

BOSE INSTITUTE
CALCUTTA.
Telephone No 4019.

93, UPPER CIRCULAR ROAD.

Calcutta, the 3rd Aug 1923

To The Scholars

I leave you my best wishes. I want you to grow in to
true manhood, strong ^{and} self-reliant. Follow only the one object
you have chosen. Cast off all small things, meanings
as jealousy. Try the friend of each other's success. Do not
talk much but do things. I have lived my utmost
for you under many difficulties. Justify my life in you.

J. B. Bose

ANNUAL REPORT
OF
THE BOSE INSTITUTE
FOR
2004-2005



Bose Institute

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

Compiled and edited by the Annual Report
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The Bose Institute

The Bose Institute was founded by Sir Jagadis Chandra Bose in 1917 for the advancement of science and dissemination of knowledge. The Institute has served the nation for the past 88 years through its pursuit of advancement of knowledge in science and technology and by developing highly competent and able scientific manpower for the country. The Institute has on its staff highly qualified and experienced scientists working in Biological, Biomedical and Physical Sciences, in the departments of Physics, Chemistry, Botany, Microbiology, Biochemistry and Biophysics, and the research sections on Plant Molecular & Cellular Genetics, Animal Physiology, Immunotechnology and Environmental Science. Besides, there are service centres like Sophisticated Analytical Instrument Facility, Bioinformatics Centre, Library, Workshop, etc. In addition, the Acharya J.C.Bose High Altitude Research Centre at Darjeeling and experimental field stations at Falta, Madhyamgram and Shyamnagar are parts of the Institute. The scientific facilities available in the institute are also used by scientists from several universities and research centres in the country.

88th Foundation Day



The 88th Foundation Day of Bose Institute was celebrated on 30th November 2004. **Prof. Asoke Sen**, FRS, Harish-Chandra Research Institute, Allahabad, graced the occasion as Guest of Honour and delivered 66th Acharya Jagadis Chandra Bose Memorial Lecture on **The Universe of Elementary Particles**. Prof. Debasis Mukherjee, Director, Indian Association for the Cultivation of Science, Kolkata, presided over the function. **Sir Nilratan Prize 2004** was awarded to Ms. Jolly Basak, a Senior Research Fellow, Plant Molecular & Cellular Genetics Section. **Prof. B.B. Biswas Outstanding Student Award 2004** was presented to Sri Ranjit Prasad Bahadur, a Senior Research Fellow, Department of Biochemistry. First volume of the Bose Institute Monograph Series entitled Bose Institute - Myself & Ribosome authored by Prof. Debi Prasad Burma was published on the occasion. 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

- | | |
|--|--|
| 1. Dr. Manish Sekhar Chakraborty | |
| 2. Shri D.Mandal | |
| 3. Prof. R. N. Chakravarti | |
| 4. Prof. (Mrs.) Debi Chakravarti | |
| 5. Shri Somnath Sanyal | |
| 6. Prof. S.N. Chatterjee | |
| 7. Mr. Dilip Bhattacharyya | |
| 8. Secretary, Department of Science & Technology, Government of India or his nominee | |
| 9. Director General, C.S.I.R. or his nominee | |
| 10. Joint Secretary and Financial Adviser, Department of Science and Technology, Govt. of India or his nominee | |
| 11. A Representative of the Lok Sabha | |
| 12. Principal Accountant General (A & E), West Bengal | |
| 13. Secretary, Higher Education (Nominee of the Govt. of West Bengal) | |

Nominees of the
Governing Body

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. Alope 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 and theoretical modeling of protein structures and docking have been undertaken.

Thermodynamic Analysis of the Sulfonamide Drug-Tubulin Interaction (Prof. B. Bhattacharyya)

Sulfonamide drugs have emerged as promising anticancer drugs but their mode of interactions with tubulin remains unrevealed. We demonstrate that these drugs bind to the colchicine site of tubulin reversibly, quench intrinsic tryptophan fluorescence but unlike colchicines, are unable to modulate GTPase activity of tubulin. Thermodynamic study using Isothermal Titration Calorimetry reveals that 5 (*N*-(5-chloro-7-indolyl)-4-methoxybenzenesulfonamide) afford large positive value of heat capacity change ($\Delta C_p = +264 \text{ cal mol}^{-1} \text{ K}^{-1}$) along with partial enthalpy-entropy compensation, whereas the 2-chloro regioisomer 2 give a large negative value ($-589 \text{ cal mol}^{-1} \text{ K}^{-1}$) and complete compensation. Thus the position of chlorine in a drug regulates drug-protein thermodynamics.

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

In continuation of our studies on the structure and assembly of the kinetochore, we have found that there are physical interactions between a spindle pole body protein Bbp1 and the kinetochore proteins Ctf19/Mcm18 and Chl4/Mcm17. This is significant because it could throw more light on the phenomenon of centromere clustering around spindle pole bodies. In addition, we have found that acetylation of alpha tubulin could have an important role in microtubule stability in this yeast. Studies on the role of Chl1p in transcriptional silencing are continuing.

Protein conformation and association (Prof. P. Chakrabarti)

Using a distance criterion, all α -turns in protein structures have been identified and classified based on conformation. For the major class, the residue composition at different positions resembles that in β -turn and N-terminal positions of helices, and this observation has been used to derive a new mechanism for α -helix nucleation and folding.

A number of parameters have been used to characterize protein-protein interfaces and to distinguish the physiologically relevant contacts from the non-specific contacts between protein molecules observed in crystals.

Environment of sulfur atoms in protein structures (Prof. P. Chakrabarti)

The sulfur atoms involved in disulfide bonds do not normally participate in hydrogen bonds, but can have stereospecific S...O contacts or interact with aromatic residues, which are highly conserved in homologous protein structures.

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, also providing a model for the recognition of direct tetra-nucleotide repeat sequence.

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

In our continuing efforts to understand the regulation of the cell division cycle in *Entamoeba histolytica*, we crossed several important milestones in the past year. Firstly, our lab participated in the international effort to sequence the amoeba genome. The draft sequence was published in *Nature*. Data from the amoeba genome changed our approach to study the cell cycle of amoeba with the discovery that a large number of cell cycle regulating protein homologs were absent from the amoeba genome. In the meantime our lab also published an important method to study gene function in amoeba. We have developed a method to use RNA interference to down regulate gene expression in stable transformants of *E. histolytica* to study targeted gene function. Using the data from the amoeba genome sequence and RNAi methodology, our efforts to understand the role of Mcm 2-3-5, CDKs, cyclins, kinesins, formins and Rho proteins are ongoing.

Protease digestion studies of λ cI repressor (Dr. R. Chattopadhyaya)

The purified cI repressor has been digested with several serine proteinases like trypsin, chymotrypsin, elastase, Glu-C, kallikrein and thrombin for various incubation and periods in the presence and absence of O_L 1 operator DNA, analyses of products performed by gel electrophoresis and mass spectrometry. This systematic characterization will let us check which of the three alternative models of the operator-bound cI tetramer (Chattopadhyaya & Ghosh, 2003) is correct.

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

We have undertaken an exercise in predicting the structures of NB-ARC domains in *Vigna Mungo*, Flax, two varieties of tomato (L2C1, PRF) two varieties of *arabidopsis*, plus those in Apaf-1 and CED4 in collaboration with Prof. Amita Pal of PMCG.

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

A model has been proposed for the recognition of direct repeats in DNA by the transcription activator CII of bacteriophage lambda, the only known example to recognize direct repeats. This novel mode of DNA recognition was arrived at using the three dimensional structure of CII that we solved recently. Additionally, work on lambda CIII showed that CIII (a 54-residue protein) is a dimer involving a disulphide linkage. However, a 28-residue peptide encompassing residues 14-41 of CIII was found to exist in the dimeric state even without the S-S linkage, and retain antiprotease activity against the *E. coli* protein, HflB (FtsH).

Tools for antibacterial screening and gene expression, phage genomics (Dr. S. Sau and Dr. T.C. Ghosh [Bioinformatics Centre])

To develop genetic tools suitable for screening antibacterials and gene expression, (a) two genes of mycobacteriophage L1 which arrest growth of mycobacteria have been cloned, sequenced and characterized to an extent, (b) some stress-inducible promoters of *S. aureus* have been cloned, sequenced and characterized to some extent, (c) molecular interaction between the repressor protein of mycobacteriophage L1 and its cognate operator have been studied at length. Besides, to study the factors influencing the codon and amino acid usage bias in bacteriophages, several phage genomes 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, drug design, spectroscopy and protein engineering are in progress.

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

Detailed calculations of the electrostatic component of binding free energy, both salt independent and salt dependent, have been performed on a series of protein-DNA and protein-RNA complexes to elucidate fundamental differences between their mode of interactions and the relevance to biological function.

α -helix / 3_{10} -helix transition in designed peptides (Dr. Gautam Basu)

A designed peptide was found to exhibit temperature dependent conformational transition between the canonical α -helix the 3_{10} -helix as a function of temperature. The transition has

been studied by CD and NMR spectroscopy to understand thermodynamic and structural features of the process.

Transcription Regulation (Prof. Siddhartha Roy)

Equilibrium binding of GalR and RNA polymerase to DNA, and real-time kinetics of base-pair distortion (isomerization) showed that the equilibrium dissociation constant of RNA polymerase-P1 closed complexes is largely unaffected in the presence of saturating GalR, indicating that mutual antagonism (steric hindrance) of the regulator and the RNA polymerase does not occur at this promoter. In fluorescence kinetics with 2-AP labeled P1 DNA, GalR inhibited the slower of the two-step base-pair distortion process. We isolated a negative control GalR mutant, S29R, which while bound to the operator DNA was incapable of repression of P1. Our results show that GalR establishes contact with alpha-CTD at the last resolved isomerization intermediate, forming a kinetic trap.

RNA-protein interaction (Prof. Siddhartha Roy)

Electrophoretic mobility shift assay with the leader RNA and the unphosphorylated P-protein demonstrated existence of two distinct complexes *in vitro*. Measurements of stoichiometry indicate the protein monomer/RNA ratio to be 1:1 and 2:1 for faster and slower migrating bands, respectively. We have also observed a concentration-dependent oligomerization of the unphosphorylated P-protein, in sub-micromolar to low micromolar range. Sedimentation velocity, dynamic light scattering and large zone gel filtration experiments suggest a monomer-dimer-tetramer model of association. RNA binding experiments suggest that the two complexes assembled from one molecule of the leader RNA binding to either a protein monomer or a dimer. A truncated RNA consisting of a 3' region of the leader transcript exclusively formed the 1:1 complex, whereas a RNA consisting of only the 5' region forms the 2:1 complex exclusively. RNA binding experiments at different protein concentrations suggest that binding of the RNA comprising the 3' region weakens significantly at higher P(0) concentrations, whereas in contrast the binding of the RNA comprising the 5' region becomes modestly tighter.

Botany

The basic theme of this 88 year old department is the improvement of crop production using basic and applied techniques. Special emphasis is given on the improvement of different aspects, e.g., methodologies of plant tissue culture, biotechnological application in medicinal plants, aromatic rice, gene expression for tolerance to salinity stress in rice, fruit ripening (in tomato, banana, and mango), expression of DNA polymerase beta (in *Vigna radiata* and rice). In addition, studies on functional genomics of seed vigour/storability of orthodox (rice) seed, clinico-immunochemical studies on airborne allergenic pollen

grains/spores, phenotypic vis-à-vis genotypic and physiological aspects of Fabacean members, resistant tomato line with elicitor of *Fusarium oxysporum* are going on.

Improvement over existing methodologies in plant tissue culture (Prof. K K Mukherjee)

Micro shoots developed from the meristematic basal portion of the innermost leaves of pineapple [*Ananas comosus* (L.) Merr] were encapsulated in alginate beads for short-term storage as a prelude for transformation program. Of the four-temperature regime for storage, the beads stored at 8°C showed maximum percentage of shoot proliferation when those were placed again on the MS medium and the rate of 'conversion' was satisfactory even beyond 45 days of incubation. The genetic fidelity of the pineapple plants growing out after storage in encapsulated form was ascertained by RAPD and ISSR techniques.

A protocol for clonal propagation of *Pandanus amaryllifolius*, a rich source of 2-acetyl-1-pyrroline (2AP), an aromatic compound has been established. Genetic fidelity of the tissue culture raised plantlets was ascertained through identical isozymic and RAPD profiles. The 2AP content of the *in vitro* plantlets was analyzed by Gas Chromatography in the backdrop of the mother plant.

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

Improved technique of artificially produced encapsulated seed has been developed for seed-less plants, that are storable for medium term period at 4°C. DNA of some of the selected plants have been extracted, purified and stored at -20°C with the aim to constitute a DNA bank, an important counterpart of the *in vitro* gene bank already developed under tissue culture condition. Preparation of a catalogue of respective DNA profile using PCR technique is under progress.

Gene Expression for Improvement of Tolerance to the Salinity stress in Rice, Progress in fruit ripening project in Tomato and Banana and Expression of DNA polymerase beta in *Vigna radiata* and Rice (Dr. Dibyendu N. Sengupta)

Overexpression of rice SamDeCarboxylase in tobacco plants (T2 generation) showed tolerance to salinity stress as the leaves hold high level of K⁺ and high level of Na level. The ABRE-binding factor OSBZ8 full length cDNA has been cloned from rice plants and the construct 35S:OSBZ8:Nos is now ready for overexpression. When Rab16A upstream DNA was used as probe in EMSA, OSBZ8 binds with the Motif I and a new protein binds to Motif II which will be cloned and characterized. A rice cDNA library has been prepared from the total RNA isolated from the 10-day-old Nonabokra rice plants which will be used for cloning the ABRE binding factors.

From Pusa Ruby the full length Le-MADS-Rin cDNA which controlled the developmental pathway, has been amplified by its primers and overexpressed the protein to produce antigen. The level of ascorbic acid, oxalic acid, free amino acids, riboflavin and iron content of the fruits in Pusa Ruby were determined. The ethylene released by the banana fruits of five cultivars was compared. The expression of MA-ACS1 and BA-ACS2 were checked

by RT-PCR. The cDNA library from ripe fruits of Mango cv. Himsagar, were prepared and out of the four cDNA clones picked up, one of the cDNAs was found to be fruit ripening specific by northern blot analysis.

The ddNTP-sensitive DNA pol (beta) from the developing seeds of mungbean *Vigna radiata* has been purified and characterized in detail. The enzyme was found to be highly susceptible to dideoxynucleotides and insensitive to aphidicolin and the enzyme was found to be recognized by the rat- pol beta-antibody. To clone its cDNA, a cDNA library has been constructed from the seeds of mungbean.

Functional genomics of seed vigour / seed storability of orthodox (rice) seed (Prof. Swati Sen Mandi)

•Functional genomics of seed vigour / seed storability of orthodox (rice) seed

A horizontal biology approach was undertaken to understand orthodox (rice) seed systems with particular focus on seed storability. Use of physiological biochemical and statistical methodologies for studying parameters associated with seed storability viz. germination, antioxidative and metabolic enzyme activity, total antioxidant potential, lipid peroxidation indicating membrane damage, and single stranded DNA breaks in comet assay as dependant variables and PCR amplified bands generated by random primers in RAPD analysis of genomes as independent variable, a DNA fragment ~900bp was established to be associated with seed storability at 99% confidence level; the same fragment was also found to be associated with high seed vigour at 99.9% confidence level as reported by us earlier. This band was found to be absent in low vigour / low storable varieties presumably due to low copy number of this band / gene in these varieties.

