	Antigens and Immune response in tuberculous infections (15.3.2003-14.3.2006)	Chemistry
	An approach to immunotherapy against Visceral leishmaniasis (2005-2008)	Microbiology
Dr. Nripendranath Mandal	Quantification of the cytokines mRNA based on competitive RT-PCR	Immunotech

Investigator /
Co-investigator

Title of scheme

Name of the
Dept./Section

Scheme funded by DAE

Prof. M. Kundu (PI)
Dr. Joyoti BasuRegulation of cytokine/chemokine release from host cells by secreted antigens of *Helicobacter Pylori* (1.4.2005-31.3.2007).

Chemistry

Dr. Parames C. Sil

Hepatoprotective Protein from the Herb *Cajanus indicus* L: Signal Transduction Mechanism (May 2003 – 30.09.2006).

Chemistry

Dr. Subrata Majumdar

Modulation and intracellular mechanism of action of chemokines during leishmaniasis (Nov, 2003 -Mar, 2007).

Microbiology

Scheme funded by IFCPAR

Dr. Joyoti Basu (PI)
Dr. M. Kundu
Prof. Parul ChakrabartiABC Transporters of *Mycobacterium tuberculosis* (1.5.2004-30.4.2007).

Chemistry

Indo-US Scheme funded by DST (India) and NSF (USA)

Prof. Barun K. Chatterjee/
Prof. Suprakash C. Roy

Investigations on theoretical aspects of Compton scattering

Physics

Scheme funded by ISRO (RESPOND Programme)

Dr. Swapan K. Saha/
Prof. Sibaji Raha

Identification and characterization of passive detection materials for heavy ion detection.

Physics

Scheme funded by NTRF

Dr. T. Das/Dr. G. Sa

Evaluation of pro and antioxidant properties of Black tea in relation to regulation of mitochondrial death cascade in cancer and immune cells.

Animal
Physiology

Scheme funded by Indo Swiss Collaboration in Biotechnology

Dr. Sampa Das

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 at (i) the Katzir Conference on Molecular Perspectives on Protein-Protein Interactions, Eilat, Israel, November 6-10, 2005; (ii) the Guha Research Conference, Goa, November 24-28, 2005; (iii) National Symposium on Molecules, Interactions and Design: A Biophysical Perspective (IBS 2006), Kolkata, January 7-9, 2006; (iv) National Workshop on Application of Bioinformatics in Molecular and Structural Biology, Kolkata, February 23-24, 2006. Attended (v) the 71st Anniversary General Meeting of the Indian National Science Academy, Hyderabad, December 26-28, 2005; (vi) the National Bioinformatics Symposium, Mangalore, February 1-2, 2006; (vii) BITS Annual Coordinators' Meeting, Kasaragod, February 3-4, 2006.

Participation by Prof. P. Chakrabarti's group members. R.P. Saha, B. Dasgupta, M. Guharoy, D. Mukherjee presented papers at the National Symposium on Molecules, Interactions and Design: A Biophysical Perspective (IBS 2006), Kolkata, January 7-9, 2006. M. Guharoy delivered talks at National Workshop on Application of Bioinformatics in Molecular and Structural Biology, Kolkata, February 23-24, 2006.

Prof. A. Lohia (Biochemistry) Invited talk at Society for Biological Chemists meeting at CDRI, Lucknow, 8th Nov., 2005.

Prof. A. Lohia (Biochemistry) Invited talk at 29th All India Cell Biology Conference, ITRC, Lucknow, 17th – 21st January, 2006.

Dr. P. Parrack (Biochemistry) Attended and presented a poster entitled "Crystal Structure of lambda CII provides a clue to the recognition of direct repeat DNA by a protein" at the FASEB Summer Research Conference on "Mechanisms & Regulation of Prokaryotic Transcription" at Saxton's River, Vermont, USA (June 18-23, 2005)

Gave a talk entitled "Structural Studies on host and phage proteins likely to be involved in the lysis-lysogeny decision of bacteriophage lambda" at the Ninth Transcription Assembly meeting, CCMB, Hyderabad, September 17th-19th, 2005.

Delivered a talk "Structure of λ CII: Implications for recognition of direct-repeat DNA by an unusual tetrameric organization" at the Symposium on Macromolecular Crystallography, CDFD, Hyderabad, November 15th-16th, 2005.

Attended the Guha Research Conference at International Center, Goa, November 24-27, 2006, as an invitee, and gave a talk "The structure of lambda CII, a transcription activator that binds DNA direct repeats."

Dr. D. Roy (BIC) participated in the Training Program on Accelrys Discovery Studio software, held at the Bioinformatics Centre, University of Pune, March 15-17, 2006.

Dr. R. Bhattacharyya, Surajit Basak, Pamela Mukhopadhyay and S. Sonavane (BIC) attended the National Symposium on Molecules, Interactions and Design: A Biophysical Perspective (10-12, 2006), Kolkata, January 7-9, 2006. Dr. R. Bhattacharyya and Surajit Basak delivered talks at the National Workshop on Application of Bioinformatics in Molecular and Structural Biology, Kolkata, February 23-24, 2006.

Pamela Mukhopadhyay (BIC) delivered a talk at "National Bioinformatics Symposium" organized by DBT Bioinformatics Center, Animal and Fisheries Sciences University, Mangalore, February 1-2, 2006.

Prof. S. Sen-Mandi (Botany) (i) Chaired a session at the Orientation Programme for 2006 Indian Fulbright Grantees, 17th May 2005. (ii) Participated as an invitee at a workshop on Conservation of Biodiversity: Current issues and challenges in West Bengal, West Bengal Pollution Control Board, Department of Environment, Government of West Bengal, June 10-11, 2005. (iii) Delivered the Professor S. M. Sircar Memorial Lecture 2005, Botanical Society of Bengal, 31st May 2005.

Prof. D.N. Sengupta (Botany) (i) Biodiversity, Biotechnology and Biosafety, Organized by Vidyasagar College, Kolkata on 26th February 10-11, 2006; (ii) Delivered a lecture on Expression of ABRE-Binding factor in rice in response to salinity stress on March 22nd in the symposium on Conservation of Biodiversity: Current issues and challenges in West Bengal, West Bengal Pollution Control Board, Department of Environment, Government of West Bengal, June 10-11, 2005. (iii) delivered a lecture on Overexpression of Samdecaboxylase in Tobacco plants and effect of polyamine enhancement against Salinity Stress in a symposium entitled "Transgenic Plants : Prometheus Unbound" on 26th March, 2006 at the Department of Biophysics, Molecular Biology, and Genetics.

Dr. Swati Gupta-Bhattacharya (Botany) (i) Participated in the 15th Annual General Meeting & a 2 day seminar on Perspectives in Environmental Management, held at Central Glass and Ceramic Research Institute, Kolkata, 25-26 November, 2005. (ii) participated and chaired a session in the "National Conference on Plant and Microbial diversity: Prospects and Potentials" held in Visva-Bharati, Shantiniketan, India, 17-19 December 2005. (iii) was invited as a speaker in a one day seminar on "Homeopathy: Zero molecules through Macromolecules" and also chaired a session in the same seminar at the Taj Bengal Hotel in Calcutta on 19th February 2005.

