



BOSE INSTITUTE

**ANNUAL REPORT
2002-2003**



The house of Jagadis Chandra at Falta, 24 Parganas (S),
on the river Ganga, a retreat for him from the busy life of Kolkata



ANNUAL REPORT
OF
THE BOSE INSTITUTE
FOR
2002-2003



Bose Institute

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Calcutta-700 009

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Foreword

An appraisal of the accomplishments of the past year is the intent of all Annual Reports, and so is that of the present one. While an all round progress over the previous year in respect of the main objectives of the institute are notable evidence of the devotion and consistent efforts of scientists, research students, technical staff and the administration, it is also obligatory on us to introspect our own research goals in relation to impending changes in socio-economic scene the world over. In other words, while retaining the distinct pre-eminence in science, we must look ahead through changes that are happening around us.

The first major change in my opinion that will have considerable impact on the course of scientific research is the result of the globalisation of economy and the mandatory change in patent laws as set out by the WTO – the cut off year of 2004 when instead of process the product will be patented. This indeed makes it imperative for all of us to recognise the implications of this inevitable change and bring about necessary modifications in our scientific vision and experimental finesse to meet the formidable challenges that it will present. India has done well in the old patent regime by making cheapest drugs and medicines in the world – drugs against HIV and vaccine for Hepatitis B are recent examples of our success. This could be made possible only due to the available scientific knowledge base, talent and required infrastructure in the country – We now need to do even better under the changed rules of the game.

The motivation and inspiration needed to accomplish the above, leads me naturally to the appreciation of Knowledge and skills that the founder of Bose Institute had developed to meet the challenges of his time more than a century ago - when what was to become Radio Science was being vigorously explored in the scientifically advanced countries of the West. Among his numerous discoveries, contributions and achievements, the most relevant in current context that comes to mind, is the world's first patent relating to a semiconductor that was granted to him in the USA in 1904. The patent on "Detector for Electrical Disturbances" was entirely based on Acharya Bose's highly original researches in microwave and millimeter wave physics and was at least fifty years ahead of the semiconductor revolution in the world.

We know that the example Acharya Bose set in Kolkata became the hallmark of development of science in the entire country, inspiring a whole generation of scientists that grew up to maturity looking up to his example. Today we are proud inheritors of his immeasurable scientific vision and lavish foresight - let us set our goals even higher than ever, to pay a fitting tribute to the achievements of our illustrious Founder and to make India a leader in the world of science.

M. Siddiqi, Director

CONTENTS

	Page
THE BOSE INSTITUTE	i
MANAGEMENT OF THE INSTITUTE	1
SCIENTIFIC REPORTS	
BIOCHEMISTRY DEPARTMENT	3
BIOPHYSICS DEPARTMENT	4
BOTANY DEPARTMENT	5
CHEMISTRY DEPARTMENT	7
MICROBIOLOGY DEPARTMENT	9
PHYSICS DEPARTMENT	11
ANIMAL PHYSIOLOGY SECTION	13
ENVIRONMENTAL SCIENCES SECTION	15
IMMUNOTECHNOLOGY SECTION	15
PLANT MOLECULAR & CELLULAR GENETICS	16
LIST OF PUBLICATIONS	17
STUDENTS AWARDED WITH A PH.D. DEGREE	25
GRANTS-IN-AID SCHEMES	27
PARTICIPATION IN CONFERENCES, ETC.	36
SERVICE DEPARTMENTS	
DISTRIBUTED INFORMATION CENTRE	43
J. C. BOSE UNIT AND MUSEUM	43
LIBRARY	43
MADHYAMGRAM EXPERIMENTAL FARM	44
PUBLICATION	45
R.S.I.C	45
WORKSHOP	47
SOCIALLY RELEVANT	48
LIST OF PERSONNEL	50
STATEMENT OF ACCOUNTS	55



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 85 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 placed in long established 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 RSIC, DIC, 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 infrastructure facilities available in the institute are also used by scientists from several universities and research centres in the country.

Management of the Institute

The Bose Institute is a grants-in-aid autonomous institution under the Department of Science and Technology (DST), Government of India. It has a Governing Body with Shri Debabrata Bose 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. Chakraborty
2. Dr. (Mrs.) Debi Chakraborty
3. Prof. S. N. Chatterjee
4. Shri Somnath Sanyal
5. Prof. D. Banerjea
6. Dr. Anutosh Chatterjee
7. Dr. Manish Chakraborty
8. Mr. D. Mondal
9. Prof. Sunando Bose
10. Prof. Parul Chakrabarti
11. The Director, (Ex-officio)
12. Shri Debabrata Bose – Secretary

Members of the Council

- | | | |
|--|---|-----------------------------------|
| <ol style="list-style-type: none">1. Dr. A. Chatterjee2. Shri Debabrata Bose3. Prof. R. N. Chakraborty4. Prof. (Mrs.) Debi Chakraborty5. Shri Somnath Sanyal6. Prof. S.N. Chatterjee | } | Nominees of the
Governing Body |
| <ol style="list-style-type: none">7. Secretary, Department of Science & Technology, Government of India, or his nominee8. Director General, C.S.I.R. or his nominee9. Joint Secretary and Financial Adviser, Department of Science and Technology, Govt. of India or his nominee10. Representative of the Lok Sabha11. Principal Accountant General (A & E), West Bengal12. Principal Secretary, Higher Education (nominee of the Government of West Bengal)13. Municipal Commissioner, Representative of the Calcutta Municipal Corporation14. Director, Bose Institute – Ex-officio | | |

- | | |
|---|--|
| 15. Dy. Director, Bose Institute – Ex-officio | } Two scientists from outside
West Bengal, nominated by
DST, Govt. of India. |
| 16. Prof. Sandip Basu | |
| 17. Prof. Asis Dutta | |

Members of the Finance Committee

1. Principal Secretary, Higher Education Department, Govt. of W. B.—Chairman
2. Shri Debabrata Bose – (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, Ex-officio
6. Registrar – Secretary

86th Foundation Day



Prof. P. M. Bhargava offering floral tribute at the Samadhi of Acharya J. C. Bose.

The 86th Foundation Day of Bose Institute, Calcutta, was celebrated on 30th November 2002. **Prof. Pushpa M. Bhargava**, Former Director, Centre for Cellular and Molecular Biology, Hyderabad graced the occasion as Guest of Honour and delivered 64th Acharya Jagadis Chandra Bose Memorial Lecture on **Relationship between Science and Art**. Dr. Saroj Gupta, Director, CCWH & Research Institute, Kolkata was present in the occasion as Chief Guest. Mr. Paritosh Sen, Eminent Painter presided over the function. **Sir Nilratan Sirkar Prize 2001** was awarded to Shri Debabrata Mandal, a Junior Research Fellow, Department of Chemistry and **Prof. B. B. Biswas Outstanding Student 2002** was presented to Shri Ajit Bikram Dutta, a Senior Research Fellow, Department of Biochemistry. The day's celebration began with floral offering and garlanding of SAMADHI and BUST of Acharya J. C. Bose at both campuses of the institute. Prof. Maqsood Siddiqi, Director, Bose Institute, delivered Welcome address and presented the institute report.



Prof. Didier Sicard visiting J. C. Bose Museum

Professor Didier Sicard, President, Comité Consultatif National d'Éthique, Paris, visited Bose Institute on 26th February, 2003 on the occasion of National Science Day Celebration and an extension of World Science Festival, 2003. Professor Sicard delivered a lecture on "Ethical problem Concerning Potential benefits and Risks in Using Human Bio-banks" where he put forward several suggestions related to the future of the biobanking system.

Scientific Report

Research Departments

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 extensively the recombinant DNA technology, and several new research programmes were initiated including plant and animal biotechnology, yeast and parasite molecular biology, and structure-activity relationships of gene regulatory proteins.

Interaction of bisANS and ANS to tubulin (Prof. B. Bhattacharyya)

BisANS and ANS binding to tubulin in the presence and absence of GTP were investigated using isothermal titration calorimetry. Both bisANS and ANS have a large number of lower affinity binding sites apart from 1-2 higher affinity sites. While GTP lowers the bisANS binding to both lower and higher affinity sites, ANS binding to those sites remains unaffected. Though the proteolytic digestion of tubulin is very specific in presence of GTP, bis-ANS treated tubulin becomes more susceptible to the digestion.

DNA replication initiation (Prof. P. Sinha)

An ARS-specific gene, *MCM12*, has been cloned. This gene was found to be the same as *CHL1*, which was earlier characterized in another laboratory as required for chromosome segregation. *CHL1* codes for a putative DNA helicase and has a human homolog, hChlR1. Work in our laboratory has shown that the *CHL1* interacts genetically with both chromosome replication and segregation genes. A further characterization of this work now suggests that Chl1p is a multifunctional protein which is also required for transcriptional silencing and may be involved at DNA replication forks for the loading of factors which affect chromatin structure.

Analysis of protein conformation and interactions (Dr. Pinakpani Chakrabarti)

An analysis of the short helices has been carried out to decipher the correlation between sequence and structure patterns in protein structures. The geometry of interaction between aromatic residues in proteins has been elucidated; the results can be used for protein modeling and for the design of proteins and small molecule inhibitors. To carry out biological functions proteins need to recognize each other in a specific manner. The structures of homodimeric proteins have been analyzed to identify the physicochemical features of the interfaces between the subunits. The results should be useful in identifying the surface of protein molecules that are used in binding other proteins.

Regulation of cell division cycle in *Entamoeba* (Dr. A. Lohia)

Using double strand RNA interference we have demonstrated that Eh Diaphanous – a modulator of actin polymerisation – regulates both cell division and nuclear division of *E. histolytica*.

trophozoites. We have also cloned and expressed homologs of the Centromere binding protein E and Cdc20 proteins in amoeba. Work in progress is directed at studying the role of these proteins in regulating chromosome segregation in this organism. Several medicinal plant extracts have been screened for anti-amoebic activity. We are in the process of further purifying these extracts to identify the active principles. Bioinformatic analysis of the amoeba genome sequence has been used to identify S/MAR elements and their organisation. The role of these sequences in regulating transcription and cell cycle is being studied.

Three dimensional model of λ repressor tetramer complex (Dr. R. Chattopadhyaya)

A culmination of decades of studies with this important regulatory protein at this institute and elsewhere happened with the publication of our paper describing three alternative but similar models of the λ repressor operator. It was shown that region 136-230 in our first model 1gfx proposed in 2000 agreed extremely well with a crystal structure reported in the same year. Two later models 1j5g and 1lwq constructed by us differ from 1gfx in the structure of the linker region between the N- and C-domains. The study correlated these models with 22 different kinds of biochemical and biophysical data on the repressor in the literature. On heart disease, 5 Bengali articles in popular magazines were published.

Structural studies on proteins involved in the lysis-lysogeny (Dr. Pradeep Parrack)

A model has been proposed for the CII protein from phage λ , in which the protein equilibrates between two alternate structures, "open" and "closed", wherein the flexible C terminal end of CII assumes different conformations. The first conformation is prone to digestion by proteases, and provides the initial attacking point for HflB. This model provides an explanation for the instability of CII, crucial for its biological function. The protein HflX from *E. coli*, whose function is unknown, was purified by IMAC. Our preliminary studies show that HflX is a GTP binding protein which probably has a GTPase activity. Work is in progress to knock out the *hflX* gene in order to find out the biological function of the protein.

Genes affecting *M. smegmatis*, mycobacteriophage L1 repressor (Dr. Subrata Sau).

To identify the genes affecting the growth of *M. smegmatis*, attempts are being made to construct a *M. smegmatis*-specific genomic library and isolate a set of mutants of *M. smegmatis*, which grow at 32°C but not at 42°C. Recently, a vector was constructed for cloning a gene of temperate mycobacteriophage L1 that kills its host *M. smegmatis*. Such L1 gene may be used also to identify the essential gene of *M. smegmatis*. To better understand the structure & function of the repressor protein of phage L1, work is in progress to purify this protein.

Biophysics

This department was started in 1983 in the Centenary Building. The major theme of this department is structure, function and dynamics of biomolecules. Interests mainly centre on proteins, nucleic acids and small pharmacologically active compounds. X-ray crystallography, spectroscopic

techniques and computer-aided modeling are extensively used to derive structural and dynamical information and its correlation with function. Several crystal structures of pharmacologically important molecules were solved.

Transcription regulation (Prof. Siddhartha Roy)

We have studied role of conformational change in Sigma32 in heat-shock response. We conclude that the temperature dependent conformational change is crucial for DnaK binding. We are attempting to localize the conformational change. We have cloned a stress sigma factor and its associated regulatory proteins from *M. Tuberculosis* which are thought to be important for drug resistance.

Drug design (Prof. Siddhartha Roy)

We have synthesized several peptide inhibitors with cell entry tags. They are directed against Mdm2 and S100B. They bind to their receptors with high affinity. Their effect in cell culture is under investigation.

Molecular modelling, drug design/drugs from Indian plants (Prof. Asok Banerjee)

Structural studies on recognition in protein-protein, protein-nucleic acid, protein inhibitor and various drug complexes are continuing. The main interest is in protease inhibitor complexes, which are involved in various diseased states including arthritis, AIDs, osteoporosis, asthma and cancer. Many of the selected inhibitors are from native medicinal plants of India and progress seems promising.

Botany

A new dimension in research through exploration, conservation and evaluation of plant biodiversity for harnessing plant genetic resource together with plant DNA fingerprinting for plant profiling in the light of Patent Laws under the expanded form regime has been highlighted this year. Studies on structural genomics for studying molecular taxonomy as well as functional genomics with an aim to cultivation needs and also for developing improved transgenic plants of economic / medicinal / ecological importance are important aspects of research.

Molecular markers for agronomic and quality traits in rice and tea (Prof. Swati Sen-Mandi)

Our studies show reduction in membrane integrity and in cell protective enzyme levels with time in post-harvest storage. The variation is correlated with status of a particular variety with respect to its seed vigour trait. Reduction in single stranded DNA integrity in aged cells was also found to be correlated with status of seed vigour. The sequence of a DNA fragment that has been identified to be associated with high seed vigour trait was found have around 95% similarity with acetyl CoA carboxylase in some cereals other important crop plants. Study of flavour related compounds by HPLC and a related enzyme viz. β D glucosidase have led to identification of a useful parameter for tea quality in Assam and Darjeeling tea clones.

Broadening the gene pool of Beta palonga (Prof. K.K. Mukherjee)

An efficient and reproducible protocol for *Agrobacterium* mediated plant transformation has been standardized in Indian spinach (*Beta palonga*) with a standard vector (pCambia 1304). The confirmed transgenics were multiplied followed by successful rooting in liquid medium with coir as alternative matrix.

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

Pre-treatment of Indian bean (*Dolichos lablab* L.) seeds with leaf extracts of neem (*Azadirachta indica* A. Juss) and lemon (*Citrus limon* (L.) Burm. f.) as well as rhizome extract of mango ginger (*Curcuma amada* Roxb.) revealed that all the extracts significantly enhanced germinability under accelerated ageing condition. The plant extracts also arrested the rapid loss of proteins and RNA in seed kernels during the process of accelerated ageing. The beneficial effect of the leaf extract of neem on maintenance of vigour and viability of the Indian bean seeds under accelerated ageing condition is important for cultivation.

DNA Polymerases from Plant (Dr. Dibyendu N. Sengupta)

DNA mis-match correction by base excision repair pathway has been detected in rice nuclear extract and involvement of DNA polymerase beta has been identified.

Salinity stress and Genetic engineering of Tomato (Dr. Dibyendu N. Sengupta)

Synthetic promoter inducible by salinity stress or by ABA treatment have been made and analysed in transgenic tobacco plants using GUS as reporter gene. The laminar nuclear factor that binds to ABA or water stress inducible cis element known as ABRE, has been found to be OSBZ8, transcriptional factor, as evident from antibody bound supershift of the promoter DNA-factor complex. Fruits of transgenic tomato plants (T2 generation) were found to produce 50% less ethylene, 2 to 3 fold more lycopene (vitamin A precursor). Delay of fruit ripening was observed for about 3 weeks in comparison to fruits of untransformed or control plants.

Engineering polyamine metabolism and molecular analysis of polyamine action (Dr. Dibyendu N. Sengupta and Prof. Bharati Ghosh)

T3 lines of transgenic tobacco plants (rice SAMDC) expressing higher level of spermidine showed heavier growth, early flowering, extended flowering and delayed petal senescence. Polyamine treatment causes activation of a protein kinase and from rice genome search, a portion encoding the acidic domain of a kinase has been detected and amplified by PCR.

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

An aqueous extract of in vitro cultured hairy roots and non-transformed adventitious roots of *Phyllanthus amarus* was effective against Bovine Viral Diarrhoea Virus (BVDV), a surrogate of Hepatitis C Virus (HCV). The crude extract caused a reproducible, dose-dependent reduction (maximum of 95%) in cytopathic effect of BVDV with no cytotoxic effect. A protocol of in vitro conservation of *Coleus forskohlii*, an endangered medicinal plant has been standardized by development of synthetic seeds which followed normal germination after low temperature storage.

Identification, characterization, cloning and production of 18 KD Catharanthus allergen (Dr. Swati Gupta Bhattacharya)

Two reactivity patterns against the *Catharanthus roseus* (CR) pollen exists within Calcutta population. Most of the IgE-reactive bands were found to be glycoproteins. The lowest IgE-reactive band (18 kD) common to both reactivity patterns, was sequenced N-terminally. Later, the c-DNA, coding the 18 kD CR allergen was cloned in *E. coli*. The recombinant protein retains immuno-reactivity. The sequence of the protein shows that it is a cyclophilin.

Study of aero-mycoflora with special reference to respiratory allergy (Dr. Swati-Gupta Bhattacharya)

Fungal aerosols were examined with the help of an Anderson sampler in Madhyamgram Experimental Farm. The most dominating species were identified to be *Aspergillus*, *Penicillium*, *Curvularia*, *Cladosporium*, *Torula*, etc. Works are in progress for diagnosis of allergy-patients.

Improvement of aromatic rice (Dr. Tapas Kumar Ghose)

A genetic map of chromosome VIII was produced from the segregation data of the alleles of 11 SSLP markers using 118 F6 lines from the cross combination IR-72/Pusa Basmati-1. Linkage and QTL analyses placed : (1) the trait aroma between RM-284 (at 10cM) and RM-80 (at 8cM), (2) a QTL for cooked kernel elongation (CKE) linked with the chromosomal interval between RM-44 and RM-42 (10cM, LOD score of 10.84), (3) a QTL for kernel length after cooking (LAC) in the same chromosomal interval with a LOD of 10.17. The positive alleles for CKE and LAC were from the parent Pusa Basmati-1.