DNA sequence of this band has been found to match with Acetyl Co A Carboxylase gene in wheat at 94% similarity (of cytosolic type) and at 96% similarity (of the plastid type). Presence of this band in high storer varieties and its absence in low storers suggest the presence of high copy number of this gene in high seed storer varieties. Data on enzyme kinetics study showing high efficiency of this enzyme in high storers confirms the proposition that overexpression of Acetyl Co-A Carboxylase confers high seed storability in rice (orthodox) seed.

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

Total protein and enzyme activity of 3 enzymes – alpha amylase, peroxidase and esterase were observed through native PAGE for four *Tephrosia purpurea* varieties. These studies revealed that the variegated seed lot is highly vigorous and remain viable for longer period during storage. Almost similar results were obtained in case of yellow seed lot.

The entry of water and its gradual progress in the seeds of *Cicer arietinum* and *Dolichos lablab* were traced using timed imbibition in TTC and NBT. Water entered through the micropyle and proceeded towards the embryo through the radical. Then the water gradually

moved along the edges of the cotyledon towards the center. The entire seed imbibition took place by two hrs.

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

Cross-reactivity of recombinant cyclophilin allergen with Mal f 6 and Asp f 11 has been proved by inhibition experiments. The result corroborates the prediction derived from modelling studies. On the basis of case study (448 respiratory allergic patients sensitive to palm pollen), skin reaction test, IgE-ELISA, IgE-immunoblot and immunoblot inhibition a number of shared/cross reactive allergen were recorded in the pollen grains of betel nut (72 & 48 kDa), coconut (16 kDa), date sugar palm (33 & 66 kDa) and fan palm (100 kDa). Immunochemical studies of *Peltophorum pterocarpum* have revealed the presence of allergenic components with two important allergens of 74 and 24 kDa. Attempts are being made to purify the important allergens. Determination of the major allergenic components of the pollen of *Eucalyptus* sp., *Cassia* sp. and two airborne fungi *Trichoderma* sp. and *Alternaria tenuissima*, through some clinical and immunochemical experiments are in progress.

Improvement of aromatic rice (Dr. Tapas Kumar Ghose)

A total of 12 SSLP markers, polymorphic between the parents of a permanent mapping population segregating for quality traits, have been identified. These SSLP markers were selected from mapping information on chromosomal intervals previously identified to be lii grain dimension QTLs. Approximately 600 F8 and 600 F9 lines have been phenotyped for grain and kernel dimension traits, and genotyping of 150 lines representing the total variation in these two traits with the 12 polymorphic SSLP markers have been completed. QTL analysis is being carried out.

Short exposure of suspension culture of resistant tomato line with elicitor of *Fusarium oxysporum* f. sp. *lycopersici*, results enhancement of Phenylalanine ammonia lyase (PAL) and Poly phenol oxidase (PPO) (Dr. Debabrata Basu)

Suspension cultures of resistant and susceptible tomato lines have been established. Treatment of these lines with elicitor prepared from *F. oxysporum* f. sp. *lycopersici* culture indicate that enhanced level of PAL activity in the resistant tomato lines compared to susceptible line within few hours. On the other hand enhanced activity of PPO has been observed in both the resistant as well as susceptible lines within less than 24 hours and maintained for few days in resistant line but the level decrease within 48 hours in susceptible lines. Further studies in this direction are continuing.

Chemistry

The Department of Chemistry is one of the oldest departments since the inception of the Institute. The department is engaged primarily in basic research and over the years has

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Chemistry

The Department of Chemistry is one of the oldest departments since the inception of the Institute. The department is engaged primarily in basic research and over the years has

diversified its work keeping in pace with the modern development. The major research of the department is focused on structure, function, interaction of bioactive proteins and their regulation by drugs and different modulators; chaperone activity of α -crystallin; organization of liquid crystal; medical biotechnology with special emphasis on the studies of mechanism of resistance to drug in pathogenic bacteria; search for bioactive plant products and synthesis of heterocyclic compounds.

Synthesis and reactions of condensed heterocycles (Prof. Manas Chakrabarty)

Novel stable indolyl primary enamines, suitable synthons for bioactive enamides, have been prepared for the first time from the reaction of 3-formylindoles with TOSMIC, and the structure of one such enamide has also been confirmed by single crystal X-ray crystallographic studies. A new regio-selective synthesis of 2-alkylamino- and 2-alkylthiothiazolo[5,4-*e*]indoles having bioactive potential has been accomplished from 5-nitroindoles. A mild basic reagent has been demonstrated to be very effective for the regeneration of indoles from their *N*-*boc* derivatives.

In the field of Green Chemistry, two environmentally benign acidic solids have been successfully employed separately for the efficient condensation of araldehydes to form 2-aryl and 1-(hetero)arylmethyl-2-(hetero)arylbenzimidazoles (from reaction with *o*-phenylenediamine) and diindolylalkanes (from reaction with indoles). This work has been carried out in collaboration with Prof. Y. Harigaya of Kitasato University, Tokyo, Japan.

Localization and expression of a 70 kDa protein in goat spermatozoa having Na^+ , K^+ -ATPase inhibitor and aryl sulfatase-A activities (Prof. P.C. Sen)

A 70 kDa protein purified from goat spermatozoa is found to have Na , K -ATPase inhibitory activity with first ten amino acid residues from the N-terminal end has high degree of homology with arylsulfatase A from mice, pig and human. Indirect immunofluorescence study shows the presence of the protein on goat sperm surface. Furthermore, live goat sperm and the extract of peripheral sperm plasma membrane proteins exhibit arylsulfatase A's desulfation activity. The P70 remains on the head surface of *in vitro* capacitated cauda epididymal sperm as shown by positive immunofluorescence staining of cauda sperm. Immunoblot and flow cytometric studies corroborate the above findings. The presence of P70 on capacitated cauda sperm surface suggest a possible role of this protein in sperm zona-pellucida binding i.e. fertilization process. This work has been carried out in collaboration with Dr. S.K. Nagdas, Vanderbilt University, USA and Dr. P.Das, NICED, Kolkata.

A group of low molecular mass novel protein having regulatory roles in cell signaling (Prof. P.C. Sen)

Our laboratory has isolated a number of low molecular mass proteins from various mammalian sources having regulatory roles in cell signaling and is in the process of purification and characterization.

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

Lens contains over 6 mM of ATP but neither α -crystallin nor its substrates β - or γ -crystallins have any significant ATPase activity. We found out that binding of ATP to α -crystallin caused subtle conformational changes in α -crystallin due to which it exposed hydrophobic patches and enhanced substrate binding. We showed that binding of ATP led to a decrease in free energy of α -crystallin that triggered the substrate binding. ATP binding was responsible for greater protection and close packing of the substrate proteins in the eye lens, greater resistance against proteolytic cleavage and enhanced chaperone activity of the α -crystallin. Our results established that hydrolysis of ATP is not required for these functions as was believed by some workers in the field.

Drug targets and drug resistance mechanisms (Prof. Parul Chakrabarti, Dr. Joyoti Basu and Dr. Manikuntala Kundu)

Polyphosphate metabolism is closely linked to the ability of cells to survive under starvation. We have characterized the polyphosphate kinase (PPK) of *Mycobacterium tuberculosis* and generated a *ppk* knockout mutant of *M. smegmatis*. The knockout is impaired in its ability to survive under stress. Cell division is a process offering opportunities for targeted intervention.

We have continued exploring the interactions among the divisome-associated proteins leading to a detailed understanding of the interacting domains of FtsZ-FtsW and FtsW-FtsI interactions. We have also demonstrated that the transpeptidase encoded by the open reading frame Rv0016c of *Mycobacterium tuberculosis* is required for cell septation.

We have characterized the peptide-binding component of the oligopeptide transporter OppA of *Mycobacterium tuberculosis*, which is likely transport essential nutrients into the cell, and is therefore an important drug target. OppA has been shown to transport the peptide glutathione into the cells. Some of the amino acid residues essential for its function have been identified.

Detailed structure-function analysis of the norfloxacin resistance-associated efflux pump NorM of *Vibrio cholerae* has provided insight into the topology of the pump and the crucial role of amino acid residues located both in periplasmic and cytosolic loops in the functioning of this pump. This should help in providing directions towards the development of new, improved fluoroquinolones, which can subvert such pumps.

Modulation of host cell signaling by bacterial pathogens (Dr. Joyoti Basu and Dr. Manikuntala Kundu)

In continuing efforts to understand how *Mycobacterium tuberculosis* subverts the innate immune response, we have delineated mechanisms through which the lipoglycan, lipoarabinomannan (LAM) and the early secreted antigen ESAT-6 negatively regulate the secretion of interleukin from lipopolysaccharide (LPS)-stimulated macrophages. We have

also elucidated the signaling mechanisms regulated the release of the matrix metalloproteinase 9 (MMP9) from *Mycobacterium avium*-challenged macrophages.

A novel pathway involving p21-activated kinase (PAK)1-mediated caspase 1 phosphorylation has been elucidated to trigger caspase 1 activation in *Helicobacter pylori* LPS-challenged macrophages. The detailed mechanisms governing *H. pylori* LPS-stimulated interleukin 1- β release from macrophages have been worked out.

Human red cell membrane (Dr. Joyoti Basu and Dr. Manikuntala Kundu)

We have continued our efforts to understand the contribution of cell death-associated aspartate proteases of the caspase family in red cell biology. We have demonstrated that oxidative stress and red cell senescence are both associated clustering of the death receptor Fas into lipid rafts, recruitment of the adapter protein FADD and caspase 9 to form a "death-inducing signaling complex", followed by caspase 8-dependent activation of caspase 3. Caspase 3 inhibits the aminophospholipid translocase resulting in externalization of phosphatidylserine, marking the cell for removal from the circulation.

We have collaborated with laboratories in Bristol and in Paris to simulate mutations of protein 4.2 that are associated with hereditary hemolytic anemias in the *Xenopus* expression and to demonstrate by confocal microscopy that at least some of these mutations lead to failure of protein 4.2 to associate with band 3.

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

Both *in vivo* and *in vitro* studies on the role of the active principle(s) responsible for the hepatoprotective and anti-oxidative actions against various potent hepatotoxins have been carried out independently from the water (phosphate/tris buffer, physiological pH) soluble fractions of two different herbs. The active principle(s) from both the sources appear to behave similarly in most of their preventive and curative activities. Signal transduction studies revealed that PKC is involved for the mechanism of action of both the active principles. More research needs to be carried out for further characterization of these active principles and currently in progress.

Mesomorphism in Cholesterol Esters (Dr. Pradip Das)

An induced chiral smectic-C phase, supposed to be ferroelectric, has been discovered in a eutectic mixture of cholesterol esters, e.g., oleate (CO) and oleyl carbonate (COC). Its potential application as an electrooptic material is being investigated. Circular dichroism and FTIR studies are currently under way to determine the nature of the intermolecular interaction. Classic blue phase materials like CO and COC give appropriate CD spectra, which is seen to differ from the CD spectrum of their mixture. Predictions of computer simulations on hard core-transverse dipole model of a mesogen appear to be consistent with the optical texture of COC, known to have a transverse dipole.

Microbiology

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

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

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

Mesorhizobium ciceri BICC 651, a microsymbiont of *Cicer arietinum*, produces a catechol siderophore under iron limitation. Tn5 mutagenesis of *M. ciceri* BICC 651 R, a rifampicin resistant derivative of BICC 651, was carried out by mating with *E. coli* S17.1 containing the suicide plasmid pSUP 5011 which carries Tn5. Transconjugants selected on a medium containing rifampicin and neomycin occurred at a frequency of 10^{-5} per donor cell. Following screening several siderophore nonproducing and overproducing mutants were isolated. Southern hybridization of Eco RI digested genomic DNA of several mutants probed with a restriction fragment of Tn5 indicated the presence of single copy of the transposon in the mutants.

Regulation of sulfur oxidation gene clusters (Dr. Pradosh Roy)

Genetic characterization of the chemolithotrophic bacterium, *Pseudaminobacter salicylatoxidans* KCT001, led to the mapping of twelve independent sulfur oxidation defective mutations in a 12 kb *sox* locus. Within this gene cluster three upstream genes are divergently transcribed and seem to be involved in the regulation of the expression of the downstream genes. These three genes, namely *soxT*, *soxR* and *soxS*, are predicted to be a permease, a transcriptional repressor and a thioredoxin like protein, respectively. The transcriptional regulator SoxR binds to the promoter/operator region present in between *soxS* and *soxV* in its dimeric form. Further footprinting assay reveals its exact binding site. Thus, upon binding with the specific intergenic region SoxR appears to repress the expression of downstream genes.

Regulation of impaired PKC signaling by MIP-1 α in murine macrophages during visceral leishmaniasis (Dr. Subrata Majumdar)

The present study explored the potential role of the MIP-1 α , a CC-chemokine, in withdrawing the impaired PKC activity during leishmaniasis both *in vitro* and *in vivo*, as well as the induction of chemotaxis and restoration of respiratory burst mechanism at the early stages of *L. donovani* infection in macrophages. Our investigation established that MIP-1 α was involved in the regulation of impaired PKC mediated signaling during diseased condition.

We also observed that MIP-1 α induced the translocation of NADPH oxidase components and restored the superoxide anion generation in *L.donovani* infected cells. We further tested its effect on the regulation of the course of infection in BALB/c mice. The *in vivo* results clearly indicated that MIP-1 α is significantly effective in controlling the parasitic burden and splenomegaly in *L.donovani* infected BALB/c mice.

Peptide antagonists of Hsp16.3, a small molecular weight mycobacterial chaperone and virulence factor (Sujoy K. Das Gupta, Prof. Siddhartha Roy [Biophysics], Prof. B. Bhattacharyya [Biochemistry])

The small molecular weight heat shock protein Hsp16.3 produced by *Mycobacterium tuberculosis* is believed to play a role in the persistence of mycobacteria during latent infections. It appears to do so by preventing irreversible de-naturation of essential proteins under adverse conditions. Random peptide libraries displayed on bacteriophage M13, were screened for Hsp16.3 binding peptides. Two such peptides, an 11-mer and a 16-mer, were identified which bind Hsp16.3 ($K_d \approx 50 \mu\text{M}$), and also inhibit its chaperone activity. Two histidine residues appear to be common to the selected peptides. NMR studies performed with the 11-mer peptide indicate that in this case histidine residues may be the crucial binding determinants. The peptide inhibitors of Hsp16.3 thus obtained could serve as the basis for developing potent drugs against persistent TB and also to understand the mechanism of Hsp16.3 action. The investigation was part of a NMITLI-CSIR sponsored project on drug development against TB.

Microbial degradation of polycyclic aromatic hydrocarbons (Dr. Tapan K. Dutta)

Several bacterial species have been isolated from petroleum and coal-contaminated soils which can assimilate various toxic and/or carcinogenic PAHs like phenanthrene, pyrene or benz[a]pyrene as sole carbon source. A novel pathway has been observed in the degradation of phenanthrene, where 2-hydroxy-1-naphthoic acid and 2-naphthol were found as the metabolic intermediates as identified by GC-MS and NMR analyses. Further analysis of the upper pathway of phenanthrene metabolism indicated dioxygenation in the atypical K-region of phenanthrene followed by *meta*-cleavage of phenanthrene-1,2-dihydrodiol.

