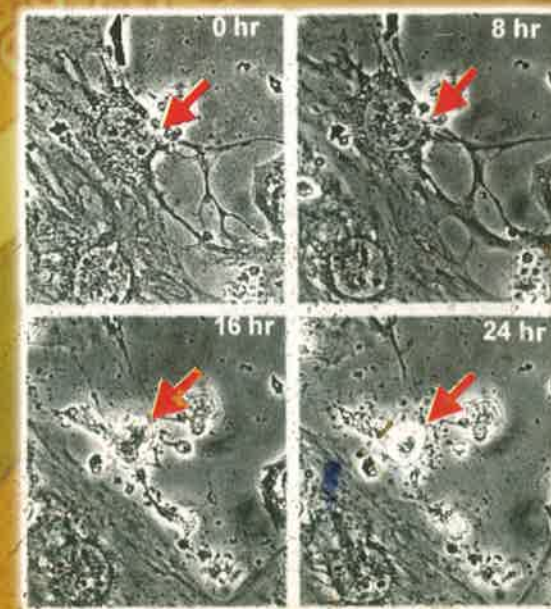




BOSE INSTITUTE

**ANNUAL REPORT
2000-2001**





ANNUAL REPORT
OF
THE BOSE INSTITUTE
FOR
2000-2001



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

Compiled and edited by the Annual Report
Committee 2000-2001 consisting of the following members :

Prof. Arun K. Roy (Chairman)

Prof. Asok Banerjee

Prof. Pran K. Chakrabartty

Prof. Indrani Bose

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Sri Kajal Chowdhury

Sri Arun Kumar Dasgupta

Prof. P. K. Saha (Convenor)

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Director's message

Acharya Jagadis Chandra Bose thought of the Institute which he founded on November 30, 1917 "not merely a Laboratory but a Temple". He saw its main purpose as the discovery of "truths which remain beyond even the super-sensitive methods known to science". Such an enterprise required a deep faith in Man's capacity to create new instruments which extend his ability to transcend the limits set by sense perception. His understanding of nature could, then, be reasonably expected to grow; the linkages between such growth and advancements in technique were well known to Bose. A Temple had to be built because truths that need faith are traditionally found in temples.

The Institute to-day is one of independent India's foremost scientific laboratories, helping the nation to become increasingly efficient in the face of intense international competition. It has started gearing itself to meet the demands of the new millennium by an extensive research program mainly focused on areas needed by the country to develop. In doing so, we have kept firmly in mind the Founder's desire to investigate the "many and ever opening problems of the nascent science which includes both Life and Non-Life".

Down the years this prestigious Institute has proved itself to be a pioneer in the frontiers of modern Physical and Life Sciences. Its work and achievements have attracted the attention of scientists at home and abroad. Members of the Academic staff are Fellows of National Academies and recipients of National and International awards and collaborate with national and international research institutions

Prof. Meher H. Engineer, Acting Director
(May 2000- September 2001)

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 the field of 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, the 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. The scientific infrastructure facilities available in the institute are also used by scientists from several universities and research centres in the country.

The Institute was started by a gift of Rupees four lakhs by the founder (invested in land, building and G. P. notes) and funds raised from public donations. The Institute is at present funded by the Department of Science and Technology, Government of India. As of March 31, 2001, the Institute had 153 research scholars (predoctoral and postdoctoral), 58 faculty members, 307 nonacademic employees, 174 pensioners, with an annual budget of Rs. 9.47 crores from the Department of Science and Technology. As elaborated on pages 29-34 of this report, the scientific research at this autonomous institute is additionally supported by about 72 grants-in-aid schemes awarded to various scientists.

The founder and his vision

Acharya Sir Jagadis Chandra Bose was the first Indian to achieve international recognition in experimental science during the British rule. A physicist by training and profession, later turned into a plant physiologist. The Acharya made important contributions in electromagnetic radiation, verifying the laws of reflection, refraction and polarization of electromagnetic waves. The demonstration of microwaves, one of the most valuable technologies to benefit human race, was first made by him at the Asiatic Society in Calcutta in 1895. Later on, he devoted much of his research on understanding the open problems involving life and non-life. His work on the response of living cells under external stimuli were ground-breaking and set the foundations of modern day biophysics. He devised several techniques to illustrate the physical basis of memory using ferromagnetic properties of matter and invented several innovative and sensitive instruments, such as crescograph for recording plant growth resulting into magnification of small movement as much as 10,000 times.

During a visit to Royal Institute, London in 1896, the Acharya conceived the idea of starting a similar scientific institute in his country where facilities be created for advance research and diffusion of knowledge through lectures and demonstrations. The thought gradually grew strong

on after his retirement from Education Service in 1915 he began planning of his dream. Thus, on November 30, 1917 the Bose Institute was inaugurated. Some passages from Dr. Bose's inaugural address of the Bose Institute on November 30, 1917 are given below

"The little that we can see is as nothing compared to the vastness of that which we cannot. Out of the very imperfection of his senses man has built himself a raft of thought by which he makes daring adventures on the great seas of the Unknown. But there are other truths which will remain beyond even the super-sensitive methods known to science. For these we require faith. And a temple is erected as a fit memorial for the establishment of that truth for which faith was needed. The personal, yet general, truth and faith whose establishment this Institute commemorates is this : that when one has gained the vision of a purpose to which he can and must dedicate himself fully, then the closed doors will be opened and the seemingly impossible become fully attainable. ..."

"... India is drawn into the vortex of international competition. She has to become efficient in every way – through the spread of education, through performance of civic duties and responsibilities, through activities both industrial and commercial. Neglect of these essentials of national duty will imperil her very existence; and sufficient stimulus for these will be found in success and satisfaction of personal ambition. But these alone do not ensure the life of a nation. Such material activities have brought in the West their fruit, in accession of power and wealth. There has been a feverish rush even in the realm of science, for exploiting applications of knowledge, not so often for saving as for destruction. In the absence of some power of restraint, civilization is trembling in an unstable poise on the brink of ruin. Some complementary ideal there must be to save man from that mad rush which must end in disaster. He has followed the lure and excitement of some insatiable ambition, not pausing for a moment to think of the ultimate object for which success was to serve as a temporary incentive.... Public life, and the various professions will be the appropriate spheres of activity for many aspiring young men. But for my disciples, I call on those very few, who, on realising some inner call, will devote their whole life with strengthened character and determined purpose to take part in that infinite struggle to win knowledge for its own sake and see truth face to face."

"The further and fuller investigation of the many and ever-opening problems of the nascent science which includes both Life and Non-Life are among the main purposes of the Institute I am opening to-day ; in these fields I am already fortunate in having a devoted band of disciples, whom I have been training for the last ten years. Their number is very limited, but means may perhaps be forthcoming in the future to increase them. An enlarging field of young ability may thus be available, from which will emerge, with time and labour, individual originality of research, productive invention and some day even creative genius."

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 nine 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. Shri Sanjoy Sen
2. Shri Debabrata Bose – Secretary
3. Prof. R. N. Chakraborty
4. Dr. (Mrs.) Debi Chakraborty
5. Prof. D. Banerjee
6. Prof. B. B. Baliga
7. Prof. S. N. Chatterjee
8. Shri Somnath Sanyal
9. Dr. A. Chatterjee
10. Director, Bose Institute

Members of the Council

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

Scientific report

Research Departments

Biochemistry

The department was created in 1974. Since its inception, the research activities of this 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 relationship of gene regulatory proteins.

Developmental regulation in *Mycobacteriophage L1* (Prof. N. C. Mandal)

RNA polymerase copies portions of the message in the DNA to give RNA. Antibiotics that bind RNA polymerase and inhibit its action have provided important insights into its structure and subunit functions. Rifampicin binds firmly to the β subunit of RNA polymerase and completely blocks production of RNA chains normally. A strange observation with mycobacteriophage L1 showed that 'early' and 'delayed early' genes do not get copied in the presence of the drug, but a certain section of the DNA of the 'late' gene category do.

Structure and function of Tubulin (Prof. B. Bhattacharyya)

Microtubules have multiple architectural and contractile roles in nearly all eukaryotic cells. They are hollow cylindrical structures built from two kinds of related proteins, called α - and β -tubulins, as a helical array of alternating α and β subunits. The effect of binding of bisANS to tubulin was studied: the drug resulted in an apparent destabilization of the native structure; stabilization could be achieved by having 1 mM GTP in the mixture. Removal of a few amino acids from the C-terminal of the β -subunit by the action of a protease causes loss of chaperone-like activity, i.e., its ability to help other proteins to fold. It was also indirectly inferred that the C-terminal residues of the α -subunit also have a role in conferring the chaperone activity.

Cell division cycle in *Entamoeba* (Dr. A. Lohia).

The alternation of DNA replication in S-phase and chromosome segregation in the M-phase is a hallmark in the cell cycle of most eukaryotes and ensures that the progeny do not have more than the normal complement of genes and chromosomes. It was observed that both *Entamoeba histolytica* and *Entamoeba invadens* routinely accumulate polyploid cells during their respective cell division cycles. The checkpoints that normally restrain S phase until after cell division in eukaryotic cells, are not observed in *Entamoeba*, so that any manipulation that slows down cell division, allows DNA replication to continue unchecked leading to polyploidy.

Analysis of protein conformation (Dr. P. Chakrabarti)

A statistical analysis of the distribution of main chain and side chain conformational torsion angles in proteins, their dependence on residue type, adjacent residues, secondary structure, residue-

14. Municipal Commissioner, Representative of the Calcutta Municipal Corporation

15. Director, Bose Institute – Ex-officio

16. Dy. Director, Bose Institute – Ex-officio

17. Prof. Sandip K. Basu

Two Scientists from outside

18. Prof. Asis Dutta

West Bengal, nominated by

DST., Govt. of India.

Registrar, Bose Institute – Secretary

Invities : 1. Representative of the Academic Council

2. Representative of Bose Institute Employees Association

Members of the Finance Committee

1. Shri Sanjoy Sen – (Representative of the Council) – 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

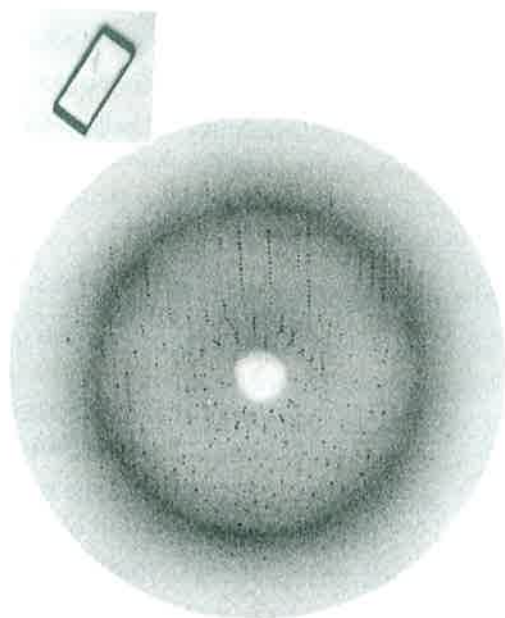
residue interactions and location at the protein termini resulted by using the large database of crystallographic structures. Similarly, a detailed analysis of the environment of the tryptophan residues in crystal structures of proteins was carried out. Tryptophan residues occur at the binding sites of many enzymes and important lessons on molecular recognition and binding affinity could be learnt from the analysis. Another investigation looked at the interaction between aromatic side chains within proteins.

Chromosome transmission in yeast (Prof. P. Sinha)

The process of chromosome transmission in the yeast *S. cerevisiae* continued to be studied using minichromosome maintenance (mcm) mutants affecting this process, namely mcm16, mcm17, mcm18, mcm19, mcm21 and mcm22. This year the investigators concentrated on the localization of the corresponding proteins, Mcm16 and Mcm19 using the chromatin precipitation assay.

Structural studies of cII (Dr. P. Parrack)

The transcription activator protein cII of lambda repressor phage activates P_{RE} and P_{int} promoters and promotes lysogeny. It is a small protein, relatively unstable, tetrameric protein of 97 amino acids per monomer. Its gene has been cloned and expressed in *E. coli* using a T7 promoter based overexpression system. The purified protein has been successfully crystallized and preliminary X-ray data collected at the Saha Institute of Nuclear Physics, Calcutta. The crystals diffracted to a resolution of 3.4Å and belong to the space group C222. Further efforts at improving the crystal data are in progress. This may lead to a three dimensional model of the protein and hence help in understanding how it functions.

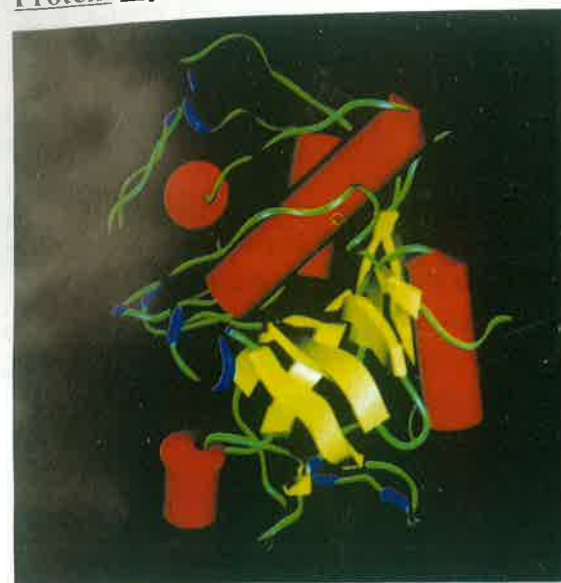


Crystal and diffraction pattern

Biophysics

This department was established 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 modelling are extensively used to derive structural and dynamical information and its correlation with function. Several crystal structures of pharmacologically important molecules were solved. Crystal structure of a cysteine protease is in progress.