Functional genomic approach towards understanding of resistance against *A. brassicicola* (Dr. Debabrata Basu)

Oil seed rapeseed-mustard incurred huge yield loss due to the fungal pathogen *Alternaria brassicicola*. However, non-availability of source for resistance against *Aternaria* blight within rapeseed-mustard like *B. napus*, *B. juncea* and *B. rapa*, and unawareness of resistance mechanism are the major problems in the development of resistant varieties. On the contrary, *Arabidopsis* shows complete resistance and *Sinapis alba* shows good amount of resistance against *A. brassicicola* and both belong to the *Brassicaceae* family along with rapeseed-mustard. Thus, functional genomic approaches have been initiated to identify the differentially expressed genes from *Arabidopsis* and *Sinapis alba*, induced on incompatible interaction with pathogen *A. brassicicola* for combating biotic stress.

Chemistry

This department is in existence since 1917, the year when Bose Institute came into being. It is engaged primarily in basic research with the final objective of drug development. In line with this view, research in this department is currently focused in the three following major areas: (i) search for bioactive plant products and synthetic heterocyclic chemistry, (ii) structure, function and

interaction of proteins and (iii) drug targets and mechanism of resistance to drugs in pathogenic bacteria. Additionally, studies on the organisation of mainly liquid crystals are also being pursued.

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

The class A penicillin-binding protein PBP1* of *Mycobacterium tuberculosis* (encoded by Rv0050) has been found to be important in maintenance of cell shape in mycobacteria, based on studies using a *M. smegmatis* strain lacking its counterpart and complementing with the wild type PBP1* or its genetically engineered derivatives. The serine/threonine kinase pknB of *M. tuberculosis* has been demonstrated to phosphorylate some of the *M. tuberculosis* PBPs, suggesting a potential role in regulation of cell wall biogenesis and cell division. A nickel transporter of *M. tuberculosis* has been expressed in *E. coli*.

Ca²⁺-ATPase in epithelial cells and aposomes of rat (Prof. Parimal C. Sen)

We have shown for the first time that an important membrane bound protein, Ca²⁺-ATPase, is located in the apical plasma membrane of rat coagulating gland epithelial cells and is also integrated into the rising aposomes. This Ca²⁺-ATPase could be responsible for removing high intracellular calcium concentrations from the aposomes during apocrine secretion. By analyzing human seminal plasma, it has been shown that the semen of infertile men displays lower Ca²⁺-ATPase activity compared to the corresponding samples of fertile men.

Phosphorylation-dephosphorylation of Ca²⁺, Mg²⁺ and Ca²⁺-ATPases (Prof. Parimal C. Sen)

In continuation of our earlier studies of the regulation of Ca²⁺, Mg²⁺ and Ca²⁺-ATPase activities by protein modulators (Bhattacharyya and Sen, Biochem. J. 330, 95-101, 1998; Sikdar et al. J. Biosc. 24, 317-421, 1999), we have shown an *in vitro* experiment that the phosphorylation step of Mg²⁺-independent Ca²⁺-ATPase is inhibited while in Mg²⁺-dependent Ca²⁺-ATPase dephosphorylation step is stimulated by the same regulator proteins isolated from rat brain cytosol.

Catalytic subunit of protein kinase A from bovine lens (Prof. Parimal C. Sen, Dr. Kali Pada Das)

The catalytic subunit of PKA has been purified from bovine lens to homogeneity and partially characterized to examine its role in phosphorylation of crystalline in relation to chaperone function and lens transparency.

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

The synthesis of the anti-AIDS sponge metabolite coscinamide B and of novel thiazolocarbazoles have been completed. Besides, three new clay-mediated reactions of indoles with each of ceric ammonium nitrate, ammonium thiocyanate and cyclohexane-1, 3-diones separately and a novel conversion of bis(indolyl)nitroethanes by titanium(III) chloride have been accomplished. Expedient syntheses of a potentially bioactive benzo[*h*]quinazolin-4(3*H*)-one and a few naturally occurring bioactive bis(indolyl)alkanes, -alkanoic acids and -alkylamines have also been achieved.

Protein folding and chaperones (Dr. Kali Pada Das)

We are trying to understand the relationship between structure and chaperone function of α -crystallin. We have studied the oligomeric structure and chaperone activity of α -crystallin through tryptic digestion. We also monitored various structural changes in the C-terminal region of recombinant α A-crystallin by measuring reactivity of its two thiol groups located in this region. Studies to delineate between sequential and hierarchical mechanism in α -crystallin folding/unfolding is underway.

Modulation of phagocyte signaling (Dr. Joyoti Basu, Dr. Manikuntala Kundu)

A novel signaling pathway involving apoptosis signal regulating kinase (ASK)1/p38 mitogen-activated protein (MAP) kinase executing apoptosis of *Mycobacterium avium*-challenged macrophages has been elucidated. A secreted putative peptidyl prolyl cis/trans isomerase of *Helicobacter pylori* has been found to activate MAP kinase signaling in gastric epithelial cells; and *H. pylori* lipopolysaccharide-stimulated interleukin 1-beta release from macrophages has been demonstrated to be critically dependent on p38 MAP kinase and phosphatidylinositol 3-kinase.

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

Aspartate residues 45 and 205 of the N-terminal cytoplasmic domain of the anion exchanger band 3 have been mapped as caspase 3 cleavage sites. *In vivo* caspase 3-mediated cleavage of band 3 has been demonstrated in staurosporine-treated HEK293 cells, suggesting a novel role of caspase 3 in regulating band 3 function.

Studies on hepatoprotective protein(s) from herbal sources (Dr. Parames C. Sil)

The active principle(s) responsible for the hepatoprotective action against paracetamol and CCl₄-induced toxicity in mouse liver has been isolated independently from the water (phosphate/tris buffer, physiological pH) soluble fraction of two different herbs. The active principle(s) from both the sources appears to be a protein molecule(s). More research needs to be carried out for further characterization of these active principles and currently it is in progress.

Intermolecular and surface forces in molecular and liquid crystals (Dr. Pradip Das)

The organization of nematic actin liquid crystal at the air-water and glass-water interfaces is intriguing. The electrostatics of this liquid crystal has been worked out using linear Poisson-Boltzmann equation and estimating the cluster integral at the level of the second virial approximation. Also, both theoretical and experimental studies have been undertaken of the melting behavior of molecular crystals such as cholesteryl stearate (saturated fatty chain) and cholesteryl oleate, linoleate and linolenate (latter three having increasing degree of un-saturation in the fatty chain).

Microbiology

This was the first department of its kind in India to be 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.

Starch degrading enzymes (Prof. Pran K. Chakrabartty)

An α -amylase purified to homogeneity from culture filtrate of a pectin utilizing strain of *Bacillus amyloliquefaciens* grown on dextrin had a specific activity of 58,000 mmole/min/mg protein. The K_m of the enzyme for starch was 16.7 mg/ml and the K_{cat} was 48,000 mmole/min/mg protein. The enzyme also hydrolyzed raw starch from several sources. The enzyme activity increased by 50% in presence of Co^{2+} ion. Biophysical studies of the protein revealed that Co^{2+} increased the stability of the structure promoting α -helix formation at the expense of random structure.

Newer β -lactams by the penicillin amidase produced by *Alcaligenes* sp. (Prof. Timir B Samanta)

The purified penicillin amidase had pI of 8.5. It is a thermotolerant protein. Its thermal stability remained unperturbed in presence of DTT and β -ME. This is contrary to that observed with the enzyme produced by *Alcaligenes faecalis*. The enzyme has got broad substrate specificity. Cephalothin seems to be the best substrate. It shares the properties of both type II and type III penicillin amidases although of type II origin. Condensation of 6-APA with various acyl donors in presence of immobilized beads in organic solvents furnished newer β -lactams.

Outer membrane protein W (OmpW) of *Vibrio cholerae* (Prof. A. C. Ghose)

The 22-kDa OmpW protein of *V. cholerae*, purified following over-expression in *E. coli*, exhibited structural features common to OMPs of gram-negative bacteria but no porin-like activity. Expression of the protein in vitro was regulated by nutrients and other growth conditions suggesting its involvement in the adaptation of *V. cholerae* to different environmental niches.

Visceral leishmaniasis (VL) in BALB/c mice (Prof. A. C. Ghose)

Temporal variation in the expression of activating (IL-2, IFN- γ and TNF- α), deactivating (IL-4 and TGF- β) cytokines as well as of iNOS enzyme was demonstrable in the spleen and liver of BALB/c mice with progressive VL which could be related to the differential control of parasite burden in these organs.

Sulfur oxidation (Sox) gene operon of a sulfur oxidizing chemolithotrophic bacterium (Dr. Pradosh Roy)

Analysis of a novel gene cluster, *soxSRT*, mapped in the upstream of and divergently transcribed from the sulfur oxidation (Sox) gene cluster (*soxVWXYZABC*) in the *sox* locus of sulfur oxidizing chemolithotrophic α -proteobacterium KCT001, predicted a transcriptional regulator and a thioredoxin-related protein for *soxR* & *soxS*, respectively. The immediately preceding ORF *soxT*, identified upon cloning and sequencing from one end of the transposon adjacent genomic DNA of a Tn5-mob insertion mutant with *sox*⁻ phenotype, predicted a permease like transporter protein seemingly involved in the uptake of sulfur substrate. Two independent mutations within *soxT*, rendering a delayed wild type phenotype, intrigue a regulatory function of the cluster.

Chemokine-induced protection against visceral leishmaniasis (Dr. Subrata Majumder)

The results of the present investigation suggest that the MIP-1 α and MCP-1 orchestrate an antileishmanial armamentarium via the induction of a NO mediated regulatory mechanism to control the intracellular growth and multiplication of the leishmanial protozoan.

Involvement of ceramide in LAM induced cell signaling (Dr. Subrata Majumder)

Lipoaralinomannan (LAM) is a major cell wall associated lipoglycan which exerts its cytotoxic activity via inhibition of PKC, a key signaling molecule inside the mononuclear cells. LAM of *M. tuberculosis* induces a signal transduction pathway in favour of survival of the host cells via the generation of ceramide, a novel second messenger.

Understanding replication mechanisms in mycobacteria (Dr. Sujoy Dasgupta)

In the mycobacterial plasmid pAL5000 replication region, the replication genes *repA* and *repB* are organized in the form of an operon. Earlier a RepB dependent origin binding activity was detected in cells expressing the *repA-repB* operon in *E. coli*. This activity was maximal when expressions of the two genes were coupled. In the present study we have shown that coupled expression of RepA is necessary for the folding of RepB into an active structure which results in more efficient formation of a DNA-protein complex at the pAL5000 origin.

Biodegradation of aromatic pollutants (Dr. Tapan K. Dutta)

Degradation of butyl benzyl phthalate by a *Gordonia* sp. furnished mono-*n*-butyl- and monobenzyl phthalates as the largely accumulated metabolites with trace amount of phthalic acid as the dead-end product, as determined by GC-MS and NMR analyses. The esterase(s) involved in the metabolic pathway was found to be inducible in nature. On the other hand, the test organism utilized benzyl alcohol and *n*-butanol, the hydrolyzed products of butyl benzyl phthalate for growth, where benzyl alcohol was found to be mineralized via catechol and cis, cis-muconic acid.

Physics

This is one of the oldest departments, as the founder himself was a physicist and thus research in Physics has been carried out from the inception of the Institute till today. The main objective of this department is to improve our understanding of the basic laws of nature, in the realm of both macro and micro worlds. Current research programmes are in the areas of radiation physics, condensed matter physics and materials science, cross-disciplinary physics, high and intermediate energy physics, astrophysics, cosmology, foundational aspects of quantum mechanics, quantum information and communication. Ongoing research activities include theory as well as experiments.

Superheated emulsion detector (Prof. S.C. Roy, Prof. B. Roy, Dr. B.K. Chatterjee)

Experiments have been undertaken to understand the physics of nucleation of the superheated drop detector (SDD). The observed data suggests the absence of acoustically (shock wave)

induced nucleation of superheated droplets by neutrons and by gamma rays. A more detailed experiment is underway to study the size and lifetime distribution of the superheated droplets.

The energy dependence of the rate of gamma induced nucleation of R502 has been studied.

Call for further inelastic scattering measurements at X-ray energies using synchrotrons (Prof. S.C. Roy)

Recent precise measurements of inelastic scattering cross sections using synchrotrons were analysed using the incoherent scattering factor (ISF) and "best predictions". The analysis reveals that further measurement of inelastic scattering cross sections at certain region of X-ray energies is needed to test the adequacy of different theoretical approaches.

Applied Radioactivity (Dr. S. N. Changdar)

Diffusion studies in several aqueous solutions and liquid metal have been carried out using the sliding cell and sheared boundary methods based on radioactive tracer techniques and developed in our laboratory. The importance of the study lies in the development and modification of kinetic and statistical theories of the liquid state. Accurate diffusion data is of paramount importance in different nuclear technologies.

Quantum antiferromagnets and strongly correlated systems (Prof. Indrani Bose)

We have studied the entanglement properties of the exactly-known ground states of some frustrated spin models. The concurrence, a measure of the amount of entanglement, can be calculated exactly for spin pairs. We have shown that macroscopic entanglement changes can occur in quantum phase transitions brought about by the tuning of external magnetic field or exchange interaction strengths.

Interdisciplinary physics (Prof. Indrani Bose)

Plants are capable of intelligent responses to complex environmental signals. Learning and memory play fundamental roles in such responses. Two simple models of plant memory have been proposed based on the calcium-signaling system. The models derive inspiration from J. C. Bose's experimental observation that plant cells are excitable and can transmit millivolt order electrical signals.

Quantum mechanics, quantum entanglement and quantum communications (Prof. D. Home)

A protocol has been formulated that communicates the knowledge of an apparatus setting between two non-interacting entangled systems. This requires an entangled state and a transmission of classical information which is totally unrelated to the apparatus setting actually communicated. This scheme has applications to quantum cryptography. Another proposed scheme is where usable quantum information is transferred without requiring any external channel and not involving any transfer of quantum state. This process uses an entangled three-particle system in which the information is transmitted from 3 to 1 even though 1 and 3 never interact but are both entangled with 2.

Intermediate and high energy physics (Dr. Swapan K Saha)

A study to understand the role of three-nucleon force (3NF) was undertaken, utilizing the storage ring facility, at the Indiana University Cyclotron Facility, Bloomington, USA. We studied pd elastic scattering at 135 and 200 MeV and $pd \rightarrow \pi\pi^+$ at 250 and 275 MeV beam energy, using polarized beam as well as target. For the elastic scattering we measured 15 of the possible 17 spin correlation coefficients and compared with Faddeev calculation. Inclusion of theoretical 3NF did not significantly improve the agreement between the data and the calculation.

Astrophysics and cosmology (Dr. Swapan K Saha and Prof. Sibaji Raha)

During the past year, we have made considerable progress in estimating the flux of strange quark matter fragments, a very plausible candidate for the cosmological dark matter, in the cosmic ray flux and the resulting abundance of such matter in geophysical samples. We have identified a cheap and readily available polymeric film, used commercially as overhead projector transparency foils (OHPT), as a detector of heavy ions. We have found that under optimum conditions, the tracks in OHPT are comparable with that obtained with more expensive Columbia Resin CR-39. Further standardization and calibration of this detector material is proceeding now.

Scaling behaviour in relaxor ferroelectric (Dr. Tripurari Prasad Sinha)

Relaxors form a special class of ferroelectrics. They are used in various devices. A low temperature scaling behaviour of frequency dependence of imaginary part of dielectric constant of barium iron niobate (a relaxor ferroelectric) synthesized by ceramic process was investigated for the first time. The scaling behaviour of the dielectric loss spectra suggests that the distribution of the relaxation times is temperature independent. The frequency-dependent electrical data are also analyzed in the framework of the conductivity and modulus formalisms. Both these formalisms provided qualitative similarities in the relaxation times.

Physics & Astrophysics of strongly interacting matter (Dr. Sanjay K. Ghosh)

We have shown that the QCD phase transition may give rise to the extended quark matter domains, which might be interpreted as one form of dark matter; namely the Massive Astrophysical compact halo objects (MACHO). These objects have been observed in the halo of Milky Way. Within the same framework, one can also explain the dark energy content of the universe.

We have studied the effect of medium modification of hadrons on the shadowing in photon-nucleus interactions. The change in the in-medium properties seem to be necessary to explain the large shadowing observed in the experiments, satisfactorily.

Animal Physiology

Sri Gopal Chandra Bhattacharya, an eminent naturalist, started animal Physiology as a separate entity as early as in 1930. Significant contributions emerged at that time from the physiological studies on different types of spiders, ants, caterpillars, butterflies, tadpoles, fish, etc., some of the

research findings were published in the Royal Society Journal of Natural History. Thereafter, Animal Physiology expressed its research motive in fundamental and applied fields like, Piscine Physiology, Amphibian Physiology, Invertebrate Physiology, Gerontology, etc., during 1970s. From 1990s, the research program were further modified and focussed in applied and medical-oriented themes with fundamental touch. At present, Animal Physiology Section is mainly engaged in applied research related to Animal Biotechnology and Cancer Chemoprevention.

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

We have monitored variations of E2-sensitive metabolic parameters, which have strong relations with silk production, in silk gland of 5th instar larva and pupal fatbody and ovary of *Bombyx mori* L. Appreciable metabolic differences have been demonstrated between the diploid (2n) and triploid (3n) variety (having faster growth rate), in different vital organs of singi fish (*H. fossilis*).

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

It has been found that despite a change in the thyroid hormone level in blood, the central nervous system maintains a steady supply of the hormone for some duration through a mechanism of 'central homeostasis'. Our experiments show that addition of phenylhydrazinehydrochloride, an omnipotent environmental pollutant aggravates the situation by damaging the cerebrocortical neurones in rat.

Curcumin-induced breast cancer cell apoptosis in G2-phase through p53-mediated Bax activation
(Dr. Gaurisankar Sa)

A search for the molecular mechanisms of curcumin-induced breast cancer cell killing revealed that this yellow pigment induced apoptosis in G2 phase of cell cycle. Apoptosis was accompanied by an increase in p53 level as well as its DNA-binding activity followed by Bax expression. Further experiments using p53-knock out MDAH041 cell as well as low and high p53-expressing TR9-7 cell, in which p53 expression is under tight control of tetracycline, we established that curcumin induced apoptosis in tumor cells via a p53-dependent pathway in which Bax is the downstream effector of p53. Such property of curcumin suggests that this molecule could have a possible therapeutic potential in breast cancer patients.