Dr. T.K. Ghose (Botany) was invited to talk on An attempt at understanding biodiversity. State Level Symposium on Biodiversity. Organized by Vidyasagar College, Kolkata.

Mr. Avik Ray (Botany) working as SRF under Dr. Sabita Bhattacharya has participated and presented Posters in (1) International Conference on Plant Genomics & Biotechnology : Challenges and Opportunities held on 26 - 28 Oct, 2005, in the Indira Gandhi Agricultural University, Raipur, Madhya Pradesh; (2) National Conferences on Forest biodiversity resources : Exploitation, conservation & management, held on March 21 - 22, 2006, in Madurai Kamraj University, Madurai, TamilNadu.

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Dr. Dola Boral, Jyotshna Mandal and Himadri Shekhar Chakrabarti (Botany) working under Dr. Swati Gupta Bhattacharya participated in the 15th Annual General Meeting & a 2 day seminar on Perspectives in Environmental Management, held at Central Glass and Ceramic Research Institute, Kolkata, 25-26 November, 2005.

Dr. Dola Boral and Jyotshna Mandal (Botany) participated and presented a paper in the "National Conference on Plant and Microbial diversity: Prospects and Potentials", held in Visva-Bharati, Shantiniketan, India, 17-19 December 2005.

Moumita Gangopadhyay (Botany) participated and presented poster in National Conference on Forest biodiversity resources : Exploitation, conservation & management held on 21 - 22 March, 2006 in the Madurai Kamraj University, Madurai, TamilNadu. She stood second position for her poster.

Prof. Parimal C. Sen (Chemistry) attended Intel Science Fair, Mumbai, April 2005; he presented a paper at 11th International ATPase Conference and 59th Annual Meeting and Symposium of the Society of General Physiology at Woods Hole, USA during September 6-11, 2005; DBT Group monitoring workshop at New Delhi in February 2006.

Prof. Manas Chakrabarty (Chemistry) participated in (i) the Seminar on New Perspectives in Physical Chemistry Curriculum held at the Department of Chemistry, University of Calcutta, Kolkata on Feb. 08, 2006 and (ii) the 3rd National Symposium on Organic Chemistry (NSOC-III) held at the Department of Chemistry, Jadavpur University, Kolkata on Feb. 22-23, 2006.

Dr. Joyoti Basu (Chemistry) attended the XXIX All India Cell Biology Conference & Symposium on Gene to Genome: Environment and Chemical Interaction from January 18-20, 2006 at Industrial Toxicology Research Centre, Lucknow as Treasurer of the Indian Society of Cell Biology; She attended and presented a progress report in the Indo-French Mid-Term Review Meeting of IFCPAR in Kochi on 20-21 October, 2005;

Dr. Joyoti Basu (Chemistry) attended and delivered a lecture in the workshop entitled "Approaches to understanding the biology of *Mycobacterium tuberculosis* : targeting the cell division machinery and modulators of the innate immune response" arranged by Indo-Swedish Research links, at Indian Institute of Science, Bangalore in March, 2006.

Prof. Manikuntala Kundu (Chemistry) presented a paper in the 2nd Gordon Research Conference on "Multi-drug efflux systems" from August 28 to September 2, 2005.

Tanusree Sengupta and Srabasti Ghoshal (Chemistry) attended and presented paper in the Symposium of the Society of Biological Chemists (India), Kolkata Chapter in April 2005 at Calcutta University.

Posters were presented by (i) Sulakshana Karmakar (Chemistry) in the 2nd International Symposium on Green/Sustainable Chemistry held at Delhi University in Jan., 2006, (ii) Taraknath Kundu and Ajanta Mukherjee (Chemistry) (separately) in the Joint International Conference on A.O.C.C.B.

held at I.I.C.T., Hyderabad during Jan. 11-12, 2006, (iii) Ratna Mukherjee (Chemistry) in the N.S.O.C.-III held at Jadavpur University (where T. Kundu, S. Karmakar and A. Mukherjee also participated). Also, T. Kundu, S. Karmakar, A. Mukherjee and R. Mukherjee participated in the 3rd CRSI Symposium at IIT, Kharagpur and the Symposium in Instrumental Techniques at the University of Calcutta, and A. Mukherjee and R. Mukherjee in the National Seminar held at Asutosh College, Kolkata.

Dr. Subrata Majumdar (Microbiology) delivered an invited lecture 'at Molecular Immunology Forum Meeting-2006 at Bhubaneswar in January 27-30, 2006 on Role of Chemokines in the disease process.

Dr. Subrata Majumdar (Microbiology) attended as a guest speaker in UGC sponsored seminar at Rastraguru Surendra Nath College at Barrackpore in February 23-24, 2006 on Free radical generation and leishmaniasis

Prof. S.C. Roy (Physics) visited University of Pittsburgh, USA for six weeks in connection with the Indo-US collaborative programme on Compton scattering during May-June, 2005. Prof. S.C. Roy delivered a keynote address in the International Conference on Innovation and Technology Management at CGCRI, Kolkata during February 3-5, 2006.

Prof. Indrani Bose (Physics) delivered an Enrichment Lecture on Magnetism: an overview in the C. K. Majumdar Memorial Summer Workshop on Experimental Physics organised by the Indian Association of Physics Teachers at the Scottish Church College, Kolkata on 9. 6. 05; delivered an invited talk on The Quantum Dream: From Magic to Reality in Meeting on World Year in Physics at Bethune College, Kolkata on 23.9.05; delivered an invited talk on Novel Quantum Phenomena in High Magnetic Field in Workshop on Application of high magnetic field and low temperature in condensed matter physics at IUCDAE, Kolkata on 6/9/05; delivered an invited talk on Quantum Entanglement in Magnetic Solids in Meeting on Recent Trends in Magnetism and Condensed Matter Physics at IACS, Kolkata on 23.12.05; delivered an invited talk

on Quantum Miracles: Challenges, Reality and Prospects in Meeting on World Year of Physics at Lady Brabourne College, Kolkata on 19.11.05; delivered an invited talk on Why Gene Copy Number Matters in the New Biology Section of the 93rd Indian Science Congress at Hyderabad during 3-7.1.06; delivered an invited talk on Cell Division Cycle: A Systems Biology Perspective in Meeting on Systems Biology organised by JNU and Delhi University, Delhi during 12-13.3.06.

Prof. Dipankar Home (Physics) visited Centre for time, and Dept. of Mathematics, Macquarie University, Sydney, Australia during 15 July – 17 August 2005 for research collaboration and gave an invited talk at an International Conference on Time-symmetric approaches to Quantum Mechanics, during 23-26 July 2005.

Prof. B.K. Chatterjee (Physics) participated in the seminar on Physics in the trails of Einstein at Saha Institute of Nuclear Physics during November 21-22, 2005.

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Dr. Swapan K. Saha (Physics) delivered a talk at the 29th International Cosmic Ray Conference in Pune, India during August 03 – 10, 2005; delivered a talk in the 1st Workshop on Astroparticle Physics & Space Science in Darjeeling, India during November 3 – 5, 2005.