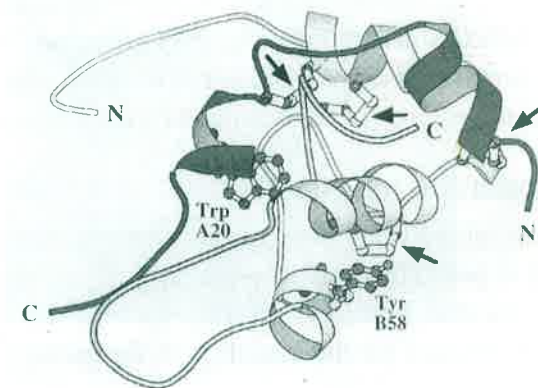
Protein crystallography of calotropin DII (Prof. A. Banerjee)



Proteases are a class of proteins that cleave other proteins and are very important in various biological processes. From the latex of the akanda flower, a protease Calotropin DII was purified. The purified protein was crystallized and X-ray diffraction data were collected from the crystals. After systematic analysis of the data obtained, a three dimensional model of Calotropin DII at 2.1Å resolution has been constructed, as shown on the left. In the diagram shown, the red cylinders represent alpha helices and the yellow arrows beta sheets within the protein structure. The three dimensional structure of this protein is similar to that of another protease, papain, present in the latex of papaya.

Protein structure and dynamics (Dr. G. Basu)

Structural studies on a 2S seed protein from *Brassica juncea* was completed by comparison with a previous structure of a similar protein determined by nuclear magnetic resonance elsewhere. The salient features of the *B. juncea* seed protein were confirmed from spectroscopic studies. A remarkable fluorescence blue shift was observed upon biomolecular quenching which was ascribed to an unusually slow dielectric relaxation in the protein/solvent system. A ribbon diagram of the proposed model of the seed protein which is one of the smallest but abundant proteins within this seed is given to the right.



Transcription regulation (Prof. S. Roy)

Molecular basis of transcription regulation was studied in a model system using a semi-synthetic repressor having a designed recognition sequence. Work with alternate sigma factors and RNA regulatory elements are in progress.

Botany

The major research goal of this department established in 1917 is to improve crop productivity using conventional and modern techniques, where genes with elite characters, particularly those endowed with biotic and abiotic stress tolerance are identified and located in wild relatives, with an objective to incorporate those in cultigens of rice, *Brassica*, *Beta* and *Chenopodium* using breeding, tissue culture and genetic engineering techniques.

Significant contributions from this department are the following : (i) attempts were made to introduce genes encoding the fragrance of basmati rice to normal cultivar species, (ii) significant approaches made to develop salt tolerant, drought tolerant species of plants, (iii) researches were conducted using plants as "bioreactors" to produce various types of useful essential oils, plant growth hormone and even industrial chemicals, (iv) plant tissue culture work was initiated to produce monoclonal varieties of plants for large scale propagation, (v) major species of mangroves were identified for afforestation programme in the rapidly degrading ecosystem of Sunderbans.

DNA polymerases from plants, delayed fruit ripening, edible fruits expressing, mechanism of polyamine action (Dr. D. N. Sengupta, Prof. B. Ghosh)

DNA Polymerase β from shoot tips of germinated rice seedlings was studied its involvement in DNA repair to better understand its role. In order to delay fruit ripening by inhibiting ethylene biosynthesis, the transgenic approach was attempted in tomato and banana, and are in progress. Similarly efforts were continued to develop an inducible expression system in tolerant and sensitive rice varieties in response to salinity stress. In the CPMB program the goal is to enhance the level of spermidine and spermine in salt sensitive, high yielding rice cultivars during abiotic stress; these polyamines protect the membrane from salt-induced damage.

Cytogenetical investigations and evolution (Prof. K. K. Mukherjee)

Tissue culture along with conventional cytomorphological data and other distinguishing traits were used to probe the evolution and ancestry of the modern day *Chenopodium album*. The results indicate that diploid *C. album*, one wild species *C. murale* and the hexaploid *C. album* have all contributed for the evolution of the present day semi-cultivated hexaploid *C. album*.

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

Albizia procera produces a large number of dormant seeds whose germination was achieved by either mechanical scarification or sulphuric acid treatment. Somatic hybrid plants of *Brassica juncea* low in harmful glucosinolate in their seed meal were isolated.

Clonal propagation of medicinal plants (Dr. S. Bhattacharya)

Two micropropagated medicinal plants, *Withania somnifera* and *Coleus forskohlii* are being maintained in Madhyamgram. Synthetic seed production has been standardized with the latter endangered plant. They are important for treating liver diseases.

Improvement of aromatic rice (Dr. T. K. Ghose, Dr. B. B. Mukherjee, Dr. S. Bhattacharya, Dr. S. Gupta Bhattacharya)

A total of 88 rice lines, including Basmati, have been identified to maintain aroma in West Bengal of which DNA fingerprinting of 65 aromatic cultivars have been completed. After screening 100 cross combinations, the cross of IR-72/Pusa Basmati I was selected for development of aroma linked marker(s) and mapping aroma gene(s). Progeny tests for aroma results in monogenic recessive control for aroma. The population is now in "Recombinant Inbred Lines" form comprising 740 families (Aman 2001, photograph below). Every individual plant advanced to the next generation is routinely characterized for at least 14 major traits. The grain quality of the plants were assessed for subsequent generations. Rice chromosome 8 specific SSLP markers are being used to map aroma and a major quantitative trait locus for cooked kernel elongation.



Rice tungro disease and protection against pest (Dr. T. K. Ghose)

A total of 300 rice cultivars and progenies from IR-72/Pusa Basmati I and IR-68305/Pusa Basmati I were screened for Rice Tungro Disease (RTD) reaction during Aman 2000; 69 cultivars were found susceptible to RTD in various degrees; 109 tolerant lines and 101 susceptible from IR-72/Pusa Basmati I were found. Response to *Sitotroga cerealella*, a major stored grain pest was assessed in 120 varieties and 363 rice lines of IR-72/Pusa Basmati I. Two varieties were found to be tolerant and various degrees of tolerance/susceptibilities (0 to 95% damage) were found in the 363 lines. For conservation purposes, more than 150 rice land races of West Bengal have been collected and characterized according to IRRI guidelines. Grain quality, seedling vigour and DNA fingerprinting are under way.

Tea clones and rice varieties development (Prof. S. Sen-Mandi)

Drought tolerance in tea was studied on the basis of free radical scavenging enzymes like superoxide dismutase and ascorbate peroxidase and other DNA markers. This led to a DNA fragment thought to possess drought tolerance properties. Similarly studies for seed vigour in rice were performed. Studies on some rice varieties suggest a variety specific difference in ability of seeds to retain DNA integrity during storage. This difference in DNA integrity was found to be associated with difference in vigour quality of the varieties as discussed above.

Allergy to pollen (Prof. S. Gupta Bhattacharya)

The airborne pollen of *Carica papaya*, a well known fruit yielding tree in the tropics, was found to be allergenic as evidenced by skin reaction studies. An immunotherapy programme of patients suffering from pollen allergic rhinitis is being conducted for the second year.

Chemistry

The research programme of this department, started in 1917 is centred on studies on biomolecules. The major objective is to unfold the chemical and biochemical nature of these molecules and gain information about their roles in biological processes. Broad research programmes of the department are : (i) chemistry of natural products and their syntheses, (ii) structure-function relationships of proteins, lipids, prostaglandins and biomembranes, (iii) medical biotechnology.

Synthetic approaches to pyrrolocarbazoles, indolocarbazoles (Dr. M. Chakrabarty)

New synthetic routes employing solvent-free procedures, for example, dry reactions on non-toxic solid surfaces like silica gel and clay for diindoyl- and triindoylalkanes have led to the formation of a diverse array of products. An attempt is being made to synthesize a recently isolated anti-AIDS sponge metabolite, a marine natural product, by organic chemistry. In another study, it was demonstrated that the aqueous alcoholic extract of the herb *Desmontrichum fimbriatum* used in Ayurveda, induces anti-oxidative enzymes in mice.

Hepatoprotective agents from herbs (Dr. P. Sil)

Along similar lines, a hepatoprotective protein from the Ayurvedic herb *Cajanus indicus L* has been purified and characterized by biochemical methods.

Fatty acids in mango and madhuca (Prof. P. Bhattacharyya)

The distribution of fatty acids in different components of lipid (fat) in different tissues of Mango and Madhuca has been carried out, indicating that the enzymes responsible are plant specific and tissue specific.

Major protein and calcium ATPase (Prof. P. C. Sen, Prof. G. Aumuller)

In the field of reproductive biology, it has been found that calcium flux which is related to Ca^{2+} -ATPase and controls capacitation and motility of sperm for fertilization, is controlled by a major protein secreted from seminal vesicles. A cytosolic protein isolated from rat brain is found to be effective as a male contraceptive agent.

Liquid crystals, phase transitions (Dr. P. Das)

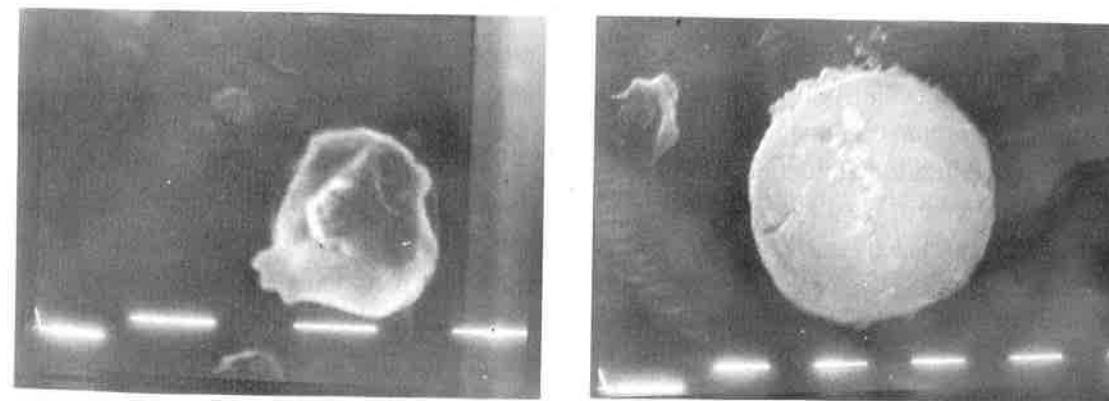
In another study, filamentous actin (F-actin), a protein present in muscle and nonmuscle cells, forms a state of matter known as liquid crystals (as present in some electronic watches, calculators, etc.). Optical studies of F-actin liquid crystals have been carried out to understand the physics of polymer liquid crystals and muscle mechanics. Cholesteryl oleate forms deposits in arteries and exhibits metastable liquid crystal states and ways are being studied to make the liquid crystal state more stable thus dissolving the deposits.

Chaperones (Dr. K. P. Das)

Chaperone proteins are those that not only have definite shapes of their own but help other proteins to assume their proper shapes (structures). Chaperone proteins find important applications in reactivating enzymes that have temporarily lost their proper structure and hence activity through denaturation. A protein named α -crystallin, available in large quantities in the mammalian eyes, is such a chaperone. It can be isolated from the eyes of slaughtered animals. It was found that α -crystallin can reactivate some denatured enzymes such that 30% of their original activity is recovered.

Immunotherapy of drug resistance (Prof. P. Bhattacharyya)

Bone marrow immunomodulator (BIM) is a heat stable, low molecular mass protein obtained from rat bone marrow. The immunotherapeutic protocol with BIM, introduced since 1999 on pulmonary tuberculosis patients in collaboration with two chest clinics in Calcutta, have shown that delivery by nose seems to shorten the time of sputum conversion in presence of standard anti tuberculosis drugs. The BIM nasal therapy was also applied to two cancer volunteers with seminoma and colon carcinoma respectively; they appear to be leading normal lives after the therapy. Scanning electron micrograph of T-cells isolated from mouse affected with Dalton's lymphoma – before (A, to the left) and after (B, to the right) treatment with bone-marrow immunomodulator, BIM, shown below.



Drug targets and drug resistance mechanisms in mycobacteria (Prof. P. Chakrabarty, Dr. J. Basu, Dr. M. Kundu)

Some basic research was carried out about the role of transporters in pumping out drugs in mycobacteria (such as those causing tuberculosis and leprosy) and in transporting important

determinants of virulence to the cell surface has been elucidated. The targets of the beta-lactam antibiotics and the mechanisms of drug resistance have been studied. Finally, the mechanisms by which these pathogens modulate the host cellular machinery for their own survival, have been studied. Mechanisms of antibiotic (betalactams and fluoroquinolones) resistance in enteric pathogens have been studied for the first time in clinical isolates of *Shigella dysenteriae* (which causes bacillary dysentery) and *Vibrio cholerae* (which causes cholera) in India.

Modulation of phagocyte signaling (Dr. M. Kundu)

Recent work has identified the biochemical pathways leading to the release of the key inflammatory mediator, interleukin-8 by clinical isolates of *Helicobacter pylori* (which causes gastrointestinal ulcers and carcinoma) from Calcutta.

Human red blood cell membrane (Dr. J. Basu)

A significant advancement has been made in understanding the structure and function of the red cell membrane in terms of interactions between its protein components, and organization of the phospholipids, and the regulatory mechanisms controlling these. This may help us to better understand the reasons behind the blood disorders like thalassemias and the leukemias.

Microbiology

Started in 1942, this department is a premier microbiological research centre in eastern India. This department is engaged both in basic and applied research to cater to the needs of science and society. The research activities of this department address the problems in the areas of parasitic and bacterial infections, drug design and detoxification, plant-microbe and mineral-microbe interactions. In the past, significant contributions have been made in the following areas: (i) Research on *Vibrio cholerae* and *Leishmania* organism to develop diagnostic agents. (ii) Development of newer variety of microbes for pesticide degradation, biological nitrogen fixation. (iii) Microbiological production of useful biochemicals. (iv) Work on the development of waste treatment to produce useful commodities, such as lactic acid, xylulose, xylitol, leather dehairing enzymes, extraction of metals, etc. (v) Molecular understanding of events which trigger defence mechanisms.