Cancer development vis-à-vis host immunity (Dr. Tanya Das)

In a longitudinal study, it was observed that at the preliminary stage of cancer, there was immunoboosting to fight back the tumor. However, at the later stage, tumor overpowered and induced apoptosis in the immunocytes, thereby causing immunosuppression. The popular beverage black tea, when administered from early stage of cancer, not only acted as immunorestorer and but also delayed tumor development.

Cancer chemoprevention by diet-derived components: Induction of apoptosis and inhibition of metastasis in cancer cells (Dr. Tanya Das)

A search for the molecular mechanism of black tea-induced tumor cell death revealed that black tea, a known antioxidant, induces tumor cell apoptosis by acting as pro-oxidant since it stimulates ROS generation, changes mitochondrial membrane potential and accelerates mitochondrial death cascade. Black tea and its polyphenols also inhibit cancer metastasis.

Environmental Science Section

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

Studies of environmental pollution samples (Prof. M. Siddiqi, Dr. N. Mandal).

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 of health effected patients coming from different Hospitals of West Bengal and analysis of different samples coming from different Academic Institute and Universities. Environmental Sciences Section earned Rs.87,775.00 in the last financial year as revenue.

Immunotechnology Section

The section was created in 1992. Major Research programs have been initiated in the field of Molecular Microbiology and Immunology.

Phase induced modification of bacterial machinery (Dr. N. Mandal)

Based on bacteriophage induced modification and inactivation of host machinery, many countries used phage therapy to control the bacterial diseases. We have initiated such type of research program using cholera phage ϕ -149 induced modification of host protein synthesis machinery in *vibrio cholerae* 154 as a model system. During the year 2002-2003, we have found cholera phage ϕ -149 induced modification of some aminoacyl-tRNA synthetases in *vibrio cholerae* 154 upon infection. This modification depends on phage encoded *de novo* protein synthesis.

Host virus interaction in *Penaeus monodon* or giant black tiger prawn (Dr. N. Mandal)

Shrimp aquaculture is one of the promising and job generating industry all over the world including India. Due to recent outbreak of pandemic white spot syndrome virus (WSSV) infection hampered this industry and failure to control the disease. Our goal is to develop disease free (WSSV free) Shrimp aquaculture industry. During the year 2002-2003 using PCR based technology, we are trying to develop microsatellite based DNA marker specific for disease resistant population of *P. monodon* (Giant black tiger prawn).

Plant Molecular & Cellular Genetics

Plant Tissue Culture Section was renamed as PMCG Section in the year 1989 with the objective of plant genetic engineering towards improvement of plant productivity. At present the major emphasis has been given to identify the basic components coding for desirable traits through molecular approaches and its application using conventional breeding and genetic engineering technology.

Plant abiotic stress tolerance (Prof A.N.Lahiri Majumder)

The gene sequences for a salt-tolerant L-myo-inositol 1-phosphate synthase(MIPS) from *Porteresia* (PINO1, patent pending) has been submitted to the GenBank (Accession no.AF 412340). The salt-tolerance domain of the gene has been mapped by *in vitro* mutagenesis, and subsequent biochemical and biophysical analysis of the bacterially expressed protein.

The gene has been introgressed into tobacco and rice plants conferring salt-tolerance phenotype. The *Synechocystis* gene for the MIPS protein has been identified through bioinformatic and molecular tools.

Yellow mosaic virus resistant gene candidates of *Vigna mungo* (Prof. Amita Pal, collaborator Dr. Tapas K. Ghose, Department of Botany)

Yellow mosaic virus resistant gene candidates (VMYR-1, VMYR-2) of *Vigna mungo* were partially sequenced for the first time and submitted; Genbank accession numbers are AY29745 and AY301991. The deduced amino acid sequences have been found to share high homology with the Ced-4 (Cell death protein) of nematode, Apaf-1 (apoptotic protease activating factor-1) of human and with the NBS region of most plant disease resistant proteins (the NB-ARC domain). This trans-kingdom homology suggests that there may be similarity between the cell death processes of animals and hypersensitive reaction leading to systemic acquired resistance in plants.

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

Attempts are being made to generate transgenic mustard, chickpea and rice plants with chimeric *Allium sativum* leaf lectin gene (ASAL) to protect them from the attack of homopteran insects namely, *Lipaphis erysimi*, *Aphis craccivora*, *Nephotettix sps* respectively. Like wise, chimeric CryIAC gene (s) are used to raise pod borer resistant transgenic chickpea plants. A major Brush Border Membrane Vesicle receptor protein of 56 kDa from target insects having binding specificity to ASAL has been identified, purified and being characterized.

Towards improvement of oil yielding Brassica and edible mushrooms (Dr. Samir R. Sikdar)

Agro-morphological, biochemical and molecular characterization of somatic hybrids between *Brassica juncea* and *Rorippa indica* have been done. The somatic hybrids appear to be tolerant against *Brassica* aphid, *Lipaphis erysimi*. Protoplast regeneration of different edible mushrooms like *Pleurotus flabellatus*, *P. djamour* and *Calocybe indica* has been done.

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Roy, P, Sengupta, A, Chakraborty, R, Lahiri, C & Ghosh, W (2002) Chemotaxis of *Acidithiobacillus ferrooxidans* vis-a-vis mineral -microbe interaction. In *Mineral Biotechnology* (edited by L.B. Sukla and V.N. Misra), p. 43-57. Allied publishers Pvt. Ltd. New Delhi. Proceedings of the National Seminar on "Mineral Biotechnology 2002" Regional Research Laboratory, Bhubaneswar.

PHYSICS DEPARTMENT

1. Kunkri, S, Roy, B, Roy, S C & Chatterjee, B K (2002) Superheated emulsion detector: A benign, non-invasive method to detect gamma radiation, *Journal of Medical Physics*, **27**, 272.
2. Roy, S C & Roy, B (2003) Use of superheated liquid in neutron detection, *Current Science*, **84**, 516-528.
3. Roy, S C (2002) Use of superheated emulsion in medical physics, *Journal of Medical Physics*, **27**, 99.
4. Roy, S C & Sandison, G A (2002) Measurement of neutron dose in the patient plane in a medical accelerator photon beam, *Journal of Medical Physics*, **27**, 262.
5. Banerjee, S, Bhattacharyya, A, Ghosh, S K, Raha, S, Sinha, B & Toki, H (2003) Massive compact halo objects from the relics of the cosmic quark - hadron transition, *Monthly notices of Royal Astronomical Society*, **340**, 284-288.
6. Banerjee, S, Bhattacharyya, A, Ghosh, S K, Raha, S, Sinha, B & Toki, H (2003) Relics of cosmic quark-hadron phase transition and massive compact halo objects, *Nuclear Physics*, **A715** 827c-830c.
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9. Chattopadhyay, E & Bose, I (2003) Magnetization plateaux in a generalized ladder model, *Physica A*, **318**, 14-22.
10. Home, D, Bandyopadhyay, S & Majumdar, A S (2002) Quantum Mechanical Effects in a Time-varying Reflection Barrier, *Physical Review A*, **65**, 052718.

11. Home, D & Majumdar A S (2002) Interpreting the Measurement of Time of Decay: Phenomenological Significance of the Bohm Model, *Physics Letters A*, **296**, 176-180.
12. Home, D, Ali, M & Majumdar, A S (2002) Understanding Quantum Superarrivals using the Bohmian Model, *Physics Letters A*, **304**, 61-66.
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14. Saha, S & Sinha, T P (2002) Low temperature scaling behaviour of $\text{BaFe}_{0.5}\text{Nb}_{0.5}\text{O}_3$, *Physical Review B*, **65**, 134103(1-7).
15. Ray, D K, Ray, P, Dutta, P K, Maji, T & Sinha, T P (2002) An analysis of collimator scatter factors of mega voltage photon beam, *Journal of Medical Physics*, **27**, 266-267.
16. Alam, J, Ghosh, S K, Roy, P & Sarkar, S (2002) Shadowing in photoabsorption: role of in-medium hadrons, *Physical Review C*, **66**, 042202 (1-5).
17. Banerjee, S, Bhattacharyya, A, Ghosh, S K, Raha, S, Sinha, B & Toki, H (2003) Massive compact halo objects from the relics of the cosmic quark-hadron transition, *Monthly notices of Royal Astronomical Society*, **340**, 284-288.
18. Banerjee, S, Bhattacharyya, A, Ghosh, S K, Raha, S, Sinha, B & Toki, H (2003) Relics of cosmic quark-hadron phase transition and massive compact halo objects, *Nuclear Physics A*, **715**, 827c-830c.
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Conference Proceedings

1. Das, Mala, Abe, Masashi, Sawamura, Teruko, Roy, S C, Chatterjee, B K & Roy, B "Application of superheated emulsions in neutron spectrometry" Proceedings of the Workshop on Radiation Detector and their uses, KEK Tsukuba, Japan during January 28-30, 2003.
2. Home, D & Corbett, J (2002) Quantum Information Transfer without An External Channel, in Proc. 7th Int. Symp. on Foundations of Quantum Mechanics in the Light of New Technology ISQM—Tokyo; World Scientific, Singapore.
3. Home, D & Majumdar, A S (2002) Quantum Information Transfer Using A Time-Dependent Boundary Condition, in Proc. 7th Int. Symp. on Foundations of Quantum Mechanics in the Light of New Technology ISQM—Tokyo; World Scientific, Singapore.

Omitted from previous year.

1. Wise, T, Haeberli, W, Lorenz, B, Quinn, P A, Rathmann, F, Schwartz, B, Walker, T G, Wellinghausen, A, Balewski, J T, Doscow, J, Meyer, H O, Pollock, R E, Przewoski, B V, Rinckel, T, Saha, S K & Pancella, P V (2001) Nuclear polarization of hydrogen molecules from recombination of polarized atoms, *Physical Review Letters* **86**, 042701 (1-4).
2. Meyer, H O, Wellinghausen, A, Balewski, J T, Doscow, J, Pollock, R E, Pizewoski, B V, Rinckel, T, Throngren-Engblom, P, Knutson, L D, Haeberli, W, Lorentz, B, Rathmann, F, Schwartz, B, Wise, T, Daehrick, W W, Saha, S K & Pancella, P V (2001) Complete set of polarized observables in $pp \rightarrow p\pi^0$ close to threshold, *Physical Review C*, **63**, 064002 (1-24).

ANIMAL PHYSIOLOGY

1. Chaudhuri, A, Krishnan, N, Sarkar, P K & Ray, A K (2001) Octopamine regulated diapause termination and its response to exogenous L-DOPA during critical phase of pupal diapause in Tasar silkworm *Antheraea mylitta* Drury (Lepidoptera: Saturniidae), *Entomol.*, **26** (Special issue), 198-206.
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7. Chakrabarti, N & Ray, A K (2002) Stimulation of $\text{Ca}^{2+}/\text{Mg}^{2+}$ -ATPase activity in adult rat cerebrocortical synaptosomes by 3-5-3'-L-triiodothyronine, *Neuroscience Research Communications*, **31**, 193-201.
8. Das, T, Sa, G, Chattopadhyay, S & Ray, P K (2002) Protein A-induced apoptosis of cancer cells is affected by soluble immune mediators, *Cancer Immunology Immunotherapy*, **51**, 376-380.
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10. Bhattacharya, A, Chattopadhyay, S, Choudhury, T, Banerjee, A, Sa, G & Das, T (2003) Apoptogenic effects of black tea on Ehrlich's ascites carcinoma cells, *Carcinogenesis*, **24**, 75-80.
11. Bhattacharya, A, Sa, G, Das, T & Siddiqi, M. (2003) Black tea-induced cellular survival: Evidence for reduced toxicity and enhanced immunity in mice under stress, *Int. J. Tea Sci.*, **2**, 34-39.

PLANT MOLECULAR & CELLULAR GENETICS

1. Hait, N C, Ray Chaudhury, A, Das, A, Bhattacharyya, S & Majumder, A L (2002) Processing and activation of chloroplast L-myo-inositol 1-phosphate synthase from *Oryza sativa* requires signals from both light and salt, *Plant Science*, **162**, 559-568.
2. Das, S & Pal, A (2003) Differential DNA endoreduplication and protein profile during cotyledon ontogeny of *Vigna radiata*, *J. Plant Biochem. & Biotech.*, **12**, 11-18.
3. Roy, A, Banerjee, S, Majumder, P & Das, S (2002) Efficiency of Mannose-Binding Plant Lectins in Controlling a Homopteran Insect, the Red Cotton Bug, *Journal of Agriculture and Food Chemistry*, **50**, 6775-6779.

DISTRIBUTED INFORMATION CENTRE

1. D'Onofrio, G, Ghosh, T C & Bernardi, G (2002) The base composition of the human genes is correlated with the secondary structures of the encoded proteins, *Gene*, **300**, 179-187.

2. Gupta, S K & Ghosh, T C (2003) Reinvestigation on the causes of genomic GC variation between the orthologous genes of *Mycobacterium tuberculosis* and *Mycobacterium leprae*, *Biochem Biophys Res Commun*, **303**, 65-68.
3. Banerjee, S & Lohia, A (2003) Molecular analysis of repetitive DNA elements from *Entamoeba histolytica*, which encode small RNAs and contain matrix/scaffold attachment recognition sequences, *Mol Biochem Parasitol.*, **126**, 35-42.

REGIONAL SOPHISTICATED INSTRUMENTATION CENTRE

1. Saha, N C, Butcher, R J, Chaudhuri, S & Saha, N (2002) Synthesis and spectroscopic studies of cobalt(III) complexes with 5-methyl-3-formylpyrazole-N(4)-diethylthiosemicarbazone (HMP_2NEt_2): X-ray crystallography of $[\text{Co}(\text{MP}_2\text{NEt}_2)_2]\text{ClO}_4 \cdot 2\text{H}_2\text{O}$ (I) and $[\text{Co}(\text{MP}_2\text{NEt}_2)_2]\text{BF}_4 \cdot 2\text{H}_2\text{O}$ (II), *Polyhedron*, **21**, 779-785.
2. Saha, N C, Saha, A, Butcher, R J, Chaudhuri, S & Saha, N (2002) Synthesis and structural characterisation of new iron(III) complexes with biologically relevant pyrazolyl thiosemicarbazones, *Inorg. Chimica Acta*, **339**, 348-354.
3. Saha, N C, Butcher, R J, Chaudhuri, S & Saha, N (2003) Synthesis and spectroscopic identification of new iron(III) complexes with 5-methyl-3-formylpyrazole-3-piperidinylthiosemicarbazone (HMP_23Pi): X-ray structure of $[\text{Fe}(\text{MP}_23\text{Pi})_2]\text{ClO}_4 \cdot 2\text{H}_2\text{O}$, *Polyhedron*, **22**, 375-381.
4. Saha, N C, Butcher, R J, Chaudhuri, S & Saha, N (2003) Synthesis and spectroscopic characterisation of cobalt(III) and nickel(II) complexes with 5-methyl-3-formylpyrazole-N(4)-dibutylthiosemicarbazone (HMP_2NBu_2): X-ray crystallography of $[\text{Co}(\text{MP}_2\text{NBu}_2)_2]\text{NO}_3 \cdot \text{H}_2\text{O}$ (I) and $[\text{Ni}(\text{HMP}_2\text{NBu}_2)_2](\text{ClO}_4)_2$ (II), *Polyhedron*, **22**, 383-390.
5. Sau, D K, Saha, N, Butcher, R J & Chaudhuri, S (2003) Synthesis, spectroscopy and cyclic voltammetry of cobalt(III) complexes with 5-methyl-3-formylpyrazole N(4)-cyclohexylthiosemicarbazone (HMPz4Cy): X-ray crystal structure of $[\text{Co}(\text{MPz4Cy})_2]\text{Cl} \cdot 2.75\text{H}_2\text{O}$, *Transition Met. Chem.*, **28**, 229-234.
6. Sinha Ray, M, Bhattacharya, R, Chaudhuri, S, Righi, L, Bocelli, G, Mukhopadhyay, G & Ghosh, A (2003) Synthesis, characterisation and X-ray crystal structure of copper(II) complexes with unsymmetrical tetradentate Schiff base ligands: first evidence of Cu(II) catalysed rearrangement of unsymmetrical to symmetrical complex, *Polyhedron*, **22**, 617-624.
7. Sen, A K (2003) Integrated address diary in Visual Basic, *Electronics for You*, **35**, 61-66.

STUDENTS AWARDED WITH A PH. D. DEGREE

Name of Student (University, Year)	Department / Title of Thesis	Supervisor
Biochemistry		
Santanu Kumar Ghosh (JU, 2002)	Characterization of the Budding Yeast Minichromosome Maintenance Gene Required for Chromosome Segregation	Prof. Pratima Sinha
Biophysics Department		
Sibani Chakravorty (JU, 2002)	Critical structural study of protease inhibitors and some molecules of biological importance.	*Prof. Asok Banerjee
Suparna Bhattacharya (JU, 2002)	Structural studies of protease system and model studies of macromolecules of biological importance	Prof. Asok Banerjee
Microbiology Department		
Sandip Bhattacharyya (JU, 2002)	Signal transduction mechanism in visceral leishmaniasis: An approach to investigate the role of free radicals, cytokines and chemokines in <i>L. donovani</i> infected murine macrophages	Dr. Subrata Majumdar
Sanjukta Ghosh (JU, 2002)	Signal transduction mechanism of macrophages during visceral leishmaniasis with special emphasis on the role of ceramide on host pathogen interactions	Dr. Subrata Majumdar
Pratap Narayan Mukhopadhyaya (JU, 2002)	Construction of suitable vectors for <i>Thiobacillus</i> and identification of a novel gene essential for thiosulfate oxidation in a sulfur lithotrophic bacterium	Dr. Pradosh Roy

**Name of Student
(University, Year)**
Department / Title of Thesis
Supervisor

Amit K. Chakraborty
(CU, 2003)

Biochemical and immunological
studies on the toxic components
of Russell's Viper venom from
Eastern India

Prof. Asoke C. Ghose

Plant Molecular and Cellular Genetics Section

Samik Das
(JU, 2002)

Analysis of differentiation in
de-embryonated cotyledons
of *Vigna radiata*

Prof. Amita Pal

Rukmini Mitra
(JU, 2002)

Growth, development and
structure of Biotechnology
Information system in India :
A critical study

Prof. Prabir
Roychaudhuri, JU
Prof. A.N. Lahiri
Majumder (co-guides)

Immunotechnology Section

Srikanta Jana
(JU, 2003)

Purification and characterization of a novel
protein from mouse T cell having affinity
with Protein A of *Staphylococcus aureus*
Cowan I.