Dr. T. P. Sinha (Physics) presented three papers in the symposium Condensed Matter Days-2005 held at Berhampur University, Berhampur during August 29-31, 2005; attended the one day Symposium on Physics of Materials held at Saha Institute of Nuclear Physics, Kolkata on September 19, 2005; presented three papers in the Annual DAE Solid State Physics Symposium held at Bhabha Atomic Research Centre and Tata Institute of Fundamental Research, Mumbai during December 5-9, 2005; attended the SERC school on Condensed Matter Physics at Saha Institute of Nuclear Physics, Kolkata from 2nd to 31st January, 2006; gave an invited talk on Dielectric Relaxation in Disordered Perovskite Oxides in the National Conference on Advances in Electronic Materials and Devices held at Guru Ghasidas University, Bilaspur during March 5–6, 2006.

Dr. Sanjay K. Ghosh (Physics) served in the organizing committee of First Workshop on Astroparticle Physics and Space Sciences during 3-5 November, 2005 at Bose Institute, Darjeeling and delivered a talk on "Why look for strangelets in cosmic rays"; acted as a resource person in the "Fourth foundation training programme for Scientists & Technologists" of IIPA, Delhi during 15-18 November, 2005 and delivered a talk on "Centre for Astroparticle Physics and Space Sciences – A National Facility at Bose Institute"; participated in a IX Workshop on high energy physics phenomenology held at Institute of Physics, Bhubaneswar, January 3-14, 2006.

Rupa Sarkar (Physics) attended and presented a poster in Sixteenth National Symposium on Radiation Physics (NSRP-16) at Meenakshi College, Chennai during January 18-20, 2006. Rupa Sarkar attended and presented a poster in Condensed Matter Days (CMDAYS-05) at Berhampur University, Berhampur during August 29-31, 2005. Rupa Sarkar participated in Demonstration and Interactive Workshop on "Innovative Experiments" at Maharaja Manindra Chandra College on July 16, 2005. Rupa Sarkar participated in the seminar on Physics in the trails of Einstein at Saha Institute of Nuclear Physics during November 21-22, 2005.

Prasanna K. Mondal (Physics) attended and presented a poster in Sixteenth National Symposium on Radiation Physics (NSRP-16) at Meenakshi College, Chennai during January 18-20, 2006. Prasanna K. Mondal attended and presented a poster in Condensed Matter Days (CMDAYS-05) at Berhampur University, Berhampur during August 29-31, 2005. Prasanna K. Mondal participated in Demonstration and Interactive Workshop on "Innovative Experiments" at Maharaja Manindra Chandra College on July 16, 2005. Prasanna K. Mondal participated in the seminar on Physics in the trails of Einstein at Saha Institute of Nuclear Physics during November 21-22, 2005.

Prof. Arun K. Ray (Animal Physiology) attended 93rd Indian Science Congress held at A.N.Ranga Agricultural University, Hyderabad in January, 2006.

Dr. Gaurisankar Sa (Animal Physiology) received travel award and delivered invited lecture at 7th International Symposium on Cytokines and Chemokines held at Montreal, Canada in September 2005. Dr. Sa was invited to deliver a talk in 1st International Conference BioMicroWorld at Badajoz, Spain, in 2005. Dr. Sa delivered invited lecture in International symposium on translational research: Apoptosis and cancer held at Trivandrum in December 2005 and invited special lecture in 93rd Indian Science Congress held at A.N. Ranga Agricultural University, Hyderabad in January, 2006. Dr. Sa also delivered invited talks (live-on-phone) on "Health benefits of Spices" in February, 2006, and on Cancer: Myth and reality" in March, 2006 in Gyanbani, Radio FM, Kolkata.

Dr. Tanya Das (Animal Physiology) delivered invited lecture in International symposium on translational research: Apoptosis and cancer held at Trivandrum in December, 2005 and invited special lecture in 93rd Indian Science Congress held at A.N. Ranga Agricultural University, Hyderabad in January, 2006. Dr. Das also delivered invited talks (live-on-phone) on Health benefits of spices in February, 2006, and on Cancer: Myth and reality in March, 2006 in Gyanbani, Radio FM, Kolkata.

Dr. Nripendranath Mandal (Environmental Sciences) has presided over as chairman of session and delivered a talk on "Disease management of Giant black tiger shrimp (*Penaeus monodon*)" at National Seminar on Biomedicine in Aquaculture March 17- 18, 2006 Organized by Centre for Marine Science and Technology, Manonamiam Sundaranar University, Marine Campus, Rajakkamanglam - 629 502, Kanyakumari District, Tamil Nadu.

Prof A.N.Lahiri Majumder (PMCG) delivered invited talk in the meeting of the Indian Academy of Sciences at Bangalore, in July, 2005 ; International meeting on Stress Biology at BARC in December, 2005 ; delivered Key Note address in the Abiotic stress conference at the Institute of Life Sciences at Bhubaneswar ,in March, 2006.

Prof. Amita Pal (PMCG) delivered an invited talk on "Identification of new motifs within the NB-domain of plant *R* genes in the family Fabaceae: Probable mechanism of integration of 'GVCP' signatures and their maintenance in the host species" in the International Conference on Plant Genomics and Biotechnology: Challenges and Opportunity, held at Raipur from October 26th to 28th, 2005. She has also participated in the National Symposium on Plant Biotechnology, new Frontiers and the 27th Annual Meeting of PTCA held in Lucknow from 18th to 20th November, 2005. She has invited to delivered an plenary talk on "Sequence specific primer amplified polymorphisms: An approach towards marker development to screen Begmovirus resistant genotypes of *Vigna*"; and chaired a Scientific session on Biotic and Abiotic Stress Tolerance in Plants, Agricultural and Microbial Biotechnology in the International Symposium on Frontiers in Genetics and Biotechnology-Retrospect and Prospect held at the Osmania University, Hyderabad from 8th to 10th January, 2006.

Dr. Sampa Das (PMCG) Participated and presented paper on "*Allium sativum* leaf lectin is antagonistic towards economically important aphids." in 7th International Symposium on Aphids

at Fremantle, Australia during 2-7th October, 2005. She has also participated and presented paper on "Mannose binding *Allium sativum* leaf lectin expression in chickpea for sap sucking insect pest resistance" in 4th International Food Legumes Research Conference at IARI, New Delhi during 18-22nd October, 2005. She has presented the progress report in Indo Swiss Collaboration in Biotechnology, Pulse Network meeting at ICRISAT during 2-5th February, 2006. She presented paper on "*Allium sativum* leaf lectin, a potent sap feeding insect control protein expressed in rice and mustard " in the National Conference on "Role of Plant Physiology and Biotechnology in Biodiversity Conservation and Agricultural Productivity", organized by the University of Rajasthan, Jaipur during 24 - 26th February, 2006.

Dr. S.R. Sikdar (PMCG) participated and Ms. Uttara Bhattacharyya presented a paper on "Development and characterization of somatic hybrids raised through protoplast fusion between edible mushroom strains *Volvariella volvacea* and *Pleurotus florida*" in the International Symposium on Agriculturally important micro-organisms: Conservation, utilization, bioremediation and ecological significance, organized by the Indian Mycological Society and the Department of Botany, University of Calcutta, Kolkata from 23-25th February, 2006.

Dr. Arun Chakraborty (Library) presented a talk in the seminar on : "Digital Archiving Systems : A Comparative Analysis" on December 27th, 2005 at the National Library of Medicine, Bethesda, Maryland, USA..