Starch degrading enzymes (Prof. P. K. Chakrabarty)

The starch hydrolyzing enzyme amylase has several industrial uses. A strain of *Bacillus amyloliquefaciens* was selected as the best producer of extracellular amylase. Fermentation conditions for production of the enzyme were optimized and the enzyme was purified from the culture. The purified enzyme had a molecular weight of 66 kilodaltons with a high starch hydrolyzing efficiency. It was estimated to contain 26% α -helix, 25% β -sheet and 49% random coil in secondary structure.

Biotransformation by microbes (Prof. T. B. Samanta)

Biotransformation of organic molecules is a very recent tool used for the synthesis for the key drug intermediate(s) and degradation of recalcitrant (harmful) compounds in the environment. Progesterone analogs were converted to the corresponding 14 α -hydroxy derivatives which are biologically important, while 6-aminopenicillanic acid was transformed into newer β -lactams due to condensation with different acyl donors in organic solvent. Nonylphenol, an industrial pollutant, was found to undergo degradation by a bacterial strain.

Leishmaniasis and NO (Prof. T. B. Samanta)

Nitric oxide has been implicated in a wide range of physiological processes. Impairment of cytochrome P₄₅₀ and induction of nitric oxide synthase were observed in hamsters infected with *Leishmania donovani*. The magnitude of these changes was found to be maximum when the parasitic load in the liver of the hamsters was highest (20 days from the day of the infection). The impairment was partially protected with the use of nitric oxide scavengers. Thus NO appears to be involved in the impairment of cytochrome P₄₅₀ system during leishmaniasis.

Signal transduction in Leishmaniasis (Dr. S. Majumdar)

Leishmania donovani, an intercellular protozoan parasite, resides and multiplies within the macrophage of the vertebrate host (several parasites about to enter a host macrophage as shown) and is the causative organism of the disease visceral leishmaniasis. Investigations of the signaling pathways revealed that the level of intracellular ceramide, a type of lipid (fat) molecule, was enhanced as a result of an in vitro infection. This in turn affected the levels of the various protein kinases in various ways. Thus, regulation of excess intracellular ceramide concentration in leishmaniasis may open up a route for therapy of the disease.



Strains of cholera (Prof. A. C. Ghose)

Vibrio cholerae is the causal agent of cholera. Important portions of the gene of a non-O1/non-139 non epidemic *Vibrio cholerae* strain 10259 were characterized. Sequence analyses of the vibrio pathogenicity island associated genes, cholera toxin genes and the intergenic regions were found to be essentially similar between the 10259, classical and El-Tor biotypes. The simultaneous expression of both pilin and toxin, an essential feature of epidemic strains, was not allowed due to a 5 base pair deletion upstream of the promoter region of the *ctxAB* operon in 10259.

Genetics of mycobacteria (Dr. S. Das Gupta)

To understand DNA replication in *Mycobacterium tuberculosis*, replication mechanism of a mycobacterial plasmid pAL5000 has been investigated using in vitro techniques as a model system.

Controlling damage in tomato (Prof. P. Chakrabartty)

Pseudomonas solanacearum is a plant pathogenic bacterium causing bacterial wilt disease (plant at left, control at right) and results in waste of tomato crop and other solanaceous crops. The pathogen was isolated from diseased plants and characterized biochemically. These biocontrol bacteria were improved through selection and were found to be useful in controlling the incidence of *Pseudomonas solanacearum* infection.



Sulphur bacteria and their potential uses (Dr. P. Roy)

Hydrometallurgy for the extraction of metals such as copper, gold etc. from low grade ores and for the desulfuring of high-sulfur containing fossil fuels mediated by sulfur oxidizing (sulfur lithotrophic) bacteria is a potential biotechnological process. The conventional metallurgy is not suitable for the utilization of these huge reserves of low grade ores and fossil fuels. Six sulfur lithotrophic bacteria were isolated from soil. Morphology, nutritional characteristics, sulfur lithotrophic properties and chemotaxonomic features of the isolates were studied and their molecular systematics established. It resulted in a new taxonomy for this class of organisms. A *sox* (sulfur oxidation) operon associated with sulfur chemolithotrophic process was identified and partially characterized in a newly isolated sulfur lithotrophic bacterium. Such knowledge will help in the development of genetically modified organisms suitable for commercialization of these processes.

Physics

Physics 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. Considerable effort is being devoted to elucidate the cosmological implications of recent advances in fundamental particle physics. In the micro world, there is an active interest in the foundations of quantum mechanics, statistical and condensed matter physics, astrophysics, radiation physics, nuclear physics and applied radioactivity.

Conducting polymers and their properties (Dr. B. Roy, Dr. T. P. Sinha)

In a study for development of new materials, composite conducting polymers based on polyaniline and polyvinyl alcohol have been prepared. Experimental measurements include density, viscosity, ultrasonic velocity, from which some thermodynamic parameters were calculated.

Applied Radioactivity (Dr. S. N. Changdar)

Diffusion studies in liquids have been carried out using the sliding cell and sheared boundary techniques, developed in the Physics Department using Radioactive isotopes. The importance of diffusion studies lies in the development of kinetic theory of liquids; also the accurate measurements of physical parameters like diffusion coefficients are needed in the technology of nuclear reactors.

Rayleigh scattering from excited states (Prof. S. C. Roy)

Elastic scattering from the ground and various excited states of carbon atoms and ions has been investigated, using the S-matrix formalism, for incident photon energies ranging from 100 eV to 10 keV. This was a theoretical study, the purpose being to throw light on contradictory results obtained on excited atoms with different configurations.



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

The functional characteristics of the superheated drop detector, developed in the department (photograph above), have been determined in neutron spectrometry and gamma ray detection.

Properties of perovskites and high-temperature superconductors (Dr. T. P. Sinha)

In search of new materials with industrial applications, a first principles study of the optical properties of perovskites has been carried out. The calculated spectra are compared with the available experimental results. Similarly, structural and ferroelectric studies of polycrystalline samples of $\text{Pb}_{0.92}(\text{La}_{1-z}\text{K}_z)_{0.08}(\text{Zr}_{0.60}\text{Ti}_{0.40})_{0.98+0.04z}\text{O}_3$ ($z = 0.0, 0.1, 0.3, 0.5, 0.7$) have been carried out. In the search for high temperature superconductors, inelastic neutron scattering experiments on

in-1 nickelate compound Y_2BaNiO_5 , doped with Ca^{2+} ions, provide evidence for an incommensurate, double-peaked structure factor $S(q)$. A microscopic theory has been formulated to explain the origin of the two peaks.

universe (Prof. S. Raha)

Problems of Quark-Hadron phase transition in the early universe and baryonic dark matter have been addressed. This is an attempt at elucidating the nature of cosmological dark matter and dark energy without having to invoke any exotic ideas beyond the realm of the standard model of particle physics.

Quantum mechanics (Prof. D. Home)

Results have been obtained in the areas of quantum entanglement and quantum information theory. Deeper understanding of the conceptual aspects of Quantum Nonlocality and its possible applications in the field of communications have motivated studies on Quantum Entanglement which gives rise to Action-at-a distance type effects known as Nonlocality. Relevance of such studies lies in their possible practical applications concerning secret information transfer and experimental tests of Quantum Nonlocality.

Spin correlations (Dr. S. Saha)

The behaviour of a system consisting of two nucleons and a pion is basic to classical nuclear physics. In collaboration with the Indiana University Cyclotron Facility (IUCF), Bloomington, the analyzing powers and longitudinal as well as transverse spin correlation coefficients of reactions $pp \rightarrow pn\pi^+$ and $pp \rightarrow pp\pi^0$ have been measured. Their work is an important step to relate the process of pion production in a nucleon-nucleon collision to our understanding of nucleon-nucleon interaction.

Work carried out is of considerable relevance and some of the results obtained have potential applications. The superheated drop detector is an efficient device for the detection of ionising particles and radiation. Conducting polymers, ferroelectrics and diffusion measurements in liquids have applications in materials science and industry. The elastic scattering studies provide useful insight on photon-atom interaction. The study of quantum spin systems provides valuable information on the physical properties of interacting many body systems. Research on quantum entanglement and communication not only clarifies important issues related to the foundational aspects of quantum mechanics but provides the basis for quantum computers, cryptography and quantum communication. The work carried out in the areas of cosmology/astrophysics makes significant contributions to our knowledge of the early universe. The experiments carried out on the intermediate energy nuclear reactions are pioneering contributions to our understanding of the nucleus and nucleon-nucleon interaction.

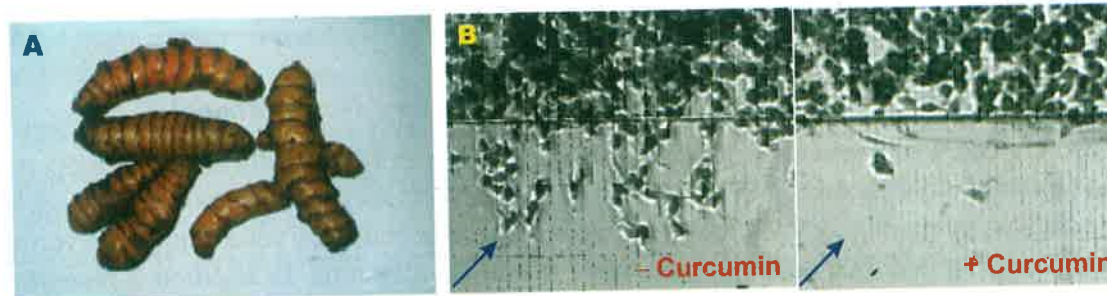
Research Sections

Animal Physiology

Established in 1930, the Animal Physiology section is mainly engaged in applied research related to Animal Biotechnology and Cancer Chemoprevention. In the early years significant contributions were made from various physiological studies on different types of spiders, ants, caterpillars, butterflies, tadpoles, fish and silkworms. The themes in recent years were : (i) to understand the nature of pesticide-induced damage in the reproductive capacity of fish and to develop means to counteract such hazards; (ii) to explore techniques for induced breeding in fresh water prawn throughout the year; (iii) to explore means for induced breeding in cat fish reducing the breeding period; (iv) to develop the rearing techniques and endocrine manipulation for better silk production in silk-worm; (v) to understand how thyroid hormone leads to brain signals, thyroid hormone-phenyl hydrazine interactions; (vi) to map the mechanisms of cancer cell death or apoptosis using phytochemicals, (vii) to restore the immunopharmacological balance of diseased host, (viii) to explore growth factor-mediated signaling pathways and their relevance in cancer.

Catfish physiology (Prof. A. Roy)

In the presence of a pesticide carbofuran, liver cells of catfish (*H. fossilis*) produced a protective enzyme called EROD for carrying out detoxification. This enzyme was purified in the laboratory by several steps and further characterized. In another study, triploid catfish having faster growth rate than normal (diploid) catfish was found to have defective reproductive properties and failed to propagate independently.



Cancer Chemoprevention (Dr. G. Sa, Dr. T. Das)

The usage of turmeric (haldi) dates back to 4500-1500 BC and is well documented in Ayurvedic records. Curcumin is a naturally occurring chemical responsible for the colour of turmeric. Efforts are under way to determine the molecular mechanisms of anti-tumour activity of curcumin, using advanced methods of modern cell biology and molecular biology. Accordingly, how curcumin works at the various stages of the cell cycle is also being studied using breast cancer and Ehrlich's ascites tumour cells. Preliminary studies indicate that curcumin inhibits the spreading of prostate cancer cells to other organs. In other studies, curcumin was found to possess detoxifying or rejuvenating / anti-aging properties. The antioxidant and detoxifying properties of black tea extract appeared from the levels of free radical scavenging enzymes that increased in the liver of tumor-bearing mice. These studies may lead to a form of dietary therapy of cancer.

ing the mechanism of the anti-tumour activity of protein A, it was observed that it kills cells through increased generation of nitric oxide (NO).

Environmental Sciences

environmental projects (Prof. M. H. Engineer)

Port Trust in collaboration with Calcutta Metropolitan Development Authority and Calcutta Corporation has undertaken a massive river front beautification programme for a total of about 9.7 kms. of the river bank on the Calcutta side and about 56 kms. on the Howrah side of the river Hooghly. Bose Institute has been entrusted with the responsibility of making an Environmental Impact Assessment (EIA) for the entire stretch. A detailed characterisation of the various components viz., its air, noise, water, land, biological and human aspects of environment along the river Hooghly around the project site has been done. Evaluation of the project has been carried out within the study area and predictions have been made.

For the project, Calcutta Port Trust has entrusted us to study the present status of the Environment of the entire Calcutta Dock System and to identify problems in and around the dock system and to suggest certain measures to upgrade the environment status of Calcutta Dock System (CDS).

Environmental Sciences Section has also carried out consultancy work regarding Quality Control, Monitoring and Control of Environmental Pollution at the local and national level. We have audited 140 industries/foundries at Howrah and Calcutta, similar work has also been done at Bandel Thermal Power Station, Purulia and Bandel Thermal Power Station, Hooghly.

Biotechnology

A, cytokines and their receptors (Prof. P. K. Ray, Dr. N. Mandal)

Protein A, a cell wall rotein of *Staphylococcus aureus* Cowan I, has multifunctional properties antitumour, antitoxic, anticarcinogenic, immunomodulatory and mitogenic. Success has been achieved in cloning the protein A gene into prokaryotic and eukaryotic expression vectors. Experiments are under way to express protein A in a mammalian system. In addition, a membrane protein of molecular weight 44 kilodaltons from mouse T cell has been isolated, having affinity for protein A. Probably the membrane protein from mouse acts as T-cell receptor. A more sensitive method to quantify a very low level (femtogram) of expressed messenger RNA from T cells for cytokine and their receptor genes is being developed.

Molecular and Cellular Genetics

Genetics was established in 1989 with an aim to study basic and applied aspects of plant genetics through modern molecular approaches. The major emphasis in the research are in the following areas : plant and tissue culture; genetic manipulation through somatic hybridization and molecular approach; molecular aspects of tissue differentiation; transgenic approach towards genetic improvement for nutritional, as well as biotic and abiotic stress tolerance, and molecular genetics through genomic and proteomic approaches.