Dr. Nripendranath
Mandal

GRANTS-IN-AID SCHEMES
**Investigator /
Co-investigator**
Title of scheme
**Name of the
Dept./Section**
Schemes Founder by CSIR

Dr. A. Lohia

Construction of yeast artificial
chromosomes of *Entamoeba*
histolytica (terminated on 31.07.02)

Biochemistry

Prof. Nitai C. Mandal

Characterisation of operators and
promoters of the temperate
mycobacteriophage and construction
of inducible expression
vectors for mycobacteria

Biochemistry

Dr. Pinakpani
Chakrabarti

Analysis of interactions in
helices in proteins and their use in
the design of Helical peptides

Biochemistry

Dr. Pradeep Parrack

Structural and thermodynamics studies
on the interaction of cII protein of
bacteriophage lambda with cII dependent
promoters

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

Prof. Asok Banerjee

Design and development
of protease Inhibitors:
A practical approach to blunt
the protease, the Nature's Swiss
Army Knife

Biophysics

Prof. Siddhartha Roy

Exploration of Structure-Function
Relationship of Aminoacyl-tRNA
Synthetases through protein Engineering
techniques

Biophysics

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Prof. Siddhartha Roy	A study of tRNA recognition and Discrimination by Glutamyl- and Glutamyl-tRNA Synthetases from <i>E. coli</i> .	Biophysics
Dr. D. N. Sengupta	Cloning of cDNA for DNA Polymerase Beta from Rice (<i>Oryza sativa</i> L.) for Structure Function analysis (Expire on 28.2.03)	Botany
Prof. Parul Chakrabarti (Emeritus)	Molecular analysis of some transporters of <i>Mycobacterium tuberculosis</i>	Chemistry
Prof. Parimal C. Sen	Further characterization of protein kinase x (PKx) from goat spermatozoa	Chemistry
Dr. Kali Pada Das	Insight into the structure, folding and molecular chaperone function of α -crystallin	Chemistry
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> (Started on 01.11.2002)	Chemistry
Dr. Parames C. Sil / Dr. Dibyendu N. Sengupta	Molecular analysis of the hepatoprotective protein identified from the leaves of the herb, <i>Cajanus indicus</i> L.: cloning of its cDNA and overexpression in cucumber fruit	Chemistry
Dr. Parames C. Sil	Purification and characterization of a hepatoprotective protein from the herb <i>Phyllanthus niruri</i>	Chemistry
Prof. A.C. Ghose	Molecular characterization of a new variant of toxin coregulated pilus protein (TcpA) of <i>Vibrio cholerae</i> and evaluation of its role in the pathogenesis of cholera (Terminated on 31.10.2002)	Microbiology
Dr. Pradosh Roy	Identification of genetic loci involved in sulfur oxidation in a sulfur lithotrophic bacterium : Genomics of sulfur lithotrophy	Microbiology

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Dr. Sujoy K. Das Gupta (Micro), S. Roy, G. Basu (Biophy), P. Chakrabarty, B. Bhatta- Charyya (Biochem)	"New Millennium Indian Technology Leadership Initiative (NMITLI)" project on latent tuberculosis, New Targets, drug delivery systems and bioenhancers and therapeutics (Multi centric project).	Microbiology
Dr. Sujoy K. Das Gupta	Investigation into the developmental expression of mycobacteriophage L1/L5 genes during the latent phase of growth using proteome analysis tools.	Microbiology
Dr. Subrata Majumder	Role of chemokines in host signal transduction and immunotherapy in experimental visceral leishmaniasis	Microbiology
Dr. T. P. Sinha	Vibronic Coupling Effect on Fe-Ions in Insulators (terminated on 31.01.2003)	Physics
Prof. Arun K. Ray	Identification of estradiol-17 β specific binding protein (receptor) in different organs of <i>Bombyx mori</i> L and study of its physiological significance.	Animal- Physiology
Prof A.N.Lahiri Majumder	Plant Fructose 1,6 bisphosphatase : Regulation and expression during salinity stress in rice (<i>Oryza sativa</i>) (Terminated on 31.03.03)	PMCG
Dr. Amita Pal	Micropropagation of commercially important bamboo species and in vitro induction of precocious flowering	PMCG
Dr. Samir R. Sikdar	Development and characterization of somatic hybrid plants between <i>Brassica juncea</i> and <i>Rorippa indica</i>	PMCG
Schemes funded by DBT		
Dr. Anuradha Lohia	Analysis of genome organization in <i>E. histolytica</i>	Biochemistry
Dr. Anuradha Lohia	Identification of medicinal plant extracts for anti-proliferative property against <i>E. histolytica</i>	Biochemistry

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Dr. D. N. Sengupta	Evaluation of Transgenic Tomato and Banana Plants and search for Fruit Ripening specific genes from Mango (8.3.02-7.3.05)	Botany
Dr. D. N. Sengupta	Post-Harvest Biotechnology For Improved Shelf life of Tomato (Inter-Institutional Collaboration (10.2.03-9.3.06) With Dr. K. C. Bansal at NRCPB, IARI, New Delhi)	Botany
Dr. Debabrata Basu	Functional genomic approaches for Identification of the gene(s) expressed differentially in <i>Atabidopsis</i> and <i>apsis alba</i> as a part of resistance mechanism Against <i>Alternaria brassicicola</i> through cDNA AFLP and DNA subtraction	Botany
Prof. Swati Sen-Mandi	Characterization and improvement of tea through biotechnological tools (a National Network Programme).	Botany
Prof. K.K. Mukherjee	Studies on biology and genetic diversity of <i>Nypa fruticans</i> from Sunderbans, India Understanding of molecular factors behind sex expression in plants	Botany
Prof. Parul Chakrabarti / Dr. Joyoti Basu	The Drr A-B efflux system of <i>Mycobacterium tuberculosis</i>	Chemistry
Prof. Parimal C. Sen	Development of highly unsaturated marine lipids and ester and specific bioactive analogues for the treatment of some prevailing chronic disorder	Chemistry
Dr. Joyoti Basu / Dr. Manikuntala Kundu	Regulation of the functions of the human anion exchanger AE1 by phosphorylation and proteolysis (Started on 01.06.2002)	Chemistry
Prof. Timir B Samanta	Enzyme reaction engineering: Synthesis of penicillins by immobilized β -lactamase free penicillin amidase	Microbiology
Dr. Nripendranath Mandal	Development of Microsatellite DNA Markers for Shrimp to Identify Disease Resistant Populations	Immunotechnology

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Dr. Samir R. Sikdar	Generation of spawn and fruiting body of edible mushrooms and demonstration of the technology to the rural SC/ST Population	PMCG
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. Amita Pal/ Dr. T.K. Ghosh	Development of PCR- based DNA marker (s) linked with MYMV- resistance in <i>Vigna mungo</i> (up to June 2002)	PMCG

Schemes funded by DST

Prof. B. Bhattacharyya	Taxol and colchicines binding to tubulin : A mechanistic Study to understand tubulin-antimitotic drug interaction (terminated on 14.9.02).	Biochemistry
Dr. A. Lohia	Role of DNA replication licensing factors in regulating Cell division in <i>Entamoeba histolytica</i> (terminated on 30.6.02).	Biochemistry
Dr. Subrata Sau	A global study to identify, clone and characterize the Essential genes affecting the growth of <i>M. smeg</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 (Started on 01/11/02).	Biochemistry
Prof. Siddhartha Roy	Spectroscopic studies of transcription initiation and regulation	Biophysics
Dr. D. N. Sengupta	Isolation of SAR from plants and development of Inducible Promoters for Efficient Expression in (15.9.2000-31.4.03) Transformed cells or plants	Botany

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Prof. Parul Chakrabarti / Dr. Joyoti Basu	Drug permeation through the mycobacterial cell wall (Terminated on 30.6.2002)	Chemistry
Prof. Parimal C. Sen Dr. Kali Pada Das	Studies on the role phosphorylation on the molecular chaperone function of α -crystallin and cataract formation	Chemistry
Dr. Manikuntala Kundu / Dr. Joyoti Basu	Mechanisms of beta-lactam resistance in <i>Shigella dysenteriae</i> (Terminated on 30.9.2002)	Chemistry
Dr. Joyoti Basu / Dr. Manikuntala Kundu	Proteins of the cell wall synthesis and cell division machinery of mycobacteria: potential drug target sites	Chemistry
Dr. Sandip Ghosh	Role of major erythrocyte membrane protein defects in hemolytic anemia Fast Track (Started on 12.09.2002)	Chemistry
Prof. A.C. Ghose and Prof. P.C. Sen (Chemistry)	Cellular and molecular mechanisms leishmaniasis of immunosuppression in visceral	Microbiology
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. Amita Pal/ Dr. D. N. SenGupta	Molecular analysis of differentiation in two cotyledons of <i>Vigna radiata</i>	PMCG
Schemes funded by DST-DAAD		
Prof. Parimal C. Sen	Isolation and characterization of human seminoma and sperm Calcium ATPase	Chemistry
Prof. A.N. Lahiri Majumder	Matrix assisted laser desorption ionization—time of flight analysis of mammalian brain Fructose-1,6- bisphosphatase	PMCG
Schemes funded by IFCPAR		
Dr. P. Chakrabarti	Analysis of protein-protein association in crystals and complexes	Biochemistry

Investigator / Co-investigator	Title of scheme	Name of the Dept./Section
Schemes funded by NMITLI, CSIR		
Dr. P. Chakrabarti	Development of a versatile portable software suite for Bioinformatics (Started on 01.8.02)	Biochemistry
Schemes funded by ICMR		
Dr. A. Lohia	Functional genomics of <i>Entamoeba</i> <i>histolytica</i> to identify genes controlling growth and proliferation (Started on March 2003).	Biochemistry
Prof. Parul Chakrabarti / Dr. Joyoti Basu / Dr. Manikuntala Kundu	Antigens and immune response in tuberculous infections (Started on 15.3.2003)	Chemistry
Dr. Manikuntala Kundu / Dr. Joyoti Basu	Host cell signaling in relation to <i>Helicobacter pylori</i> pathogenesis	Chemistry
Dr. Joyoti Basu / Prof. Parul Chakrabarti / Dr. Manikuntala Kundu / Prof. Manas Chakrabarty	Genomics, proteomics and bioinformatics of some target genes of <i>Mycobacterium tuberculosis</i> for drug development	Chemistry
Dr. Pradip Das	Experimental determination of suitability of cholesteryl oleyl carbonate in fluidizing cholesteryl oleate in atherosclerotic plaque	Chemistry
Dr. Sujoy K. Das Gupta and Prof. A.C. Ghosh	Generation of peptide mimics against the immunodominant lipoglycan/lipopolysaccha- ride antigens of <i>Mycobacterium tuberculosis</i> and <i>Vibrio Cholerae</i> using phage display libraries and their evaluation as diagnostic and prophylactic agents	Microbiology
Dr. Nripendranath Mandal	Quantification of the cytokines mRNA based on competitive RT-PCR	Immuno- technology
Schemes funded by DAE		
Prof. Siddhartha Roy	A study of structural effects of Phosphorylation on the N-terminal Domain of P 53	Biophysics

Investigator /
Co-investigator

Title of scheme

Name of the
Dept./SectionDr. Joyoti Basu (PI)/
Dr. Manikuntala KunduModulation of host cell signal
transduction by lipoarabinomannan
from Mycobacterium tuberculosis

Chemistry

Dr. Parames C. Sil

Functional characterization of a
Hepatoprotective protein from the herb
Cajanus indicus L: signal
transduction mechanism

Chemistry

Dr. Sampa Das

Cloning of new lectin gene from
Allium sps. in order to develop
transgenic aphid resistant plants

PMCG

Schemes funded by ICAR

Prof. Pran K. Chakrabartty

Suppression of bacterial wilt of tomato
and related crops caused by Pseudomonas
solanacearum (Smith) Smith in India
making use of introduced microorganisms in
the rhizosphere (terminated on 30.9.2002)

Microbiology

Scheme funded by ISRO (RESPOND programme)

Dr. Swapan K. Saha/
Prof. Sibaji RahaIdentification and characterization
of passive detection materials for
heavy ion detection
(started on 15.03.2003)

Physics

Scheme funded by NIH (USA)

Dr. G. Sa/Dr. D.W.
Stacey (Cleveland
Clinic Foundation, USA)Proliferative signaling and
topoisomerase IIa. regulation.Animal-
Physiology

Scheme funded by NTRF

Dr. T. Das/
Dr. G. SaAn approach to induce selective
apoptosis in tumor cells without
harming the normal cells of the
host by black tea extract.Animal-
PhysiologyInvestigator /
Co-investigator

Title of scheme

Name of the
Dept./Section

Schemes funded by Indo-Swiss Collaboration in Biotechnology

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

Participation in Conferences/Symposia/Workshops

Dr. Pinakpani Chakrabarti (Biochemistry) attended the XIX general Assembly of International Union of Crystallography, Geneva, during August 6-15 and the first CAPRI (Critical Assessment of Prediction of Interactions) Evaluation Meeting, Agelonde, France, during September 19-21, 2002.

Dr. Anuradha Lohia (Biochemistry) delivered invited talks at the International Flow cytometry workshop, CCMB, and at the Indo-German workshop on Infectious diseases, CDFD, Hyderabad during December 2002.

Dr. Pradeep Parrack (Biochemistry) participated in "Quantitative Genetic Networks", a discussion meeting organized at the Banbury Center, Cold Spring Harbor Laboratory, USA, during March 16-19, 2003 and delivered a talk "Stability mediated control of transcription by lambda CII: Structural Insights and Functional Implications". Dr. Parrack and his students, Dipak Dutta and Ajit Bikram Datta participated in the International Seminar on "Frontiers of Basic & Applied Molecular Biology" held at Science City, Kolkata during January 9-11, 2003. They presented two posters, one of which won an award for the best poster.

Prof. Asok Banerjee (Biophysics) spoke at the 90th Indian National Science Congress, Bangalore University, January 2003 on "Understanding differential inhibition and role of water in protease system" and acted as an expert in their young scientist selection.

Prof. Swati Sen-Mandi (Botany) participated in a DBT sponsored training course on IPR in Biotechnology, to be held in the National Law School of Indian University, Bangalore during April 24-29, 2003. She also delivered a talk on "Varietal difference in cellular damage associated with ageing in dry stored seeds" at the 2nd International Congress of Plant Physiology at the Indian Agricultural Research Institute, New Delhi, during January 8-12, 2003.

Prof. Prabir K. Saha (Botany) participated in a National Workshop cum Seminar on Environmental pollution and its Management, Jadavpur University Campus, Poster presentation on December 10-12, 2002. He also participated in the first International Exhibition-cum-Conference on Biotechnology (Biotech India 2003), Pragati Maidan, New Delhi. Conference on Frontier Technologies in Agriculture, February 5-8, 2003.

Dr. Dibyendu Sengupta (Botany) participated in a International Symposium on Plant Physiology at IARI, New Delhi (8-12 January, 2003) and presented three posters, along with the students Dr. Sailendra Nath Sarkar, Mrs. Kakali Banerjee, Ms. Kamala Niyogi, Mr. Sujit Roy and Mr. Aryadeep RoyChoudhury. Kakali Mukherjee, Aryadeep RoyChoudhury and Dr. Dibyendu N. Sengupta (Botany) visited the Department of Crop Physiology, Gandhi Krishi Viswavidyalaya, University of Agricultural Science, Bangalore, to conduct a workshop on Production of Subtractive cDNA library from Groundnut leaves to clone drought-inducible genes, in June, 2002.

Prof. Swati Sen-Mandi (Botany) was the organizing secretary of an International Conference on Plant Biodiversity: Conservation and Evaluation, at Bose Institute during December 17-20.

2002. Prof. Sen-Mandi and her students, Subhra Talai, Sudeshna Bhattacharya, Rajan Kumar Mishra, Rituparna Kundu-Chaudhuri and Rupa Banerjee presented two posters there. Dr. Dibyendu Sengupta (Botany) also participated, presenting a poster with his students Mrs. Rohini Trivedi and Mrs. Kakali Banerjee. Prof. Prabir K. Saha (Botany) was a member of the local organizing committee and poster presentation. Dr. Tapas K. Ghose (Botany) and his students, T. Roy Chaudhury, N Dey, S Biswas, S R Dey, M De presented three different posters at this conference. Dr. Sabita Bhattacharya (Botany) and Rajasri Bhattacharyya participated and presented a poster in the same conference. Dr. Swati Gupta Bhattacharya (Botany) also attended this conference, while Prof. Parimal C. Sen (Chemistry) chaired a session at this meeting. Mr. Malay Das (PMCG) and others presented a poster on "Validation of DNA-based markers for critical evaluation and utilization of bamboo-biodiversity" in this symposium.

Dr. Tapas K Ghose (Botany) and his students T Roychaudhury, N Dey, S Biswas, S R Dey and M De presented a paper titled "DNA Fingerprinting: A Tool for Determining Genetic Diversity in Rice (*Oryza sativa* Linn.)" at the National Conference on Biodiversity-Past and Present, at the Palaeobotanical Society, Lucknow, during November 28-29, 2002.

Dr. Swati Gupta Bhattacharya (Botany) attended and presented a paper in the 7th International Congress on Aerobiology held at Montebellow, Canada from August 5 to 9, 2002.

D. Ghosh (Botany) attended the 10th International Paul-Ehrlich Seminar on 'Regulatory control and standardization of Allergenic Extracts', held in Lubeck, Germany during October 2-5, 2002. D. Ghosh was awarded a fellowship in 2002 for a period of six months by the German Academic Exchange Service (DAAD), to work on a part of his Ph.D. work.

Dr. Sabita Bhattacharya (Botany), attended 4th All Indian People's Technology Congress, Organised by Forum of Scientists, Engineers & Technologists (FOSET), Govt. of India, held on February 22-23, 2003 at Science City, Kolkata.