Bacterial metabolism of phthalate esters (Dr. Tapan K. Dutta)

Metabolic pathways involved in the degradation of benzyl alcohol and 1-butanol, the hydrolyzed products of butyl benzyl phthalate by the *Gordonia* sp. strain MTCC 4818 were investigated. Benzyl alcohol was found to be metabolized via benzaldehyde, benzoic acid and catechol, which was further degraded by *ortho*-cleavage dioxygenase to *cis,cis*-muconic acid and subsequently to muconolactone leading to β -ketoadipate pathway, while 1-butanol was metabolized via butyraldehyde and butyric acid, which was channeled into the tricarboxylic acid cycle via β -oxidation pathway. Numbers of dehydrogenases, both NAD^+ -dependent and NAD^+ -independent, and the ring cleavage dioxygenase involved in the degradation process exhibited relaxed substrate specificity.

Physics

The Department of Physics has been in existence since the inception of Bose Institute and hence it is one of the oldest Departments in the Institute. The Department's current research activities are in the areas of Radiation Physics research with Photons and Neutrons; 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. The aim of this research program is to contribute both to fundamental knowledge as well as applications relevant to industry and society in general.

Radiation Physics (Prof. Suprakash C. Roy, Prof. Biva Roy, Prof. Barun K. Chatterjee)

Polydispersed superheated emulsion detector consists of droplets of different sizes. A volume distribution function for drops has been adopted for analyzing the radiation induced nucleation rate data from polydispersed superheated emulsion. It has also been established as a special tool for data analysis.

Pressure scanning system has been installed. Further works on fabricating different parts to customize the need of the present experiment are in progress. This system will be used to obtain the energy spectrum of neutrons.

Energy dependence of the gamma detection efficiency of superheated emulsion detector show that the gamma detection efficiency increases with the energy of the gamma ray photon.

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

Used the S-Matrix code developed at the University of Pittsburgh to identify the parameter region where the impulse approximation results deviate markedly from the S-Matrix results.

The Impulse Approximation predicts a symmetric Compton profile. However, experimental findings indicate an asymmetric profile. In contrast to several other theories based on finite interaction time, we have explained such an asymmetry due to a shift of the momentum of the scattered electron – which we term as the Profile Defect.

Interdisciplinary physics (Prof. Indrani Bose)

Gene transcription regulatory networks of *E.coli* and *S.cerevisiae* contain an abundance of motifs one of which is the feed forward loop (FFL). A FFL consists of three genes X, Y and Z. The protein product of the X gene regulates the expression of the Y gene. The expression of the Z gene is regulated by the protein products of both the X and Y genes. We have shown using mathematical and computer simulation techniques that the Type-I coherent FFL, which is the most abundant amongst the different types of FFLs, acts as the best noise filter. Our results lead to the interesting conjecture that noise is one of the parameters on which natural selection acts.

The distribution of wealth in societies is a well-known problem in economics. We have proposed a stochastic model of wealth distribution and shown, using statistical physics techniques, that the steady-state distribution is given by the Beta distribution. Evidence for this type of distribution is available in economic literature.

Quantum Entanglement (Prof. Indrani Bose)

Recent experiments provide evidence of entanglement in the thermal states of macroscopic solids. An entanglement witness (EW) is an observable which has a negative (positive) expectation value in entangled (unentangled) states.

Using magnetic susceptibility and entanglement gap as EWs, we have shown the existence of bipartite as well as multipartite entanglement in molecular magnets at finite temperatures. The analysis is based on the available experimental data for such systems. The results are of interest as entanglement is the fundamental resource in quantum communication and information applications and its presence in macroscopic systems opens up the possibility of entanglement generation and manipulation in a large-scale setting.

Foundations of Quantum mechanics and Quantum Entanglement (Prof. Dipankar Home)

It is shown how it is possible to verify the quantum statistics of identical particles prepared in distinguishable internal states without ever bringing these particles to the same internal state. Using our method, the identical nature of particles can be probed through entanglement and their specific statistics can be studied by discriminating between different types of entangled states. It is also shown how without using any classical channel, quantum information can be transferred using an entangled tripartite system with nonorthogonal states. A specific dynamical model is given and a new type of a quantum non-local effect is obtained.

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

Our Universe consists of a large amount (~ 73%) of Dark Energy (DE), comparatively smaller amount (~ 23%) of Cold Dark Matter (CDM) and a very small amount (~ 4%) of visible matter. We have shown that starting from early universe QCD phase transition, one can explain the presence of CDM and DE entirely from the standard principles of strong interaction physics, in quantitative agreement with present data, without the need for any adjustable parameters. These findings have been published in Physics Letters B. But still there are many unanswered questions. The number of quarks and anti-quarks, which must have been equal during the production, changed during baryogenesis and/or leptogenesis to facilitate the present day small baryon number anisotropy. These processes, which occurred much earlier than the QCD phase transition, should be consistent with our doctrine for the formation of dark matter and dark energy; this is under investigation.

The quark-hadron phase transition inside a rotating compact star may have some interesting consequences. The interactions producing the strange quark matter occur with a production

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. These findings have been reported in the Vth International Conference on Physics and Astrophysics of Quark-Gluon plasma held in Kolkata during February 2005.

Characterisation and standardization of novel detection materials for heavy ions (Dr. Swapan K. Saha and Prof. Sibaji Raha)

Considerable progress has been made on the characterisation of OHP films as detector heavy ions. We analyzed data taken with ^{16}O beam at the Nuclear Science Centre, New Delhi. We found that the OHP films cannot detect particles with $z/\beta < 35$ but particles with $z/\beta \sim 900 - 1600$ can be detected. The high detection threshold identifies this particular material as a suitable candidate for setting up a large area array of detectors, aiming at the search of cosmic ray massive particles at mountain altitude.

In-medium properties of Hadrons (Dr. Sanjay K. Ghosh)

The effects of in-medium hadronic properties in photon nucleus interactions in the context of shadowing as well as the dilepton spectrum have been studied. The results are published in Journal of Physics G. However, at higher energies, the quark structure of hadrons becomes important. So one may consider a photon to be consisting of a bare photon and a large number of quark-antiquark excitations. Starting from this picture we are presently studying the photon-nucleus scattering processes.

Dielectric relaxation in strontium and calcium iron niobate (Dr. Tripurari Prasad Sinha)

Dielectric strontium and calcium iron niobate are synthesized by ceramic process. X-ray analysis of the samples shows monoclinic phase. Frequency dependent dielectric constant and the loss tangent of the samples are analyzed at various temperatures considering Maxwell-Wagner mechanism arising from space charge polarization. Dielectric relaxation in the samples is explained using Debye formula for complex permittivity.

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 applied research in the fields of (a) animal biotechnology (aquaculture and sericulture) and (b) medical biotechnology (cancer chemoprevention and thyroid hormone-brain relationship) as well as in basic research in the fields of cell cycle regulation and immunology.

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

In order to establish the biological role of estradiol-17 β in silkworm, we were searching estradiol-related several sub-cellular physiological parameters in fat body, testis and ovary in larval and pupal stage. Several sub-cellular enzymes, different in different organs, have been found to be estradiol-specific. Their relationship with specific binding of estradiol-17 β in the different organs of silkworm will be further correlated. The triploid catfish (*H. fossilis*) prepared earlier in our laboratory showed 2.5 times higher growth rate than the diploid counterpart. In order to understand why the triploid variety showed so much enhanced growth rate, we searched several key enzyme activities in different yielded like, liver, kidney, ovary and brain in different reproductive stages. The study has emerged interesting observations that indicate higher metabolic activity in the triploid fish than the diploid counterpart.

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

In hypo-or hyper-thyroidism in adult humans, the serum thyroid hormone levels change and the patients develop abnormal intellectual and behavioural manifestations, which can be corrected by adjustment of the peripheral thyroid hormone levels. Despite the alterations in the peripheral hormone levels 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 remain unclear. Our 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. Such chronology of the homeostatic phenomenon will help us to understand its mechanism of operation.

Curcumin selectively induces apoptosis in deregulated cyclin D1 expressed cells at G2 phase of cell cycle in a p53-dependent manner (Dr. Gaurisankar Sa)

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. 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 an 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.

Theaflavins-induced human breast cancer cell apoptosis is p53-dependent (Dr. Tanya Das)

The aims of this study were to determine the effect of black tea polyphenols, i.e., theaflavins, on two breast cancer cell lines, hormone-dependent MCF-7 and hormone-independent MDA-MB-231, and to investigate the mechanism of action of theaflavins in human breast cancer cells. Our results indicated that theaflavins induced apoptosis in both cell lines after 8h of treatment with greater effect in MCF-7. In fact, in MCF-7 with wild type p53, theaflavin-induced apoptosis involved mitochondrial transmembrane potential loss, cytochrome c release, activation of caspases 9, 6 and 7, and DNA fragmentation and membrane pore inhibitor completely abrogated apoptosis. However, in MDA-MB-231, having mutated p53, theaflavins failed to activate mitochondrial death cascade. In these cells, theaflavins activated extrinsic pathway of apoptosis and induced caspase 8 activation. However, suppression of Akt-mediated survival signal has not been overruled. We conclude that theaflavins induce apoptosis in breast cancer cells, an effect that is independent of estrogen receptor status but dependent on p53 profile of the cells.

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. 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.

Studies of environmental pollution samples (Prof. Maqsood Siddiqi)

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 analysed. Environmental Sciences Section earned Rs.1,05,700.00 in the last financial year as revenue.

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*.

Medical Biotechnology (Dr. Nripendranath Mandal)

The theme of research programs in this area is to develop a very sensitive PCR based method for quantification of very low levels of mRNA from various immunologically important genes during immune response in infectious and non-infectious diseases. During last few years we are constructing a synthetic plasmid DNA that will be used to quantify very low levels (femto gram) of expressed mRNA from as many as 18 different cytokine genes. 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 natural resources.

Another theme of our research program is Immuno-genetic study of non-communicable disease like coronary heart disease (CHD) among Asian Indian population in Eastern part of India. The consistency of a high prevalence of premature CHD in Asian Indians settled in widely different geographical locations, despite having varied dietary and lifestyle profiles, suggests a prominent role of immuno-genetic factor(s). Immuno-genetic factors of CHD appear to be mediated by changes in plasma cytokines level namely Interleukin 6 (IL-6), IL-10 (IL-10), IL-1 β and tumor necrosis factor alpha (TNF- α) etc. In our research program we are 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. Anticipated results are expected that some SNPs in the promoter region of IL-6, IL-10, IL-1 β and TNF- α gene will predispose individuals to CHD. Identification of these functional SNPs will be useful in prediction of premature and accelerated CHD in Eastern Indian population.

Finally our aim is to develop a novel diagnostic and prognostic method in biological fluid for all kinds of tuberculosis, including tuberculous meningitis. Recently we found a heat stable inhibitor of pseudo cholinesterase from the serum of TB patients. The presence of this inhibitor is an indicator for tuberculosis. Inhibition wanes gradually with successful treatment and finally, no inhibition is found when the disease is cured completely.

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 is 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. During last three years we are developing disease resistant DNA markers in *P. monodon* that will be useful to develop marker assisted breeding program to generate disease free seeds of shrimp aquaculture.

Plant Molecular & Cellular Genetics

Plant Tissue Culture Section was established in the year 1976 by late Dr. V. N. Gadgil and renamed as PMCG Section in the year 1989 with specific focus on researches on the plant genetic engineering towards improvement of plant productivity. In the last few years the major emphasis has been given to identify the 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 : A genomic and proteomic approach (Prof A.N.Lahiri Majumder)

In an attempt to identify novel genes for salt-tolerance in line with the discovery of PINO1, subtraction cDNA libraries have been made from *Porteresia coarctata* plants. Sequencing of the clones obtained enabled identification of ~500 ESTs (deposited in the GenBank). A salt-tolerant chloroplastic Fructose-1,6-bisphosphatase (PCFR) has been identified, cloned, bacterially expressed, characterized and currently being tested in transgenic tobacco system. PINO1 gene has been introgressed in rice and mustard plants conferring salt-tolerance phenotype.

Species-specific SCAR marker development in bamboo (Prof. Amita Pal)

The development of species-specific molecular markers is of immense importance for the bamboo industry to avoid unintentional adulteration that affects the quality and quantity of the merchandise production. To overcome the fundamental problem of bamboo identification, we have developed, for the first time, ubiquitously present molecular markers for two commercially important species, *Bambusa balcooa* and *B. tulda*. The species-specific SCAR markers were named as 'Balco836' for *B. balcooa* and 'Tuldo609' for *B. tulda* (GenBank accession nos. AY 653073 and AY684298). These two diagnostic markers are potentially useful for regulatory agencies to establish exclusive sovereign rights of the species in the country of origin and to resolve IPR conflicts.

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

Allium sativum leaf lectin (ASAL), a potent insect control agent, has been expressed in mustard plants. The transgenic plants were multiplied up to T₂ generations. The molecular analyses confirmed the integration and expression of transgene. The bioassay conducted with the transgenic mustard samples on *Lipaphis erysimi* established the efficacy of the T₁ and T₂ plants to affect the survival and fecundity of the insects. Likewise, transformation experiments with chickpea and rice with chimeric ASAL gene under the control of phloem specific promoters also resulted into respective transformed lines. The molecular analyses and insect bioassay of those lines against *Aphis craccivora* and *Nephotettix sps* are going on. A ~ 38kDa brush border membrane vesicle protein has been identified from the gut of *Aphis craccivora*. Further characterisation in terms of glycosylation and other features related to lectin binding are underway.

Towards development of aphid tolerant mustard cultivar (Dr. Samir R. Sikdar)

The mustard aphid (*Lipaphis erysimi*) causes 54.2% yield loss in mustard and rapeseed crops. In absence of any aphid tolerant gene in *Brassica* germplasm, an aphid tolerant stable somatic hybrid plant (*Rorippobrassica*) have been developed through protoplast fusion between aphid susceptible Indian mustard (*Brassica juncea*) and one of its aphid tolerant wild relatives (*Rorippa indica*). Progenies of selfed BC₁ plants (somatic hybrid backcrossed with mustard plant or vice versa) have been raised, which is a step towards development of aphid tolerant commercial mustard cultivar.

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4. Bandyopadhyay S, Das A, Mukherjee G N, Cantoni A, Bocelli G, Chaudhuri S. and Ribas J. (2004) Equilibrium and structural studies on Co (II), Ni(II), Cu (II) and Zn (II) complexes with N-(2-benzimidazolyl) methyliminodiacetic acid: crystal Structures of Ni (II) and Cu (II) complexes. *Inorg. Chimica Acta*, 357, 3563-3573.
5. Sen A K. (2004) 'Remote controlled sophisticated electronic code lock' in 'Electronics for you', New Delhi. vol-36, No. 7, pages 57-62.