Transgenic crop improvement (Prof. A. N. Lahiri Majumder, Dr. S. Das)

Inositol synthase from *Oryza* and *Porteresia* were bacterially expressed and characterized by several biophysical methods. The results predict a slightly different structure which explains the salt sensitivity of the former and the salt tolerance of the latter species. An yet unassigned ORF from *Synechocystis* has been identified as the gene coding for the cyanobacterial inositol synthase, a presumed progenitor of the chloroplast enzyme. Gamma linoleic acid, an essential fatty acid being an early precursor of prostaglandin is absent in mustard and other oil crops. However, most of the cyanobacterial organisms and some fungi like *mucor* are able to synthesize gamma linoleic acid by the activity of delta 6 desaturase, which converts linoleic acid into gamma linoleic acid. The gene for this enzyme from *Spirulina* has been cloned into pGEMT vector and *Synechocystis* sequence cloned into pBluescript vector. Efforts for inserting this gene into mustard (*Brassica*) is in progress. A series of experiments are under way to transfer agronomically useful traits into different cultivars of rice, mustard, chickpea and a model plant, tobacco.

DNA markers in mung bean virus, cotyledon types and bamboo (Dr. A. Pal)

With an aim to develop Mung bean Yellow Mosaic Virus resistance linked DNA markers, a method was perfected for possible use in molecular breeding. In another study, biochemical differences between two cotyledon types of Mung bean were analysed. The presence and importance of arabinogalactan protein in regeneration was demonstrated in both cotyledon types for the first time. A hypothesis has been developed to explain why the protein accumulated at higher levels in the 'Cot E' variety and how that affects regeneration efficiency and direct shoot differentiation. In a separate study, since the natural propagation is of long duration, a faster shoot regeneration protocol by axillary branching method using nodal explants from secondary and tertiary branches of adult clumps has been worked out to multiply elite bamboo.

Insect resistance in plants (Dr. S. Das)

Every year, we lose much of our crops to insects. Lectins are proteins in plants that protect them from the attack of insects. Mannose binding lectins isolated from members of *Alliaceae* and *Araceae* were chosen to determine their efficacy against sucking pests. Insect bioassays were set up to quantify the properties of the lectins against several insects like aphids, red cotton bugs and tea mites. Lectins were found to bind to the insect gut epithelial membrane. In another study, three wild *Rorippa* species were grown next to three varieties of *Brassica* in alternate rows in a field. The former are resistant to the pest *Lipaphis erysimi*, whereas the *Brassica* plants were devastated by the pest unless insecticide was applied. Somatic hybrids between the two may be useful for introducing insect tolerance in *Brassica*.

PUBLICATIONS

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Dr. Rajagopal Chattopadhyaya, Prof. N. C. Mandal, Dr. Subrata Sau,
Dr. Pradeep Parrack, Dr. Pinakpani Chakrabarti



Biophysics

Dr. Goutam Basu, Prof. Asok Banerjee, Dr. Siddhartha Roy

Annual Report



Botany

Dr. S. Gupta-Bhattacharyya, Dr. S. Bhattacharya, Dr. Dibyendu N. Sengupta, Prof. Prabir Kr. Saha, Dr. Kalyan Mukherjee, Dr. Debabrata Basu, Dr. Tapas Ghose



Chemistry

Dr. Manikuntala Kundu, Prof. Parul Chakrabarti, Dr. Joyoti Basu, Dr. Manas Chakraborty, Prof. Parimal Ch. Sen, Dr. Parames Sil, Dr. Kalipada Das

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23. Saha S, Sinha T P & Mookerjee A (2000) First principles study of electronic structure and optical properties of CaTiO₃, *European Physical Journal B* **18**, 207.
24. Saha S, Sinha T P & Mookerjee A (2000) Electronic structure, chemical bonding and optical properties of paraelectric BaTiO₃, *Physical Review B* **62**, 8828.
25. Shannigrahi S R, Choudhary R N P, Acharya H N & Sinha T P (2000) Microstructure and electrical characterisations of K-modified PLZT, *Journal of Materials Science* **35**, 1737.
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Microbiology

Dr. Prodosh Roy, Prof. Asoke Ghose, Prof. Prankrishna Chakrabartty, Prof. Timir Baran Samanta, Dr. Sujoy Dasgupta, Dr. Subrata Mazumder, Dr. Tapan Dutta



Physics

Prof. D. Home, Prof. S.C. Roy, Dr. Swapan Saha, Prof. Indrani Bose, Prof. M. H. Engineer, Dr. Biva Roy, Dr. S. N. Changdar, Dr. T. P. Sinha



Animal Physiology

Prof. Arun Kumar Ray, Dr. Tanya Das,
Dr. Gaurisankar Sa



Immunotechnology

Dr. Nripen Mondal



Plant Molecular & Cellular Genetics

Dr. Amita Pal, Dr. Sampa Das, Dr. Samir Ranjan Sikdar,
Prof. Arun Lahiri Mazumder

Annual Report

25

ANIMAL PHYSIOLOGY SECTION

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2. Ghosh M C, Ghosh R & Ray AK (2000) Induction of CYP1A by carbofuran in primary culture of fish hepatocytes; *J. Biochem. Molecular Toxicology*, **14**, 204-209.
3. Maitra S K & Ray A K (2000) Role of light in the mediation of acute effects of a single afternoon melatonin injection on steroidogenic activity of testis in the rat; *J. BioSci.* **25**, 253-256.
4. Tiwary B K, Kirubakaran R & Ray A K (2000) Gonadal development in triploid *Heteropneustes fossilis*; *Journal of Fish Biology*, **57**, 1343-1348.
5. Das T, Sa G, Subbulakshmi V, Subramaniam S, Sen P C, Biswas S & Ray P K (2000) Protein A-activated rat splenic lymphocyte proliferation involves tyrosine kinase - phospholipase C - protein kinase C pathway, *Immunopharmacol. Immunotoxicol.* **22**, 75-90.
6. Ray P K, Das T, Sa G, Ghosh A K & Chattopadhyay S (2000) Protection of apoptotic cell death by Protein A, *Apoptosis* **5**, 509-514.
7. Ray P K, Das T & Sa G (2001) How to activate intrinsic stress resistance mechanisms to obtain therapeutic benefit, in *Cell and Molecular Responses to Stress* (ed. Storey JM and Storey KB) Elsevier Science, USA, Volume 2, Chapter 14.

ENVIRONMENTAL SCIENCES SECTION

1. Datta J, Maiti A K, Modak D P, Chakrabartty P K, Bhattacharyya P & Ray P K (2000) Metabolism of γ -hexachlorocyclohexane by *Arthrobacter citreus* strain BI-100: identification of metabolites, *J. Gen. Appl. Microbiol.* **46**, 59-67.

IMMUNOTECHNOLOGY SECTION

1. Das T, Sa G, Subbulakshmi V, Subramaniam S, Sen P C, Biswas S & Ray P K (2000) Protein A-activated rat splenic lymphocyte proliferation involves tyrosine kinase - phospholipase C - protein kinase C pathway, *Immunopharmacol. Immunotoxicol.* **22**, 75-90.
2. Ray P K, Das T, Sa G, Ghosh A K & Chattopadhyay S (2000) Protection of apoptotic cell death by Protein A, *Apoptosis* **5**, 509-514.
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PLANT MOLECULAR AND CELLULAR GENETICS SECTION

1. Pal A & Basu S (2000) Role of biotechnology in the improvement of bioactive compound with special reference to the medicinal plants. In: *Recent Trends in Spices and Medicinal Plants Research* (Ed. A. K. De) APC Publishing Co., New Delhi, pp. 106-121.
2. Mitra A & Pal A (2000) Isozyme analysis of *Populus deltoides* and a hybrid poplar for the evaluation of genetic stability in the culture regenerated plants, *J. Trop. For. Sci.* **12**, 697-706.
3. Ghosh S, Bagchi S & Majumder A L (2001) Chloroplast fructose-1,6-bisphosphatase from *Oryza* differs in salt tolerance property from the *Porteresia* enzyme and is protected by osmolytes, *Plant Science* **160**, 1171-1181.

DISTRIBUTED INFORMATION CENTRE

Mandal D, Jana S, Panda S, Bhattacharya S, Ghosh T C, Bhattacharya S K & Chakrabarti S (2000) Distribution of HIV-I subtypes among female sex workers of Calcutta, India, *Ind. Journal of Med.Res.*, **112**.

Metawat D, Ghosh T C, Bhattacharya M K, Bhattacharya S K & Chakrabarti S (2001) Molecular characterization of the VP7 gene of Rotavirus isolated from a clinical sample of Calcutta, India, *Virus Res.*

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ANALYTICAL SOPHISTICATED INSTRUMENTATION CENTRE

Chatterjee T, Chaudhuri S, Moore M, Ray S, Chatterjee P & Roychowdhury P. (1999) Synthesis and structures of 5-amino-1-(2-hydroxyethyl)imidazole-4-carboxamide and 5-amino-1-(2-chloroethyl)-4-imidazole, *J. Chem. Crystallogr.* **29**, 1281-1286.

Jana S, Bandyopadhyay C, & Chaudhuri S (2000) Synthesis and crystal structure analysis of 13,13a,9-methyl-13-methoxydinaphtho[2,1 c;1'2'-f]-1-benzopyrano [4,3-i]-2,8-dioxabicyclo [3,3,1]nonane, *Acta Cryst.* **C56**, 1450-1451.

Chakraborty I R, Maji T K, Chaudhuri S, Ghosh A & Ray Chaudhuri N (2000) Synthesis and characterization of *trans* isomers of [NiL₂(NCS)₂] [L = 1-(2-aminoethyl)pyrrolidine] : X-ray single-crystal structures, *Chem. Lett.* **19**, 1803-1807.

There are a total of 105 publications listed above, among which some have been listed more than once as the same authors from more than one unit of the Institute. When these duplicates are removed we are left with 97 unique publications. Some publications from 1999 are included as their authors came to know their exact volume and page numbers late for inclusion in the previous annual report.

and technology development :

Modak DP, Datta J, Maiti AK, Bhattacharyya P and Chakrabarty PK A method of preparing purified oil, water and milk contaminated with γ -hexachlorocyclohexane.

STUDENTS AWARDED WITH A Ph. D. DEGREE

Name of Student (University, year)	Department/ Title of Thesis	Supervisor
Biochemistry		
Santanu Ray Chaudhuri (JU, 2001)	Studies on the regulation of galactokinase expression in <i>Mycobacterium smegmatis</i>	Prof. Nitai C. Mandal
Kaustuv Sanyal (JU, 2001)	Cloning & Characterization of <i>MCM16</i> and <i>MCM18</i> genes of <i>Saccharomyces cerevisiae</i> required for chromosome segregation	Prof. Pratima Sinha
Atasi Poddar (JU, 2001)	A genetic study of Chromosome segregation in the yeast <i>Saccharomyces cerevisiae</i> using <i>mcm</i> mutants	Prof. Pratima Sinha
Debnath Pal (JU, 2000)	Analysis of the nonbonded interactions and their implications in protein structure and function	Dr. Pinakpani Chakrabarti
Uttamkumar Samanta (JU, 2000)	Structural studies on interactions in protein small molecules	Dr. Pinakpani Chakrabarti
Jayanta Mukhopadhyay (JU, 2000)	Structural studies on the cyclic AMP receptor protein from <i>Escherichia coli</i>	Dr. Pradip Parrack
Kaushik Ghosh (JU, 2001)	Crystallographic and Structural Studies of Intact Lambda cI Repressor and its C-terminal Fragments	Dr. Rajagopal Chattopadhyaya
Runa Sur (JU, 2000)	Characterisation of a specific RNA polymerase binding site upstream of the galactose promoter in <i>Escherichia coli</i>	Dr. Pradip Parrack
Biophysics		
Asim Kumar Bera (CU, 2001)	Characterization of biopolymers and molecules of biological importance by X-ray crystallography and modeling	Prof. Asok Banerjee
Botany		
Biswajit Das (CU, 2000)	Studies on Testa Ultrastructures and Water Uptake Patterns in Relation to Germination of Some Legume (Fabaceae) seeds	Prof. Prabir K. Saha

of Student
University, year)Department/
Title of Thesis

Supervisor

Moon Sen
(01)Contribution To Aerobiology And Pollen
Allergy In a Selected Semi-Rural Places Of
West Bengal, IndiaDr. Swati
Gupta
Bhattacharyadhikari
(01)Investigations On Aero-Mycology In Relation
To Allergy In Some Selected Semi-Rural Places Of
West Bengal, IndiaDr. Swati
Gupta
Bhattacharya**Chemistry**ha Dutta
(01)Hepatoprotective and immunomodulatory
studies on Indian medicinal plantsProf. Prantosh
BhattacharyyaKhasnobis
(01)Studies on New Reagents and Reactions of
Aromatics and HeteroaromaticsDr. Manas
ChakrabartyMdin Ahamed
(01)Beta-lactamase of *Shigella*Dr. Manikuntala
KunduMondal
(01)Studies on the human erythrocyte
membrane protein band 3 (anion transporter)Dr. Joyoti
Basu**Microbiology**Ghosh
(00)Studies on an extracellular invertase
produced by *Aspergillus ochraceus* TSProf. Timir
B. Samantar
orty
(01)Repetitive DNA sequence(s) in *Thiobacillus*
ferrooxidans and search for its role in regulation
of sulfur lithotrophyDr. Pradosh
Roy**Physics**Gayen
(00)Electronic and Magnetic
Properties Correlated SystemsProf. Indrani
Bose**Plant Molecular & Cellular Genetics**a Ray
uri
(00)Attempts to develop a nuclear male sterile
Brassica juncea line using another specific
promoter expression of a killer geneDr. Sampa
Das**GRANTS-IN-AID SCHEMES**Investigator/
Co-investigator

Department / Title of Scheme

Financed by

Animal PhysiologyDr. Gaurisankar
SaIntracellular signaling mechanisms of basic
fibroblast growth factor-stimulated early gene
transcription