Rajasri Bhattacharyya (Botany) participated by presenting a poster in NIM 2002 – National Interactive Meet on "Scope and Opportunities in Research and Business of Medicinal and Aromatic Plants" held at Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow during May 17-18, 2002. She attended a practical course on "Molecular approaches for Crop Improvement" organised by International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi during November 11-22, 2002.

Prof. Parul Chakrabarti (Chemistry) led an Indian delegation sent by the Department of Science and Technology, Government of India to a two-day meeting on Tuberculosis convened by the Royal Society in London from December 9 to 10, 2002 as part of the "India Day" celebrations and delivered an invited talk. She chaired a session in a Seminar on Biochemistry and Biophysics organised jointly by the West Bengal Academy of Science and Technology and Viswabharati and held at Viswabharati, Shantiniketan on May 26, 2002. She chaired a session in the 6th International Symposium on "Biochemical Roles of Eukaryotic Cell Surface Macromolecules" held in Kolkata from January 16 to 18, 2003. She and Dr. Manikuntala Kundu (Chemistry) delivered lectures in the Gordon Research Conference on "Multidrug Efflux Pumps" held in Ventura, California from March 9 to 14, 2003.

Prof. Parimal C. Sen (Chemistry) visited University of Marburg, Germany in connection with the DST-DAAD Collaborative Project in September 2002; participated in International Conference on Iron-Sulfur Proteins: Biogenesis, Structure, Function, Pathogenesis and Evolution, Philipps University, Marburg, Germany, September 11-13, 2002. Prof. Sen attended and presented papers along with Dr. Dipankar Bhattacharyya, Ms. Bhaswati Samanta and Ms. Madhumouli Chatterjee at International Symposium on Molecular Endocrinology and Cell Signals held at Kolkata, during November 14-16, 2002. Prof. Sen along with Dr. Dipankar Bhattacharyya, Madhuchanda Kundu and Bhaswati Samanta also attended and presented paper in a conference at Viswabharati University in April 2002 organized by the Society of Biological Chemists (India), Kolkata Branch.

Dr. Joyoti Basu (Chemistry) delivered a lecture in the SAS conference on "Apoptosis in Cancer and Infection" held in Capri, Italy from October 6 to 10, 2002; presented a paper in the Gordon Research Conference on "Bacterial Cell Surfaces" held in New Hampshire from June 23 to 28, 2002; and in the 6th International Symposium on "Biochemical Roles of Eukaryotic Cell Surface Macromolecules" held in Kolkata during January 16-18, 2003. She delivered invited lectures in a Seminar on Biochemistry and Biophysics organised jointly by the West Bengal Academy of Science and Technology and Viswabharati and held at Viswabharati, Shantiniketan on May 26, 2002; in the Guha Research Conference held at the Claridges Corbett Hideaway, Uttaranchal from November 16 to 20, 2002 and in the XXVI All India Cell Biology Conference held in Mumbai from December 12 to 14, 2002.

Dr. Kali Pada Das (Chemistry) delivered an invited lecture in the Guha Research Conference held at the Claridges Corbett Hideaway, Uttaranchal from November 16 to 20, 2002; attended "Workshop on Proteomics" at CCMB Hyderabad, from May 1-3, 2002 organised jointly by Labindia and CCMB.

Prof. Timir B. Samanta (Microbiology) delivered a talk at "Training Workshop on Environment Biotechnology under Envis Programme" at Department of Environmental Science, Kalyani University on March 21, 2003.

Prof. Asoke C. Ghose (Microbiology) chaired a session in the "6th International Symposium on Biochemical Roles of Eukaryotic Cell surface Macromolecules" held at Indian Institute of Chemical Biology, Kolkata, during December 16-18, 2002.

Dr. Subrata Majumdar (Microbiology) spoke at an International Symposium on "Molecular endocrinology and cellular signal transduction" in November 14-16, 2002 at the Indian Institute of Chemical Biology, Kolkata. He delivered a lecture on 'Introduction of microbiology in health and disease' sponsored by UGC at the Lady Brabourne College on February 6 and 7, 2003. Dr. S. Majumdar presented a plenary talk in the Indo-Norwegian Seminar on "Recent Trends in Tuberculosis Research" on January 15-16, 2003 at the Indian Institute of Technology, Kharagpur, whereas **Dr. Sujoy Dasgupta** (Microbiology) presented a poster, **Dr. Manikuntala Kundu** (Chemistry) chaired a session and delivered an invited lecture, **Dr. Joyoti Basu** (Chemistry) delivered lectures and **Prof. Parul Chakrabarti** (Chemistry) delivered the keynote address, chaired a session and delivered an invited lecture in the same meeting.

Prof. S.C. Roy (Physics) presented an invited talk "Use of superheated emulsion in medical physics" in the "23rd Annual Conference on Medical Physics and Radiation Safety" at SMS Medical College and hospital, Jaipur (Rajasthan) during November 15-17, 2002; presented a poster in the "23rd Annual Conference on Medical Physics and Radiation Safety" at SMS Medical College and hospital, Jaipur (Rajasthan) during November 15-17, 2002; presented an invited talk "Superheated drops as radiation detector" in an Workshop on Radiation Detectors held at Nuclear Science Centre, New Delhi on March 14, 2003; attended Trends in Medical Imaging and Image Processing at Saha Institute of Nuclear Physics, Kolkata during November 29, 2002.

Dr. Satya Naryan Changdar (Physics) attended, chaired a session and presented papers at NSERD-2002 at the University of Tirupati, Tirupati during August, 2002; delivered an invited talk and chaired a session at the National Conference on Thermal Physics at University of Rajasthan, Jaipur, during September, 2002.

Prof. Sibaji Raha (Physics) delivered an invited talk entitled "Relics of cosmic quark-hadron phase transition and massive compact halo objects" at Quark Matter'2002 at Nantes, France during July 18-24, 2002; delivered an invited talk entitled "Some aspects of strangeness in astrophysics and cosmology" at the Particle and Nuclear International Conference (PANIC'02) at Osaka, Japan during September 30 - October 4, 2002.

Prof. Indrani Bose (Physics) delivered invited talks at the Symposium Condensed Matter Days-2002 held at the Physics Department, T. M. Bhagalpur University during August 29-31, 2002; the 17th Annual General Meeting of Plant Physiology Forum held at Srerampore College on September 14, 2002; Discussion Meeting on Biological Physics organized by the Institute of Mathematical Sciences, Chennai during December 1-3, 2002; AKR-80, a National Symposium organized on the occasion of the 80th birthday of Prof. Amal Kumar Ray Chaudhuri, by Jadavpur University and the S.N. Bose National Centre for Basic Sciences during February 22-24, 2003; National Seminar on Frontier Research in Advanced Materials organized by B. E. College, Howrah on February 27, 2003; International Conference on Unconventional Applications of Statistical Physics organized by the Saha Institute of Nuclear Physics during March 20-22, 2003.

Prof. Dipankar Home (Physics) delivered an invited talk on "Arrival Time in Quantum Mechanics" at the International Conference on Foundations of Quantum Mechanics, India International Centre, New Delhi, 16-21 December 2002; delivered an invited talk on the "Quantum Measurement Problem: Present Status and Future Outlook" at a Conference "New Directions in Physics" in honour of Profs. R. Penrose and E. C. G. Sudarshan, Centre for Philosophy and Foundations of Science, New Delhi, 10-11 January 2003.

Prof. Biva Roy (Physics) presented a poster in the "23rd Annual Conference on Medical Physics and Radiation Safety" at SMS Medical College and hospital, Jaipur (Rajasthan) during November 15-17, 2002.

Dr. Barun K. Chatterjee (Physics) attended Trends in Medical Imaging and Image Processing at Saha Institute of Nuclear Physics, Kolkata during November 29, 2002.

Dr. Swapan K. Saha (Physics) attended the 21st International Conference on Nuclear Tracks in solid, New Delhi to present a poster, October 2002.

Dr. Tripurari Prasad Sinha (Physics) delivered an invited talk entitled "Barium iron niobate – a new ferroelectric relaxor" in the symposium Condensed Matter Days – 2002 held at University Department of Physics, T. M. Bhagalpur University, Bhagalpur from 29th to 31st August 2002.

Dr. Sanjay K. Ghosh (Physics) delivered an invited talk in DAE-BRNS Workshop on Mesons and Quarks at Bhaba Atomic Research Centre, Mumbai, January 28 – February 1, 2003.

Prof. Arun K. Ray (Animal Physiology) Chaired sessions and delivered talks in Annual Conference of Physiological Society of India, held in November, 2002 at Serampore, and in Indian Science Congress held in Bangalore in January 2003.

Dr. Gaurisankar Sa (Animal Physiology) and **Dr. Tanya Das** (Animal Physiology) chaired Sessions and delivered talks in Medical and Physiology Session of the Indian Science Congress held at Bangalore in January 2003. Dr. Sa and Dr. Das delivered talks in the Cleveland Clinic Foundation, Learner Research Institute, USA in October, 2002 and September 2002 respectively. They were invited to deliver talks in 14th Annual Conference of National Environmental Science Academy at Kolkata in March 2003 and in UGC-sponsored conference at Kanchrapara College in February 2003.

Mr. Malay Das (PMCG) presented a poster on "Influence of physiological age and position of the nodal explants on *in vitro* regeneration of *Dendrocalamus strictus* from field grown culms" in the National Symposium on "Biotechnology 2003", organized by the Society of Plant Tissue Culture Association of India at Jaipur from 17th to 21st February, 2003.

Prof. Arunendra Nath Lahiri Majumder (PMCG) participated and presented paper on invitation in the Gordon Research Conference on "Salt and water stress in plants" at the Oxford University, U.K during July 2002. He worked as a Rockefeller Biotechnology Fellow in the University of Illinois, USA during July-August, 2002. He also participated in the Guha Research Conference during December, 2002.

Prof. Amita Pal (PMCG) delivered lectures during her visit to Czech Republic under INSA International Collaboration/ Scientist Exchange Programme to visit Academy of Science of the Czech Republic at Olomouc, Ceske Budejovice and Prague during 2002-2003. She delivered an invited talk on "A PCR-based approach to develop DNA-marker linked with Yellow Mosaic Virus tolerance in *Vigna mungo*" in the National Symposium on "Biotechnology 2003", organized by the Society of Plant Tissue Culture Association of India at Jaipur from 17th to 21st February, 2003. She also served as a Chairperson in a Scientific Session.

Dr. Sampa Das (PMCG) attended and presented poster in first International Conference on Legume Genomics and Genetics in Minneapolis, University of Minnesota, during June 2-6, 2002. She also visited the laboratories in the Division of Biology, Kansas State University, Manhattan during June 7-9, 2002 and the laboratories of Swiss collaborators at FMI, Basel, Switzerland and FAL at Zurich, Switzerland during June 10 -July 10, 2002. She participated, delivered the

reports and presented posters in 2nd International Annual Pulse Net Work meeting at Madurai, Madurai Kamraj University, during November 22-25, 2002. She attended and presented poster in 6th International Symposium on Biochemical Roles of Eukaryotic Cell Surface Macromolecules held at IICB, Kolkata during January 16-18, 2003.

Dr. Sampa Das and Dr. Samir R. Sikdar (PMCG) delivered invited talks on "Improvement of plants for a better society" and "Protoplast Fusion: A potential Technique for Crop Improvement" respectively in the UGC sponsored seminar on "Biotechnology – its role in plant and human welfare" organized by Kanchrapara College, Kanchrapara, North 24 Parganas, W.B. during 18-19 January, 2003.

Invited talks delivered at various organizations

Dr. Rajagopal Chattopadhyaya (Biochemistry) delivered three talks on the lambda repressor structure at the International Institute of Information Technology, Hyderabad (March 25), Indian Institute of Science, Bangalore (March 27) and Madurai Kamaraj University, Madurai (March 31) respectively. During the same trip, he also spoke on heart disease at the University of Agricultural Sciences, Bangalore, on March 28, 2003.

Dr. Pinakpani Chakrabarti (Biochemistry) spoke on "Analysis of protein structures and interactions and some use of soft computing" at the Machine Intelligence Unit, Indian Statistical Institute, March 31, 2003.

Prof. Swati Sen-Mandi (Botany) imparted training in Seed Molecular Biology training in Seed Molecular Biology to two undergraduate students from Bangalore, "Garden City College of Science and Management Bangalore", for one month in June, 2002. She was Guest Lecturer for teaching Plant Biochemistry and Molecular Biology to M.Sc Students at Department of Plant Physiology, Institute of Agricultural Sciences, Calcutta University.

Prof. Prabir K. Saha (Botany) delivered a talk "Aspects of seed germination with reference to a timber yielding plant *Shorea robusta*" at Bidhan Chandra Krishi Viswavidyalay on September 9, 2002. He also spoke in a refresher course at the Vidyasagar University, on "Water uptake and structure-function relationship during seed germination" on January 25, 2003.

Dr. Dibyendu N. Sengupta (Botany) delivered a lecture at Refresher's Course for College Teachers in the University of Kalyani, Biochemistry Department, University of Calcutta, in the department of Chemistry. Invited by JBNSTS, Calcutta and conducted a Workshop on Molecular Basis of Biodiversity for the School Children (200 in nos) in the University of Agricultural Sciences at Jorhat (Assam) in November, 2002.

Prof. Sibaji Raha (Physics) delivered a talk on Finite size effects in hadronic and nuclear collisions in Shinshu University Matsumoto, Japan, on October 8, 2002; delivered an invited talk on Dark matter without exotica in Saha Institute of Nuclear Physics Kolkata, on February 10, 2003.

Prof. Dipankar Home (Physics) delivered talks on Foundations of Quantum Mechanics at the Department of Mathematics and Centre for Astro-Biology, Macquarie University, Sydney, on October 2 and November 10, 2002.

Honours received

Prof. Pratima Sinha (Biochemistry) and **Dr. Anuradha Lohia** (Biochemistry) have been nominated convenors of the Guha Research Conference, 2003.

Dr. A. Lohia (Biochemistry) Invited to edit special issue of Journal of Biosciences, Indian Academy of Sciences – The Biology of *Entamoeba*. September 2002

Prof. Parul Chakrabarti (Chemistry) served as Convenor of the Sectional Committee on Biochemistry and Biophysics of the West Bengal Academy of Science and Technology.

Dr. Joyoti Basu (Chemistry) was elected to the executive committee of the Indian Society of Cell Biology; was elected Fellow of the National Academy of Sciences, Allahabad; was elected Member of the Guha Research Conference; was awarded the National Bioscience Award for Career Development, 2002-2003, by the Department of Biotechnology.

Prof. Indrani Bose (Physics) has been invited to become a member of the Board of Editors of the Indian Journal of Physics.

Prof. Dipankar Home (Physics) has been awarded Jawaharlal Nehru Fellowship for the period 2003-2005.

Service Departments

Distributed Information 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 modelling as the two major research areas.

Evolutionary perspectives of synonymous codon usage and DNA base composition in different organisms. (Dr. T.C. Ghosh)

Synonymous codon usage bias and DNA base composition are the two simplest parameters from genomic sequences but it has not been well understood and has been under-utilized in genomic analyses. Our main goal is to incorporate such information in bioinformatics tools and achieve thorough and multi-dimensional understanding of genomic data.

By studying the orthologous sequences of *Mycobacterium tuberculosis* and *Mycobacterium leprae* it was observed that strong selective pressure is operational in the evolutionary changes of the genomic GC contents.

The analyses of a non-redundant set of human proteins, show that bases at third codon position are non-uniformly distributed along the coding sequences. The results are not compatible with any of the hypotheses based on a neutral process of formation/maintenance of the high GC₃ levels of the genes localized in the GC-richest isochore of the human genome.

J.C. Bose Unit and Museum

During the year, people from both India and abroad visited the museum. Special display in the museum was organized on November, 30 2002 (Foundation Day of the institute). On a special request from the Assam Science Society, Dibakar Sen (J.C. Bose Unit & Museum) gave live demonstrations of Sir J.C. Bose's Microwave Instrument and Compound Lever Crescograph at the Golden Jubilee celebration of the Society at Guahati Cotton College during February 11-16, 2003. Prof. M. Siddiqi, Director, Bose Institute was the Guest of Honour at the occasion. Highlights of J.C. Bose's work and its current application were displayed before a large gathering of students and distinguished scientists including Prof. Rama Rao, Secretary, DST. Mr. Alok Mukherjee, Workshop Superintendent, BI assisted Mr. Sen in the exhibiton

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 34, 842 [23,646 Bound journals + 10,886 Books + 310 Theses] volumes of Books/Journals/Theses up to 31.03.2003. Total number of periodicals subscribed {foreign + Indian} were 175 during this year. During the year, 3125 readers used the Library for their reference work, 113 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 1,62,000 pages of photocopying (Xerox) services were given to our faculty and outside users. Some 938 bound volumes of book/journals and 2,360 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 400 documents were scanned for faculty members as well as research scholars. 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 in centralised 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-2002" was compiled and sent to all the leading National and International organizations for effective resource sharing.

Madhyamgram Experimental Farm

During the year a special Task Force was constituted by the Director, Bose Institute for development of essential infrastructure and other core facilities with a view to catering to the present-day demands of the researchers in field research activities. On the recommendations of the Task Force, action have already been initiated – (a) for extension of the existing laboratory building; (b) for installation of submersible deep tube well so as to ensure uninterrupted water supply, as and when required; (c) for ensuring hotline for uninterrupted power supply, and (d) for arranging economically important plantation for generation as well as utilization of the vacant/boundary line land. The technology developed was applied and the low cost house for mushroom production was built where round the year cultivation started. The existing laboratories were well-equipped and modernized for the researchers and the newly developed Rural Biotechnology Laboratory started rendering service to the local farmers. Development of the proposed Seed Storage Facility was also taken up.

The following experimental crops and plants were grown during the year – (a) paddy, (b) mustard, (c) palanga (d) bethua (e) pointed gourd, (f) makal, (g) moong, (h) costus, (i) bean, (j) tapratia, (k) sunflower, (l) garlic, (m) bengalgram, (n) tomato, (o) ground nut, (p) arhar, (q) mulberry plant and (u) different medicinal plants. Plantation of (i) high yielding Variety of bamboo, coconut and papaya (ii) good quality pine apple (iii) elite variety of micropropagated teak was taken up for immediate implementation.