STUDENTS AWARDED WITH PH.D. DEGREE

Name of Student (University, Year)	Department/Title of Thesis	Supervisor
Biochemistry Department		
Ajit Bikram Datta (JU, 2004)	The Lysis-Lysogeny Switch of Bacteriophage Lambda : A Structural and Biophysical Analysis	Dr. Pradeep Parrack and Prof. Pinakpani Chakrabarti
Suchismita Das (JU, 2004)	Regulation of DNA reduplication during the cell cycle of <i>Entamoeba histolytica</i> .	Prof. A. Lohia
Sulagna Banerjee (JU, 2004)	Genome organization and function in <i>Entamoeba histolytica</i>	Prof. A. Lohia
Sujata Hajra (JU, 2004)	Kinetochore structure of the budding yeast <i>Saccharomyces cerevisiae</i> : A study using genetic and protein-protein interactions.	Prof. P. Sinha
Biophysics Department		
Ms. Sreya Ghosh (Pal) (CU, 2004)	Structural basis of interaction of amino acid and protein with ligands	Prof. Asoke Banerjee
Ms. Ruchira Chattopadhyay (JU, 2004)	A study of structural basis of heat shock regulatory circuit	Prof. Siddhartha Roy
Botany Department		
Rajasri Bhattacharyya (Jadavpur Univ., 2004)	<i>In vitro</i> studies of <i>Phyllanthus amarus</i> Schum & Thonn. Micropropagation and evaluation of culture raised plants and organs in relation to antiviral activities	Dr. Sabita Bhattacharya

Name of Student
(University, Year)

Department/Title of Thesis

Supervisor

Chemistry Department

Nandita Ghosh
(JU., 2004)

Studies on the synthesis and reactions of heteroarenes and arenes

Prof. Manas Chakraborty

Somesh Baranwal
(JU., 2004)

Mechanisms of antibiotic resistance in enteric bacteria

Dr. Manikuntala Kundu

Physics Department

Sonali Saha
(C.U.: 2004)Structural, optical, electronic and ferroelectric studies of some ABO_3 oxides

Dr. T. P. Sinha

Microbiology Department

Mithu De
(J.U., 2004)

Studies on the amylase production by a bacterial strain

Prof. P.K. Chakrabartty

Abhijit Basu
(J.U., 2004)

An Investigation into the DNA-protein interactions at the origin of replication of the mycobacterial plasmid pal 5000

Dr. Sujoy K. Dasgupta

Bisweswar Nandi
(J.U., 2004)Characterization, distribution and function of an outer membrane protein OmpW of *Vibrio cholerae*

Prof. A.C. Ghose

Jiaur Rahaman Gayen
(J.U., 2005)Synthesis of newer β -lactams by a β -lactamase-free penicillin amidase produced by *Alcaligenes* sp.

Prof. Timir B. Samanta

Sriparna Palit
(C. U., 2005)

Lipoarabinomannan isolated from different species of mycobacteria induces survival and cytotoxic effect

Dr. Subrata Majumdar

Name of Student
(University, Year)

Department/Title of Thesis

Supervisor

Animal Physiology Section

Sreya Chattopadhyay
(J.U.)

Molecular mechanisms of Protein
A-induced selective tumor killing

Dr. Tanya Das &
Dr. Gaurisankar Sa

Santanu Banerjee
(J.U., 2004)

Studies on the Insecticidal Activities
of *Allium sativum* (Garlic) Lectin(s)
and determination of their Mechanism
of Action on Homopteran Insect Pests

Dr Sampa Das

Palash Mandal
(J.U., 2004)

Development and characterization
of somatic hybrids between
Rorippa indica and *Brassica juncea*.

Dr. S.R. Sikdar

Manoj Majee
(J.U., 2005)

Cloning, bacterial expression and
characterization of a salt-tolerant
L- myo-inositol 1-phosphate
synthase from wild halophytic rice

Prof. A.N.Lahiri
Majumder

GRANTS-IN-AID SCHEMES

Investigator /
Co-investigator

Title of schemes

Name of the

Schemes Founder by CSIR

Dr. Pradeep Parrack

Structural and thermodynamics studies on the
interaction of cII protein of bacteriophage
lambda with cII dependent promoters
(terminated on 31.3.05)

Biochemistry

Dr. Subrata Sau

Studies on the host lethal gene of the temperate
mycobacteriophage L1

Biochemistry

Prof. B. Bhattacharyya

Biochemical & Biophysical Studies to establish
tubulin as a molecular chaperon

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

Theoretical and Crystallographic studies on
protein-protein Interactions (started from 05/3/05)

Biochemistry

Prof. Asoke Banerjee

Design and development of protease inhibitors:
A practical approach to blunt the protease. The
Nature's Swiss Army knife

Biophysics

Prof. Siddhratha Roy

A study of tRNA recognition and discrimination
by glutamyl and glutamyl-tRNA synthetases
from E. Coli.

Biophysics

Dr. Gautam Basu (co-
investigator) & Prof.
Pinakpani Chakrabarti
(principal investigator)

Theoretical and crystallographic studies on
protein-protein interactions

Biophysics /
Biochemistry

Prof. Parimal C. Sen

Further Characterization of Protein Kinase x
(PKx) from Goat Spermatozoa (Terminated
on 30.11.2004)

Chemistry

Dr. R. P. Das

Insight into the structure, folding and
molecular chaperone function of α -crystallin
(Terminated on 31.12.2004)

Chemistry

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Dr.Manikuntala Kundu Dr.Joyoti Basu	Mechanisms of antibiotic resistance in enteric bacteria	Chemistry
Dr.Joyoti Basu Dr.Manikuntala Kundu	Structure, function and regulation of high-molecular mass penicillin-binding proteins of <i>Mycobacterium tuberculosis</i>	Chemistry
Dr. Parames C. Sil	Purification and Characterization of a hepatoprotective protein from the herb <i>Phyllanthus niruri</i> .	Chemistry
Dr. P. Roy	Identification of genetic loci involved in sulfur oxidation in sulfur lithotrophic bacterium: Genomics of sulfur lithotrophy	Microbiology
Sujoy K. Das Gupta	Investigation into the stimulatory effect of host factors on the origin binding activity of a mycobacterial plasmid replication protein.	Microbiology
Dr. Tapan K. Dutta	Microbial management of environmental carcinogens: High molecular weight polycyclic aromatic hydrocarbons.	Microbiology
Prof. Amita Pal	DNA fingerprinting for identification of bamboo species and genotypes for IPR protection and conservation.	PMCG
Dr. Samir R. Sikdar	Development and characterization of somatic hybrid plants between <i>Brassica juncea</i> and <i>Rorippa indica</i> (terminated on 19.12.2004).	PMCG

Schemes funded by DBT

Dr. Anuradha Lohia	Analysis of genome organization in <i>E. histolytica</i> (terminated on 19/9/04)	Biochemistry
Dr. Anuradha Lohia	Identification of medicinal plant extracts for anti-proliferative property against <i>E. histolytica</i> (terminated on 31/3/05)	Biochemistry
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

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
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. K.K.Mukherjee	Understanding of molecular factors behind sex expression in plants	Botany
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
Dr. Debabrata Basu	Functional genomics approaches for identification of the gene(s), expressed differentially in <i>Arabidopsis</i> and <i>Sinapis alba</i> as a part of resistance mechanism against <i>Alternaria brassicicola</i> through cDNA AFLP and cDNA subtraction.	Botany
Dr. D.N.Sengupta	Evaluation of transgenic Tomato and Banana plants and Search for new gene from ripened Mango fruit.	Botany
Dr. D.N.Sengupta	Post Harvest biotechnology for Improved Shelf life of Tomato : Effect of overexpressing Le-MADS-Rin and ACS 4 genes	Botany
Dr. D.N.Sengupta	Sub-project in National Net-work: Analysis of ABRE-based promoter & Cloning of trans-acting factor for over-expression in salt sensitive rice.	Botany
Prof. Swati Sen Mandi	Characterization and Improvement of Tea through Biotechnological Tools" (A National Network Programme), 2004-2005	Botany
Prof. Parimal C. Sen In collaboration with Dr. R. Bhadra, I.I.C.B.	Development of highly unsaturated marine lipids and ester and specific bioactive analogues for the treatment of some prevailing chronic disorder	Chemistry

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Prof.Parul Chakrabarti Dr. Joyoti Basu	The DrrA-B efflux system of <i>Mycobacterium tuberculosis</i> (Terminated on 22.11.2004)	Chemistry
Dr.Joyoti Basu Dr.Manikuntala Kundu	Regulation of the functions of the human anion exchanger AE1 by phosphorylation and proteolysis	Chemistry
Dr. Joyoti Basu	Role of lipoarabinomannan of <i>Mycobacterium tuberculosis</i> as a modulator of macrophage cell signaling	Chemistry
Dr. N. Mandal	Development of microsatellite DNA markers For shrimp to identify disease resistant population	Immunotechnology
Prof. P. K. Chakraborty Dr. P. Roy	Genetic organization of <i>Mesorhizobium</i> <i>ciceri</i> operon encoding components of Iron acquisition system and possibility Of development of improved biofertilizer Having increased symbiotic efficiency	Microbiology
Dr. Sujoy K. Das Gupta	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
Dr. Samir R. Sikdar	Generation of spawn and fruiting body of edible mushrooms and demonstration of the technology to the rural SC/ST population (terminated on 15.10.2004)	PMCG

Scheme funded by DST

Dr. Subrata Sau	A global study to identify, clone and characterize the Essential genes affecting the growth of <i>M. smegmatis</i> and development assay.	Biochemistry
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
Dr.Joyoti Basu Dr.Manikuntala Kundu	Proteins of the cell wall synthesis and cell division machinery of mycobacteria; potential drug target sites (Terminated on 09.07.2004)	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	Identification of active site amino acid residues of eukaryotic L-myo-inositol 1-phosphate synthase- A biochemical and molecular approach	PMCG
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> .	PMCG

Scheme funded by Indo Swiss Collaboration in Biotechnology (ISCB/DBT)

Dr. Sampa Das	Development of transgenic insect resistant Indian cultivar of chickpea	PMCG
Dr. Sampa Das	Effects of transgenic insect resistant chickpea plants on non target insects.	PMCG

Schemes funded by NMITLI - CSIR

Dr. P. Chakrabarti	Development of a versatile portable software suite for Bioinformatics (terminated on 31/3/05).	Biochemistry
Dr. Sujoy K. DasGupta Dr. G. Basu, Prof. S. Roy	"New Millennium Indian Technology Leadership Initiative (NMITLI)" project	Microbiology Biophysics

Investigator /
Co-investigator

Title of scheme

Bose Institute
Name of the
Dept./SectionDr. P. Chakrabarti
Prof. B. Bhattacharyyaon "Latent tuberculosis, new targets,
drug Delivery systems and bioenhancers
and Therapeutics". (Multi centric project)

Biochemistry

Scheme funded by ICMR

Prof. Anuradha Lohia
Prof. Pratima Sinha)Functional genomics of *Entamoeba histolytica*
to Identify genes controlling growth and
proliferation (terminated on 28/2/05).

Biochemistry

Prof. Parul Chakrabarti/
Dr. Joyoti Basu/
Dr. Manikuntala KunduAntigens and Immune response in
tuberculous infections

Chemistry

Dr. Manikuntala Kundu
Dr. J. BasuHost cell signaling in relation to
Helicobacter pylori pathogenesis
(Terminated on 13.03.2005)

Chemistry

Dr. Joyoti Basu/
Prof. Parul Chakrabarti/
Dr. Manikuntala Kundu/
Prof. Manas ChakrabartyGenomics, proteomics and bioinformatics
of some target genes of *Mycobacterium*
tuberculosis for drug development
(Terminated on 28.02.2005)

Chemistry

Dr. Pradip Das

Experimental determination of suitability
of cholesteryl oleyl carbonate in fluidizing
cholesteryl oleate in atherosclerotic plaque
(Terminated on 28.02.2005)

Chemistry

Dr. N. Mondal

Quantification of the cytokines of mRNA
Based on competitive RT-PCR

Immunotechnology

Dr. Sujoy K. Das Gupta

Germination of peptide mimics against the
Immunodominant lipoglycan / lipopolysaccharide
Antigens of *Mycobacterium tuberculosis* and
Vibrio cholerae using phage display libraries
And their evaluation as diagnostic and
prophylactic agents

Microbiology

Schemes Funded by DRDO

Prof. Siddhartha Roy

Drug design against Glu-tRNA^{Gln} amidotransferase
from *M. tuberculosis*

Biophysics

Annual Report

Investigator /
Co-investigator

Title of scheme

Name of the
Dept./Section

Scheme funded by DAE

Dr. Joyoti Basu
Dr. Manikuntala KunduModulation of host cell signal transduction
by lipoarabinomannan from *Mycobacterium*
tuberculosis (Terminated on 16.08.2004)

Chemistry

Dr. Parames C. Sil

Functional characterization of a
hepatoprotective protein from the herb
Cajanus indicus L: signal transduction
Mechanism

Chemistry

Dr. Subrata Majumdar

Modulation and intracellular mechanism
of action of chemokines during leishmaniasis

Microbiology

Scheme funded by IFCPAR

Dr. Joyoti Basu/
Dr. Manikuntala Kundu/
Prof. Parul ChakrabartiABC Transporters of *Mycobacterium*
tuberculosis

Chemistry

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

Dr. Barun K. Chatterjee/
Prof. Suprakash C. RoyInvestigation on theoretical aspects
of Compton scattering

Physics

Scheme funded by ISRO (RESPOND Programme)

Dr. Swapan K. Saha

Identification and characterization of
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

Participation in Conferences/Symposia/Workshops

Prof. P. Chakrabarti (Biochemistry) (i) Presented a talk at the Environmental and Therapeutical Applications of Nanobiotechnology and Genomics, Sophia-Antipolis, France, September 8-10, 2004. (ii) Presented a talk at the structural Biology at Crossroads : From Biological Molecules to Biological Systems, Hamburg, September 15-18, 2004. (iii) Presented a talk at the 2nd Indo-French Bioinformatics Meeting, Saint Denis de La Reunion, France, December 10-12, 2004. (iv) Delivered lecture at the 34th National Seminar on Crystallography, Guwahati, January 10-12, 2005. (v) Delivered lecture at the Discussion Meeting on Macromolecular Crystallography and Structural Genomics, SINP, Kolkata, January 7-8, 2005. (vi) Delivered lecture at the International Seminar on Role of Biotechnology in the Modern Industrial Scenario, Haldia, January 21-22, 2005. (vii) Presented a talk at the one-day seminar on Structural Biology, Madras University, March 4, 2005.

Prof. P. Sinha (Biochemistry) Delivered an invited talk 'Chromosome stability in the budding yeast *Saccharomyces cerevisiae*'. At "Chromatin: Folded Secrets unfolded" held at ACTREC, Navi Mumbai, Aug. 28-29, 2004.

Prof. A. Lohia (Biochemistry) (i) Invited talk at "Genomics and biology of the Mitochondria", Woods Hole USA, September 2004; (ii) Invited talk at "Pathogenesis of amoebiasis: From Genomics to disease", Ein Gedi, Israel, November 2004; (iii) Invited talk at "The genome repertoire of *Entamoeba histolytica* affords a glimpse of its unique biology", IICB, Kolkata, March 2004.

Dr. P. Parrack (Biochemistry) attended and delivered an invited talk entitled "Interaction of lambda CII with its cognate phage operators : structural basis for direct repeat recognition" at the 8th Transcription Assembly Meeting at the National Centre for Cell Sciences, Pune (October 28-30, 2004).

Dr. P. Parrack (Biochemistry) attended the 2nd RNA Group Meeting on "RNA Research in India" held at Saha Institute of Nuclear Physics, Kolkata (Dec 21-22, 2004) and chaired a session.