CSIR

Dr. Gaurisankar Sa /
Dr. D. W. Stacey (USA)Proliferative signaling and topoisomerase IIa
regulation

NIH, USA

Dr. Tanya. Das /
Dr. Gaurisankar SaAn approach to induce selective apoptosis in tumor
cells without harming the normal cells of the host by
black tea extract

NTRF

BiochemistryProf. Susweta
Biswas / Dr.
Siddhartha RoyBiochemical and biophysical studies on the novel
NTP-NDPase (apyrase) linked with the sensitivity of
Mimosa pudica leaflets (Terminated on 09.09.2000)

DST

Prof. Nitai
C. MandalStudies on the mechanism of action of gene G23 in
post-transcriptional regulation of bacteriophage L1
gene expression (Terminated on 30.09.2000)

CSIR

Prof. Nitai
C. MandalCharacterisation of operators and promoters of the
temperature mycobacteriophage and construction of
inducible expression vectors for mycobacteria
(Started on 01.08.2000)

CSIR

Prof. Bhavatarak
BhattacharyyaTaxol and colchicine binding to tubulin : A
Mechanistic study to understand tubulin-
antimitotic drug interaction

DST

Prof. Pratima
SinhaCharacterisation of MCM genes required for DNA
replication and segregation in the yeast *S.cerevisiae*

CSIR

Dr. Pinakpani
ChakrabartiAnalysis of interactions in helices in proteins and
their use in the design of helical peptides

CSIR

Dr. Pinakpani
ChakrabartiAnalysis of protein-protein association in
crystals and complexes

IFCPAR

Dr. Anuradha
LohiaRole of DNA replication licensing factors in
regulating cell division in *Entamoeba histolytica*

DST

Investigator/Co-investigator	Department / Title of Scheme	Financed by
Suradha	Construction of yeast artificial chromosomes of <i>Entamoeba histolytica</i>	CSIR
Suradha	Transformation of <i>E. histolytica</i> to study the role of proteins involved in the growth virulence and drug sensitivity of the parasite	US-INDIA
Agopal Adhyaya	Sequence and three dimensional structure determination of lipase from <i>Aspergillus niger</i> (Terminated on 31.03.2001)	CSIR
lip	Structural basis of control of transcription initiation in bacteria by the cyclic AMP receptor protein (Terminated on 30.06.2000)	CSIR
Biophysics		
sok	Structural basis of differences in catalytic mechanism of different Cysteine Proteases, Calotropin DII by X-ray and modelling	DBT
ddhartha	Exploration of structure — protein Engineering Techniques by Aminoacyl-tRNA synthetases	CSIR
ddhartha	Spectroscopic studies of transcription initiation and regulation	DST
am	Theoretical studies of peptide and protein dynamics from a collective motion viewpoint	CSIR
am	A thermodynamic scale for the Relative preferences of amino acids between 3_{10} and α -helical states.	DST
am Basu / Chakrabarti	Analysis of interactions in helices in proteins and their use in the design of helical Peptides	CSIR
am Basu	Solution NMR conformation of short peptides at low temperatures	TWAS, Italy
Botany		
ati Sen Mandi/ antosh Bhattacharya	DNA Finger Printing and Cataloguing Of Tea Germplasm Developing Molecular Markers in Elite Tea Clones	DBT / TEA-BOARD
ati Sen Mandi / antosh Bhattacharya/ nda Paria (CU)	National Agricultural Technology Project (NATP) for Exploration and Collection of Medicinal Plants.	NBFAR (ICAR)

Investigator/Co-investigator	Department / Title of Scheme	Financed by
Prof. Kalyan Kumar Mukherjee / Dr. B. K. Dutta, Nimpith	Studies on Biology and genetic diversity of <i>Nypa fruticans</i> from Sundarbans, India	DBT
Dr. Swati Gupta Bhattacharya	Environmental Biopollution and its Impact on Human Health	Dept. of Environment & Forest, W.B.
Dr. Dibyendu N. Sengupta	Cloning of cDNA for DNA polymerase beta from rice for structure function analysis	CSIR
Dr. Dibyendu N. Sengupta	Isolation of scaffold Attachment Region (SAR) from plants and Development of inducible promoter for efficient expression in transformed cells in plants.	DST
Dr. Dibyendu N. Sengupta	Molecular analysis of antifungal proteins to control Leaf spot (Tikka) disease of Groundnut	DAE
Prof. Bharati Ghosh / Dr. D. N. Sengupta	Cloning of molecular markers involved in salt tolerance for their overexpression to enhance salt tolerance in rice plants	DBT-CPMB
Prof. Bharati Ghosh	Molecular mechanism of PA induced plasma membrane Stabilisation and activities of membrane bound protein in salt tolerant and salt sensitive cultivars of rice	CSIR-ES
Dr. Tapas K. Ghosh and others	Genetic improvement of aromatic rices suitable for the agroclimatic conditions of West Bengal : Mapping the aroma gene(s)	DBT-CPMB
Chemistry		
Prof. Parul Chakrabarti / Dr. Manikuntala Kundu	Molecular Basis of Non-specific Resistance in Mycobacteria : Role of Efflux Pumps	DBT
Prof. Parul Chakrabarti / Dr. Joyoti Basu	Drug Permeation through Mycobacterial Cell Wall	DST
Prof. Prantosh Bhattacharyya / Dr. D. N. Sengupta	Molecular analysis of the hepatoprotective protein identified from the leaves of the herb <i>Cajanus indica</i> L : cloning of its cDNA and overexpression in cucumber fruit	CSIR
Prof. Parimal C. Sen / Dr. Kali Pada Das	Studies on the role of phosphorylation on the molecular chaperone function of α -crystallin and cataract formation	DST

Investigator	Department / Title of Scheme	Financed by
Parimal Sen	Amphiphilic drug induced alteration of ion transporting ATPase activities modulated through protein kinases and endogenous modulators	CSIR
Parimal Sen	Isolation and characterization of human Semiosomal and sperm Calcium ATPases	DST-DAAD
Parimal Sen	Synthesis of pyrrolocarbazoles, an emerging class of bioactive heterocycles	CSIR
Parimal Sen	Conformational specificity of α -crystallin for its function as molecular chaperone	CSIR
Parimal Sen / Kundala Kundu	Protein palmitoyl transferase : a potential regulator of dynamic protein palmitoylation	DBT
Parimal Sen / Kundala Kundu	Molecular analysis of the functional role of palmitoylation of human erythrocyte membrane protein 4.2	Indo-French
Parimal Sen	Structural and functional analysis of a high molecular mass class A penicillin-binding protein in <i>Mycobacterium leprae</i>	CSIR
Parimal Sen	Proteins of the cell wall synthesis and cell division machinery of mycobacteria : potential drug sites	DST
Parimal Sen / Kundala Kundu	Role of outer membrane proteins in drug resistance in <i>Shigella dysenteriae</i>	CSIR
Parimal Sen / Kundala Kundu	Mechanisms of beta-lactam resistance in <i>Shigella dysenteriae</i>	DST
Environmental Sciences		
Parimal Sen / Kundala Kundu	Environmental Impact Assessment Study and Preparation of Environmental Management Plan for the proposed River-Front Beautification Work (Phase-1) From Princep Ghat to Fairlie Place on Calcutta River Side.	Calcutta Port Trust
Parimal Sen / Kundala Kundu	Comprehensive Environmental Study and Preparation of Environmental Management Plan for Calcutta Dock System.	Calcutta Port Trust
Parimal Sen / Kundala Kundu	Environmental Monitoring control of air pollution of Santaldih Thermal Power Station	WBSEB (Govt. of West Bengal)

Investigator/ Co-investigator	Department / Title of Scheme	Financed by
Prof. Meher H. Engineer	Environmental Monitoring and control of air pollution of Bandel Thermal Power Station	WBSEB
Microbiology		
Prof. Asoke Chandra 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	CSIR
Prof. Asoke C. Ghose/ Prof. Parimal C. Sen	Cellular and molecular mechanisms of immunosuppression in visceral leishmaniasis	DST
Prof. Timir B. Samanta	Enzyme reaction engineering : Synthesis of penicillins by immobilized β -lactamase free penicillin amidase in organic solvent under reduced water activity	DBT
Prof. Pran K. Chakrabartty	Suppression of bacterial wilt of tomato and related crops caused by <i>Pseudomonas solanacearum</i> (Smith) Smith in India making use of introduced microorganisms in the rhizosphere	ICAR
Dr. Subrata Majumdar	Signal transduction mechanism visceral in leishmaniasis in mice : Role of TNF in leishmaniasis	DAE
Dr. Subrata Majumdar	Role of chemokines in host signal transduction and immunotherapy in experimental visceral leishmaniasis	CSIR
Dr. Sujoy K. Das Gupta	Understanding the mechanism of replication of the mycobacterium plasmid pAL5000 using an in vitro approach	CSIR
Dr. Sujoy K. Das Gupta	A cosmid vector for cloning genes linked to viability of virulent mycobacteria	DBT
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	CSIR
Dr. Sujoy K. Das Gupta / Drs. S. Roy, G. Basu, P. Chakrabarti/ Prof. B. Bhattacharyya	Latent tuberculosis, new targets, drug delivery systems and bioenhancers and therapeutics (Multicentric project)	CSIR (NMITLI)
Dr. Sujoy K. Das Gupta / Prof. Asoke C. Ghose	Generation of peptide mimics against the immunodominant lipoglycan/ lipopolysaccharide antigens of <i>Mycobacterium tuberculosis</i> and <i>Vibrio cholerae</i> using phage display libraries and their evaluation as diagnostic and prophylactic agents	ICMR

Participation in National Conferences

Dr./ gator	Deartment / Title of Scheme	Financed by
Physics		
akash	Investigations on photon detector using super-heated liquid and development of an educational kit to demonstrate through sight and sound the radiation interaction with matter	DST
inha	Vibronic Coupling Effect on Fe-Ions in Insulators Plant Molecular and Cellular Genetics	CSIR
Plant Molecular and Cellular Genetics		
N. umder	Role of inositol and polyamine metabolism in relation to osmotic stress in rice (<i>Oryza sativa</i>)	Indo-US
N. umder	Metabolic engineering of inositol pathway in rice: Implications in the chloroplast functions (CPMB Phase II)	DBT
N. umder	Plant Fructose-1,6-bis- phosphatase(s): regulation and expression during salinity stress in rice	CSIR
N. umder	Identification of active site amino acid residues of eukaryotic L-myo-inositol 1-phosphate synthase – a biochemical and molecular approach	DST
Pal/ K. Ghose	Development of PCR- based DNA- marker (s) linked with MYMV- resistance in <i>Vigna mungo</i>	DBT
	Micropropagation of commercially important bamboo bamboo species and <i>in vitro</i> induction of precocious flowering	CSIR
Das	Cloning of a new lectin gene from <i>Allium sp</i> in order to develop transgenic aphid resistant plants	DAE

Dr. Gaurisankar Sa (Animal Biotechnology) participated the 27th Annual Conference of Indian Immunological Society at Agra in 2000. **Dr. Tanya Das** (Animal Biotechnology) delivered invited lecture at the same conference.

Prof. Nitai C. Mandal (Biochemistry) and **Prof. Pran K. Chakrabartty** (Microbiology) chaired a scientific session each in the 69th Annual Meeting of the Society of Biological Chemists (India) held at Science City, Calcutta during December 7-9, 2000. **Dr. Kali P. Das** (Chemistry), **Prof. Asoke C. Ghose** (Microbiology), **Prof. Arun N Lahiri Majumder** (PMCG) delivered invited talks and **Prof. Parimal C Sen** (Chemistry) delivered the award lecture in the same meeting and has been conferred Prof. P.A.Kurup Endowment Lecture Award - 2000 of the Society. Many others from the Institute attended and presented posters at this meeting. The poster entitled "Molecular mechanism of higher polyamine protecting Rice plants from salinity stress" presented by **Papiya Roy**, Saswati Laha, Kamala Niyogi, Dibyendu N. Sengupta and Bharati Ghosh, received Best Poster award (B.S.Narasinga Rao Best Poster) in the scientific session.

Dr. Pinakpani Chakrabarti (Biochemistry) attended GRC meeting at Mandawa, Rajasthan in December, 2000.

Dr. Pradip Parrack (Biochemistry) delivered an invited talk "A subunit crosslinked form of the cyclic AMP receptor protein (CRP) from E. coli is transcriptionally active in the absence of cyclic AMP" and **Prof. Asok Banerjee** (Biophysics) delivered an invited talk on "X-ray crystallographic application in Drug Design" at the National Symposium on Biophysics, held at IICB, Kolkata, on January 17th, 2001. **Prof. Asok Banerjee** delivered two more talks, "Biodiversity in Proteases" at Physics Department, Guahati University, 2000 and "Molecular Design of life at structural level" at the Kedareshwar Banerjee Birth Centenary Celebration, IACS, Calcutta 2000, respectively.

Dr. Amita Pal (PMCG) chaired a session and **Dr. Debarata Basu** (Botany), **Dr. Sampa Das** (PMCG) and **Dr. Samir Sikdar** (PMCG) delivered a lecture each on a one day workshop on "Alien gene transfer in plants", 28th March, 2001 organised by Centre of Advanced Study, Department of Botany, Calcutta University.

Prof. P. Chakrabarty (Chemistry) delivered lectures on invitation in the Indo-French Workshop on Tuberculosis in Chennai, 2000 and in the International Symposium on "Mycobacterial Diseases : Pathogenesis, Protection and Control" in Calcutta, 2001.

Dr. Kali P. Das (Chemistry) delivered an invited lecture entitled "Microcapsules of β -lactoglobulin - a vehicle for drug delivery" at the Annual Meeting of the Surface Society at the Chemistry Department of Jadavpur University, June 2, 2001.

Ramkrishna Basak (Chemistry) presented his work on the synthesis of the diindolylalkanes at the 37th Annual Convention of Chemists, I.C.S., held at Gurukula Kangri University, Harwar during November 15-18, 2000.