During the year 14 faculty members and 52 research scholars/associates of the institute and seven outside scientists utilized the Madhyamgram Field Research Station for their research activities. A Good number of Non Government Organization (NGOs) were also extended facilities and support for organizing practical/hands-on training

Publication

Since its inception in 1980 the Publication Section has been doing all sorts of publications from institute i.e. Annual Report (both English & Hindi versions); Bi-annual Technical Report; Bose Institute News; Memorial Lectures; Director's Report; folders; Posters and Leaflets of different Symposia, Seminars and Training programmes; and works of Sir J.C. Bose. Beside these Publication Section provides photocopying facilities to the staff members of both the Campuses of the institute. Soft copy of the Bi-annual Technical Report & Bose Institute News are now available in the net (www.boseinstitute.org).

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

Regional Sophisticated Instrumentation Centre

Introduction

During the year, the concept of Regional Sophisticated Instrumentation Centres (RSICs) was reviewed by the RSIC/SIF Steering Committee, and it was decided to re-christen them to

Sophisticated Analytical Instrument Facilities (SAIFs). This was done with the idea of lending them a more national character. The mandate of the facilities remains more or less the same, namely, to make sophisticated instruments available to research personnel, to provide consultancy in planning experiments and interpreting the results, to provide in-house training to researchers, and to organise workshops on various aspects of instrumental analysis in research, both fundamental and applied.

Highlights

The Single crystal X-ray Diffractometer was recommissioned during the year. The user base for this instrument is building up once again, but it has become necessary to provide extensive consultancy in the form of full structure analysis to sustain it. The dwindling number of users for most of the instruments is primarily because these have become obsolete, with some of them dating back to the mid-1970s. With the release of recurring grants from the host institution for maintenance of the instruments, it is hoped that some of the instruments which have practically outlived their normal lifespan can be used for some time more. But, at the same time, the Kolkata SAIF urgently needs funds to replace a few of the more sophisticated instruments with their latest models. This is the only way to attract users and show a better "performance ratio" as demanded by the funding authorities.

Instrument Utilisation

Name of Instrument	No. of samples		Revenue earned (Rs)
	External	Internal	
Atomic Absorption Spectrometer	780	0	44,775
Spectrofluorimeter	23	0	840
EPR Spectrometer	0	12	600
Transmission Electron Microscope	40	0	15,820
Mass Spectrometer	0	22	2,640
Gas Liquid Chromatograph	59	21	4,850
HPLC (housed in ESS)	0	0	0
XRD (Single Crystal)	5	2	5,100

Workshop

The Workshop of Bose Institute consisting the following units of maintenance, repair and fabrication of different instruments as needed as well as on successful completion of project work on payment basis are as follows.

Units	Requisition receipts	Job discharged	Continuing job
Mechanical	140	95%	5%
Electrical	952	95%	5%
Carpentry	50	100%	Nil
Refrigeration	155	95%	5%
Drafting	144	100%	Nil
Lecture & seminars attended	470	100%	Nil
EPABX unit	84	100%	Nil

Sl.No	Name of Organisation	Name of Instruments	Project value
1.	Central Research Institute for Jute & Allied Fibres (ICAR), Nilganj, Barrackpore,	Co2 Assimilation Chamber	Rs.2,14,875.00
2.	Gurudas College, Narkeldanga, Kolkata-700054	Simple Inoculation Chamber	Rs.5,000/-
3.	Indian Statistical Institute Barrackpore Trunk Road, Kolkata- 700 035	TLC Applicator with table	Rs. 3500/-

Social Relevance of Research Performed at Bose Institute

Achievements in Plant Biodiversity research and harnessing of Plant Genetic Resources in the Botany Department are expected to generate considerable impact in the fields of agriculture / environment / herbal medicine. DNA fingerprinting pattern of Darjeeling Tea plants has been developed to assist in establishment of proprietary rights of this valuable cash crop of the country. This data have been included in the DBT sponsored, Web enabled database for "Molecular Profiles of Plant Diversity: A Reference Catalogue" for students and research workers in Bioprospecting and Molecular Taxonomy programmes. A DNA marker has been established for screening germplasm for high vigour and enhanced storability of rice seed for farmers' field and storage particularly in hot and humid monsoonal Asia.

Land races of rice in West Bengal have also been characterized and conserved for use by farmers. Synthetic seed production has been established in *Coleus forshkolhi* with an aim to conserving this medicinally important vegetatively propagated plant from the threat of extinction; micropropagation of endangered medicinal plants has also been evolved in other plant species. Plant transformation to delay fruit ripening has been achieved in tomato with an aim to assisting in the transportation and packaging industries. Study undertaken on air borne pollen / fungal spore is expected to help in establishing diagnostic and therapeutic protocols for respiratory allergy. A patent has been filed for a process for preparing antiviral composition effective against "Hepatitis virus".

Production of α -amylase and its characterization are being carried out since it has many applications in industries including production of food grade high fructose syrup, manufacture of dextrin etc. Works on penicillin amidase will be useful both for production of 6-amino penicillanic acid (6-APA) from penicillin G and for the synthesis of newer penicillins from 6-APA with different acyl donor to combat penicillin resistance. Studies on chemokines have been undertaken to develop a therapeutic measure against visceral leishmaniasis. It is essential to control the ceramide level during tuberculosis as it may be a therapeutic target to restrict the pathogenesis. Studies on the immune responses in experimental animals with progressive visceral leishmaniasis are expected to provide useful information relevant for the disease kala-azar in man which causes considerable public health problem in some parts of India.

Works on microbial sulfur oxidation have been undertaken since the process leads to formation of soluble sulfate which is most available form of sulfur to plants and sulfate in the form of sulfuric acid in plant rhizosphere can control root pathogens. To interfere with the replication of *Mycobacterium*, studies are underway on the mycobacterial plasmid. Works on biodegradation of phthalate esters and polycyclic aromatic hydrocarbons are underway to evolve a suitable treatment process, particularly in the industrial effluents and municipal waste treatment plants.

The superheated drop detector (SDD) is a cheap and a viable alternative to costly BF_3 counters for detection of neutrons and measuring its dosage. These SDDs also have commercial implications

since the imported variety is quite expensive. Such detectors can be widely used in clinical radiotherapy where ionizing radiation or neutrons are used to treat the patients.

The ongoing work on identification and characterization of the commercially available, inexpensive overhead transparency films as viable passive detectors of heavy charged nuclear fragments is expected to have important industrial application.

Spawns of various edible mushroom strains like oyster milky and button and are being developed. About 1200 packets of oyster mushroom's spawn have been handed over to one NGO for cultivation through the SC/ST beneficiaries for their income generation. Demonstration of cultivation of this mushroom have been carried out at the Madhyamgram Experimental Farm. 'Rorippobrassica', the somatic hybrids developed between *Brassica juncea* and *Rorippa indica* would be helpful in developing insect tolerant oil, yielding stable mustard lines through the plant breeding programme.

List of personnel

Administration

Prof. Maqsood A. Siddiqi (Director)

Birendra N. Singh (Registrar)

T. K. Ghorui (Dy. Registrar)

Kajal Chaudhuri (Asstt. Registrar I), R. K. 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 K. Sengupta, Sankar Nath Sinha; Accountants: P. K. Barman, T. Mukherjee, S. Kar, S. Sen, A. Chakraborty, P. C. Das; Cashier: T. Chakraborty, Officer Superintendents: Ankur Dutta, M. S. Mitra, Amit Kr. Ghosh, Nikhilesh Roy Ghatak; Others: E. Pal, Swapan Kr. Sinha, Dhruvajyoti Sen, Sujit Kr. Ghosh, B. K. Mondal, M. C. Das, Rita Nath, Sisir Chakraborty, Baladeb Goswami, Rubi Sarkar, Sudam Jana, Rina Das, Somnath Das, Sujata Roy, S. Chatterjee, R. C. Sarkar, Dipak Dutta, C. Rangwa, K. Sur, T. K. Banerjee, K. Turi, S. Turi, K. Basar Molla, N. Yadav, K. Ansari, Kanai Hazra, Prafulla Bhunya, Nema Das (Retired 31-08-2002), Kanak Baran Hazra, Duryodhan Nayak, Bablu Mandal, Sukanta Chakraborty, Subrata Banerjee, Dulal Turi, Amarnath Hela, Ranjit Das, Sukumar Mandal, Bulaki Das, Kamala Turi, Sanat K. Dhara, Thakur Gond, Rajbrat Ram, Kasinath Pal (absent from 09-07-2001 till date), R. R. Pandey, P. K. Mullick, R. Chakraborty, S. K. Chaki, D. Koley, A. Bhowmik, Sanjib Kr. Das, Biplab Malakar.

Supporting Staff, Main Campus: Office Superintendent: Arun Kr. Dasgupta, Others: Dibakar Sen, Rina Roy, Rabindra Nath Karmakar, Sri Nathuranjan Gope (retired on 30-06-2002), Ramani Kanta Jana, Chandra Kanta Sasmal, Tarun Chakraborty, Sarada Devi, Sanat Kr. Dey, M. N. Shee, Santosh Kr. Patra, Jubaraj Paul, Harekrishna Thoyal, Madhusudhan Marick, Fulchanda Sardar, Kalicharan Turi, Kissan Das, Munna Turi, Kodan Das, Sk. Kalu, Md. Eliash, Sm. Manju Turi, Rajkumari Balmiki.

Animal Physiology Section

Faculty* : Professor Arun K. Ray (Head), Dr. Gaurisankar Sa, Dr. Tanya Das

Students** : Dr. Mitali Pramanik, Suman Pal, Tathagata Choudhuri (up to 1st February, 2003), Sreya Chattopadhyay, Sumedha Ray, Angshuman Biswas, Jhuma Dey, Arindam Bhattacharya, Samita Kundu, Laksmishri Lahiri (from 7th May, 2002), Debaprasad Mondal, Suman Patel and Sushila Patel (both from March 10, 2003).

Supporting Staff: Indrajit Ray, Sujit Kr. Ghosh, Uttam Kumar Ghosh (from 31st May, 2002)

Biochemistry Department

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

Students : Tapas Kumar Manna (Till 28/1/03), Sujata Hazra, Rajasree Bhattacharya, Rima Chattopadhyaya, Subhra Majumdar, Taradas Sarkar (till 30.9.02), Ajit Bikram Datta (till 31.3.03), Rudra Prasad Saha, Dipak

*Faculty : a collective term for Lecturers, Senior Lecturers, Readers and Professors.

**Students : includes Research Scientists/Research Associates/Post Doctoral Fellows/Pool officers/Senior Research Fellows/Junior Research Fellows.

Datta, Gopa Mitra, Sudeshna Lahiri, Mithu Banerjee, Promita Ghoshdastidar (nee Roy), Bhaskar Dasgupta, Alakesh Bera, Sulagna Banerjee, Chandrama Mukherjee, Suchismita Das, Lipika Pal (till 07.3.03) Suvroma Gupta, Ranjit Prasad Bahadur, Gursharan Kaur, Pamela Ghosh (till 24.4.02), Dr. Phuljhuri Chakraborty, Partha Chatteraj (from 11.4.02), Soumitra Sau, Shankar Prasad Das (from 20.6.02), Manjusha Sarkar (from 25.6.02), Manaswita Nag (till 30.9.02), Malabika Das (from 18.7.02), Atasi Pal (from 18.7.02), Santanu Kumar Ghosh, Lalita Das (from 10.7.02), Tridib Ganguly (from 01.8.02), Sabyasachi Haldar (from 01.8.02), Sumit Biswas (from 01.8.02), Chandrama Mukherjee, Anirban Gupta (from 02.1.03).

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

Biophysics Department

Faculty : Prof. Siddhartha Roy (Chairman), Prof. Asok Banerjee, Dr. Gautam Basu

Students : Dr. Tanaya Chatterjee, Rajat Banerjee, Atanu Maity, Amlanjyoti Dhar, Rajesh Saha, Smarajit Polley, Subhashish Chatterjee, Ruchira Chattopadhyaya, Soma Samaddar, Suranjana Chattopadhyaya, Soumi Guha, Sanchari Bhattacharyya, Srijata Mukherjee, Sanchaita Das, Sibani Chakrabarti, Suparna Bhattacharyya.

Supporting Staff : Amitava Bhattacharyya, Basudeb Marick, Barun Mazumdar, Swapan Joghsharma, Bijoy Munshi.

Botany Department

Faculty : Prof. Bharati Ghosh, Prof. Sukumar Gupta, Prof. Kalyan K. Mukherjee, Prof. Swati Sen-Mandi (Chairperson), Prof. Prabir K. Saha, Dr. Dibyendu N. Sengupta, Dr. Swati Gupta-Bhattacharya, Dr. Sabita Bhattacharya, Dr. Tapas K. Ghose, Dr. Debabrata Basu.

Students : Mausumi Sengupta, Aryadeep Roy Choudhury, Sujit Roy, Swarup Roy Choudhury, Kamala Niyogi, Sailendra Nath Sarkar, Subhrajit Banerjee, Bhaskar Gupta, Sudip Sinha, Rohini Trivedi, Saswati Laha, Progyparamita Saha, Malay Adak, Rajasri Bhattacharyya, Bratati Mukherjee, Sudip Kumar Das, Sri Debajyoti Ghosh, Srimati Shaonli Das, Sanjukta Dey, Dr. Gaurab Gangopadhyay, Dr. Tanoy Bandyopadhyay, Sri Siraj Datta, Rupa Banerjee, Rituparna Kunduchoudhuri, Sudeshna Bhattacharya.

Supporting Staff : Sankar Bose, Sukumar Majumdar, Dr. Romit Poddar, Chanchal Chakraborty, Jadab Kumar Ghosh, Binoy Krishna Modak, Chaitali Roy, Kaberi Ghosh, Shyamal Kumar Ghosh, Dilip Kumar Chakraborty, Sukdeb Das, Sasanka Shekhar Bera, Shambhunath Debnath, Bipul Kr. Nag, Kanan Singh, Jagannath Das, Sarama Pradhan, Manimohan Ghosh.

Central Instrumentation Facility

Faculty : Prof. B. Bhattacharyya (Chairman)

Supporting Staff : Jaganmay Guin, Ranjan K. Dutta, Smriti Ranjan Maji, Mrinal Das, Alpana Bhattacharya.

Chemistry Department

Faculty : Prof. Manas Chakrabarty (Chairman, from 01.03.2003), Prof. Parul Chakrabarti (Emeritus Scientist), Prof. Prantosh Bhattacharyya (till 28.02.2003), Prof. Parimal C. Sen (Chairman till 28.02.2003), Dr. Kali Pada Das, Dr. Joyoti Basu, Dr. Manikuntala Kundu, Dr. Parames C. Sil, Dr. Pradip Das.

Student : Sandipan Sarkar, Madhumouli Chatterjee, Ramkrishna Basak, Nandita Ghosh, Sudipa Saha, Ashima Bhattacharyya, Bhaswati Samanta, Somesh Baranwal, Debabrata Mandal, Shresh Pathak, Kasturi Sarkar, Arunava Dasgupta, Ashis Biswas, Pratik Datta, Rajesh Bhattacharyya, Dr. Dipankar Bhattacharyya, Dr. Sujata Law, Madhuchhanda Kundu, Rajib Barik, Taraknath Kundu, Randhir Sinha, Sharmila Basu, Tanusree Sengupta, Srabasti Ghoshal, Chaitali Basak, Anil Kumar Singh, Mary Chatterjee, Saurabh Acharyya, Dr. Sandip Ghosh, Kamakshi Sureka, Monali Banerjee, Rajen Halder, Satarupa Banerjee.

Supporting staff : Nirmal Kumar Das (till 31.08.2002), Prasanta Kumar Pal, Anirudha Aich, Sukumar Maitra, Gopinath Mukherjee (till 31.01.2003), 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, Sachidanand Ram, Kalyan Das.

Distributed Information Centre

Faculty : Dr.A. Lohia (Scientist-in-Charge), Dr. T.C. Ghosh

Students : Dr. D. Roy , Dr. L. Pal, Dr. B. Medya, A. Bagchi, P. Mukherjee

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

Environmental Sciences Section

Faculty : Prof. Maqsood A. Siddiqi, Dr. Nripendranath Mandal

Supporting Staff : Anandamay Adak, Asis Kumar Dalal, Sudam Chandra Jana, Siddhartha Ray

Immunotechnology Section

Faculty : Prof. Maqsood A. Siddiqi, Dr. Nripendranath Mandal

Students: Supratik Dutta, Kuntal Mukherjee, Sudakshina Paul, Sudeep Kumar

Supporting Staff : Ranjit Das, Amartya Sen

Library

Dr. Arun Kumar Chakraborty (Librarian), 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) w.e.f. 08.1.2003, Dr. T.K. Ghosh (Scientist In charge), Dr. S.R. Sikdar (Co-Scientist In charge up to 07.01.2003).

Supporting Staff : Pulak Kumar Roy, Kachiram Koley, Subhash Senapati, Rakhal Ch. Jana, Dilip Pramanik, Chittaranjan Mallik, Sukumar Das, Sabita Baisya, Jagabandhu Nayak, Robin Talukdar, Laxmikanta Pradhan, Inal Ali, Bhanu Kisku, Mahesh Dasgupta, Rajkishore Lenka, Tapas Chakraborty.

Microbiology Department

Faculty : Prof. Pran K. Chakrabarty (Chairman), Prof. Asoke C. Ghose, Prof. Timir B. Samanta, Dr. Pradosh Roy, Dr. Subrata Majumdar, Dr. Sujoy K. Dasgupta, Dr. Tapan K. Dutta

Students : Dr. Anup K. Halder (upto 30.09.02), Dr. Madhumita Sirkar, Dr. Sovan Roy, Ananda Mukherjee, Sandip Bhattacharya, Sanjukta Ghosh, Bisweswar Nandi (upto 31.10.02), Shuvendu Das (upto 22.12.02), Chandrajit Lahiri, Abhijit Basu, Mahashweta Mitra, Mithu De, Amit Sarkar, Anasuya Ray (upto 30.09.02), Piyali Mukherjee, Avik Saha, Archana Sharma, Sujoy Chatterjee, Jiaur Rahaman Gayen, Sutapa Biswas Majee, Ranjana Roy (upto 08.03.03), Sujoy Chatterjee (from 4.3.02), Wriddhiman Ghosh (from 12.3.02), Ranadhir Dey (from 02.05.02), Subhankar Chatterjee (from 18.07.02), Nivedita Majumdar (from 31.01.03), Moumita Roy (from 10.02.03).