Mr. Ranjit P. Bahadur (Biochemistry) attended the CECAM Workshop on Flexible Docking, Lyon, France, April 28-30, 2004.

Dr. Gautam Basu (Biophysics) presented a poster at the annual meeting of the Protein Society in San Diego (August, 2004).

Dr. Sabita Bhattacharya (Botany) chaired a session "Agriculture & Biotechnology" of "5th All India People's Technology Congress" held on 19 - 20th February, 2005 at Science City, Kolkata

Rajasri Bhattacharyya (Botany) participated and presented a paper in "Workshop on Regional Cooperation on Conservation of Biodiversity Hotspots of the Indian Subcontinent and Taxonomic Databases for Conservation" held on 30th August - 1st September, 2004 at

Bangalore, Karnataka. She also participated and presented a poster in "National Seminar on Medicinal Plants, Plant Products & Patents" held on 30th September - 3rd October, 2004 at Asutosh Birth Centenary Hall, Indian Museum, Kolkata.

Avik Ray (Botany) participated in "National Seminar on Medicinal Plants, Plant Products & Patents" held on 30th September - 3rd October, 2004 at Asutosh Birth Centenary Hall, Indian Museum, Kolkata. He also participated and presented a poster in "National Conference on Medicinal Plants : Resources, Applications and Conservation in India" held on 11 - 12th February, 2005 at Jadavpur University, Kolkata.

Dr Dibyendu N. Sengupta (Botany), Ms. Chaitali Roy, Dr. Kakali Mukherjee, Mr. Sujit Roy, Mr. Swarup Roy Chaudhuri, Mr. Aryadeep Roy Chaudhuri went to Pune University to attend the Plant Physiology Meeting held on.

Dr. Swati Gupta-Bhattacharya (Botany) chaired a session in 38th National Convention of the Indian College of Allergy, Asthma & Applied Immunology held in Hotel May Fair Lagoon, Bhubaneswar, Orissa.

Dr. Pampa Chakraborty, Dr. Dola Boral, Ms. Shaonli Das, Ms. Jyotshna Mandal (Botany) participated and presented paper on 38th National Convention of the Indian College of Allergy, Asthma & Applied Immunology held in Hotel May Fair Lagoon, Bhubaneswar, Orissa.

Dr. Swati Gupta-Bhattacharya (Botany) chaired a session and presented a paper in 13th National Conference on Aerobiology held in the Institute of Science at Nagpur during 29 - 31 January, 2005. She was elected as the fellow of the Indian Aerobiological Society. She was invited as a speaker in a one day Seminar on 'Air-pollution and Human Health' at Brahma Balika Vidyalaya, Kolkata conducted by CSME on 2nd February, 2005.

Ms. Shaonli Das participated, presented paper and was awarded the "P. H. Gregory Memorial Award" in 13th National Conference on Aerobiology held in the Institute of Science, Nagpur during 29th-31st January, 2005.

Prof. Prabir Saha (Botany) participated in the BIOTECH INDIA 2005, 2nd International Exhibition and Conference on Biotechnology held on February 9-12, 2005 at Pragati Maidan, New Delhi.

Prof. Swati Sen-Mandi (Botany) was invited as a resource person at Workshop on Biodiversity for generating Wealth with Biotechnological Intervention; Institute of Life Science, Bhubaneswar, March 11-13, 2004. She was invited for poster presentation at 3rd Plant Genomics European Meeting, organized by several European organizations and companies; Scientific Secretariat at CNRS / Bayer Crop Science. Registration and local hospitality provided by Bayer Crop Science, France 22-25 September 2004. Prof. Sen Mandi was invited for conducting workshop on Biodiversity sponsored by Jagadish Bose National Science Talent Search (JBNSTS) at Along, Arunachal Pradesh, 2nd-4th December 2004. She was also invited as speaker for Lead lecture at the Section of Agriculture and Forestry

Sciences at the 92nd session of the Indian Science Congress Association (ISCA), Ahmedabad, January 3-7, 20. She was an invited speaker at the one day seminar entitled "Environment Issues in Agriculture" organized by Kolkata Chapter of Indian Science Congress Association in cooperation with National Bureau of Soil Survey and Land Use Planning (ICAR) Kolkata, 11th March, 2005.

Prof. Parul Chakrabarti (Chemistry) delivered a plenary lecture in "The International Conference on Functional Genomics for Novel Vaccine and Drug Design against Mycobacterial Infection" (VDMI) organized jointly by Indian Institute of Technology, Kharagpur and The Gades Institute, Bergen, Norway in Kharagpur from February 10th to 11th, 2005.

Prof. Parimal C. Sen (Chemistry) attended DBT group monitoring workshop at New Delhi in January 2005; delivered a plenary Lecture at UGC Sponsored Symposium on Recent Advances in Regulatory Mechanisms in Animal function: A Molecular Approach at Sregopal Banerjee College in February 2005; acted as a panel of judge and examiner in INTEL Science Discovery Fair at Gauhati and Mumbai.

Prof. Manas Chakrabarty (Chemistry) delivered an Invited Lecture entitled "Reaction of 3-formyl-indoles with TOSMIC: Novel formation of stable indolyl primary enamines" at the International Symposium "Chemistry Biology Interface: Synergistic New Frontiers" organized by B.R. Ambedkar Center for Biomedical Research, University of Delhi, Delhi and held at Vignan Bhavan, New Delhi Nov. 21-24 (2004); delivered an Invited Lecture entitled "Assorted encounters with 3-formylindoles" at the 19th NASOC organized by the CAS on Natural products, Dept. of Chemistry, University of Calcutta, Kolkata held on March 29, 2005.

Tarakanth Kundu, Sulakshna Karmakar, Ajanta Mukherjee and Ratna Mukherjee (Chemistry) participated in the aforesaid Symposium; Prof. Manas Chakrabarty along with his students, T. Kundu, S. Karmakar and A. Mukherjee, participated in the 7th CRSI National Symposium in Chemistry held at IACS, Jadavpur, Kolkata during Feb. 4-6, 2005.

Dr. K.P. Das (Chemistry) attended and gave an invited talk entitled: "Molecular chaperone function of α -crystallin – a micellar protein" at the International Conference on Soft Matter, held at Park Hotel, Kolkata during Nov. 18-20, 2004; attended and gave an invited lecture entitled: "SDS induced structural changes in α -crystallin and its effect on refolding" at the National Seminar on Polymers, Surfactants and Gels", held at the Chemistry Department, University of Baroda, Gujrat during March 11-13, 2005.

Dr. Joyoti Basu (Chemistry) delivered lecture in The Second Indian Symposium of the Protein Society organized by Indian Institute of Technology, Mumbai from October 28 to 30, 2004; delivered a talk in The 7th International Symposium on Biochemical Roles of Eukaryotic Cell Surface Macromolecules organized by the Indian Institute of Chemical Biology in Puri in January, 2005; delivered a lecture in The International Conference on Functional Genomics for Novel Vaccine and Drug Design against Mycobacterial Infection

(VDMI) organized jointly by Indian Institute of Technology, Kharagpur and The Gades Institute, Bergen, Norway in Kharagpur from February 10th to 11th, 2005.

Dr. Joyoti Basu (Chemistry) delivered a lecture in the 37th Annual Meeting of the Society for Leukocyte Biology, held in Toronto, Canada from October 21st to the 23rd, 2004 and presented a paper in the 8th IUBMB Conference and ASBMB Annual Meeting held in Boston, USA from June 12th to the 16th, 2004

Dr. Manikuntala Kundu (Chemistry) delivered a lecture in "AIDS in India: A regional symposium-workshop on Research, Trends and Treatment" Organized by the Jawaharhal Nehru Centre for Advanced Scientific Research from July 31 to August 6, 2004 in Bangalore; delivered a talk in The International Conference on Functional Genomics for Novel Vaccine and Drug Design against Mycobacterial Infection (VDMI) organized jointly by Indian Institute of Technology, Kharagpur and The Gades Institute, Bergen, Norway in Kharagpur from February 10th to 11th, 2005; delivered a lecture in The Indo-Australian Symposium on "Modern Biological Approaches for Diseases Caused by Mycobacteria and Helicobacter" held in Centre for DNA Fingerprinting and Diagnostics, Hyderabad, 5th March, 2005.

Dr. Manikuntala Kundu (Chemistry) delivered a lecture in the XVII International Workshop of the European Helicobacter Study Group, held in Vienna from September 22nd to the 24th, 2004

Prof. P.K. Chakrabartty (Microbiology) chaired a session in the National Seminar "Role of Microbes in Human Welfare" organized by the Department of Microbiology, Vidyasagar University on 28th March, 2005.

Dr. Subrata Majumdar (Microbiology) delivered an invited lecture on 'IL-10 plays a dual role in murine peritoneal macrophages treated with ManLAM and AraLAM' at Molecular Immunology Forum Meeting-2005 at Goa in February 2-5, 2005.

Dr. Subrata Majumdar (Microbiology) attended as a guest at the 'Biotechnology Consortium' Meeting at NII, New Delhi in October, 2004.

Abhik Saha, Archana Sharma, Amlanjyoti Dhar, Bhabatarak Bhattacharya, Siddhartha Roy and **Dr. Sujoy K. Das Gupta** (Microbiology) presented a poster "Peptide inhibitors of Hsp16.3, a small molecular weight mycobacterial chaperone and virulence factor" in the International Conference on "Functional genomics for novel vaccine and drug design against mycobacterial infection (VDMI)" during Feb. 10-11, 2005 at IIT, Kharagpur, India. (The poster was awarded First prize).

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 July-August, 2004. He presented a lecture on September 9, 2004 in the XVIII Training Programme on Science Communication and Media Practice organised by the Indian Science News Association held at Calcutta University Science College campus. He presented an invited talk and chaired one technical session in the International Workshop on Frontier Research

in Radiation Physics and Related areas held at Chengdu, China during November 10-14, 2004. He attended the Executive Council meeting of the International Radiation Physics Society as Vice-President (S-E Asia) of the Society in China. He presented an invited talk on March 23, 2005 in the Workshop on Contribution and Impact of Science on Indian Society during 20th Century held at Asiatic Society, Kolkata. He presented an invited talk in the Conference on Accelerators and Radiation Physics Research (ARPR05) held at Bose Institute and VECC, Kolkata during March 28-30, 2005.

Prof. Sibaji Raha (Physics) delivered an invited plenary talk entitled "Strangeness, cosmological cold dark matter and dark energy" at the 8th International Conference on Strangeness in Quark Matter (SQM2004) held at Cape Town, South Africa September 15 - 20, 2004. He delivered an invited talk on "Brownian Motion a hundred years later - Applications in Quark-Gluon Plasma" at the National Seminar entitled "Hundred Years of Three Seminal Papers of Albert Einstein and Contemporary Ideas" at North Bengal University, Raja Rammohanpur, West Bengal, January 3-5, 2005. He organized and attended a topical meeting on Mathematical modeling of Atmospheric Processes at Darjeeling during January 2005. He participated at the 5th International Conference on Physics and Astrophysics of Quark-Gluon Plasma (ICPA-QGP'05) held at Kolkata during February 8 - 12, 2005 and chaired a plenary session. He also acted as a member of the International Advisory Committee for the same conference

Prof. Biva Roy (Physics) participated in a conference on Accelerators and Radiation Physics Research (ARPR-05) (in memory of Prof. A. M. Ghose) held at Bose Institute and VECC, Kolkata during March 28-30, 2005.

Dr. Barun K. Chatterjee (Physics) visited University of Pittsburgh, USA for six weeks in connection with the Indo-US collaborative programme on Compton scattering during 27/07/2004 to 06/09/2004. He participated in a conference on Accelerators and Radiation Physics Research (ARPR-05) (in memory of Prof. A. M. Ghose) held at Bose Institute and VECC, Kolkata during March 28-30, 2005.

Rupa Sarkar (Physics) attended and presented a poster in DAE-BRNS Symposium on Nuclear Physics at Banaras Hindu University, Varanasi during December 6-10, 2004. She also presented a paper in the conference on accelerators and Radiation Physics Research (ARPR-05) (in memory of Prof. A. M. Ghose) held at Bose Institute and VECC, Kolkata during March 28-30, 2005.

Prof. Indrani Bose (Physics) delivered invited talks at (i) International Discussion Meeting on Complex networks: structure, function and processes held at the S.N.Bose National Centre for the Basic Sciences, Kolkata during June 27 - July 1, 2004, (ii) International Discussion Meeting on Disorder, Complexity and Biology held at the Banaras Hindu University, Varanasi during July 12-15, 2004, (iii) Meeting on Statistical Physics - Present and Future held at Calcutta University on January 5, 2005, (iv) International Workshop on Econophysics of Wealth Distribution in Society held at the Saha Institute for Nuclear

Physics during March 14-19, 2005; presented poster and chaired a session at the International Conference on Statistical Physics (Statphys-22) held at I.I.Sc., Bangalore during July 4-9 (2004).

Dr. Sanjay K. Ghosh (Physics) delivered an invited talk in DAE-BRNS QGP Meet '04 held at Institute of Physics, Bhubaneswar, October 7 - 9, 2004. He participated in the 5th International conference on Physics & Astrophysics of Quark-Gluon Plasma (ICPA) during February 8-12, 2005 as an organizing committee member. He participated in a workshop on weather modeling at Bose Institute, Darjeeling, January 28-30, 2005.

Dr. T. P. Sinha (Physics) presented three papers in the symposium Condensed Matter Days-2004 held at North-Eastern Hill University, Shillong during August 25-27, 2004; presented two papers in the Annual DAE Solid State Physics Symposium held at Guru Nanak Dev University, Amritsar from 27th to 31st december, 2004.

Prof. Arun K. Ray (Animal Physiology) chaired a session in XXIII National Symposium on Reproductive Biology and Comparative Endocrinology, held during February, 2005, in Department of Zoology, Visva-Bharati University, Santiniketan; Delivered lecture in the UGC-sponsored symposium in "Advances in Regulatory Mechanisms in Animal Function: A Molecular Approach" held at Bagati, in February, 2005.

Dr. Gaurisankar Sa (Animal Physiology) was invited to deliver a talk in "International Symposium on Diet in Causation & Prevention of Cancer & XXX Annual Conference of EMSP" at Lucknow in 2005. Dr. Sa was invited to deliver a talk in 1st International Conference on BioMicroWorld at Badajoz, Spain, in 2005. Dr. Sa delivered invited lecture in "The 37th Annual Conference of Indian Pharmacological Society" at Kolkata in 2004 and UGC-sponsored Conference in "Advances in Regulatory Mechanisms in Animal Function: A Molecular Approach" at Bagati, in February 2005.

Mr. Sankar Bhattacharyya and Mr. Gaurisankar Sen (Animal Physiology) participated in Society of Biological Chemists' Symposium (India) in April 2004.

Dr. Tanya Das (Animal Physiology) delivered invited lecture at the "International Symposium on Diet in Causation & Prevention of Cancer & XXX Annual Conference of EMSP" at Lucknow in March, 2005. Dr. Das delivered invited lecture in "The 37th Annual Conference of Indian Pharmacological Society" at Kolkata in 2004 and UGC-sponsored Conference in "Advances in Regulatory Mechanisms in Animal Function: A Molecular Approach" at Bagati in February 2005.