Joy K. Das Gupta (Microbiology) presented a paper "The instability of vector systems applications in the area of mycobacterial genetic engineering" at the Indo- French Workshop on Tuberculosis (1st and 2nd December 2000) at Tuberculosis Research Centre (ICMR) Chetput, Chennai.

Indrani Bose (Physics) gave several invited talks at : the mid-year meeting of the Indian Academy of Sciences, Bangalore (July, 2000); One Day Symposium on Recent Trends in Condensed Matter Physics in honour of Prof. C. K. Majumdar at I.A.C.S., Calcutta (August 11, 2000); Recent Trends in Condensed Matter Physics at the Physics Department, Visva-Bharati, Varanasi (December 17, 2000); Workshop on Strongly Correlated Electron Systems at the Statistical Institute, Calcutta (Feb. 6-9, 2001); Interdisciplinary Workshop on Probability and Statistical Physics at the S. N. Bose National Centre for the Basic Sciences, Calcutta (January 19-23, 2001).

Sibaji Raha (Physics) delivered an invited plenary talk at the 15th National Symposium on Plasma Science and Technology (Plasma 2000) at Saha Institute of Nuclear Physics, Kolkata, during December 2000.

N. Changdar (Physics) attended, chaired a session and presented papers in NSERD - 2000 at the University of Tirupati, Tirupati in August, 2000. Delivered an invited talk, chaired a session and presented a paper at the symposium on Physico-chemical studies in solids and related topics at ISM, Dhanbad in December 2000.

Iva Roy (Physics) presented a paper in the International symposium on Nuclear Physics at BARC, Mumbai during Dec. 18-22, 2000. She also attended the National Seminar on Accelerator Safety at VECC, during Nov. 16-17, 2000.

P. Sinha (Physics) presented paper in the meeting "Condensed Matter Days - 2000" held at Department of Physics, Guru Ghasidas University, Bilaspur from 29th to 31st August 2000.

Das (Physics) participated in the IPA Young Physicist Colloquium (YPC-2k) held at BARC, Mumbai during 24-25 August, 2000 and attended the National Seminar on Accelerator Safety at VECC, during Nov. 16-17, 2000.

Abita Bhattacharya (Botany) and her student attended a Seminar Cum-Exposition on Venous Drugs : Their Resource Based Management, Utilisation and Conservation, held on 24th July 2000 at Industrial Section, Indian Museum, Botanical Survey of India, Calcutta.

Abita Bhattacharya (Botany) and some students from Botany and PMCG participated in and presented posters/talks in National Symposium on Prospects and Potentials of Plant Biotechnology in India in the 21st Century & 23rd annual meeting of PTCA (India) held on 18-20 October, 2000 at J.N.Vyas University, Jodhpur. Some students from PMCG attended the National Symposium on Biotechnology for sustainability in Agriculture, Organized by Society of Plant Biochemistry and Biotechnology at Pantnagar, April, 2000, and presented posters.

Arun N. Lahiri-Majumder (PMCG) chaired the technical session on "Stakeholders Dialogue on Agricultural Biotechnology" organized by TERI/DBT in Dec. 2000.

Dr. Amita Pal (PMCG) presented a paper on "Genomic DNA endoreplication and storage protein profile in the cotyledons of *Vigna radiata* during ontogeny", in a National Symposium on "Relevance of Plant Biochemistry and Biotechnology: Recent Trends", organized by Society of Plant Biochemistry and Biotechnology, held at The American College, Madurai in March, 2001.

Prof. Arun N. Lahiri-Majumder (PMCG) and **Dr. Sampa Das** (PMCG) participated in the workshops organised by Indo-Swiss collaboration in Biotechnology in May, 2000 and February, 2001.

Invited talks delivered in India at various organizations

Prof. Pratima Sinha (Biochemistry) spoke at the Indian Academy of Sciences, Bangalore on July 14, 2000 on "Chromosome Transmission During Cell Division", at the Institute of Microbial Technology, Chandigarh on November 1, 2000 on "The kinetochore of the budding yeast" and at IIT Kanpur, Chemistry Department. March 30, 2001. "Kinetochores: drivers of chromosome movements during nuclear division".

Dr. Rajagopal Chattopadhyaya (Biochemistry) gave a talk at CCMB on November 15, 2000 on the *Vibrio cholerae* TcpA model. He spoke on the LexA dimer structure at the Molecular Biophysics Unit, Indian Institute of Science, Bangalore, on November 16, 2000. On January 31, 2000 and February 1, 2000 he gave talks at the Department of Chemistry, Indian Institute of Technology, Kanpur on the *Vibrio cholerae* TcpA and the lambda repressor models respectively.

Prof. Parimal C. Sen (Chemistry) delivered invited Lecture at IIT, Kharagpur.

Prof. Arun N. Lahiri Majumder (PMCG) delivered the XVIIIth Parija Memorial Lecture at the Utkal University in March.

Prof. Timir B. Samanta (Microbiology) attended the workshop on Industrial Hazardous Waste Management held at American Centre, Calcutta;; participated in an electronic conference on Bilateral Cooperation between India and USA in Science & Technology with Dr. Marco DiCapua held at American Centre, Calcutta.

Prof. Dipankar Home (Physics) delivered an invited talk at the National Conference titled "Geometrical Phase and Foundations of Quantum Mechanics"- Indian Institute of Science, Bangalore, 28-30 March, 2001

Dr. Arun Kr. Chakraborty (Library) delivered an invited lecture on Digital Libraries on 2nd December, 2000 in the British Council, acted as a Chairperson to the 255th IASLIC study circle meeting on the theme "Recent developments in academic libraries in the United States" on 15th January, 2001 and delivered an invited talk on "Digital preservation : challenges and opportunities" on 15th February, 2001 held at IASLIC, Kolkata.

Symposia organized at Bose Institute

Kuntala Kundu (Chemistry) and Dr. Joyoti Basu (Chemistry) acted as the Joint Convenors International Symposium on "Mycobacterial Diseases : Pathogenesis, Protection and Control" Calcutta in January, 2001.

Molecular & Cellular Genetics in collaboration with the Centre for Plant Molecular Biology Department of Botany organized a three day workshop on "Plant Biology in the Era of Genomics & Proteomics" during March 23-25, 2001 held at Bose Institute. All faculty members and research scholars of PMCG Section participated in the workshop.

Workshop on "biological databases through ORACLE" was organized by the Bioinformatics Department during February 28 to March 2, 2001. In the era of genomics and proteomics when the sequencing of whole organism is being carried out, there is ever increasing need of data storage and data ware housing etc. The workshop covered some of the basic issues in developing biological databases through ORACLE.

Participation in international conferences or talks delivered abroad

Dr. **Prisankar Sa** (Animal Physiology) visited The Cleveland Clinic Foundation, USA, as a "Visiting Scientist" and delivered invited lecture at the Dept. of Molecular Biology of that

Dr. **Chakraborti** (Biochemistry) delivered an invited talk at LEBS, CNRS, Gif-sur-Yvette, France in June.

Dr. **Aradhya Lohia** (Biochemistry) delivered several invited talks at : the Centenary year symposium at the Bernard Nocht Institute, Hamburg, Germany (Talk on "DNA reduplication in *E. histolytica*"); the XIVth Amoebiasis meeting at Mexico City, Mexico (Two talks on "Membrane proteins of *E. histolytica*" and "Eh Diaphanous in cell motility and division"); the XIVth Amoebiasis meeting at Mexico City, Mexico; Brigham and Women's Hospital, Harvard, Medical School, Boston (Talk on "The cell cycle of *E. histolytica*").

Dr. **Chattopadhyaya** (Biochemistry) and Dr. **Joyoti Basu** (Chemistry) were invited to participate at the 5th International Meeting on Molecular Epidemiology and Evolutionary Genetics of Infectious Diseases (MEEGID-5) held during November 12-16, 2000 at Ramoji Film City, Chennai. Dr. **Chattopadhyaya** spoke at the cholera session on November 13 on the TcpA gene developed in collaboration with Prof. A. C. Ghose of Microbiology.

Dr. **Ganesh Kumar** (Biochemistry) delivered a talk entitled *Microbial alkaline phosphatases : From a biotechnological viewpoint* at the International Conference on Industrial Biotechnology, Trade and Public Policy, Hyderabad, July 15-17, 2000 presented a



Participants of the International Symposium on Mycobacterial Diseases : Pathogenesis, Protection and Control held in Kenilworth Hotel, Kolkata from January 9 to 11, 2001, Organized by Bose Institute



Dr. T. Mohan, Director DBT delivering the keynote address in the Workshop on "Biological Database Through ORACLE"



Prof. P. Balaram, Molecular Biophysics Unit, Indian Institute of Science, Bangalore delivering the 62nd Acharya Jagadis Chandra Bose Memorial Lecture on "Genes, Genomics, Proteins and Proteomics"

poster entitled *Novel thermostable alkaline protease from alkaliphilic Bacillus pumilus* at the International Conference on New Horizons in Biotechnology, Trivandrum, April 18-21, 2001.

Dr. Gautam Basu (Biophysics) delivered an invited talk in the Japan-France joint seminar "protein Dynamics and Its Relation to Protein Function", Kyoto, Japan, December, 2000.

Prof. Swati Sen Mandi (Botany) was nominated Indian representative in the Nominated Committee of the International Society for Seed Science (ISSS) since 2000 till date. Recipient of Rockefeller Foundation Award of Residency at Bellagio Study and Conference Center, Italy. Delivered invited lecture at Millennium Seed Bank, Kew Garden, London, March 2001.

Prof. Parul Chakrabarty (Chemistry) presented a paper on invitation in the International Symposium on "Signal Transduction and Nucleic Acids" in Boston, USA, in July, 2000.

Dr. Joyoti Basu (Chemistry) presented her work in the mid-term review meeting of the IFCPAR Council in Grenoble, France; participated in the Gordon Conference on "Bacterial Cell Surface" held in New Hampshire, USA in June 2000.

Prof. Asoke C. Ghose (Microbiology) attended and presented a paper in the conference "Oxford 2000-New challenges in tropical medicine and parasitology" held in Oxford and visited London School of Tropical Medicine & Hygiene in September 2000.

Prof. Timir B. Samanta (Microbiology) attended and delivered lecture at the Tenth Asian Symposium on Medicinal Plants, Spices and other Natural Products held at Dhaka, Bangladesh.

Prof. Suprakash C. Roy (Physics) had informal discussions as well as delivered an Invited lecture at the NIRS, Chiba, Japan during this visit. He visited various laboratories at Hokkaido University, Sapporo during August 26-29, and delivered an invited talk in the Division of Quantum Energy Engineering. He also delivered 30 credit-hours equivalent lecture courses on Radiation Detection and Measurements to the graduate students of Tohoku University at Sendai. He attended 2nd International Workshop on EGS held at KEK during August 8-10, 2000 as a full registered participant. Prof. S. C. Roy worked in the Medical Physics Department of Tom Baker Cancer Centre, Calgary, Canada as a Visiting Professor for two months during April-June 2000. In addition, he delivered an invited talk and presented two poster papers in the 8th International Symposium on Radiation Physics held at Prague, Czech Republic during June 8-12, 2000.

Prof. Indrani Bose (Physics) delivered invited talks at the International Conference on Strongly Correlated Electron Systems at S.I.N.P., Calcutta (October 23-28, 2000) and the International Conference on Current Trends in Molecular Magnetism held in I.I.Sc., Bangalore (December 4-12, 2000).

Prof. Dipankar Home (Physics) visited Macquarie University, Sydney, Australia during 20 June-10 August 2000 for research collaboration and gave an invited talk at an International Conference on Foundations of Modern Physics and Philosophy, University of Sydney, 7-10 July 2000. He also visited Institute of Physics, Groningen, Netherlands during 17 September - 10 October 2000 for research collaboration and delivered a series of lectures on Foundations of Quantum Mechanics. Next, he visited Atominstitut, Vienna, Austria during 11 October - 24 October 2000 for research collaborations and gave two invited talks.

Japan K. Saha (Physics) attended the Meeting of the American Physical Society to deliver at Long Beach, California in April 2000.

Das (Physics) presented a paper in the International symposium on Nuclear Physics held at IITC, Mumbai during Dec. 18-22, 2000 and attended the International school on instrumentation and detector (ICFA-2001) during March 26 - April 7, 2001 at National Accelerator Centre, Faure, South Africa.

Arun N. Lahiri Majumder (PMCG) visited and worked in the laboratories of Dr Autar K. M. USDA, USA and Prof Klaus Eshrich, University of Leipzig, Germany during August-September, 2000. He also participated and presented paper in the Gordon Research Conference "Salt and water stress in Plants" in New Hampshire, USA during August, 2000.

Honours Received

October, 2000 number of *Journal of Biomolecular Structure and Dynamics* featuring article by **Dr. Rajagopal Padhyaya** and coworkers, colour figures were published on cover.

Subyendu N. Sengupta (Physics) was awarded SERC Young Scientist fellowship by Govt of India.

Suprakash C. Roy (Physics) has been awarded the JSPS Invitation Fellow for the year 2000 by the Japan Society for Promotion of Science to visit Japan for two months. The host is Prof. T. Nakamura at Tohoku University, Sendai. Following were the activities during his visit. He also visited National Institute of Radiological Sciences (NIRS), Chiba during August 2000 which was culminated from the interaction of NIRS scientists during our joint experiment at Tohoku University, Sendai.



Service Departments

Distributed Information Centre

The Bioinformatics Centre of Bose Institute started in 1988 as one of nine Centres under the Biotechnology Information System (BTIS) programme of the Department of Biotechnology, Government of India, with genetic engineering and molecular modelling as major thrust areas. The Centre has become the main source of information related to bioinformatics and its dissemination in eastern India. The centre works as the backbone of the research and development activities in various fields, like genetic engineering, biocrystallography, biocomputing, molecular modelling, etc.

The main areas of research using this facility are genome analysis, molecular modelling, plant genomics and proteomics, protein folding and threading, and biomolecular structure and recognition. A workshop on "biological databases through ORACLE" was organized by the Bioinformatics Centre during February 28 to March 2, 2001. Software / hardware augmentation for the computers during the year were carried out with funds provided by the Department of Biotechnology, Government of India.