Supporting Staff : Salil K. Das (II), Biswanath De Sarkar, Barindranath Mandal, Provat K. Chattopadhyay, Prabal Gupta, Saifulla Gazi, Debashis Sarkar, Babli Marrick, Prabir Halder, Debashis Majumdar, Nityananda Patra, Jamuna Prasad, Dilip Bhattacharyya, Ramesh Prasad, Birendra k. Ram, Saral Das, Rabin Paul, Sankar Bari, Purnendu Manna, Narayan Patali.

Physics Department

Faculty : Prof. Indrani Bose (Chairperson up to 31.12.2002), Prof. Dipankar Home (Chairman from 01.01.2003), Prof. Suprakash C. Roy, Prof. Meher H. Engineer (up to 31.12.2002), Prof. Sibaji Raha, Prof. (Mrs.) Biva Roy, Dr. Satya Narayan Changdar, Dr. Barun K. Chatterjee, Dr. Swapan K. Saha, Dr. Tripurari Prasad Sinha, Dr. Sanjay K. Ghosh

Students : Dr. Basudhara Basu Nandi (up to 01.01.2003), Sonali Saha (up to 17.09.2002), Emily Chattopadhyay (up to 12.12.2002), Debabrata Parihari (up to 03.07.2002), Samir Kunkri (up to 15.08.2002), Rajesh Karmakar, Tamal K. Mukherjee

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 and Cellular Genetics Section

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

Students : Dr. Biswajit Das, Dr. Sanghamitra Bhattacharyya, Dr. Jyotirmay Bhattacharyya, Manoj Majee, Anirban Chatterjee, Aparajita Das, Krishnarup Ghosh Dostider, Sushmita Maitra, Lily Goswami, . Sudipta Ray, Barunava Patra, Jolly Basak, Malay Das, Shamik Bhattacharya, Sabiha Khan, Indrajit Chaudhury, Santanu Banerjee, Indrajit Datta, Pralay Majumder, Anindya Sarkar, Dipankar Chakrabarty, Prasenjit Saha, Palash Mandal, Ritu Kapoor, Sharmistha Mazumder, Uttara Bhattacharya and Sruti Datta

Supporting Staff : Puspita Mukherjee, Ashim Kr. Nath, Subal Basak, Motilal Singh, Sk. Eklas Ali, Arup Kr. Dey, Nadiram Kayal

Publication

Arun Kumar Das Gupta (Superintendent)

Supporting Staff : Chandra Kanta Sasmol

Regional Sophisticated Instrumentation Centre

Faculty : Dr Dilip K Mukherjee (Scientist-in-Charge), 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 Tanim Modak Dhar, Ms Manisha Banerjee, Mr Ranjit K Ghosh, Mr Debabrata Polley, Mr Sankar Santra, Ms Saraswati Sarkar (Sen).

Workshop

Alok Mukherjee (Superintendent)

Supporting Staff : Ashutosh Sarkar, Samar Dutta, Sisir Kr. Ghosal, Sithil Mukherjee, Tarapada Das, Dipen sen, Bankim Dutta, Sk.Md. Eha Hossain, Basanta Kr. Shit, Bholanath Soren, Sourendra Nath Chakraborty, Abdul Rahaman Molla, Panchanan Santra, W.D. Rozario, Panchugopal Karak, Rajkumar Das, Pranab Banerjee, Subrata Basak, Lochan Shee, Gopal Ch.Das, Sairoon Begum, Sk. Md. Farruck, Kishori Mohan Saha, Kalachand Sen, Bramdeo Prasad, Alok Kundu, Mr. Dipak Dutta, Anil Sengupta, Tapan Kr. Mondal, Jogendra Nath Das, Ashit Banerjee, Sk. Md. Raffick, Murari Mohan Shee, Baidya Nath Murmu & Sanjoy Santra.

National Science Day, 2003



Prof. M. Siddiqi welcoming Prof. B. N. Chakraborty

The National Science Day was celebrated in Bose Insititute, Calcutta on 28th February, 2003. This years theme was -"50 years on DNA - 25 years of IVF". In this connection two lectures by eminent scientists were arranged. Professor B. N. Chakraborty of Institute of Reproductive Medicine, Calcutta delivered a lecture on "25 years of invitro fertilization" and Professor A. N. Lahiri Majumder of Department of PMCG, Bose Insititute Calcutta talked about "Gene to Genomics : A historical perspective".

Plant Biodiversity : Conservation and Evaluation



Participants of the Symposium

An International Symposium on "Plant Biodiversity : Conservation and Evaluation" was organized by Bose Institute during 17th-20th December, 2002. Prof. Swati Sen-Mandi was the Organizing Secretary of this Symposium. This symposium attended by about 200 participants, aimed at establishing a forum for discussion between senior and junior scientists, research scholars, policymakers, environmentalists, agriculturists, biotechnologists, information technologists as well as remote sensing organizations and NGOs which work for raising awareness among common people. Sponsorship for this conference was obtained from Government Departments and the various Councils of Government of India and the State of West Bengal as well as from some Non-Government Agencies and Business Houses. As a gesture in encouraging International cooperation in the very important cause of Plant Biodiversity the Indo-US Science and Technology Forum also provided logistic and financial support. Prof. A. K. Sharma, Botany Department, Calcutta University inaugurated the symposium and Dr. V. Arunachalam, M. S. Swaminathan Research Foundation, Chennai, delivered the Key Note address.

Statement of Accounts for the year 2002-2003

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 2003 and also the Income and Expenditure Account for the year ended on that date in which are incorporated the accounts of the Council and the Governing Body audited by a separate auditors. 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.

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 misstatements. 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.

We draw the attention of the management to our observations/comments on the accounts of Bose Institute as annexed herewith for necessary action.

Further we report that :

- i) 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.
- ii) 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.
- iii) The Balance Sheet and Income & Expenditure Account dealt with by this report are in agreement with the Books of Accounts.
- iv) In our opinion, the Balance Sheet and Income & Expenditure Account dealt with by this Report Comply with the accounting standards issued by the Institute of Chartered Accountants of India.

In our opinion and to the best of our information and according to the explanations given to us, the said Balance sheet and Income & Expenditure Account read with the Notes in Schedule IX and subject to Note Nos. 8 and 10 of Schedule IX and subject to our observations / comments as annexed herewith, the accounts 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 its state of affairs of this Institute as at 31st March, 2003, and
- (b) in the case of the Income & Expenditure Account of the surplus (Plan Account), after adjustment of deficit of Non Plan Account for the year ended on that date.

Encl : Observations/Comments

For RAY & RAY
Chartered Accountants

Sd/
(N. Saha)
Partner

Bose Institute Kolkata

SCHEDULE NO. IX

NOTES FORMING PART OF ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 2003

A. NOTES ON ACCOUNTS :

1. Land at Madhyamgram :

Government of West Bengal acquired plots of land measuring 40.99 acres for Experimental Farm out of which a total area of 18.73 acres was handed over to the Institute through Certificate of possession on different dates. The balance land could not be handed over as the same was disputed. The Governing Body in its meeting held on 31.07.1989 decided not to claim the balance land from the Government of West Bengal, considering other related factors.

2. Fixed Assets :

- (a) Register of Fixed Assets relating to Council Account has been updated upto 98-99 by a firm of Chartered Accountants and for the year 99-2000, 2000-2001, 2001-2002 and 2002-2003 it has not yet been done.
- (b) As Governing Body's Account is concerned, similar register is yet to be introduced.
- (c) As per previous practice no depreciation is being charged on fixed assets in case of Council as well as in case of Governing Body Account.

3. Grant-in-Aid Schemes :

- (a) Stipend payable to Research Scholars under Sponsored Project account are treated on cash basis. For other expenses hybrid system is followed.
- (b) Net excess of receipts over expenditure of grants-in-aid schemes, sponsored by various bodies are included in the bank balance with Savings Bank Account of Union Bank of India, Manicktala Branch, Kolkata (Schedule IV of the Balance Sheet may be referred).

Regarding ISCB/DBT and ISCB/SDC projects, two separate bank accounts have been opened with the same bank in the last year.

Regarding DBT and ICMR Project of Dr. Anuradha Lohia two separate Bank Accounts have been opened with the same bank during the year.

4. The Institute has a hybrid system of accounting. In respect of items like Salary, Gratuity, Leave Salary, Interest on Bank Deposits, Prepaid Service Contract Values, Rates and Taxes etc., cash basis is followed. Liabilities for amount payable to suppliers of materials and services are partly considered on accrual basis. In this connection item B6 (ii) under Accounting Policies may also be referred.

5. Funds required during the year for Capital Expenditure have been generated by transferring requisite amount from Plan Grants. This has been done as the Central Government has provided Grants during the year in lumpsum without earmarking any part thereof as Plan/Non-Recurring Grant.

6. In respect of House Building Loans given to employees, interest becomes receivable after recovery of the principal amount in full. Interest is therefore, accounted as and when become receivable. This is being done as per Central Government guidelines.

7. Contingent Liabilities :

Letter of Credit : Rs. 88,44,623.00 (Including Rs. 81,89,003.00 for Sponsored Projects for the 2002-2003). (Previous year Rs. 4,13,000.00)

8. (a) In the Finance Committee dated 24.09.1996, the Jt. Secretary & F.A., Department of Science & Technology, Government of India suggested to consider forming Trust Committee to manage the Provident Funds. These suggestions is under consideration.

(b) Although by virtue of the provision 9 of the "Bose Institute Employees Pension Scheme Regulations" approved by the Government of India, Department of Science & Technology and Rule 3.3 of the "Bose Institute Contributory Provident Fund Rules" the Pension Fund, General Provident Fund and Contributory Provident Fund vest with the Bose Institute, separate Income and Expenditure Account and Balance Sheet have been prepared in respect of the said three Funds and appended hereto.

9. To accommodate revised salary since 1998-1999, institute had to borrow Rs. 226.41 lakhs in that year from Development and Modernization Fund owing to lack of budgetary support from Department of Science & Technology. Out of Which during the current financial year 2002-2003, a sum of Rs. 177 lakhs has been replenished by investing in fixed deposit with the Union Bank of India, Manicktala Branch, Kolkata and during the year 2003-2004 a sum of Rs. 50.00 lakhs dated 13th May, 2003 has been replenished by investing In Fixed Deposit with the same bank. Thus the borrowed amount has been replenished in full to the aforesaid fund.

10. Accumulated deficit of Rs. 323.51 lakhs upto 2000-2001 entirely arose for pay revisional effect for the year from 1998-99 to 2000-2001 under Non Plan as a result of non-receipt of required additional budgetary support in this respect. Now finding no other alternative the same has been transferred to Miscellaneous Expenditure Account with a view to adjust the same out of savings of Plan grant in the previous year as well as in the year 2002-2003 leaving and unadjusted balance of Rs. 6.50 lakhs as on 31.03.2003.

11. Previous year's figure have been regrouped/recast wherever necessary.

B. ACCOUNTING POLICIES :

1. Accounts are prepared on historical cost convention.
2. Fixed Assets.
Fixed assets are stated at cost. Cost includes purchase price and attributable expenses. No depreciation is charged on fixed assets.
3. Investments are stated at cost.
4. Consumable stores are charged to expenditure on purchases.
5. Retirement benefit :
 - i) Institute has General Provident Fund and Contributory Provident Fund Schemes. The Institute also has a Pension Scheme.
 - ii) Leave encashment, Gratuity, Provident Fund and Pension are accounted for on cash basis.
6. Recognition of Income & Expenditure :
 - (i) All income other than Government Grant are considered on cash basis. Government Grant receivable, is accounted for only if order sanctioning the Grant is received before the end of the financial year. Accounted for on cash basis.
 - (ii) For accounting of expenses, the Institute has a Hybrid System of Accounting. Liabilities for amounts payable to suppliers of materials and services are partly considered on accrual basis. Other expenses are accounted for on cash basis. In this connection Notes No. A3(a) and A4 may also be referred.
7. Foreign Currency Transactions :
Transaction in foreign currency are recorded at the exchange rate applicable on the date of transaction.
8. Research and Development Costs :
 - i) Research and development costs are charged as expense in the Income & Expenditure Account for the year in which it is incurred.
 - ii) Capital expenditure is included in Fixed Assets under appropriate heads.

FOR RAY & RAY
CHARTERED ACCOUNTANTS

Sd/-
Acting Registrar
Bose Institute

6, Church Lane
Kolkata-700 001
Dated : 29 October, 2003

Sd/-
(N. Saha)
Partner

Observation / Comments on the Accounts of the Bose Institute (Refer Auditors' Report dated 29th October, 2003)

1. The requirement of section 16 and 17 of the West Bengal Societies Registration Act, 1961 in regard to holding of Annual General Meeting and filling of Annual Return were not complied with. Similar violation occurred in earlier years also.
2. **Governing Body Account**
 - (a) Details of movements during the year in respect of various Funds and Property and Investments and brief break-up of other assets and liabilities in respect of Governing Body account have not been mentioned in the attached Balance Sheet and Schedules annexed thereto. Those details are available in the Balance Sheet and related Schedules of Governing Body account audited by M/s. A. K. Sau & Co, Chartered Accountants. Copies of such audited accounts of Governing Body are enclosed with the Institute's amalgamated Balance Sheet, Income and Expenditure Account and related Schedules. Regarding Income & Expenditure Account of Governing Body only net deficit has been considered. It is suggested to club each head of account of Income & Expenditure Account of Governing Body with the Council Income & expenditure Account.
 - b) Auditor M/s. A. K. Sau & Co., Chartered accountants of the Governing Body observed the followings :
 - i) Interest accrued but not received during the year on Fixed Deposits aggregating to Rs. 6,08,750/- has not been considered as income in the accounts, although the accounts are maintained on accrual basis and as a result excess of expenditure over income has been arrived at for the year.
 - ii) Term Deposit Receipts of State Bank of India and share certificates of C.E.S.C. Ltd. representing investment of Capital Fund and special fund were not made available to the auditor. However, the statements of TDRs Issued by the State Bank of India was made available from which term deposits representing particulars special fund or capital fund can not be identified by the auditor of the Governing Body. It was stated by the Governing Body that the balances with Special Fund have been fully covered by the investments and the balance of investments is considered as the investment from Capital Fund. Therefore, in the opinion of the auditor of the Governing Body that it was a deviation from the accounting policy followed in the earlier years.
 - iii) Cultivation expenses shown in the Income and Expenditure Account include prior periods adjustment of Rs. 1,12,020.13 for which adequate supportings as evidence of expenditure were not made available to the auditor of Governing Body for verification. Due to inclusion of the above amount, expenditure has been overstated by Rs. 1,12,020.13.

3. Madhyamgram Land (Note 1 Schedule IX)

The acquired land at Madhyamgram and Structures thereon show following cost as per records :

a) Land [shown in attached Balance Sheet under Sir J. C. Bose Centenary Laboratory Fund (G.B.) Rs. 15,99,768.40]	4,07,690.98
b) Building (shown under Schedule V of attached Balance Sheet)	7,30,444.27
c) Boundary Wall (Do)	2,85,737.27
d) Metal Road (Do)	2,66,741.00

16,90,613.52

4. Schedule - IV : Grant-in-Aid Schemes

- The Grant-in-Aid Schemes also include Rs. 48,81,424.88 recoverable from 81 different sponsored Projects/Fellowships in respect of terminated Schemes/Fellowships. Most of these terminated Schemes/Fellowships were completed between 1990 to 2003 and a few between 1986 to 1989. In most of the cases after lapse of long fifteen years or more, recovery from different Government Agencies is absolutely impossible, Therefore, an alternative measure needs to be taken to write off the same with the permission of Finance Committee Taking into consideration the interest income etc. of the Sponsored Projects as far as practicable.
- Grant-in-Aid Schemes also include Rs. 26,17,423.25 recoverable from 41 Schemes - Fellowship i.e. which are in progress other than terminated schemes. Money Receipt Books for the year 2003-2004 confirms the recovery aspect of the same is positive.
- Grant-in-Aid received during 2002-2003 as per Schedule IV is Rs. 4,48,94,306.00 which has been verified from individual sanction of different sponsoring authority.
- Expenditure as per Schedule IV which is Rs. 4,01,65,996.87 is found in conformity with the books of accounts.
- The Institute has introduced some control measures of Grant-in-Aid projects. Audit & finance Officer has been entrusted with the responsibility of internal audit system to restrict the expenditure within the sanctioned grant. It was observed that in many cases amount spent by the principal investigators are more than the grant sanctioned/received by them from the sponsoring authorities and as a result many schemes terminate with a significant debit balances, for which the concerned investigator-in-charge should be made accountable for its recovery to avoid future financial consequences.
- Fixed Assest worth Rs. 69,72,452.75 was transferred to Bose Institute from terminated Schemes long time back, since then no further transfer was made although the number of terminated schemes are steadily increasing year after year.

5. Schedule-III : Deposits and other Liabilities

Earnest Money in respect of Global Tender Rs. 1,57,295.02 received in foreign currency lying unadjusted from earlier year and effect of variation in foreign exchange would be accounted for in the year of such payment. Security/Earnest Money (Global Tender) also include Rs. 40,467.50 refundable to the indigenous parties are being carried forward from pervious year.

6. Schedule-V Fixed Assets

- In the Council Account, an unsigned record of date-wise purchases of assets for some years is maintained. It does not conform to the concept of Asset Register showing details of purchase and value added/disposed in respect of each asset in different period, identification, location, any physical verification thereof, state of usability/obsolescence, out of operation/damaged assets and reconciliation with financial accounts etc. This is particularly important in respect of the following assets.

a) Apparatus & Equipments	Rs. 6,35,52,130.09
b) Workshop & Apparatus	Rs. 7,74,414.74
c) Furniture & Fittings	Rs. 37,97,032.64
d) Books & Journals	Rs. 5,29,21,568.91
e) Air Conditioning	Rs. 44,20,984.51
f) Electrical Installation	Rs. 12,75,925.38
g) Motor Car	Rs. 21,85,145.09
h) Internet/Website facilities	Rs. 6,04,555.00
i) EPABX System (1992-93)	Rs. 7,72,186.00
j) Fixed Assest under Institute Development & Modernisation Fund Investment	Rs. 6,14,41,498.15

In the absence of updated register of Fixed assets and other physical verification thereof by the management, the Fixed Assets as shown in the Balance Sheet were not verified by us. No inventory for Library books was made available for our verification. It was observed that library books include many old journals, which are of no value at present. It is suggested to scrutinize these back dated journals and proper action should be taken to write off the same after obtaining approval from the competent authority.

- In the Governing Body Account, Auditor M/s A. K. Sau & Co., Chartered Accountants observed that in absence of such register, fixed assets could not be verified.