Dr. Arun Chakraborty (Library) Delivered a talk in the seminar on "Digital Archiving Systems and Open Archives" on January 20, 2006 at the Seminar Room of the Center for Human-Computer Interaction, Digital Library Research Laboratory, Virginia Tech, Blacksburg, USA.

Dr. S.Chaudhuri (SAIF) attended a meeting of SAIF personnel involved in XRF and XRD held at the behest of DST at SAIF, Chennai in September, 2005.

Mrs. Tanima Modak Dhar (SAIF) presented poster paper at International Symposium on Medicinal Plants and Herbal Products in Biomedicine and their efficacy in the Present Era & XXVI Annual Conference of Indian Association of Biomedical Scientists, November 25-27, 2005 Organised by SN Pradhan Centre of Neurosciences, University of Calcutta.

Sri Jaydeb Chatterjee (SAIF) took classes on 'Techniques & Applications of Fluorescence Spectroscopy' to the college teachers under UGC-Refresher course during February, 2006.

Invited talks delivered at various Organizations

Prof. P. Chakrabarti (Biochemistry) Delivered a talk at the University of Tel Aviv, Israel, November 3, 2005.

Dr. Parrack (Biochemistry) Delivered a lecture entitled "Lysis-lysogeny switch in bacteriophage λ : A complex regulatory network involving proteins from the phage and the host" at Tufts University School of Medicine, Boston on June 16th 2005, and a seminar "Crystal Structure of λ CII provides a clue to the recognition of direct repeat DNA by a protein" at the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, July 8th 2005.

Prof. Parimal C. Sen delivered an invited talk at Worcester Institute of Technology, Boston, USA in September 2005.

Prof. Manas Chakrabarty (Chemistry) delivered Invited Lectures in (i) the 3rd C.R.S. Symposium (Kolkata Chapter) held at the I.I.T., Kharagpur on August 06, 2005, (ii) the U.G.C. sponsored National Seminar on Green Chemistry and Environment held at Asutosh College, Kolkata during December 19-20, 2005, (iii) the IUPAC-sponsored 2nd International Symposium on Green/Sustainable Chemistry held at the University of Delhi, Delhi during January 10-13, 2006, (iv) the 42nd Annual Convention of Chemists of the Indian Chemical Society, Kolkata held at Visva-Bharati, Santiniketan during Feb. 9-13, 2006, (v) (as a Resource Person), the U.G.C. sponsored Refresher Course on Analytical Instruments and Their Applications held at the Department of Instrumentation Science (in collaboration with Academic Staff College), Jadavpur University, Kolkata during Jan. 30-Feb. 18, 2006 and (vi) the Symposium on Instrumental Techniques in Chemistry arranged by the C.A.S. on Natural products, Department of Chemistry, University of Calcutta, Kolkata on March 28, 2006.

Dr. Subrata Majumdar (Microbiology) delivered an invited talk at Leishmania Journal Club, Indian Institute of Chemical Biology, Kolkata on March 15, 2006 on Protective role of Chemokines against visceral leishmaniasis.

Dr. Subrata Majumdar (Microbiology) delivered an invited talk at the Dept. of Biotechnology and Institute of Management at Burdwan University, Burdwan on Sept., 15, 2005 on the Role of Protein Kinase C during leishmaniasis.

Dr. Subrata Majumdar (Microbiology) delivered an invited talk at the Dept. of Physiology, Vidyasagar University, Midnapore, Dec.2, 2005 on unusual role of lipoarabinomannan.

Prof. Indrani Bose (Physics) delivered an invited colloquium on Some novel aspects of Gene expression: theory and experiment at T.I.F.R., Mumbai on 18.7.05; delivered six lectures on Magnetism: interactions, order and disorder at the SERC School on Condensed Matter Physics held at SINP, Kolkata during January 2006.

Dr. Sanjay K. Ghosh (Physics) delivered an invited talk at Institute of Physics, Bhubaneswar, during September 3, 2005, on "QCD phase transition in rotating compact star"; delivered an invited talk at Variable Energy Cyclotron Centre, during September 2005, on "A search for strange matter in Rotating compact stars : QPO & GRB";

Dr. T.C. Ghosh (BIC) delivered an invited talk in the XXIX All India Cell Biology Conference and Symposium on January 19, 2006 at Lucknow.

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Prof. Arun K. Ray (Animal Physiology) delivered invited special lectures in Department of Human Physiology and in Department of Medical Biology and Laboratory Techniques, Vidyasagar University, Midnapore, in March, 2006.

Dr. Gaurisankar Sa (Animal Physiology) gave special lecture at the Department of Immunology, the Cleveland Clinic Foundation, Ohio, USA in November 2005.

Honours received

Prof. B. Bhattacharyya (Biochemistry) Received the Biresh Chandra Guha Memorial Lecture award (INSA)

Prof. P. Chakrabarti (Biochemistry) has been elected a Fellow of the Indian National Science Academy, New Delhi; received the Prof. Y.T. Thathachari Prestigious Award for Science 2005.

Prof. A. Lohia (Biochemistry) received Stree Shakti Science Samman Award 2005 for excellence in science and service to society.

Prof. Parimal C. Sen (Chemistry) has been elected Council Member, Indian Chemical Society (2006-08).

Prof. K.P. Das (Chemistry) has been elected fellow of the National Academy of Sciences India, Allahabad in 2005 for contribution in Biophysical Chemistry of Proteins. He also has been selected co-editor of the International Journal: Journal of Surface Science and Technology.

Dr. Joyoti Basu (Chemistry) has been elected Fellow of the Indian Academy of Sciences, Bangalore and also elected Treasurer of the Indian Society of Cell Biology.

Prof. Amita Pal (PMCG) has been elected Fellow of the Indian National Academy of Science (FNASc.) Allahabad.

Dr. Arun Kumar Chakraborty (Library) has been awarded "Fulbright Research Scholar ship" 2005-2006. of USA.

Dr. Arun Kumar Chakraborty (Library) has been elected as one of the Joint Secretary of the Indian Association of Special Libraries and Information Centre (IASLIC), Kolkata for the year 2006 and 2007.

Sri Pridip Kumar Sarkar (Library) has received a certificate of honour from IASLIC, Kolkata in recognition of his admirable initiative, imagination, creativiity and interest for the development and modernisation of Library & Information Service profession in India.

Service Department

Bioinformatics Centre

The Bioinformatics Centre of Bose institute was established in 1988 as one of the ten nodes 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.

Conservation of residues in protein-protein interfaces and hot spots for binding (Prof. P. Chakrabarti).

The protein-protein interfaces have been dissected into a core region surrounded by a rim. The sequence entropies of the residues comprising the core are smaller than those in the rim, indicating the importance of residues in the core, which also contain most of the hot spots for binding. To a good approximation there is a correlation between the accessible surface area lost because of complexation and $\Delta\Delta G$ values obtained through alanine-scanning mutagenesis for residues located in the core, a relationship that is not discernable for rim residues.

Genomic adaptation of microorganisms at high temperature (Dr. T.C. Ghosh).

Evolutionary forces for temperature adaptation of DNA and RNA molecules have been identified by comparing large number of genome sequences having widely different growth temperatures. It has been demonstrated that elevated growth temperature imposes selective constraints not only on nucleic acid level but also affects the stability of codon-anticodon interaction.

Studies on synonymous codon and DNA base composition in relation to the dynamics of genome evolution. (Dr. T.C. Ghosh).