Mr. Arindam Bhattacharyya (Animal Physiology) participated and delivered lecture in European workshop of Cell Death, Istanbul, Turkey in May, 2004

Mr. Arindam Bhattacharyya, Mr. Deba Prasad Mandal & Ms. Lakshmeshri Lahiry (Animal Physiology) delivered lectures in Society of Biological Chemists' Symposium (India) in April 2004.

Mr. Deba Prasad Mandal (Animal Physiology) presented poster at the "International Symposium on Diet in Causation & Prevention of Cancer & XXX Annual Conference of EMSP" at Lucknow in March, 2005.

Prof A.N.Lahiri Majumder (PMCG) presented paper as an invited participant at the Gordon research Conference on "Salt and water stress in plants" in June, 2004 at Hong Kong.

Prof. Amita Pal (PMCG) presented a paper on "Functional markers linked with yellow mosaic virus resistance in *Vigna mungo*" as an invitee in the '2004 Plant Molecular Biology' Gordon conference, held in Plymouth, NH, USA from 18th to 23rd July, 2004.

Dr Sampa Das (PMCG) participated and presented paper on "Establishment of transgenic Indian mustard plants to develop resistance against aphids" in International Crop Protection Congress in Beijing during 10-18th May, 2004; participated and presented a poster on "A Symbionin group of chaperonin purified from the endosymbiont of mustard aphid involved in transmission of viruses to plants" at Gordon Research Conference held in New Hampshire, USA during 18-23rd July, 2004; participated and presented a paper on "Mannose binding garlic lectin a potential candidate for crop management programme" in National Rice Biotechnology Network meeting held at IARI, Delhi during 15th -17th April, 2004; participated and presented the progress report in Indo Swiss Collaboration in Biotechnology, Pulse Network meeting in Madurai during 5-7th February, 2005.

Dr.T.C.Ghosh (BIC) delivered a series of lectures in a training programme on "Proteomics: Bioinformatics approaches" organized by Biotechnology Park in Biotechnology City, Lucknow from 13th to 15th July, 2004.

Dr.T.C. Ghosh (BIC) delivered an invited talk at a workshop on "Bioinformatics in Genomics and Proteomics" organized by Bioinformatics Centre, Indian Institute of Technology, Kharagapur on 25th September 2004.

Dr. T.C. Ghosh (BIC) delivered an invited talk at a workshop on "Bioinformatics and its applications" organized by Institute of Life Sciences, Bhubaneswar on 12th January, 2005.

Dr. Arun Kumar Chakraborty (Librarian) attended XXI National Seminar of Indian Association of Special Libraries and Information Centres (IASLIC), Kolkata held at Jadavpur University Kolkata on Information Support for Rural Development during 31st Dec, 2004 -3rd Jan 2005).

Dr. (Ms). R. Mitra (Library) attended XXI National Seminar of Indian Association of Special Libraries and Information Centres (IASLIC), Kolkata held at Jadavpur University Kolkata on Information Support for Rural Development during 31st Dec, 2004 -3rd Jan 2005).

Shri P. K. Sarkar, (Library) attended XXI National Seminar of Indian Association of Special Libraries and Information Centres (IASLIC), Kolkata held at Jadavpur University Kolkata on Information Support for Rural Development during 31st Dec, 2004 -3rd Jan 2005).

Mrs. Tanima Modak (Dhar) and Mr. Subhas Maikap (SAIF) participated actively in 1st discussion meeting of EM personnel at IIT, Bombay in the month of June, 2004.

Mr. A.K.Sen (SAIF) attended an international conference on Instrumentation (INCON 2004) from December 19th to December 21st, 2004 at Pune, Maharashtra organised by Department of Instrumentation and Control, Pune Institute of Engineering & Technology, Pune, Maharashtra & Instrument Society of India, Department of Instrumentation, IIS, Bangalore.

Mrs. Tanima Modak (Dhar) and Mr. Subhas Maikap (SAIF) participated actively in 1st discussion meeting of EM personnel at IIT, Bombay in the month of June, 2004.

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Invited talks delivered at various organizations

Prof. P. Chakrabarti (Biochemistry) delivered a talk at the Laboratory of Molecular Biology, Medical Research Council, Cambridge, UK, September 13, 2004; delivered lecture at the National Seminar on Statistics in Natural, Social and Biological Sciences, Calcutta University, December 23-24, 2004.

Prof. A. Lohia (Biochemistry) (i) Boston University Medical Centre, Boston, USA, 8th April 2004 Delinking of S-phase and cytokinesis in *Entamoeba histolytica* (Distinguished lecture series); (ii) University of Freiburg, Freiburg, Germany, 28th July, 2004 Delinking of S-phase and cytokinesis in *Entamoeba histolytica*; (iii) International Centre for Genetic Engineering and Biotechnology, New Delhi, India, 8th October, 2004. Delinking of S-phase and cytokinesis in *Entamoeba histolytica*.

Prof. P.K. Chakraborty (Microbiology) delivered an invited talk entitled "Biocontrol of plant diseases" at the National Seminar "Role of Microbes in Human Welfare" organized by the Department of Microbiology, Vidyasagar University on 28th March, 2005.

Prof. Sibaji Raha (Physics) visited the Physics Department of University of Stellenbosch, South Africa during September 2004 for a week and delivered a colloquium entitled "Looking for a strange universe".

Prof. Indrani Bose (Physics) delivered invited talks (i) on Physics and Biology at St. Xavier's College, Kolkata on March 15, 2005, (ii) on The Fascinating World of Solids at Sarojini Naidu College for Women on March 21, 2005.

Dr. Swapan K. Saha (Physics) delivered a talk at the ISRO Headquarter, Bangalore in August, 2004 on the Characterization of Solid State Nuclear Track Detector.

Prof A.N.Lahiri Majumder (PMCG) delivered the "Dr R.M.Datta Memorial Lecture" of the Agricultural Society of India on "Engineering of inositol metabolic pathway – A road to stress-tolerant crop plants" on May 31, 2004 at Kolkata; delivered the First "Probir Chatterjee Memorial Lecture" in the Department of Botany, Calcutta University on "Diversification and evolution of inositol synthase: *Synechocystis* genome as a link" on September 10, 2004; delivered Plenary lecture in the International meeting on Plant Tissue Culture and Biotechnology at the Dhaka University, Bangladesh in December, 2004; delivered invited talk organized by the Plant Physiology Forum at the Presidency College, Kolkata on September 4, 2004; delivered the Key-Note address on "Recent Trends in Plant Sciences: Genomics, Proteomics and Biotechnology" in the UGC seminar organized by the Ashutosh College Calcutta on March 4, 2005.

Prof. Amita Pal (PMCG) has delivered two invited talks on "Biotechnological approaches for secondary metabolite production in plants: An overview" and "Generation of stable, pure diosgenin yielding embryo clones in *Costus speciosus*", in one day seminar on "Recent advances in Biochemistry and Biotechnology" organized by the Burdwan Institute of Management and Computer Science, Burdwan.

Dr. Nripendranath Mandal (Immunotechnology Section) delivered two talks on the Biotechnology in 21st century at Ramananda College, Bishnupur, Burdwan University (12th March, 2004) and North Bengal University (27th March, 2004). During the same time Dr. N. Mandal delivered few lectures on Gene therapy and other Molecular Biology Techniques to M.Sc Part-II students at Biotechnology Department, North Bengal University (22-26th March, 2004).

Dr. Arun Kumar Chakraborty (Librarian) delivered an invited talk in the seminar on SCOPUS on 26th March, 2005 at Grand Hotel, Kolkata organized by Elsevier, Singapore.

Dr. Arun Kumar Chakraborty (Librarian) is Guest Lecturer for Post Graduate Diploma in Library Automation and Networking (PGDLAN) in IGNOU and BLISc. in Rabindra Bharati University, Kolkata.

Honours received

Prof. B. Bhattacharyya (Biochemistry) has been elected as a member of Third World Academy of Science (TWAS).

Prof. P. Chakrabarti (Biochemistry) Received the PS Sarma Memorial Award of the Society of Biological Chemists (India) for the year 2004 for his contributions in the field of Biochemistry and Allied Sciences. He has also been nominated a member of DBT Task Force Committee on Bioinformatics.

Prof. A. Lohia (Biochemistry) Received Zee Network "Astitva" award for excellence in Science and Service to Society.

Prof. Parimal C. Sen (Chemistry) was elected Associate Editor in "Science & Culture".

Dr. Manikuntala Kundu (Chemistry) was elected Fellow of the West Bengal Academy of Science and Technology.

Dr. Subrata Majumdar (Microbiology) received a membership from the American Society for Cell Biology, Bethesda, Maryland, USA for the year 2004-2005.

Dr. Gaurisankar Sa (Animal Physiology) is the Associate Editor of the Journal "Head and Face Medicine".

Dr. Gaurisankar Sa (Animal Physiology) has been selected as Member of the Review Board of the Journals "Cancer Detection and Prevention", "Human Immunology", "Future Oncology", "Toxicology Letter".

Dr. Gaurisankar Sa (Animal Physiology) has been nominated as a regular Member of American Society for Biochemistry and Molecular Biology (ASBMB)

Dr. Gaurisankar Sa (Animal Physiology) has been nominated as a regular Member of Federation of American Societies for Experimental Biology (FASEB)

Dr. Gaurisankar Sa (Animal Physiology) has been nominated as member of Cancer Expert Group Member of DBT

Dr. Tanya Das (Animal Physiology) has received "National Young Woman Bioscientist Award" of DBT, Govt. of India, for 2004.

Dr. Tanya Das (Animal Physiology) has received "Seva Samman" Award from Dakshin Kolkata Krira & Sanskriti Samsad.

Dr. Tanya Das (Animal Physiology) has been selected as Member of the Review Board of the Journal "Carcinogenesis"

Mr. Arindam Bhattacharyya (Animal Physiology) has been selected for DAAD Fellowship at University of Freiburg, Germany in 2004.

Prof A.N.Lahiri Majumder (PMCG) has been elected Fellow of the Indian National Science Academy (FNA) and the Indian Academy of Sciences (FASc).

Service Departments

The Bioinformatics Centre

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

Analysis of protein structure and binding (Prof. P. Chakrabarti)

Structural motifs in proteins are being deciphered by looking at known protein structures at two levels – local conformation and the geometry of interaction between residues. Surface crevices and cavities responsible for ligand binding are being identified. New algorithms are being generated to study protein-protein interactions and simulate docking.

Evolutionary forces for isochore organization in human genome (Dr. T.C. Ghosh).

In order to understand the factors driving the formation of the GC-rich isochores during the major compositional transition a detailed analysis was performed on the orthologous set of xenopus and human genes. The fluctuations of C3 and G3 levels along the coding sequences correlated with the secondary structures of the encoded proteins. The human genes that underwent compositional transition showed a different increment of the C3 and G3 levels within and among the structural units of proteins. The relative synonymous codon usage (RSCU) of several amino acids was also affected during the compositional transition, showing that there exists a correlation between RSCU and protein secondary structures in human genes. The importance of natural selection for the formation of isochore organization of the human genome has been advocated on the basis of these results.

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

The discovery and optimization of antiparasitic compounds have benefited from the newly emerging information-based methods in the modern drug development process. The generation of computer models enables the cost-efficient and fast computational screening of virtual compound libraries for biologically active molecules. Both Receptor-based and Ligand-based drug design approaches are being used in order to locate parasitic targets and design antiparasitic compounds. Various methods used in these approaches are: homology modeling, virtual screening by molecular docking, molecular dynamics simulation. Trypanothione reductase, glycosomal glyceraldehyde-3-phosphate dehydrogenase and dihydrofolate reductase are examples of a few drug targets currently under investigation.

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. It 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 contains 36,968 [25,411 Bound journals + 11,219 Books + 338 Theses] volumes of Books / Journals / Theses] upto 31.03.2005. Total number of periodicals subscribed {foreign + Indian} were 186 numbers (Print 84 and ONLINE 102) during this year. During the year, 1654 readers used the Library (both campus) for their reference work, 35 permission cards were issued to the outside readers. Under Inter Library Loan system book / journals were issued to other institutions and also books / journals were taken on loan. Photocopy services are provided to outside users. A total 1,75,920 pages of photocopying (Xerox) services were given to our faculty and outside users. Some 997 bound volumes of book / journals and 2580 loose periodicals were issued by our research scholars and faculty members throughout the year for their reference work.

This year the library extended a scanning facility to faculty and researchers of the Institute. More than 500 documents were scanned for faculty members as well as research scholars and more than 600 hours computer / internet used for accessing full text subscribed / free journals by the scholar from the Library itself. The Library has started online service for the faculty members and research scholars. This year library has subscribed to more than 100 journals Full Text online. Network access is possible from 10 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 next year.

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, sanflower, 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, mushroom
8. Dr. Debabrata Basu	Mustard, tomato
9. Dr. Paramesh Sil	Arahar
10. Swati Gupta Bhattacharya	Pollen traper

Inspection by WBSEB has been completed for the installation of new power supply line for the farm. Necessary action has been taken for repairing the existing garage, electrical meter room etc. Internal partition of the laboratory building has been completed.

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 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.

Sophisticated Analytical Instrument Facility (SAIF)

The Sophisticated Analytical Instrument Facility (SAIF) (formerly known as Regional Sophisticated Instrumentation Centre) at Bose Institute is now 29 years old and is one of the first four such facilities set up by the Department of Science and Technology, Government

of India, in the 1970s. During the year this facility has continued providing instrumental services and consultancy to the R & D personnel from academic industrial organisations. An Ultramicrotome was provided as replacement by DST, while the infrastructural and manpower support were provided by the host institution.

With considerable support from the host institution in the way of improving the infrastructure and providing funds for the maintenance of some of the major instruments/accessories it has been possible to improve the performance of the facility significantly during the year.

Instrument utilisation and Revenue earned (from 1.4.04 to 31.3.05)

Name of instrument	No. of samples		Revenue earned Rs.
	(Extn.)	(Int.)	
Atomic Absorption Spectrometer	846	243	58,275
Spectrofluorimeter	31	—	1,240
EPR Spectrometer	47	—	2,650
Mass Spectrometer	5	1	480
Gas Liquid Chromatograph	63	44	8,900
XRD (Single Crystal)	15	5	18,400
HPLC (housed in ESS)	35	173	—

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	124	95%	5%
ELECTRICAL	978	95%	5%
CARPENTRY	63	98%	2%
REFRIGERATION	126	95%	5%
DRAFTING	75	100%	Nil
LECTURE & SEMINARS ATTENDED	Above 350	100%	Nil
EPABX UNIT	81	100%	Nil

Social Relevance of Research Performed at Bose Institute

Successful outcome of the project on bacterial metabolism of phthalate esters will have a impact on the industrial and governmental sectors that release phthalate esters and polycyclic aromatic hydrocarbons due to non-availability of suitable treatment process, particularly in industrial effluents and municipal waste treatment plants.