- iii. It appears that no Insurance policies were taken for building, furniture, apparatus and equipments etc., which should be taken care of in the interest of the Institute.
- iv. Since depreciation is not charged, identification of obsolete/damaged assets and assets out of operation and adjustment of value thereof is essential in order to indicate a fair view of the value of the assets shown in the Balance Sheet. As no depreciation is charged, it also resulted overstatement of fixed assets value in the accounts and understatement of expenditure over income.
- v. Title deeds for property under the custody of the Council at C.I.T Scheme, Kolkata-700 054 (Centenary Building) and at Salt Lake, Kolkata-700 091 (Hostel) were not made available to us for our verification. However, it was stated to us that Institute possess the title of land and building.

7. Depreciation

Depreciation on Fixed Assets, the amount of which has not been ascertained, has not been charged in the accounts. It was stated to us that arrear depreciation on fixed assets as per past practice of the Institute has also not been ascertained and provided for in the accounts.

8. Schedule VII

Investment (Governing Body Account)

a) Richard Mary Keating Scholarship Funds Investment :

Auditor M/S. A. K. Sau & Co. Chartered Accountants observed that investment in the 843 Nos. of 7½% preferential shares CESC Ltd. having face value of Rs. 8,430/- has been taken into account as per earlier years at Rs. 6,041.67. adequate explanation or evidence was not furnished to the auditors as to the difference in face value and book value of the said investment.

- b) In respect of the following five special Funds while the income from investments was being added to augment the Funds, matching investment has not been made out of the same income resulting in shortfall of total investment of Rs. 14,69,197.23 as on March 31, 2003 as per details below : -

Balance as on 31.03.2003			
	Funds Rs.	Investment Rs.	Shortfall Rs.
a) Sir J.C. Bose Medal Fund	3,17,191.83	1,72,750.00	1,44,441.83
b) Sir J.C. Bose Endowment Lecture Fund	19,04,662.22	10,00,000.00	9,04,662.22
c) Sir Nilratan Sarkar Prize Fund	61,032.61	39,000.00	22,032.61

	Funds Rs.	Investment Rs.	Shortfall Rs.
d) Samir Sinha Memorial Fund	35,949.66	19,500.00	16,449.66
e) Sir J.C. Bose's Contribution through Trust Fund	3,58,868.24	68,000.00	2,90,868.24
f) Publication Fund	26,947.76	—	26,947.76
g) J. C. Bose Scholarship Fund	68,716.79	50,000.00	18,716.79
h) Urmila Devi Benevolent Fund	16,239.75	11,793.75	4,446.00
i) Birla Jute Scholarship Fund	25,115.31	20,000.00	5,115.31
j) R. M. Keating Scholarship Fund	1,40,058.48	1,04,541.67	35,516.81
	<u>29,54,782.65</u>	<u>14,85,585.42</u>	<u>14,69,197.23</u>

9. Schedule-VIII : Security Deposits

Security Deposits Rs. 15,93,210.21 : Details are given below :

Opening Balance	1,90,414.00
Add : Paid during the year	14,02,796.21
Closing Balance :	<u>15,93,210.21</u>

Confirmation in respect of deposits for Rs. 1,90,414.00 lying with various parties were not made available for our verification.

10. Accrued liability in respect of gratuity and leave encashment on retirement have neither been actuarially valued as at the end of the year nor provided for in the accounts subject to an annual provision of Rs. 20.00 lakhs for contribution towards gratuity.
11. There has been variation in the expenditure incurred during 2002-2003 between Plan and Non Plan items compared to those of the budget submitted to the Department of Science & Technology, Government of India.
12. **Contribution towards Gratuity / Pension Fund**
Total contribution towards Gratuity and Pension Fund due to revised Government Rules has been Rs. 20.00 lacs and Rs. 1,92,99,989.66 respectively.
13. (a) Bose Institute Modernization and Development Fund
(b) Bose Institute Modernisation and Development Fund Investment

Rs.	10,36,51,325.78
Rs.	9,86,32,238.15
<u>Rs.</u>	<u>50,19,087.63</u>

The above Fund is sanctioned for the up-gradation and modernization of the Bose Institute and the Fund is to be utilized for certain specific purposes. The above shortfall of Investment

of Rs. 50,19,087.63 has been replenished by investing Rs. 50 lakh on 13th May 2003 (F.D. with Union Bank of India)

14. Medical Advance :

Old Medical Advance are lying unadjusted since long time as stated below :

Prof. M. H. Engineer Rs. 1,75,150.00 outstanding since 22.03.96. It was stated that after repeated request Prof. M. H. Engineer submitted on 07.04.2000 some vouchers towards adjustment of the advance drawn by him in the year 1995-96 which were difficult to be verified after such a long period. Due to non-refund/adjustment of such advances for more than 5 years, Institute has lost more or less the same amount of interest. which may be recovered immediately.

15. The following amounts are lying outstanding for more than 1 year under different heads of account as detailed below. Appropriate steps should be taken to realise/adjust the same at the earliest.

Head of Account	Total Amount as on 31.03.2003 (Rs.)	Outstanding for more than three year as on 31.03.2003 (Rs.)
a) Platinum Jubilee Celebration Committee	28,411.43	28,411.43
b) Leave Travel Concession Advance Prof. M. H. Engineer	6,400.00	6,400.00
d) Advance (includes Rs. 43,834.00) paid to Prof. M. H. Engineer from 1989 to 2001-02)	2,66,585.00	No ascertained.

16. AECD Fund with P. F. Commissioner Rs. 6,213.96 (As per last Account). No supporting paper was made available for our verification.

17. Only one Finance Committee Meeting as well as one Council Meeting was held during the year as against minimum of two as required by Bye-laws.

18. (a) The Institute does not strictly follow allocation of expenditure of Revenue Account between Plan and Non Plan. As result a lot of Non Plan expenditure on Revenue Account has been transferred to Plan Account to reduce the deficit on Non Plan expenditure.

- (b) For the year a sum of Rs. 80,54,877.94 has been transferred from the surplus of Plan Account to Non Plan Account to make good the deficit in the Non Plan Expenditure.

19. In pension fund, it appears that the shortfall of investment has been replenished in 2002-2003 by making fixed deposit with State Bank of India on 17.04.2002 for Rs. 26.00 lakhs.
20. Work-in-progress for Rs. 54,97,216.00 are being carried forward for long time without capitalization. Appropriate steps should be taken to capitalize it after obtaining completion Certificate from the executing authority with out further delay.
21. Inadequate budgetary support under Non-Plan has created a perpetual practice of transferring shortfall amount under Non-Plan from Plan Grant-in-Aid.

FOR RAY & RAY
CHARTERED ACCOUNTANTS

6, Church Lane
Kolkata-700 001
Dated : 29th October, 2003

Sd/-
(N. Saha)
Partner

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

As at 31st March 2002 Rs.	P.	Funds and Liabilities	Schedule No.	As at 31st March 2003 Rs.	P.
14,52,19,428.95		CAPITAL FUND	I	15,87,50,874.95	
		DEVELOPMENT FUND			
10,22,97,760.78		Institute Development & Modernisation Fund		10,36,51,325.78	
8,00,51,244.91		OTHER FUNDS	II	8,84,12,612.09	
1,55,90,299.29		CURRENT LIABILITIES	III	2,13,61,538.17	
1,47,77,547.44		Excess of Income over Expenditure in respect of Grant-in-Aid Schemes	IV	2,03,45,600.59	
35,79,36,281.37				39,25,21,951.58	

Institute
Kolkata-700 009
as at 31st March, 2003

As at 31st March 2002 Rs.	P.	Properties and Assets	Schedule No.	As at 31st March 2003 Rs.	P.
14,52,51,889.44		FIXED ASSETS	V	15,87,83,335.44	
52,98,701.00		WORK IN PROGRESS	VI	54,97,216.00	
31,84,010.38		INVESTMENTS	VII	32,31,173.38	
		INSTITUTE DEVELOPMENT AND MODERNISATION FUND INVESTMENT			
1,28,22,683.00		In Fixed deposit with Bank		Rs. 3,17,09,274.00	
6,14,41,498.15		In Fixed Assests		Rs. 6,14,41,498.15	9,31,50,772.15
		CURRENT ASSETS, LOANS & ADVANCES VIII			
2,07,99,087.94		A. CURRENT ASSETS		Rs. 2,44,35,860.98	
2,13,58,157.13		B. LOANS & ADVANCES			
		Secured:		Rs. 1,90,51,560.00	
		Unsecured:			
		Considered Good		Rs. 14,52,425.00	
		Considered bad or doubtful not provided for		Rs. —	2,05,03,985.00
66,59,104.11		Excess of Expenditure over Receipts in respect of Grant-in-Aid Schemes	IV		4,49,39,845.98
1,51,34,003.05		Employees Pension Fund Investment etc. (As per Balance Sheet attached)			74,98,848.13
5,14,56,190.44		Employees General Provident Fund Investment etc. (As per Balance Sheet attached)			1,55,79,144.05
36,31,585.26		Employees Contributory Provident Fund Investment etc. (As per Balance Sheet attached)			5,81,94,829.50
					42,16,614.70
34,70,36,909.90					39,10,91,779.33

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

As at 31st March 2002 Rs.	Funds and Liabilities	Schedule No.	As at 31st March 2003 Rs.	P.
B/F 35,79,36,281.37			39,25,21,951.58	

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35,79,36,281.37

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39,25,21,951.58

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Sd/-
P. Barman
Accountant
Bose Institute

Sd/-
S.P. Sit
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, 2003

As at 31st March 2002 Rs.	Properties and Assets	Schedule No.	As at 31st March 2003 Rs.	P.
34,70,36,909.90			39,10,91,779.33	
	MISCELLANEOUS EXPENDITURE :			
	Excess of Expenditure over Income (Nonplan)			
	As per last Account			
1,05,04,475.19	Council :	Rs. 1,05,04,475.19		
	Less : Excess of Income			
	over Expenditure (Plan)			
	during the year	Rs. 98,54,426.19	6,50,049.00	
	Excess of Expenditure over Income			
	as per last Account			
3,94,896.28	Governing Body	Rs. 3,94,896.28		
	Add : Excess of Expenditure			
	over Income during the year	Rs. 3,85,226.97	7,80,123.25	

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35,79,36,281.37

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39,25,21,951.58

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

Sd/-
Prof. M. Siddiqi
Director
Bose Institute

Sd/-
N. Saha
Partner
Ray & Ray
Chartered Accountants

Dated : 9th October, 2002

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

2001-2002 Rs.	P.	Expenditure	Non-Plan Rs.	P.	Plan Rs.	P.	Total Rs.	P.
To								
A. Pay & Allowances etc. :-								
69,00,322.00		Director and Administration	54,43,824.00		15,26,347.00		69,70,171.00	
2,08,52,651.55		Research Staff	1,01,05,838.00		1,09,70,493.00		2,10,76,331.00	
34,20,128.00		Workshop	30,05,015.00		2,12,140.00		32,17,155.00	
10,52,937.00		Library	7,44,590.00		3,54,862.00		10,99,452.00	
1,38,94,510.00		Dearness Allowances	99,06,983.00		59,01,287.00		1,58,08,270.00	
9,64,168.00		City Compensatory Allowances	5,91,138.00		3,43,335.00		9,34,473.00	
93,07,592.00		House Rent Allowance	57,38,605.00		34,34,153.00		91,72,758.00	
13,47,427.00		Transport Allowances	7,49,308.00		5,39,418.00		12,88,726.00	
93,456.00		Institute Contribution to P.F.	—		80,013.00		80,013.00	
41,001.00		Small Family Incentive	23,700.00		20,120.00		43,820.00	
6,36,240.00		Ad-hoc Bonus	3,75,988.00		2,52,704.00		6,28,692.00	
1,39,95,048.19		Institute's Contribution to Pension Fund for Gratuity Commutation & Pension Arrear Dues (Promotion)	—		2,12,99,989.66		2,12,99,989.66	
—		Leave Encashment	—		8,12,828.00		8,12,828.00	
12,23,336.00		Medical Benefit	—		24,79,758.00		24,79,758.00	
14,61,853.00		Children Education Assistance	—		13,04,209.00		13,04,209.00	
11,280.00		Subsistence Allowance	—		12,480.00		12,480.00	
23,825.00		Leave Travelling Concession	—		9,180.00		9,180.00	
42,143.00			—		—		—	
7,52,67,917.74			3,66,84,989.00		4,95,53,316.66		8,62,38,305.66	

Contd....

Institute
Kolkata-700 009
for the year ended 31st March, 2003

2001-2002 Rs.	P.	Income	Non-Plan Rs.	P.	Plan Rs.	P.	Total Rs.	P.
By								
A. Grants and other Receipts :-								
11,50,00,000.00		Grant from Govt. of India (DST)	3,15,00,000.00		10,40,00,000.00		13,55,00,000.00	
		Service Charge :						
4,11,634.00		Hostel & Guest House	3,34,402.00		—		3,34,402.00	
79,757.00		Pick-up Service Charges	72,288.00		—		72,288.00	
14,88,265.00		Over-head Charges	13,13,925.00		—		13,13,925.00	
2,22,701.03		Interest from Bank : S.B. A/c. : 7,91,440.79 T.D.R. : 3,48,274.00						
			11,39,714.79		—		11,39,714.79	
25,458.71		Interest on Security Deposit :	26,438.29		—		26,438.29	
1,80,486.00		Miscellaneous Receipts	1,54,670.00		—		1,54,670.00	
5,350.00		Income from Institute Vehicle	3,000.00		—		3,000.00	
		Sample Testing FTNNR	44,850.00		—		44,850.00	
85,430.00		Sample Testing (RSIC)	60,455.00		—		60,455.00	
4,00,068.00		Institute Consultancy	—		—		—	
9,500.00		Bid Fees/Tender Fees	2,04,663.00		—		2,04,663.00	
1,54,420.00		Instrument usages	36,870.00		—		36,870.00	
13,485.00		Sale proceeds of J. C. Boses publication	—		—		—	
53,23,666.81		Deficit meet up Fund	80,54,877.94		—		80,54,877.94	
12,34,00,221.55			4,29,46,154.02		10,40,00,000.00		14,69,46,154.02	

Contd....

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

2001-2002		Expenditure	Non-Plan		Plan		Total	
Rs.	P.		Rs.	P.	Rs.	P.	Rs.	P.
To								
B. Office Maintenance & Other Establishment Expenses:-								
6,07,508.50		Office Expenses including General Maintenance and Stationery	4,85,897.02		4,48,883.55		9,34,780.57	
83,000.00		P o s t a g e	64,127.00		---		64,127.00	
15,507.00		Advertisement	95,692.00		---		95,692.00	
15,750.00		Audit Fees (for 2001-2002)	15,750.00		---		15,750.00	
5,44,669.00		Telephone, Telex, EPABX	2,80,600.00		2,94,616.00		5,75,216.00	
67,02,024.00		Electric Bill	30,78,119.00		54,22,648.17		85,00,767.17	
3,76,672.00		Travelling Expenses	1,32,569.00		5,68,568.00		7,01,137.00	
4,51,356.00		Building Repair and Maintenance	1,59,756.00		18,88,227.00		20,47,983.00	
6,30,694.00		Car Repair and Maintenance	7,21,725.00		---		7,21,725.00	
66,175.00		Garden Maintenance	66,158.00		---		66,158.00	
2,550.00		Legal Expenses	---		---		---	
10,12,846.00		Security Guard	11,60,772.00		---		11,60,772.00	
91,288.00		National Science Day Foundation Day Celebration	---		1,84,914.00		1,84,914.00	
18,000.00		Assistance for Hindi Language Education	---		18,000.00		18,000.00	
2,29,713.00		Assistance to Staff Canteen	---		2,37,600.00		2,37,600.00	
---		Liveries	---		78,145.00		78,145.00	
---		SAC/RAP meeting	---		2,49,029.00		2,49,029.00	

1,08,47,752.50

62,61,165.02 93,90,630.72 1,56,51,795.74

Contd....

Institute
Kolkata-700 009
for the year ended 31st March, 2003

2001-2002		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

2001-2002 Rs. P.	Expenditure	Non-Plan Rs. P.	Plan Rs. P.	Total Rs. P.
To, C. Laboratory Expenses :-				
7,17,509.50	Physics	—	9,13,913.50	9,13,913.50
7,98,418.00	Chemistry	—	14,18,853.00	14,18,853.00
10,50,300.50	Botany	—	14,36,243.00	14,36,243.00
9,85,367.00	Microbiology	—	12,45,095.00	12,45,095.00
8,81,714.00	Bio-Chemistry	—	18,84,412.50	18,84,412.50
5,36,787.50	Bio-Physics	—	8,34,774.00	8,34,774.00
4,60,841.00	Animal Physiology	—	5,46,525.00	5,46,525.00
1,47,932.00	Library	—	2,94,267.00	2,94,267.00
5,47,959.00	P.M.C.G.	—	8,58,460.00	8,58,460.00
1,89,093.50	Immunotech Lab.	—	2,17,984.50	2,17,984.50
90,766.00	Environment Science Section	—	1,27,581.00	1,27,581.00
1,61,868.50	Workshop	—	2,84,980.58	2,84,980.58
1,63,903.86	Experimental Farms	—	2,18,196.00	2,18,196.00
1,85,423.00	Publication	—	2,08,393.00	2,08,393.00
2,88,502.00	Scholar's Hostel	—	4,15,570.00	4,15,570.00
59,500.00	Assistance to Institute Scientific Symposium/ Seminar/Exhibition etc.	—	1,24,823.00	1,24,823.00
1,37,741.00	R. S. I. C.	—	53,606.50	53,606.50
3,34,536.00	Central Instrumentation Lab.	—	11,07,502.00	11,07,502.00
4,51,860.26	F.T.N.M.R Maintenance	—	3,12,769.00	3,12,769.00
7,34,100.00	Internet/Website Facility Maintenance	—	9,89,362.00	9,89,362.00
—	Darjeeling Exp. Firm (High altitude Research Centre)	—	51,991.91	51,991.91
89,24,122.62		—	1,35,45,302.49	1,35,45,302.49

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Institute
Kolkata-700 009
for the year ended 31st March, 2003

2001-2002 Rs. P.	Income	Non-Plan Rs. P.	Plan Rs. P.	Total Rs. P.
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The ashes of the parents of Jagadis Chandra, his own and wife's are enshrined in the garden of the Rose Institute