Role of evolutionary forces in shaping base composition and codon usage variation within and between organism(s) have been elucidated in different organisms. Comparative genome analysis of both prokaryotic and eukaryotic organisms led us to conclude that natural selection is the main driving force for the genome-wide nucleotide bias in protein evolution.

Global analysis of codon and amino acid usage in diverse array of viruses: Implications in therapy (Dr. T. C. Ghosh and Dr. S. Sau).

Codon and amino acid usage analyses had been carried out in the genomes of bacterial viruses infecting *E. coli*, *S. aureus*, *M. smegmatis*, *P. aeruginosa* and in Mimivirus.

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a virus of *Acanthamoeba polyphaga*. Analyses have helped in understanding the architectures, functions and evolutions of the genes/genomes of viruses infecting the above organisms. In addition, based on our study and other studies, we proposed that three viruses out of 16 staphylococcal viruses considered in our study could be inducted in phage therapy.

Identifying drug targets and structure based drug design for human parasites (Dr. D. Roy).

Over the past several years structure-based design has emerged as a new tool in medicinal chemistry. This method requires a predetermined crystal structure of the target protein or its model derived from the crystal structure of a closely related protein. The features of the active site of the target protein can be used to generate new ideas about ways of improving an existing ligand or of developing new one with better affinity and selectivity. Glycolysis is considered as a promising target for new inhibitor design against different protozoan parasites. Structure-based drug design approaches are applied to design compounds that inhibit the glycolytic enzymes of the parasites without affecting the corresponding proteins of the human host.

J C Bose Centre

J. C. Bose Centre has a valuable collection of documents and photographs of Acharya J. C. Bose. The instruments designed and fabricated by him and the books, published during his lifetime and also by the Bose Institute Publication Department after his demise are displayed. The Centre has kept this collection in good shape and is trying to add some other precious documents to its collection. J. C. Bose centre took the responsibility of the duplication of J. C. Bose's microwave apparatus and crescograph with the help of the workshop of Bose Institute for providing the replica to other Research Institutes / Universities who requested for it.

During the current year a large number of visitors both from Kolkata and outside visited the Centre. The visitors were not only eminent scientists, but people from all walks of life including enthusiastic school children. Visitors' book revealed their impression about J. C. Bose.

Another important work has been undertaken by the J. C. Bose Centre. The first floor of late Prof. D. M. Bose's residence is littered with the belongs of the versatile scientist. The J. C. Bose Centre has started the work of classification and cataloguing the books, journals and papers of Prof. D. M. Bose. Documentation of the items of the historical importance is under process.

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. It

is being upgraded / equipped with state-of-the-art facilities and technology infrastructure. endeavours to provide 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 37,44,31,03,2006. During this year library subscribed to 207 numbers of foreign and Indian periodicals out of which, print 93, online 114 and a few Print Journals are also available online. Library also subscribed to online-only full-text journals of different academic societies such as ASM, ACS, Life sciences reviews, cell press journals of Elsevier etc. The library has also added full-text databases of H.W. Wilson and SCOPUS; the largest abstract and citation database of research literature and quality web sources of Elsevier. During the year, 1749 readers used the Library (both campus) for their reference work. 38 permission cards were issued to the outside researchers / faculty members in and around Kolkata. Under Inter Library Loan System books / journals were issued to other institutions and also books / journals were taken on loan from different academic institutions for our researchers. Photocopy services from BI resources are provided to outside users. A total 1,40,352 pages of photocopying (Xerox) services were given to our faculty and outside users. Some 543 bound volumes of books / journals and 2251 loose periodicals were issued by our research scholars and faculty members throughout the year for their reference work.

Since 2004 the library has extended a scanning facility to faculty and researchers of the Institute. More than 60 documents were scanned for faculty members as well as research scholars and more than 1028 hours computer / internet used for accessing in full-text subscribed / free journals by the scholar from the Library itself. The Library has started online services for the faculty members and research scholars. This year library has subscribed to more than 114 journals Full-text online. Network access is possible from BI nodes is centralized access area of both campus Library. Access is also available from faculty members' desktop computers. The activities towards automation of library have been continued from previous years. Till date library has created following databases (i) Theses : Database of thesis at BI Library, (ii) BIL-JR : Database of Journal holdings at BI Library (iii) Books. The journal database is up-to-date. All new books are searchable from Book database, old books data entry are also in process. Library has engaged project staff for computerization and automation. A complete and up-to-date "Periodicals Holdings of BI Library - 2004" was compiled and sent to all the leading National and International organizations for effective resource sharing. 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 coming year. In March, 2006, library has launched Digital Archiving System of Bose Institute collection in D-space (<http://202.141.148.30:8080/dspace>).

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Madhyamgram Experimental Farm

The following scientists utilized the facilities of the farm for growing their crops.

Name of the Scientists	Name of the crops grown / facility availed by the Scientists
1. Prof. A.N. Lahiri Majumder	Paddy, mustard
2. Prof. K.K. Mukherjee	Palong, pointed gourd
3. Prof. P.K. Saha	Taphrosia, beans
4. Dr. Amita Pal	Vigna moonga, V. radiata
5. Dr. D.N. Sengupta	Vigna, groundnut, paddy
6. Dr. Sampa Das	Mustard, mushroom
7. Dr. S.R. Sikdar	Mustard, tomato
8. Dr. Debabrata Basu	Mustard, tomato
9. Dr. Paramesh Sil	Arahar
10. Dr. Swati Gupta Bhattacharya	Pollen traper

The enhanced power supply for the new laboratory and other requirement of the farm has been installed. The Task Force for the development of Madhyamgram, initiated to set up the facilities like transgenic green house facility and insect house adjacent to the laboratory building. Steps have been taken to install a deep tubewell to provide sufficient water for cultivation. Necessary street lights arrangement has been taken for consideration. The new laboratory building is ready for use pending final inspection by the authority.

Publication

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 Report; Folders; Posters and Leaflets of different Symposia, Seminars and Training Programmes and works of Sir J. C. Bose. Soft copy of Annual Report, Technical Reports and BI News are available in the net (boseinst@ernet.in). The following books 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 Rs.1500.00; Vol-V Rs.550.00; Patrabali (Bengali) Rs.150.00; Acharya Jagadis Chandra Bose (Bengali) Rs.12.00 and Picture Post Cards (five sets) Rs.125.00 and Abyakta (Bengali book written by Sir J.C. Bose Rs.50.00).

Sophisticated Analytical Instrument Facility (SAIF)

The Sophisticated Analytical Instrument Facility (SAIF) (formerly known as Regional Sophisticated Instrumentation Centre) at Bose Institute is one of the first four such facilities established by the Department of Science & Technology, Government of India, in the 1970s and is now 30 years old. During the year this facility continued providing instrumental services to different users from educational Institutions, Government R&D and Industry. It has also provided consultancy to the R&D personnel from academia and industry. Major funds for acquiring new instruments, spares and accessories are provided by the Steering Committee set up by DST while the manpower and infrastructural support for maintaining the instruments are provided by the host institution.

With adequate support provided by the host institution in the way of improving the infrastructures and providing funds for the maintenance of some of the major instruments/accessories it has been possible to improve the performance of the facility during the year.