J. C. Bose Unit and Museum

During the year a good number of visitors both from India and abroad including Prof. P. Balaram, Indian Institute of Science, Bangalore on 30.11.2000. Prof. Asis Datta, V.C., J.N.U. on 8.12.2000 and R. Celeste, U.S. Ambassador to India on 13.1.2001 visited the museum.

The J.C. Bose Unit and Museum furnished information regarding Acharya J. C. Bose and his works to various organization, eminent persons and common men on request.

Special display in Museum was organized to make the foundation Day of the Institute on November 30, 2000.

Film Shooting in the Museum on J.C. Bose :

To celebrate Telecommunication day, Zee News on 18.5.2000, T.V. Serial on Heritage Building of Kolkata, Bose Institute Museum, Centre for Development of Image Technology (C-DIT), Kerala on 16.11.2000, Central Institute of Educational Technology, National Council of Educational Research and Training, New Delhi from 15.1.2001 to 17.1.2001.

Library

The Bose Institute Library was established in 1917 by Acharya J. C. Bose in the main campus. A Wing of the Library has been opened at Acharya J. C. Bose Centenary Building in 1983 with reading and lending facilities, now also a library. Taken together, the Institute Library system is

the best Science Reference Libraries in Eastern India. The Library is primarily meant for research staff/faculty members of its ten departments/sections. It is also frequently used by research scholars/faculty members of the eight Universities of West Bengal including University of Tropical Medicine, Medical Colleges, Indian Institute of Chemical Biology, Central Institute of Ceramic Research Institute and many other research institute located in and around Calcutta.

Presently, the library is open from 9.45 A.M. to 6.15 P.M. on weekdays [Monday to Friday] at all campuses.

The library contains 33,232 [22,549 Bound journals + 10,392 Books + 290 Theses] volumes of Journals/Theses upto 31.03.2001. Total number of periodicals subscribed (foreign + Indian) were 34 during this year due to paucity of funds, whereas in the recent past as many as 100 were subscribed. During the year, 2745 readers used the Library for their reference work, 1000 library cards were issued to the outside readers. Under Inter Library Loan system 1000 journals were issued to other institutions and also books/ journals were taken on Loan. 1070 bound volumes of books/journals and 3448 loose periodicals were issued by our library to research scholars and faculty members throughout the year for their reference work. Total 1099 copies of photocopying (Xerox) services were given to our faculties and also outside from other institutions.

The library has started its computerization activity since September, 2000. Till date library has the following databases (i) Theses : Database of Thesis at BI Library, (ii) BIL-JR : Database of journal holdings at BI Library.

Nyayagram Experimental Farm

During the year a total of three acres of land was used for growing experimental plants including Cabbage, moong, palang, Ipomea, pointed gourd, snake gourd, Tephrosia, castor, bamboo, Abroma, Withania, arhar, gram groundnut, tomato, Andrographis, Rauwolfia, Costus, and other medicinal plants. More than 100 species of different medicinal plants are maintained from the year 1999-2000 in the form of a demonstration garden funded by the Government. A large number of micropropagated plants have been established and are being maintained in the field.

Publication

Since inception in 1980 the Publication Section has been doing all sorts of publications from the Institute i.e. Transactions of the Bose Research Institute ; Annual Report (both English and Bengali versions) ; Memorial Lectures ; Director's Report ; Folders ; Posters and Leaflets of the Institute ; Symposium, Seminars and Training Programmes ; and works of Sir J. C. Bose. The Publication Section provides photocopying facilities to the staff members of both the campuses of the Institute.

M/s. Das Gupta & Co. Private Limited, 54/3, College Street, Calcutta 700073 has been appointed as sole distributor of our publications. The following books are available for sale from their counter.

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	RS.	150.00

Workshop

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

Units	Requisition receipts	Job discharged	Continuing job
Mechanical	185	80%	20%
Electrical	900	95%	5%
Carpentry	90	100%	Nil
Refrigeration	50	90%	10%
Glass blowing	60	100%	Nil
Drafting	100	100%	Nil
Electronic	85	100%	Nil
Lecture and Seminars Attended	250	100%	Nil

The Workshop won a big project for design and fabrication of CO₂ Assimilation Chamber of Central Research Institute for Jute & Allied Fibres, (ICAR), Nilganj, Barrackpore, North 24 parganas of worth Rs. 2.00 lakhs recently and the job is in progress.

Regional Sophisticated Instrumentation Centre

The Regional Sophisticated Instrumentation Centre has continued to provide instrumental and consultancy services to the scientific and industrial communities of the region. With the obsolescence of the older instruments it has become extremely difficult to procure spare parts to keep the instruments in running condition. Efforts are continuing to obtain funds to replace some of the older instruments — in particular the Scanning Electron Microscope — with new state-of-the-art models. The services of the technical staff of RSIC have also been requisitioned in the maintenance of instruments in various departments of the Institute.

Name of Instrument	No. of samples		Revenue Earned (Rs.)
	Internal	External	
Atomic Absorption Spectroscopy	—	1250	60,025
Electron Paramagnetic Resonance Spectrometer	—	39	3,150
Fluorescence Spectrophotometer	75	32	4,320
Liquid Chromatograph	—	19	960
Mass Spectrometer	30	6	4,320
Transmission Electron Microscope	27	119	31,190
Single Crystal X-Ray Diffractometer	1	1	—
High Pressure Liquid Chromatograph	289	12	73,393

Social relevance of some research performed at Bose Institute

Animal Physiology : The projects undertaken in this section have great relevance for improvement of commercially important aquacultural products, vis-à-vis improvement of socio-economic condition and drug development from herbal sources for cancer.

Biophysics : The structural study of protein, nucleic acids and compounds extracted from Indian medicinal plants / herbs are characterized for knowledge and their activity for effective drug design for the benefit of humanity.

Botany : Relevant areas include crop improvement and plant biodiversity conservation. Under crop improvement, one is the development of basmati-quality long grain aromatic rice of wider adaptation, cultivation of which will uplift the economic status of farmers in the Gangetic plains, understanding the mechanism of stress tolerance and plant quality improvement through cell-molecular studies / transgenic approach, which in turn will allow us to grow crops in drought prone and saline coastal areas. For conservation of medicinal and other economically important plants with special emphasis on endangered species, micropropagation protocols have been evolved; appropriate technology for some of the plants has already been transferred to the Department of Science and Technology, Govt. of west Bengal. A survey of wild gene pool for conservation of valuable plants growing particularly in Eastern India was done in the native region, in the field away from the native area or tissue culture in the laboratory for gene banking. Environmental issues with reference to airborne pollens and fungal spores causing allergy and respiratory diseases are being extensively studied for diagnostic and therapeutic uses. Faculty members also participate in training programmes aiming at human resource development in latest technologies important in resource generation in an era of global IPR regime and bio-patenting. For protection of bioresources, characterization of important plant species through DNA fingerprinting is a major thrust area of the department.

Chemistry : Many of the diverse activities are aimed at understanding diseases and development of their remedies. Thus, work is being carried out on the search for mainly hepatoprotective and immunomodulatory principles from Ayurvedic plants, on the development of green chemical syntheses of mainly heterocyclic drugs, on drug-targeting in the fields of tuberculosis and dysentery, on small proteins involved in the regulation of fertility, on eye-lens proteins to understand the mechanism of cataract formation and on biomolecules such as cholesterol esters and F-actin for the prevention of atherosclerosis and muscle atrophy.

Microbiology : To improve plant productivity and crop yield works on biocontrol of plant diseases have been undertaken. The mechanism of iron acquisition was worked out to gain knowledge with an objective of increasing the nodulation and nitrogen fixing efficiency of root nodule bacteria, thereby increasing the yield of pulse crops. In health related aspects, attempts are under way to develop diagnostics and detection of tuberculosis. Characterization of cholera-

using epidemic strains as opposed to non epidemic strains is being carried out for better understanding and prevention of cholera. Signal transduction mechanism during leishmaniasis is being studied to provide protection against the disease. Bioconversion of steroids starting from cheap intermediate has been carried out by fungal strains. Microbial biotechnological process for the utilization of lower grade ores and minerals has been studied. This process is environmentally friendly and economically viable compared to the chemical process in metallurgy.

Physics : Superheated Drop Detector (SDD) technology has been transferred to two National Laboratories, the Defense Research Laboratory, Jodhpur and the Indira Gandhi Centre for Atomic Research, Kalpakkam. Three 'Pressure Reactors' and three 'Measuring Devices' have been fabricated in our workshop with guidance from our faculty and sent to the Defense Research Laboratory, Jodhpur for their work on SDD. Measured AC susceptibility of stainless wires for S. N. B. Fasteners, dielectric constants of some ACCI paints and solvents for M/s. IEL Limited, noise levels generated by an industry near a residential neighbourhood at Rajpur, 24 Gaganas, WB. Studies on Quantum Entanglement have possible applications in secret information transfer.

Plant Molecular and Cellular Genetics : Through different research programmes, attempts are being made for quality improvement against biotic (viral- and pest- resistance) and abiotic (salt stress) stresses in rice, mustard, chickpea and urd bean. Molecular understanding of mechanism of salt tolerance has been developed and tolerant genes are being incorporated in rice and mustard to increase crop production. In another study, tissue culture technique is being adapted to circumvent the problems inherent in the traditional bamboo propagation method. Technology for the mushroom seed (spawn) and fruit-body production is being developed which will help to develop entrepreneurship through training of the SC/ST community.

List of personnel

Administration

Prof. Prasanta K. Ray (Director, till 19.05.2000), Prof. M. H. Engineer (Acting Director, after 19.05.2000)

Prof. P. Bhattacharya (Acting Registrar, till 06.09.2000), Mr. B. N. Singh (Registrar, joined 06.09.2000)

Shri T. K. Ghorui (Dy. Registrar)

Mr. K. Chaudhuri (Asth. Registrar I), Mr. R. K. Kundu (Asth. Registrar II) Mr. S. Pal (Accounts Officer), Mr. R. N. Bhattacharyya (Audit & Finance Officer)

Supporting Staff : S. P. Sit, P. K. Burman, Ankur Dutta, S. R. Deychaudhuri, A. K. Sengupta, T. Mukherjee, E. Pal, T. Chakraborty, S. Kar, Debidas Saha, M. S. Mitra, Amit Kr. Ghosh, Subir Sen, A. Chakraborty, 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 Pandit, Sukumar Das, S. Chatterjee, R. C. Sarkar, Dipak Dutta, C. Rangwa, K. Sur, T. K. Banerjee, K. Turi, S. Turi, K. Basar, M. Yadav, Md. A. Ansari, Kanai Hazra, Prafulla Bhunya, Nema Das, Kanak Baran Hazra, Duryodhan Nayak, Bablu Mandal, Sukanta Chakraborty, Subrata Banerjee, Dulal Turi, Amarnath Hela, Ranjit Das, Sukumar Mandal, Bulaki Das, Kamala Turi.

Animal Physiology Section

Faculty : Prof. A. K. Ray (In-Charge), Dr. G. Sa and Dr. Tanya Das (from : 07.07.2000)

Students* : Dr. Mitali Pramanik, Mr. Manik Ch. Ghosh (upto 21.01.2001), Mr. Suman Pal, Mr. Tathagata Choudhuri, Ms. Sreya Chattopadhyay (from 01.02.2001), Ms. Puspita Sarkar (from 16.02.2001), Mr. Ramendranath Saha (from 16.02.2001), Ms. Sumedha Roy (from 01.02.2001).

Supporting Staff : Mr. Indrajit Ray, Mr. Sujit K Ghosh, Mr. Apurba. K. Santra (30.09.2000) and Mr. Narayan Ch. Jana.

Biochemistry Department

Prof. Pratima Sinha (Chairperson), Prof. B. Bhattacharyya, Prof. N. C. Mandal (Emeritus Scientist, from 01.08.2000), Dr. P. Chakrabarti, Dr. Anuradha Lohia, Dr. R. Chattopadhyaya, Dr. P. Parrack, Dr. Dipa Bhaumick (from 11.07.2000 to 25.01.2001), Dr. Subrata Sau (from 28.09.2000)

Students : Ms. Anasuya Ganguly, Mr. Tapas Kumar Manna, Ms. Sujata Hajra, Ms. Rajasri Bhattacharyya, Ms. Debasree Dutta, Ms. Rima Chattopadhyay, Ms. Paromita Roychowdhury, Ms. Sulagna Ghatak, Dr. Mita Sen, Ms. Suchismita Das, Mr. Rajat Bhattacharyya, Mr. Santanu Kumar Ghosh, Mr. Taradas Sarkar, Mr. Debnath Pal, Mr. Ajit Bikram Datta, Ms. Lipika Pal, Ms. Suvroma Gupta, Dr. C. Ganesh Kumar, Mr. Pushpankur Ghosal, Mr. Ranjit Prasad Bahadur, Ms. Doyel Mitra

Supporting Staff : Mr. Subhash Chandra Debroy, Mr. Durga Charan Das, Mr. Swapan Kumar Das, Mr. Ashim Kumar Banerjee, Mr. Narayan Chandra Datta, Mr. Susanta Kumar Das, Mr. Subhash Chakraborty, Mr. Asim Kumar Poddar, Ms. Debarati Kanjilal, Sri Durjyodhan Roy (Expired on 08.07.2000), Sri Biswanath Bez, Md. Asraf Ali Molla, Sri Sudhangsu S. Maity, Sri Basudeb Ghorui, Sri Dulal Chandra Mandal, Smt. Ranubala Das.