Effective treatment of any disease involves two key steps- early diagnosis and development of improved, non-toxic drugs. Infectious diseases like Tuberculosis, Malaria etc. does not yet have a reliable diagnostic method, which makes subsequent treatment difficult. For non-communicable diseases like Coronary heart disease, Diabetes, Cancer etc. an early diagnosis can possibly control the diseases. The research contribution in the field of Medical Biotechnology from Immunotechnology section will be useful in solving the above problems in a better way. Research work in the field of Marine Biotechnology from Immunotechnology Section will be commercially very useful to develop a kit to identify disease resistant brooders of shrimp (*P. monodon*) for developing disease free shrimp aquaculture worldwide. This will also be very useful as genetic marker for marker-assisted breeding program in shrimp hatcheries for generating disease free progeny of *P. monodon*. Finally disease resistant larvae of *P. monodon* will be supplied by the hatcheries to the rural shrimp farmers that can reduce the socio-economic damages due to viral disease in shrimp aquaculture industry. So the research outcome from Immunotechnology Section will enhance rural development, socio-economic upliftment and improve the health of both rural and urban populations, helping the society in a big way.

In a DBT funded societal programme for SC/ST people (Title of the project : Generation of spawn and fruiting body of edible mushroom strains and demonstration of the technology to the rural SC/ST population) about 4,560 packets of oyster and milky mushroom spawn (each weighing 200 gm) have been handed over to the NGO (South Asia Research Society) free of cost for cultivation of mushroom through their SC/ST beneficiaries for income generation. Besides that from Institutes grant mushroom spawn production and two training programmes on mushroom cultivation and spawn production had been organized at Madhyamgram Experimental Farm, Bose Institute during April 20 to May 26, 2004 and August 7 to September 14, 2004 and 63 candidates were trained of which 29 candidates belonged to BPL category. Mushroom spawns have been distributed to the local growers in nominal rate for popularization of mushroom; free consultancy services were also given to the local mushroom growers.

List of personnel

Administration

Prof. M. A. Siddiqi (Director)

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: Dibakar Sen (Retired on 31-12-2004), Rabindra Nath Karmakar, Chandra Kanta Sasmal, Tarun Chakraborty, Sanat Kr. Dey, Mahendra Nath Shee, Santosh Kr. Patra, 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. A.K. Ray (Head), Dr. Gaurisankar Sa, Dr. Tanya Das.

Students*: Dr. Sreya Chattopadhyay, Mr. Arindam Bhattacharyya (up to September 30, 2004) Ms. Sumedha Roy, Mr. Angshuman Biswas (up to June 30, 2004), Ms. Samita Kundu, Ms. Jhuma De (up to June 30, 2004), Mr. Debaprasad Mandal, Ms. Laksmishri Lahiri, Mr. Gaurisankar Sen (up to November 12, 2004) Mr. Sankar Bhattacharyya, Mr. Avijit Bhattacharya (from May 5, 2004), Mr. Subhomay Banerjee (from October 12, 2004) and Mr. Arnab Goswami (from January 6, 2005).

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

Biochemistry Department

Faculty: Prof. B. Bhattacharyya (Chairman upto 31/7/04), Prof. Pratima Sinha, Prof. Pinakpani Chakrabarti (Chairman from 01/8/04), 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, Rajasri Bhattacharyya (upto 30/4/05), Gursaran Kaur, 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 Chatteraj, Chandrama Mukherjee, Tridib Ganguly, Soumitra Sau, Manjusha Sarkar (upto 30/11/04), Suparna Laha, Palas Kr. Chanda, Hem Ch. Jha (upto 28/2/05), Saptarshi Mandal (upto 30/6/04), Tarun Kanti Mandal (upto 12/7/04), Arumay Pal, Somasri Pal, Krishnendu Chakrabarti, Ajit Bikram Dutta (upto 31/8/04), Dipak Manna (from 5/11/03), Rakesh Kundu (upto 31/8/04).

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, Sudhangsu S. Maity, Basudeb Ghorui, Dulal Chandra Mandal, Ranubala Das.

Bioinformatic Centre

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

Students : Dr. D. Roy, Dr. L. Pal, A. Bagchi, T. Banerjee, S. Basak, S. Srihari.

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

Biophysics Department

Faculty : Prof. Siddhartha Roy, Prof. Asoke Banerje, Dr. Gautam Basu

Students : Dr. Tanaya Chatterjee, Dr. Ruchira Chattopadhyay, Atanu Maity, Amlanjyoti Dhar, Rajesh Saha, Smarajit Polley, Asik K. Manna, Subrata Debnath, Soma Samaddar, Suranjana Chattopadhyay, Soumi Guha, Srijata Mukherjee, Paromita Raha, Nilanjana Banerjee, Anutosh Ganguly

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

Botany Department

Faculty : Prof. Kalyan K. Mukherjee, Prof. Swati Sen Mandi, Prof. Prabir Kr. Saha, Dr. Dibyendu N. Sengupta, Dr. Swati Gupta-Bhattacharya, Dr. Sabita Bhattacharya, Dr. Tapas K. Ghose, Dr. Debabrata Basu

Students : Dr. Gourab Gangopadhyay, Ms. Shaonli Das, Ms. Suptothita Choudhury (23.6.03 to 1.10.03), Dr. Tanay Bandopadhyay, Mr. Koushik Ghosh (from 14.5.03), Mr. Sandeep Chand Chaudhury (upto 3.2.05), Sm. Kamala Niyogi (upto 1.12.04), Ms. Jyotshna Mandal (from 29.1.04), Mr. Avik Ray (from 4.2.04), Mr. Debajyoti Ghosh, Mr. Sujit Roy, Sm. Sudeshna Bhattacharya, Sm. Sanjukta Dey, Ms. Bratati Mukherjee, Dr. Pampa Chakraborty, Dr. Malay Kr. Adak, Mr. Sudip Kr. Sinha, Mr. Narottam Dey, Mr. Bhaskar Gupta, Mr. Subhrajit Banerjee, Mr. Swarup Roy Choudhury, Ms. Pragya Paromita Saha, Ms. Saptadwipa Mukherjee, Ms. Pinki Choudhury, Mr. Aryadeep Roychoudhury, Sm. Kakali Mukherjee.

Supporting staff : Dr. Ramit Poddar, Sukumar Majumdar, Shyamal Kr. Ghosh, Chanchal Chakraborty, Jadab Kumar Ghosh, Binoy Krishna Modak, Chaitali Roy, Kaberi Ghosh, Dilip Kr. Chakraborty (upto 28.2.05), Sasanka Sekhar Bera, Sambhunath Debnath, Bipul Kr. Nag, Kanan Singh, Jagannath Das, Sarama Pradhan, Monimohon Ghosh.

Central Instrumentation Facility

Faculty : Prof. B. Bhattacharyya (Chairman)

Supporting Staff : Jaganmoy Guin, Ranjan Dr. Dutta, Smriti Ranjan Maji, Mrinal Das, Alpana Bhattacharyya.

Chemistry Department

Faculty : Prof. Parimal C. Sen (Chairman, from 01.03.2005), Prof. Manas Chakrabarty (Chairman, till 28.02.2005), Prof. Parul Chakrabarti (Emeritus Scientist, till 30.06.2004), Dr. Kali Pada Das, Dr. Joyoti Basu, Dr. Manikuntala Kundu, Dr. Parames C. Sil, Dr. Pradip Das.

Students : Sandipan Sarkar, Madhumouli Chatterjee, Ramkrishna Basak, Nandita Ghosh, Sudipa Saha, Ashima Bhattacharyya, Bhaswati Samanta, Debabrata Mandal, Shresh Pathak, Kasturi Sarkar, Arunava Dasgupta, Ashis Biswas, Pratik Datta, Rajesh Bhattacharyya, Dr. Dipankar Bhattacharyya, Dr. Sujata Law, Madhuchhanda Kundu, Taraknath Kundu, Randhir Sinha, Sharmila Basu, Tanusree Sengupta, Srabasti Ghoshal, Chaitali Basak, Anil Kumar Singh, Mary Chatterjee, Kamakshi Sureka, Rajen Halder, Sushil K. Pathak, Dr. Meghamala Dutta, Bidhyadhar Mandal, Ayantika Ghosh, Partha Mukherjee, Tushar K. Dhara, Sulakshana Karmakar Ajanta Mukherji, Ratna Mukherjee, Subhomoy Ghosh, Piyali Mukherjee, Paromita Saha, Sanjib Dey, Sanchita Basu.

Supporting staff : Prasanta Kumar Pal, Aniruddha Aich, Pranab Kumar Dey, Bhabani Prasad Banerjee, Debdas 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

Faculty : Prof. Maqsood Siddiqi

Supporting Staff : Anandamay Adak, Sudam Chandra Jana, Siddhartha Ray.

Immunotechnology Section

Faculty : Prof. M. Siddiqi, Dr. Nripendranath Mandal

Students: Dr. Arnab Ghosh, Mr. Kuntal Mukherjee, Mr. Sujay Paul and Mr. Shubha 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)

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), Prof. Timir B. Samanta (upto 30.04.2004), Dr. Pradosh Roy, Dr. Subrata Majumdar, Dr. Sujoy K. Dasgupta, Dr. Tapan K. Dutta

Students : Dr. Madhumita Maitra (upto 20.12.04), Abhijit Basu (upto 01.02.05), Amit Sarkar (upto 31.05.04), Anasuya Ray (upto June'04), Piyali Mukherjee (upto 01.10.04), Avik Saha, Archana Sharma, Sujoy Chatterjee, Jiaur Rahman Gayen (upto 07.02.05), Sutapa Biswas Majee (15.04.04), Wriddhiman Ghosh (upto 31.03.05), Ranadhir Dey, Subhankar Chatterjee, Nivedita Majumdar, Moumita Roy (upto 05.07.04), Bejoy Sekhar Datta, Twishasri Das Gupta, Dr. Dola Boral (upto 12.07.04), Sukhendu Mandal, Somnath Mallick, Bomba Dam, Bidisha Bhattacharya, Nabanita Giri, Prasenjit Das, Suchandra Majumdar, Subhadipa Sengupta, Mahasweta Mitra (upto 30.6.04), Joydeep Chakrabarty

Supporting Staff : Salil K. Das (II) (retired on 30.11.04), 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 Department

Faculty : Prof. Dipankar Home (Chairman upto 31.12.2004), Prof. Biva Roy (Chairperson from 01.01.2005), Prof. Suprakash C. Roy, Prof. Sibaji Raha, Prof. Indrani Bose, Prof. Barun K. Chatterjee, Dr. Swapan K. Saha, Dr. Tripurari Prasad Sinha, Dr. Sanjay K. Ghosh

Students : Dr. Basudhara Basu Nandi, Rajesh Karmakar, Tamal K. Mukherjee, Alok Kumar Pan, Bhaswar Ghosh, Rupa Sarkar, Alo Dutta, Amit Tibedi (from 3.8.2004), Rittam Mallick (from 25.2.2005), Prasanna Mondal (from 7.3.2005).

Supporting Staff : Narayan C Dey, Amit K Ganguly, Kamal C Das, Sankar P Singha, Shyamsundar Mallick, 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, since December 3, 2004) Prof. Amita Pal (Head. upto December 2, 2004), Dr. Sampa Das, Dr. Samir Ranjan Sikdar.

Students: Dr. Sanghamitra Bhattacharyya, Dr. Biswajit Das, Dr. Jyotirmoy Bhattacharya, Manoj Majee, Indrajit Datta, Jolly Basak, Malay Das, Aparajita Das, Krishnarup Ghosh Dastidar, Pralay Majumder, Susmita Maitra, Lily Goswamy, Sudipto Roy, Aninda Sarkar, Dipankar Chakrabarty, Barunava Patra, Samik Bhattacharya, Prasenjit Saha, Sabiha Khan, Ritu Kapoor, Uttara Bhattacharya, Sruti Dutta, Sonali Sengupta, Hossain Ali Mondal, Samayeeta Sarkar, Radharaman Bar, Sumanti Gupta.

Annual Report

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

Publication

In-Charge : Mr. Arun Kumar Das Gupta

Supporting Staff : Sri Chandra Kanta Sasmol

Sophisticated Analytical Instrument facility

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. Jaideb 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).

Workshop

Mr. A.K. Mukherjee – Workshop Supdt.

Supporting Staffs (Main Campus) : Mr. Dipak Dutta, Mr. Asutosh Sarkar, Mr. Samar Dutta, Mr. Sisir Ghosal, Mr. Tarapada Das, Mr. Dipen Sen, Mr. Bankim Dutta, Sk. Md. Ehia Hossain, Mr. Basanta Kr. Shit, Mr. Bholanath Saren, Mr. Abdul Rahaman Molla, Mr. Panchanan Santra, Mr. Panchugopal Karak, Mr. Goplal Ch. Das, Sk. Md. Farruck, Mr. Kishori Mohan Saha, W.D. Rozario, Mr. Kalachand Sen, Mr. Rajkumar Das, Mr. Pranab Banerjee, Mr. Brahmdeo Prasad, Mr. Subrata Basak, Mr. Sanjoy Santra.

(New Campus) : Mr. Alok Kundu, Mr. Anil Sengupta, Mr. Jogendra Nath Das, Mr. Tapan Mondal, Mr. Ashit Bsnrejee, Md. Raffick, Mr. Murari Mohan Shee, Mr. Baidya Nath Murmu.

National Science Day



National Science Day was observed on February 28, 2005. The theme of this years National Science Day Celebration was **100 years of Einstein's theories: Brownian Motion, Photoelectric effect, Relativity**. The celebration was formally inaugurated by Prof. M. Siddiqi, Director, Bose Institute. The welcome address was delivered by Prof. S.C. Roy (Bose Institute) and a popular lecture on **Birth of quantum mechanics: a sketch** was delivered by Prof. Debajyoti Bhaumik (Saha Institute of Nuclear Physics). A lecture competition was held for high school students and Prof. Partha Sarathi Majumder (Saha Institute of Nuclear Physics), Prof. Indrani Bose and Dr. Rajagopal Chattopadhyay (Bose Institute) acted as a panel of judges. Posters were presented by the research scholars of Bose Institute and the day was considered as Open House for the participating students and visitors. In addition to certificates and prizes to the students who ranked first, second and third, consolation prizes were awarded to the all other participants.

**Statement of Accounts
for the year
2004-2005**

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

AUDITOR'S REPORT

We have audited the attached Balance Sheet of the BOSE INSTITUTE as at 31st March 2005, and also the Income and Expenditure Account for the year ended on that date, annexed thereto. The accounts of the Council and the Governing Body, audited by a separate auditors are incorporated in these financial statements. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

2. We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.
3. Further to our comments referred to above, we report that :
 - a. 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;
 - b. In our opinion, proper books of account as required by law have been kept by the Institute so far as appears from our examination of those books;
 - c. The Balance Sheet and Income & Expenditure Account dealt with by this report are in agreement with the Books of Account.
4. In our opinion and to the best of our information and according to the explanations given to us, the said account together with the NOTES and OBSERVATIONS annexed thereto give a true and fair view in conformity with the accounting principles generally accepted in India :
 - a. in the case of the Balance Sheet, of the state of affairs of the Institute as at 31st March, 2005; and
 - b. in the case of the Income & Expenditure Account, of the deficit (Plan Account) for the year ended on that date.