During the year we have participated in a USG-Refresher course on Analytical Instruments and their application for University and College teachers, organised by Jadavpur University during February, 2006, by way of giving training on instruments like TEM, GC, AAS, EPR etc.

Instrument utilisation

Name of Instrument	No. of samples		Revenue earned Rs.
	Extn.	Int.	
Atomic Absorption Spectrophotometer	995	440	92,075/-
Spectrofluorimeter	37	—	1,480/-
Transmission Electron Microscopy	35	6	12,900/-
Gas Liquid Chromatograph	57	7	3,800/-
Single Crystal X-ray Diffractometer	5	2	4,250/-

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	REQUISITION RECEIPTS	JOB DISCHARGED	CONTINUING JOB
MECHANICAL	113	95%	5%
ELECTRICAL	771	95%	5%
CARPENTRY	59	98%	2%
REFRIGERATION	50	95%	5%
DRAFTING	50	100%	Nil
LECTURE & SEMINARS ATTENDED	Above 350	100%	Nil
EPABX UNIT	83	100%	Nil

Workshop has successfully completed the Co2 Assimilation Chamber at a project value of Rs.2.14 lack only for Central Research Institute for Jute & Allied Fibres, Nilganj, Barrackpore and workshop has also obtained a new project from West Bengal University of Technology for construction of 2 nos. special type Gel Apparatus at a project cost of- Rs.30,000/- only, BF-142, Saltlake, Sector-1 Kolkata 700064.

List of personnel

Administration

Prof. M. A. Siddiqi (Director) upto 31.12.2005.

Prof. B. Bhattacharyya (Acting Director) upto 26.02.2006.

Prof. S. Raha (Director) from 27.02.2006

Sri Birendra N. Sing – Registrar (under suspension)

Tushar Kanti Ghorui (Acting Registrar and Deputy Registrar)

Kazal Chaudhuri (Asstt. Registrar I), Ram Krishna Kundu (Asstt. Registrar II), Debidas Saha (Asstt. Registrar III), Satyananda Pal (Accounts Officer), Saktipada Shit (Audit & Finance Officer).

Supporting Staff, Centenary Campus: PAs to Director: Arup Kr. Sengupta, Sankar Nath Sinha; Accountants: Prasanta Kr. Barman, Tushar Kanti Mukherjee, Satrajit Kar (Retired on 28-02-2005), Subir Sen, Ashis Chakraborty, Parimal Ch. Das; Cashier: Tapan Chakraborty, Officer Superintendents: Ankur Dutta, Nikhilesh Roy Ghatak, Madhusudan Mitra, Amit Kr. Ghosh, Rina Roy; Others: Elizabeth Pal, Swapan Kr. Sinha, Ram Raj Pandey, Dhrubajyoti Sen, Sujit Kr. Ghosh, Bidyut Kr. Mondal, Manick Ch. Das, Rita Nath (Retired on 31-08-2004), Sisir Chakraborty, Baladeb Goswami, Rubi Sarkar, Sudam Jana, Rina Das, Somnath Das, Sujata Roy, Satya Chatterjee, Ramesh Chandra Sarkar, Dipak Dutta, Chotelal Rangwa, Kamalendu Sur, Tapan Kr. Banerjee, Jubaraj Paul, Krishna Turi, Sudhir Turi, Khoirul Basar Molla, Nagnarayan Yadav, Kuddush Ansari, Kanai Hazra, Prafulla Bhunya, Kanak Baran Hazra, Duryodhan Nayak, Bablu Mandal, Sukanta Chakraborty, Subrata Banerjee, Dulal Turi, Amarnath Hela, Ranjit Das, Sarada Devi, Sukumar Mandal, Bulaki Das, Kamala Turi, Sanat Kr. Dhara, Prodip Kr. Mullick, Rita Chakraborty, Sanjoy Krishna Chaki, Debasis Koley, Angshuman Bhowmik, Sanjib Kr. Das, Biplab Malakar.

Supporting Staff: Main Campus: Office Superintendent: Arun Kr. Dasgupta, Others: Rabindra Nath Karmakar, Chandra Kanta Sasmal, Tarun Chakraborty, Tapas Kumar Chakraborty, Sanat Kr. Dey, Mahendra Nath Shee, Harekrishna Thoyal, Madhusudhan Marick, Fulchanda Sardar, Kalicharan Turi, Kissan Das, Munna Turi, Kodan Das, Sk. Kalu, Md. Eliash, Manju Turi, Rajbrat Ram, Rajkumari Balmiki.

Animal Physiology Section

Faculty: Prof. Arun Ray (Head), Dr. G. Sa, Dr. T. Das

Students: Dr. Sreya Chattopadhyay (up to July 31, 2005), Dr. Aparna Palit (from July 1, 2005 to February 28, 2006) Ms. Sumedha Roy, Ms. Samita Kundu, Mr. Debaprasad Mandal, Ms. Laksmishri Lahiri, Mr. Sankar Bhattacharyya, Mr. Avijit Bhattacharya, Mr. Subhomay Banerjee, Mr. Arnab Goswami (up to March 8, 2006), Mr. Pallab Roy (from July 15, 2005), Ms. Juni Chakrabarty (from July 5, 2005)

Supporting Staff: Mr. Indrajit Ray, Mr. Sujit Ghosh and Mr. Uttam K. Ghosh.

Biochemistry Department

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

Students: Rima Chattopadhyaya, Subhra Majumdar, Malabika Das, Atasi Pal, Mainak Guha Roy, Sourav Sarkar, Rudra Prasad Saha, Dipak Dutta, Gopa Mitra, Sudeshna Lahiri, Mithu Banerjee, Promita Ghosh Dastidar, Bhaskar Dasgupta, Sankar Prasad Das, Sumit Biswas, Lalita Das, Sabyasachi Halder, Atanu Banerjee, Pabitra Kr. Parua, Suvroma Gupta, Ranjit Prasad Bahadur, Partho Chattoraj, Chandrama Mukherjee, Tridib Ganguly, Soumitra Sau, Suparna Laha, Palas Kr. Chanda, Arumay Pal, Somasri Pal, Krishnendu Chakrabarti, Dipak Manna, Manjari Tharad, Kaustav Bandyopadhyaya, Suroopa Chakrabarti, Amitava Bandhu, Debadrita Mukherjee, Prabal Kr. Chakrabarti, Dr. Tanaya Chatterjee.

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

Bioinformatic Centre

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

Supporting staff: Mr. T.K. Bhattacharyya, Mr. S.K. Gupta, Ms. S. Roy, Mr. J. Mandal.

Students: Dr. D. Roy, Dr. R. Bhattacharyya, Mr. A. Bagchi, Miss T. Banerjee, Mr. S. Basak, Mr S. Sonavane, Miss P. Mukhopadhyay, Miss M. Das, Miss S. Kundu and Miss B. Kahali.

Biophysics Department

Faculty: Dr. Gautam Basu

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

Students: Dr. Tanaya Chatterjee, Soumya Dasgupta, Madhurima Das.

Botany Department

Faculty: Prof. Kalyan Kr. Mukherjee, Prof. Swati Sen-Mandi, Prof. Prabir Kr. Saha (Chairman upto 31.12.05), Dr. Dibeyendu Narayan Sengupta (Chairman from 01.01.06), Dr. Swati Gupta-Bhattacharya, Dr. Sabita Bhattacharya, Dr. Tapas Kr. Ghose, Dr. Debabrata Basu.