For Nundi & Associates
Chartered Accountants

Sd/.
(M. Nandi)
Partner

Membership No. 016369

7C, Kiran Shankar Roy Road
Kolkata-700001
Dated : 5th October, 2005

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

As at 31st March 2004 Rs.	Funds and Liabilities	Schedule No.	As at 31st March 2005 Rs.	P.
17,48,03,610.95	CAPITAL FUND	I	18,97,40,768.95	
	DEVELOPMENT FUND			
8,16,25,974.00	Institute Development & Modernisation Fund created with the Grant in aid sanctioned by the Planning Commission, Govt. of India and received through Govt. of W. Bengal during 1995-96 – Rs. 8,00,00,000.00			
	i) Other resources 16,25,974.00			
	ii) Addition during the year 6,28,131.00			
2,35,80,373.78	Fund for others Development work As per last Accounts 2,35,80,373.78 Addition during the year 8,76,906.00		8,22,54,105.00	
9,54,31,234.68	OTHER FUNDS	II	9,94,25,700.97	
1,12,27,609.94	CURRENT LIABILITIES	III	2,06,91,461.69	
1,65,65,045.77	Excess of Income over Expenditure in respect of Grant-in-Aid Schemes	IV	2,66,96,864.99	

40,32,33,849.12

44,32,66,181.38

Institute
Kolkata-700 009
as at 31st March, 2005

As at 31st March 2004 Rs.	Properties and Assets	Schedule No.	As at 31st March 2005 Rs.	P.
17,47,74,874.44	FIXED ASSETS	V	18,65,30,667.44	
15,750.00	WORK IN PROGRESS (Other than Modernisation)	VI	13,09,750.00	
39,21,910.69	INVESTMENTS	VII	39,28,935.69	
	INSTITUTE DEVELOPMENT AND MODERNISATION FUND INVESTMENT			
6,14,71,876.15	i) In Fixed Assests Rs. 6,14,71,876.15			
59,51,088.00	ii) Work in Progress Rs. 59,51,088.00			
1,34,22,259.00	iii) In Fixed deposits Rs. 1,48,50,390.00			
			8,22,73,354.15	
1,97,60,441.00	Fund for other Development work investment in Fixed Deposit :			
	As per last Accounts Rs. 1,97,60,441.00			
	Addition during the year Rs. 46,76,906.00		2,44,37,347.00	
	CURRENT ASSETS, LOANS & ADVANCES VIII			
2,20,19,865.26	A. CURRENT ASSETS Rs. 3,79,24,418.53			
1,64,83,761.00	B. LOANS & ADVANCES			
	Secured : Rs. 59,85,682.00			
	Unsecured :			
	Considered			
	Goods Rs. 25,66,703.00			
	Considered bad or doubtful not provided for Rs. 85,52,385.00		4,64,76,803.53	
76,10,778.31	Excess of Expenditure over Receipts in respect of Grant-in-Aid Schemes	IV	93,77,975.18	
1,41,29,481.05	Employees Pension Fund Investment etc. (As per Balance Sheet attached)		1,44,46,278.05	
6,68,78,983.90	Employees General Provident Fund Investment etc. (As per Balance Sheet attached)		6,98,84,102.41	
36,13,300.38	Employees Contributory Provident Fund Investment etc. (As per Balance Sheet attached)		39,16,023.16	

41,00,54,369.18

44,25,81,236.61

Contd.

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

As at 31st March 2004 Rs.	P.	Funds and Liabilities	Schedule No.	As at 31st March 2005 Rs.	P.
B/F					
40,32,33,849.12				44,32,66,181.38	
	76,91,563.80	Excess of Income over Expenditure : As per last Accounts (Plan) 76,91,563.80 Less : Excess of Expenditure Over income during the Year (Plan)			
		<u>74,69,017.44</u>		2,22,546.00	
41,09,25,412.92				44,34,88,727.74	

Notes on Accounts IX A
Significant Accounting policies IX B

Place : Kolkata
Date : 5th October 2005

Sd/-
P. Barman
A & FO
Bose Institute

Sd/-
S. Pal
Accounts Officer
Bose Institute

Sd/-
T. K. Ghorui
Actg. Registrar
Bose Institute

Institute
Kolkata-700 009
as at 31st March, 2005

As at 31st March 2004 Rs.	P.	Properties and Assets	Schedule No.	As at 31st March 2005 Rs.	P.
41,00,54,369.18				44,25,81,236.61	
	8,71,043.74	Excess of Expenditure over Income as per last Account Governing Body Add : Excess of Expenditure over Income during the year			
		Rs. 8,71,043.74 Rs. 36,447.39		9,07,491.13	
41,09,25,412.92				44,34,88,727.74	

This is the Balance Sheet referred to in our attached
report of even date.

Sd/-
Prof. M. Siddiqi
Director
Bose Institute

Sd/-
(M. Nandi)
Partner
Nundi & Associates
Chartered Accountants
M. No. 16369

Dated : 5th October 2005

Bose
93/1, Acharya Prafulla Chandra Road
Income and Expenditure Account

2003-2004 Rs. P.	Expenditure	Non-Plan Rs. P.	Plan Rs. P.	Total Rs. P.
To				
A. Pay & Allowances etc. :-				
69,31,271.00	Director and Administration	56,58,636.00	15,31,540.00	71,90,176.00
2,04,78,538.00	Research Staff	92,87,172.50	1,02,74,059.00	1,95,61,231.50
30,58,122.00	Workshop	27,64,743.00	2,31,780.00	29,96,523.00
10,93,545.00	Library	7,83,660.00	3,45,935.00	11,29,595.00
—	Dearness Pay	84,40,905.00	55,06,812.00	1,39,47,717.00
1,75,55,971.00	Dearness Allowances	43,37,522.00	28,09,338.00	71,46,860.00
9,02,798.00	City Compensatory Allowances	6,14,904.00	4,30,005.00	10,44,909.00
90,74,971.00	House Rent Allowances	80,39,729.00	52,48,906.00	1,32,88,635.00
12,32,512.00	Transport Allowances	7,04,539.00	5,39,229.00	12,43,768.00
15,911.00	Institute Contribution to P.F.	—	92,856.00	92,856.00
49,902.00	Small Family Incent.	—	64,155.00	64,155.00
6,80,565.00	Adhoc Bonus	3,26,700.00	3,60,952.00	6,87,652.00
1,27,89,954.77	Institute's Contribution to Pension Fund for Gratuity Commutation & Pension	—	1,86,85,976.75	1,86,85,976.75
—	Arrear Dues (Promotion)	—	16,88,514.00	16,88,514.00
6,63,481.00	Leave Encashment	—	14,49,237.00	14,49,237.00
14,14,418.00	Medical Benefit	—	16,70,205.00	16,70,205.00
14,760.00	Children Education Assistance	—	11,660.00	11,660.00
1,54,329.00	Subsistence Allowance	—	3,02,886.00	3,02,886.00
3,71,089.00	Leave Travel Concession	—	7,40,863.00	7,40,863.00
7,64,82,137.77		4,09,58,510.50	5,19,84,908.75	9,29,43,419.25

Contd....

Institute
Kolkata-700 009
for the year ended 31st March, 2005

2003-2004 Rs. P.	Income	Non-Plan Rs. P.	Plan Rs. P.	Total Rs. P.
By				
A. Grants and other Receipts :-				
13,25,00,000.00	Grant from Govt. of India (DST)	2,22,00,000.00	11,63,00,000.00	13,85,00,000.00
Service Charges :				
5,01,193.00	Hostel & Guest House	4,06,971.00	—	4,06,971.00
90,487.00	Pick up Service	54,239.00	—	54,239.00
19,61,000.00	Overhead Charges	22,22,616.00	—	22,22,616.00
3,10,609.45	Interest from Bank : S.B. a/c : 3,56,028.11 On F.D : —	—	—	—
—	—	3,56,028.11	—	3,56,028.11
76,197.58	Interest on security deposit	1,07,853.74	—	1,07,853.74
1,24,098.00	Miscellaneous Receipts	2,30,845.82	—	2,30,845.82
—	Interest on Staff Adv.	8,034.00	—	8,034.00
—	Income from Institute Vehicle	—	—	—
2,31,700.00	Sample Testing FTNMR	4,53,200.00	—	4,53,200.00
68,460.00	Sample Testing (RSIC)	86,245.00	—	86,245.00
49,461.00	Bid Fees/Tender Fees	22,100.00	—	22,100.00
78,541.00	Instrument usages	1,04,580.00	—	1,04,580.00
1,28,11,049.97	Deficit meet up Fund (2004-05)	2,32,18,066.26	—	2,32,18,066.26
14,88,02,797.00		4,94,70,778.93	11,63,00,000.00	16,57,70,778.93

Contd....

Bose
93/1, Acharya Prafulla Chandra Road
Income and Expenditure Account

2003-2004 Rs.	P.	Expenditure	Non-Plan Rs.	P.	Plan Rs.	P.	Total Rs.	P.
To								
B. Office Maintenance & Other Establishment Expenses:-								
10,15,859.75		Office Expenses including General Maintenance and Stationery	5,00,000.00		5,65,016.12		10,65,016.12	
51,720.00		P o s t a g e	35,000.00		—		35,000.00	
99,774.00		Advertisement	1,34,576.00		—		1,34,576.00	
16,200.00		Audit Fees (2003-2004)	24,836.00		—		24,836.00	
7,31,688.00		Telephone, Telex EPABX	4,01,104.00		4,35,802.00		8,36,906.00	
98,87,665.00		Electric Bill	40,09,685.43		66,44,800.31		1,06,54,485.74	
7,09,850.00		Travelling Expenses	95,657.00		4,91,161.00		5,86,818.00	
20,82,110.00		Building Repair & Maintenance	—		38,21,909.00		38,21,909.00	
8,65,865.00		Car Repair & Maintenance	9,87,041.00		—		9,87,041.00	
81,250.00		Garden Maintenance	87,850.00		—		87,850.00	
5,35,810.00		Legal Expenses	6,07,766.00		—		6,07,766.00	
12,32,033.00		Security Guard	16,28,753.00		—		16,28,753.00	
1,96,215.00		National Science Day/ Foundation celebrations	—		1,36,542.00		1,36,542.00	
32,000.00		Assistance for Hindi Language Education	—		16,000.00		16,000.00	
—		Sac/Rap/Parliamentary & Other meeting expenses	—		5,22,623.00		5,22,623.00	
2,29,800.00		Assistance for Staff Canteen	—		2,31,000.00		2,31,000.00	
1,77,67,839.75			85,12,268.43		1,28,64,853.43		2,13,77,121.86	

Contd....

Institute
Kolkata-700 009
for the year ended 31st March, 2005

2003-2004 Rs.	P.	Income	Non-Plan Rs.	P.	Plan Rs.	P.	Total Rs.	P.

Bose
93/1, Acharya Prafulla Chandra Road
Income and Expenditure Account

2003-2004		Expenditure		Non-Plan		Plan		Total	
Rs.	P.			Rs.	P.	Rs.	P.	Rs.	P.
To,									
C. Laboratory Expenses :-									
7,67,000.50		Physics	—			8,91,108.50		8,91,108.50	
16,70,510.50		Chemistry	—			15,61,435.50		15,61,435.50	
21,34,702.00		Botany	—			14,77,773.50		14,77,773.50	
12,84,964.50		Microbiology	—			13,80,462.50		13,80,462.50	
16,43,172.50		Bio-Chemistry	—			19,87,817.00		19,87,817.00	
7,74,860.00		Bio-Physics	—			12,73,421.50		12,73,421.50	
8,81,055.50		Animal Physiology	—			10,13,320.50		10,13,320.50	
4,44,167.00		Library	—			1,42,262.00		1,42,262.00	
13,51,291.00		P.M.C.G	—			15,90,186.50		15,90,186.50	
4,63,743.00		Immunotech Laboratory	—			4,51,729.00		4,51,729.00	
1,16,309.00		Environment Science Section	—			3,43,627.00		3,43,627.00	
4,51,888.00		Workshop	—			3,78,775.50		3,78,775.50	
1,58,080.00		Experimental Firms	—			2,42,867.00		2,42,867.00	
2,84,986.00		Publication	—			2,21,863.00		2,21,863.00	
6,00,602.00		Scholar's hostel	—			6,44,646.00		6,44,646.00	
2,12,524.00		Assistance to Institute Scientific Symposium/ seminar/Exhibition etc.	—			4,91,160.00		4,91,160.00	
5,19,987.73		R.S.I.C	—			2,28,116.00		2,28,116.00	
10,26,038.00		Central Instrumentation Laboratories	—			20,35,475.00		20,35,475.00	
7,54,929.00		F.T.N.M.R Maintenance	—			6,35,096.00		6,35,096.00	
13,20,729.00		Internet/Website Facility Maintenance	—			16,55,639.00		16,55,639.00	
3,69,899.48		Darjeeling Exp.Firm (High altitude Research Centre)	—			5,63,622.00		5,63,622.00	
—		Facs calibre maintenance	—			15,02,078.00		15,02,078.00	
—		Patent application & Processing fees	—			51,550.00		51,550.00	
1,72,31,438.71						2,07,64,031.00		2,07,64,031.00	

Contd....

Institute
Kolkata-700 009
for the year ended 31st March, 2005

2003-2004		Income		Non-Plan		Plan		Total	
Rs.	P.			Rs.	P.	Rs.	P.	Rs.	P.

Contd....

Bose
93/1, Acharya Prafulla Chandra Road
Income and Expenditure Account

2003-2004	Expenditure	Non-Plan	Plan	Total
Rs. P.		Rs. P.	Rs. P.	Rs. P.
To				
D. Transfer to Fund for Capital Expenditure :-				
74,11,062.00	BOOKS & JOURNALS	—	64,21,765.00	64,21,765.00
75,53,475.00	APPARATUS & EQUIPMENT		60,07,159.00	60,07,159.00
2,77,159.00	FURNITURE & FITTINGS	—	2,15,314.00	2,15,314.00
5,37,977.00	Air Conditioners	—	2,66,413.00	2,66,413.00
77,645.00	Electric Installation	—	5,03,144.00	5,03,144.00
3,11,400.00	Internet/Website Facility	—	2,39,363.00	2,39,363.00
—	Biosafe Lab (1st Floor)	—	12,84,000.00	12,84,000.00
1,28,11,049.97	Deficit meet up Fund	—	2,32,18,066.26	2,32,18,066.26
83,41,612.80	Excess of Income Over Expenditure Transferred to Balance Sheet	—	—	—
3,73,21,380.77		—	3,81,55,224.26	3,81,55,224.26
14,88,02,797.00	Total (A+B+C+D)	4,94,70,778.93	12,37,69,017.44	17,32,39,796.37

Sd/-
P. Barman
A & FO
Bose Institute

Sd/-
S. Pal
Accounts Officer
Bose Institute

Sd/-
T. K. Ghorui
Actg. Registrar
Bose Institute

Institute
Kolkata-700 009
for the year ended 31st March, 2005

2003-2004	Income	Non-Plan	Plan	Total
Rs. P.		Rs. P.	Rs. P.	Rs. P.
By				
	Excess of expenditure over Income transferred to Balance Sheet		74,69,017.44	74,69,017.44
			74,69,017.44	74,69,017.44
		—	74,69,017.44	74,69,017.44
		4,94,70,778.93	12,37,69,017.44	17,32,39,796.37

This is the Income & Expenditure Account referred to in our attached report of even date.

The 5th October 2005

Sd/-
Prof. M. Siddiqi
Director
Bose Institute

Sd/-
(M. NANDI)
PARTNER
M. No. 16369
Nundi & Associates
Chartered Accountants



Bust of Acharya Jagadis Chandra Bose by Deviprasad Roychoudhury