Students: Mr. Sujit Roy, Ms. Sanjukta Dey, Ms. Jyotsna Mondal, Mr. Avik Roy, Mr. Bhaskar Gupta, Ms. Dola Boral, Mr. Sudip Kr. Sinha, Mr. Swarup Roychoudhury, Mr. Madhuvanti Chatterjee, Ms. Pragya Paromita Saha, Mr. Aryadeep Roychoudhury, Ms. Kakali Mukherjee, Dr. Subhas Kanti Roy, Ms. Shaonli Das (resigned on 04.04.05), Ms. Pinki Chowdhury (resigned on 04.04.05), Ms. Rajasri Bhattacharya (resigned on 01.06.05), Basabdatta Das (joined on 19.07.05), Himadri Sekhar Chakrabarti (joined on 19.07.05), Ms.

Moumita Gangopadhyay (joined on 18.07.05), Ms. Sudhesna Bhattacharya (terminated on 31.08.05), Malay Kr. Adak (terminated 22.09.05), Ms. Sharmila Datta (joined on 01.09.05), Mr. Subhrajit Banerjee (resigned on 30.09.05), Mousita Karmakar (joined on 08.09.05), Mr. Bithin Roychoudhury (joined 08.09.05), Mr. Subhrajit Das (joined on 09.09.05 and resigned on 28.02.06), Dr. Pampa Chakraborty (resigned on 08.11.05), Mr. Anirban Bhattacharya (joined on 14.11.05), Ms. Bratati Mukherjee (resigned on 12.12.05), Mr. Sanjoy Kr. Sinha (joined 02.12.05), Mr. Sandeep Kr. Sinha (terminated on 31.12.05), Ms. Saptadwipa Mukherjee (terminated on 09.02.06), Dr. Gourab Gangopadhyay (transferred to DBT Project on 01.03.06), Mr. Koushik Ghosh (transferred to CSIR Adhoc Project on 01.03.06).

Supporting Staff : Dr. Ramit Poddar, Mr. Sukumar Majumdar, Mr. Shyamal Kr. Ghosh, Mr. Chanchal Chakraborty, Mr. Jadab Kr. Ghosh, Mr. Binoy Krishna Modal, Ms. Chaitali Roy, Ms. Kaberi Ghosh, Mr. Sasanka Sekharia Bera, Mr. Sambhunath Debnath, Mr. Bipul Kr. Nag, Mrs. Kanan Singh, Mrs. Sarana Pradhan, Mr. Monimoh Ghosh, Ms. Moumita Basu Roy.

Central Instrumentation Facility

Faculty : Prof. B. Bhattacharyya (Chairman)

Supporting Staff : Jaganmoy Guyin, ranjan Kr. Dutta, Smriti Ranjan Maji, Mrinal Das, Alpanas Bhattacharyya

Chemistry Department

Faculty : Prof. Parimal C. Sen (Chairman, from 01.03.2005 to 28.02.06), Prof. Manas Chakrabarty, Prof. Kalpada Das (Chairman from 01.03.2006), Dr. Joyoti Basu, Prof. Manikuntala Kundu, Dr. Parames C. Sil, Dr. Pradip Das.

Students : Sandipan Sarkar, Madhumouli Chatterjee, Ramkrishna Basak, Ashima Bhattacharyya, Bhaswati Samanta, Debabrata Mandal, Shresh Pathak, Kasturi Sarkar, Arunava Dasgupta, Ashis Biswas, Pratik Datta, Rajesh Bhattacharyya, Dr. Dipankar Bhattacharyya, Madhuchhanda Kundu, Taraknath Kundu, Randhir Sinha, Tanusree Sengupta, Srabasti Ghoshal, Anil Kumar Singh, Kamakshi Sureka, Sushil K. Pathak, Dr. Meghamala Dutta, Ayantika Ghosh, Partha Mukherjee, Tushar K. Dhara, Sulakshana Karmakar, Ajanta Mukherji, Ratna Mukherjee, Piyali Mukherjee, Sanjib Dey, Sanchita Basu, Prasenjit Manna, Mrinal Kr. Sarkar, Tofajjen Hosain, Supratim Dey, Arnab Banerjee, Mahua Sinha, Rabindranath Bera, Kamala Gupta, Srabani Karmakar.

Supporting staff : Prasanta Kumar Pal, Aniruddha Aich, Pranab Kumar Dey, Bhabani Prasad Banerjee, Debidas Nandy, Rama Chatterjee, Gopal Kumar Biswas, Amarnath Bhatta, Tapas Ghosh, Arindam Basu, Dipak Chandra Konar, Subhas Chandra Paul, Ashoke Kumar Maity, Sachchidanand Ram, Kalyan Das.

Environmental Science Section

Incharge : Prof. Sibaji Raha

Supporting Staff : Anandamay Adak, Sujata Roy, Siddhartha Ray.

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Immunotechnology Section

Faculty: Dr. Nripendranath Mandal

Students: Mr. Kuntal Mukherjee, Mr. Santanu Biswas, Mr. Tathagata Chakraborty and Mr. Sunny Das

Supporting Staff: Mr. Amartya Sen and Mr. Ranjit Das

Library

Dr. Arun Kumar Chakraborty (Librarian)

Supporting Staff : Dr.(Mrs.) Rukmini Mitra, Mr. Panchugopal Das, Mr. Kalipada Hait, Mr. Samir Kumar Pal, Mr. Pradip Kumar Sarker, Dr.(Mrs.) Banhisikha Chaudhuri, Mrs. Gopa Dasgupta, Mr. Ajit Kolay, Mr. Gautam Mukherjee, Mr. Sarat Chandra Bhuiyan, Mr. Mritunjoy Jogsharma, Mr. Arun Nandi, Mr. Dinanath Das.

Madhyamgram Experimental Farm

Prof. P.K. Saha (Professor-in-Charge up to 31.12.2005);

Prof. A.N. Lahiri Majumder (Chairman from 01.01.2006)

Prof. P.K. Saha (Co-Chairman from 01.01.2006)

Dr. S.R. Sikdar (Convenor from 01.01.2006)

Supporting Staff : Sri Pulak Kr. Roy, Sri Rakhal Ch. Jana, Sm. Sabita Baisya, Sri Subash Senapati, Sri Chittoranjana Mallick, Sri Rabin Talukder, Sri Sukumar Das, Sri Dilip Pramanick, Sri Laxmikanta Pradhan, Sri Rajkrishore Lenka, Sri Bhanu Kisku, Sk Inal Ali, Sri Mahesh Dasgupta

Microbiology Department

Faculty : Prof. Pran K. Chakrabarty (Chairman upto 31.01.2006), Dr. Pradosh Roy (expired on 02.04.2005), Dr. Subrata Majumdar, Dr. Sujoy K. Dasgupta, Dr. Tapan K. Dutta

Students : Avik Saha, Archana Sharma, Sujoy Chatterjee, Ranadhir Dey, Subhankar Chatterjee, Nivedita Majumdar, Bejoy Sekhar Datta, Twishasri Das Gupta, Sukhendu Mandal, Somnath Mallick, Bomba Dam, Bidisha Bhattacharya, Nabanita Giri, Prasenjit Das (upto 21.06.05), Suchandra Majumdar, Subhadipa Sengupta, Joydeep Chakrabarty, Surajit Bhattacharjee (from 20.05.05), Madhumita Roy (from 10.08.05)

Supporting Staff : Biswanath De Sarkar, Barindranath Mandal, Provat K. Chattopadhyay, Prabal Gupta, Saifullah Gazi, Debashis Sarkar, Babli Marrick, Prabir Halder, Debashis Mazumder, Nityananda Patra, Jamuna Prasad, Dilip Bhattacharyya, Ramesh Prasad, Birendra K. Bari, Saral Das, Robin Paul, Sankar Bari, Purnendu Manna, Narayan Patali.

Physics

Faculty: Prof. Biva Roy (Chairperson upto 30.9.2005), Prof. Barun K. Chatterjee (Chairman from 1.10.2005), Prof. Suprakash C. Roy, Prof. Sibaji Raha (on lien; joined as Director on 27.2.2006), Prof. Indrani Bose, Dipankar Home, Dr. Swapan K. Saha, Dr. Tripurari P. Sinha, Dr. Sanjay K. Ghosh

Students: Dr. Basudhara Basu Nandi (Women Scientist Scheme of DST), Dr. Sandhya Dey (Mondal ISRO Project), Rajesh Karmakar, Tamal K. Mukherjee, Alok K. Pan, Bhaswar Ghosh, Rupa Sarkar, Alok D. Amit Tribedi, Rittam Mallick, Prasanna K. Mondal.

Supporting Staff: Narayan C. Dey, Amit K. Ganguly, Kamal C. Das, Sankar P. Singha, Shyamsundar Mahapatra, Subhasis Banerjee, Manas Datta, Subrata Das, Tarun K. Maji, Bharat P. Ram, Bansi Dutta, Dayakant Thakur, Sujit K. Basu, Rajkumar Mourya, Prabir Halder.

Plant Molecular & Cellular Genetics Section

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

Students: Dr. Aparajita Mitra, Dr. Sanghamitra Bhattacharyya, Dr. Biswajit Das, Jolly Basak, Malay D. Aparajita Das, Krishnarup Ghosh Dastidar, Pralay Majumder, Susmita Maitra, Lily Goswamy, Sudipto R. Aninda Sarkar, Dipankar Chakrabarty, Barunava Patra, Samik Bhattacharyya, Prasenjit Saha, Ritu Kapur, Uttara Bhattacharyya, Sruti Dutta, Sonali Sengupta, Hossain Ali Mondal, Radharaman Bar. Sumanti Gupta, Nilanjana Banerjee, Soumitra Maity, Shubhra Mondal, Jayadri Shekhar Ghosh.

Supporting Staff: Puspita Mukherjee, Asim Kumar Nath, Subal Basak, Motilal Singh, Arup Kumar Das, Nadiram Kayal, Thakur Gond.

Publication

Mr. Arun Kumar Das Gupta (Superintendent)

Supporting Staff: Mr. C.K. Sasmaol

Sophisticated Analytical Instrument Facility (SAIF)

Faculty: Dr. Dilip K Mukherjee (Head), Dr. Siddhartha Chaudhuri

Supporting staff: Mr. Tapan Datta, Mr. Shyam S Kundu, Mr Gobinda Das, Mr. Amit K Mahindar, Mr. Jaidev K Chattopadhyay, Mr. Pathik R Ray, Mr. Alokanda Sarkar, Mr. Arup K Sen, Mr Samir K Mukherjee, Mr. Pradip K Karmakar, Mr Subhas C Maikap, Mr. Jaganmoy Guin (deputed to PD Laboratory), Ms. Tanima Modak Dhar, Ms Manisha Banerjee, Mr Ranjit K Ghosh, Mr Debabrata Polley, Mr. Sankar Santra, Ms. Saraswati Sarkar (Sen).

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Workshop

A.K. Mukherjee – Workshop Supdt.

Supporting Staff : (MAIN CAMPUS) : Dipak Dutta, Asutosh Sarkar, Samar Dutta, Sisir Ghosal, Tarapada Das, Dipen Sen, Bankim Dutta, Sk. Md. Ehia Hossain, Basanta Kr. Shit, Bholanath Saren, Abdul Rahaman Molla, Panchanan Santra, Panchugopal Karak, Gopal 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.

National Science Day



National Science Day was observed on February 28, 2006. The theme of the National Science Day – 2006 was **“Nurture Nature for our Future”**. As part of the celebration the Institute conducted Quiz and Debate competition among School Students at Sudhir Memorial School, Madyamgram on February 14, 2006 where a large number of students participated. On 28th February 2006, a number popular lectures were delivered by well known Environmentalist on this partiucclar topic at Bose Institute. Both Institute employees’, students from different schools and interested people from different parts of the city attended the lectures. Prizes were distributed to the winning students in Quiz and Debate competition.

**Statement of Accounts
for the year
2005-2006**

REPORT ON REVISED ACCOUNTS

AUDITOR'S REPORT TO THE MEMBERS OF THE COUNCIL GOVERNING BODY
OF BOSE INSTITUTE

We have audited the attached Balance Sheet of Bose Institute as at March 31, 2006, duly revised in accordance with letter of instruction, bearing no. R/42/06/2971 dated 01.09.2006, issued by the Registrar of the Institute for incorporation of depreciation and the Income and Expenditure Account for the year ended on that date annexed thereto. These financial statements are the responsibility of the management of the Bose Institute. Our responsibility is to express an opinion on these financial statements based on our audit.

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

We report that

1. We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.
2. In our opinion proper books of account as required by law have been kept by Bose Institute so far as it appears from our examination of those books. The Auditors' Report on accounts of Governing Body have been forwarded to us and have been appropriately dealt with.
3. The Balance Sheet and Income and Expenditure Account dealt with by this report are in agreement with the books of account.

BOSE INSTITUTE
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31.03.2006
Amount in Rs.

INCOME		
	Current Year	Previous Year
Income from Services		
Grants	44,27,827.00	33,27,851.00
Income from publication	15,72,02,318.81	13,85,00,000.00
Interest Earned	4,480.00	
Other Income	20,13,899.85	4,71,915.85
	5,19,929.50	2,52,945.82
TOTAL (A)	16,41,68,455.16	14,25,52,712.67
EXPENDITURE		
Establishment Expenses		
Other Administrative Expenses	977,93,196.46	931,90,419.25
Laboratory Expenses.	232,00,047.41	211,30,121.86
Fund for Capital Expenditure	192,53,762.78	207,64,031.00
	239,21,448.51	149,37,158.00
TOTAL (B)	16,41,68,455.16	15,00,21,730.11
Balance (A - B)		(74,69,017.44)
BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND		(74,69,017.44)
SIGNIFICANT ACCOUNTING POLICIES		
NOTES ON ACCOUNTS		

Place : Kolkata

Date : 14th September, 2006

Sd/-
(T. K. Ghorui)
Registrar

Sd/-
(Prof. S. Raha)
Director

Sd/-
(P. K. Barman)
Audit & Finance Officer

Sd/-
(S. Pal)
Accounts Officer

This is the Balance Sheet referred
to in our REPORT of even date.
For Nundi & Associates
Chartered Accountants

Sd/-
(M. Nandi, Partner)
M. No. 016369



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