* Includes Research Scientist/Research Associates/Post doctora Fellows / Pool Officers / Senior Research Fellows / Junior Research Fellows

Physics Department

Faculty : Prof. Asok Banerjee (Chairman), Prof. S. Roy, Dr. G. Basu

Students : Ms. Manashi Ghose, Ms. Ruchira Chattopadhyaya, Ms. Suparna Bhattacharya, Ms. Sibani Chatterjee, Ms. Sanchari Kar, Ms. Soma Samaddar, Mr. Atanu Maity, Mr. Asim Kr Bera, Dr. Sudip Bose, Dr. Arun Ghosh, Mr. Raja Banerjee, Mr. Rajesh Saha, Ms. Suranjana Chatterjee, Mr. Amlanjyoti Dhar, Mr. Atanu Polley.

Supporting Staff : A. Bhattacharyya, B. Majumder, B. Marick, B. Munshi, S. Jogsharma

Chemistry Department

Faculty : Prof. B. Ghosh, Prof. S. Gupta, Prof. K. K. Mukherjee (Chairman), Prof. S. Sen Mandi, Prof. P. K. Das, Dr. D. N. Sengupta, Dr. S. Bhattacharyya, Dr. T. K. Ghose, Dr. S. Gupta Bhattacharyya, Dr. D. Basu.

Students : Sarat Kumar Raj, Dr. Pampa Chakraborty, Debajyoti Ghosh, Rajasri Bhattacharya, Subhra Talai, Dr. Rouf, Saswati Laha, Papia Roy, Mousumi Sengupta, Kakali Banerjee, Kamala Niyogi, Rajan Kr. Das, Indrani Bhattacharya, Dr. Gourab Gangopadhyay, Dr. Malabika Roy, Sujit Roy, Sailendranath Das, Indrani Chowdhury, Sudipta Datta, Amitava Bhattacharya, Prasenjit Chakraborty, Dr. Saswati Sen, Dr. Ghosh, Sudeshna Bhattacharya, Rohini Trivedi, Aryadeep Roychowdhury, Mekhala Maiti, Siraj M. De, S. R. Dey, S. Biswas and N. Dey, S. Dey, S. Dey.

Supporting staff : Sankar Bose, Sukumar Majumder, Dr. Romit Poddar, Chanchal Chakraborty, Jadab Kr. Ghosh, Krishna Modak, Chaitali Roy, Kaberi Ghosh, Shyamal Kr. Ghosh, Dilip Kr. Chakraborty, Sukadeb Das, Arun Chatterjee, Sudhir Jana, Sasanka Sekhar Bera, Sambhunath Debnath, Dhiren Kumar Das, Rabin N. Choudhury, Bipul Kr. Nag, Kanan Singh, Jagannath Das, Sarama Pradhan, Manimohan Ghosh.

Botany Department

Faculty : Prof. P. Chakrabarti, Prof. P. Bhattacharyya (Chairman till 28.02.2001), Prof. P.C. Sen (Chairman till 28.02.2001), Dr. M. Chakrabarty, Dr. K.P. Das, Dr. J. Basu, Dr. M. Kundu, Dr. P.C. Sil, Dr. P. Das.

Students : Nilanjana Chakraborty, Sandipan Sarkar, Madhumouli Chatterjee, Dr. Prasun Kanta Moitra, Dr. Arun Ghosh, Dr. Debasish Ghoshal, Suman K. Singh, Ramkrishna Basak, Debasish Maity, Sanjib Bhakta, Arun Ghosh, Sudipa Saha, Ashima Bhattacharyya, Baisakhee Saha Chowdhury, Bhaswati Samanta, Arun Baranwal, Debabrata Mandal, Shresh Pathak, Snehangshu Kundu, Samiran Saha, Kakali Dey, Arun Sarkar, Arunava Dasgupta, Indranil Chakraborty, Ashis Biswas, Pratik Datta

Supporting Staff : Nirmal Kumar Das, Prasanta Kumar Pal, Anirudha Aich, Sukumar Maitra, Gopinath Chatterjee, Paresh Bhattacharyya, Pranab Kumar Dey, Bhabani Prasad Banerjee, Debdas Nandy, Rama Chatterjee, Gopal Kumar Biswas, Amarnath Bhatta, Tapas Ghosh, Arindam Basu, Dipak Chandra Konar, Arun Chandra Paul, Ashoke Kumar Maity, Sachidanand Ram, Kalyan Das

Distributed Information Centre

Dr. Akpani Chakrabarti (Scientist-in-charge).

Supporting Staff : Dr. T.C. Ghosh, Mr. V.S. Sundararajan, Mr. T.K. Bhattacharyya, Ms. S. Majumdar, Mr. S.K. Das, Dr. D. Roy (RA) and Mr. J. Mandal

Environmental Sciences Section

Faculty : Prof. P. K. Ray (till 19.05.2000), Prof. Meher H. Engineer (from 19.05.2000).

Supporting Staff : Anandamay Adak, Asis Kumar Dalal, Sushmita Bid, Sudam Chandra Jana, Siddhartha Ray, Arun Maji, Dwijendra Mukherjee and Biswajit Das.

Immunotechnology Section

Prof. P. K. Ray (till 19.05.2000) and Dr. Nripendranath Mandal

Students : Srikanta Jana and Selvaniani Vijayalingam.

J. C. Bose Unit and Museum

Dibakar Sen (In-Charge), Shri N. Das.

Library

Dr. A. K. Chakravorty (Librarian), Mrs. R. Mitra, Mr. P. G. Das, Mr. K. Hait, Mr. S. Pal, Mr. P. K. Sarkar, Dr. (Mrs.) B. S. Chaudhuri, Mrs. G. Dasgupta, Mr. G. Mukherjee, Mr. A. Kolay, Mr. S. Bhuiyan, Mr. M. J. Jogsharma, Mr. A. K. Nandi, Mr. D. Das.

Madhyamgram Farm

Dr. T. K. Ghose (Scientist-In-Charge) and Dr. S. R. Sikdar (Co-Scientist-in-Charge)

Supporting Staff : Sri Pulak Kummar Roy, Sri Bimal Chandra Modok, Sri Kachi Ram Kole, Sri Basudeb Jana, Sri Rakhil Chandra Jana, Sri Dilip Pramanick, Sri Chittaranjan Mallick, Sri Sukumar Das, Sri Subhas Senapati, Smt. Sabita Baisya, Sri Jagobandhu Nayak, Sri Rabin Talukdar, Sri Laxmi Kanta Prodhan, Sk. Inal Ali, Sri Bhanu Kisku, Sri Mahesh Dasgupta, Sri, Nodiran Kayal, Sri Rajkishor Lenka.

Microbiology Department

Faculty : Prof. A.C. Ghose (Chairman), Prof. Timir B. Samanta, Prof. P.K. Chakrabarty, Dr. Pradosh Roy, Dr. S. Majumdar, Dr. S.K. Das Gupta, Dr. Tapan K. Dutta.

Students : Dr. Anup K. Halder, Dr. Anjana Singh (upto 16.3.01), Dr. Madhumita Sirkar, Dr. Radharani Marick (upto 30.9.2000), Dr. Sovan Roy, Ananda Mukherjee, Sandip Bhattacharya, Sanjukta Ghosh, Bisweswar Nandi, Shuvendu Das, Chandrajit Lahiri, Abhijit Basu, Mahashweta Mitra, Mithu De, Amit Sarkar, Anasuya Ray, Piyali Mukherjee.

Supporting Staff : S.K. Das (II), Dr. Bandana Banik (upto December, 2000), N.K. Malakar, B.N. De Sarkar, B.N. Mandal, P.K. Chattopadhyay, P. Gupta, S. Gazi, D. Sarkar, Babli Marrick, Prabir Halder, Debashis Majumdar, B. Bahali, N. Patra, J. Prasad, D. Bhattacharyya, R. Prosad, B. Ram, S. Das, Rabin Pal, Sankar Bari, Purnendu Manna, Narayan Patali.

Physics Department

Faculty : Prof. I. Bose (Chairperson from 01.01.2001), Prof. S. Raha (Chairman till 31.12.2000), Prof. S. C. Roy, Prof. M. H. Engineer, Prof. D. Home, Dr. S. N. Changdar, Dr. (Mrs.) B. Roy, Dr. B. K. Chatterjee, Dr. S. K. Saha, Dr. T. P. Sinha.

Students : Dr. Ranjana Kumari (till 5.2.2001), Dr. Basudhara Basu Nandi (from 2.1.2001), Mala Das, Shibaji Banerjee, Som Shubhro Bandyopadhyay, Sonali Saha, Emily Chattopadhyay, Ujjwal Sen, Debabrata Parihari (from 2.1.2001), Samir Kunkri (from 2.1.2001).

Bose Institute

ing Staff : N. C. Dey, A. K. Ganguly, K. C. Das, S. P. Singha, Shyam Sundar Mallik, Subhasis Banerjee, Datta, Subrata Das, Tarun Kumar Maji, B. P. Ram, B. Dutta, D. K. Thakur, S. K. Basu, R. K. Mourya, Calder.

Molecular and Cellular Genetics Section

N. Lahiri Majumder (Head), Dr. Amita Pal, Dr. Sampa Das, Dr. S.R. Sikdar.
s : Dr. Shilpi Ghosh, Dr. Sabyasachi Kundagrami, Dr. Sanghamitra Bhattacharyya, Dr. Sitakanta k, Dr. Biswajit Das, Ms. Krishna Roy, Dr. Santi Ranjan Dey, Shamik Das, Palash Mondal, Santanu adhyay, Anirban Chatterjee, Sudarsana Biswas, Indrajit Dutta, Manoj Majee, Jolly Basak, Malay rottam Dey, Aparajita Das, Krishnarup Ghosh Dastidar, Rittika Bhattacharyya, Raja Bhattacharya, Majumder.

ing Staff : Puspita Mukherjee, Ashim Kumar Nath, Motilal Singh, Pravash Basu Roy, Ganesh Dey, Arup Kumar Dey, Sk. Eklas Ali and Subal Basak.

tion

K. Das Gupta (Superintendent), C. K. Sasmol

al Sophisticated Instrumentation Centre

. Mukherjee (Scientist-in-Charge) and Dr. Siddhartha Chaudhuri
ing Staff : Mr Tapan Datta, Mr Shyam Sundar Kundu, Mr Gobinda Das, Mr Amit Kumar Mahindar, eb Kumar Chattopadhyay, Mr Pathik Ranjan Ray, Mr Alokanda Sarkar, Mr Arup Kumar Sen, Mr umar Mukherjee, Mr Pradip Kumar Karmakar, Mr Subhas Chandra Maikap, Ms Tanima Modak (Dhar), isha Banerjee, Mr Ranjit Kumar Ghosh, Mr Debabrata Polley, Mr Sankar Santra, Ms Saraswati Sen.

nop

ukherjee (Superintendent), Mrinal Ch. Roy, Ashutosh Sarkar, Samar Dutta, Sisir Kr. Ghosal, Sithil ee, Tarapada Das, Dipen Sen, Bankim Dutta, Subhas Chakraborty, Sk. Md. Ehia Hossian, Basanta Bholanath Saren, Sourendra Nath Chakraborty, Abdul Rahaman Molla, Panchanan Santra, W.D. Panchugopal Karak, Rajkumar Das, Pranab Banerjee, Subrata Basak, Lochan Shee, Gopal Ch. Das, Begum, Sk. Md. Farruck, Kishori Mohan saha, Kalachand Sen, Bramdeo Prasad, Thakur Gond, Das, Alok Kundu. Mr. Dipak Dutta, Pitambar Patra, Anil Sengupta, Tapan Kr. Mondal, Jogendra s, Ashit Banerjee, Sk. Md. Raffick, Murari Mohan Shee, Baidya Nath Murmu & Sanjoy Santra.

Statement of Accounts for the year 2000-2001

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** (including Governing Body Account audited by a separate Auditors) **as at 31st MARCH 2001** and the annexed Income and Expenditure Account for the year ended on that date, which are in agreement with the books of account and records/ audited accounts of Governing Body produced to us.

The aforesaid Balance Sheet and Income and Expenditure Account have been drawn up by the amalgamation of :

- a) Council Account as on 31.03.2001
- b) Governing Body Account (G.B.) as on 31.03.2001, which has been audited by Mr. H. S. Maiti, Chartered Accountant with his report thereon dated 10.08.2001.

In our opinion and to the best of our information and according to the explanations given to us, the Balance Sheet and Income & Expenditure Account read with the Notes in Schedule-IX and subject to Note No. 9 of Schedule-IX and our observations as enclosed herewith, give a true and fair view in the case of the Balance Sheet of the state of affairs of the Institute as at 31st March, 2001 and in the case of the Income and Expenditure Account, of the deficit for the year ended on that date.

Encls : Observations

For RAY & RAY
Chartered Accountants

6, Church Lane
Kolkata-700001
Dated 9th September 2001

Sd/.
(N. Saha)
Partner

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

	Funds and Liabilities	Schedule No.	As at 31st March 2001 Rs. P.
8.95	CAPITAL FUND	I	14,40,29,278.95
	DEVELOPMENT FUND		
3.78	Institute Development & Modernisation Fund		10,10,39,491.78
0.93	OTHER FUNDS	II	7,21,41,357.28
0.57	CURRENT LIABILITIES	III	1,22,07,202.45
1.97	Excess of Income over Expenditure in respect of Grant-in-Aid Schemes	IV	1,12,11,755.84
6.20			34,06,29,086.30

Institute
Kolkata-700 009
as at 31st March, 2001

As at 31st March 2000 Rs. P.	Properties and Assets	Schedule No.	As at 31st March 2001 Rs. P.
14,12,69,204.44	FIXED ASSETS	V	14,40,71,794.44
20,12,368.00	WORK IN PROGRESS	VI	52,98,701.00
31,68,110.38	INVESTMENTS	VII	31,68,110.38
	INSTITUTE DEVELOPMENT AND MODERNISATION FUND INVESTMENT		
1,20,60,757.00	In Fixed deposit with Bank	Rs. 1,15,64,414.00	
6,14,39,519.15	In Fixed Assets	Rs. 6,14,41,498.15	7,30,05,912.15
	CURRENT ASSETS, LOANS & ADVANCES	VIII	
1,52,28,697.71	A. CURRENT ASSETS	Rs. 63,79,827.92	
52,72,757.93	B. LOANS & ADVANCES		
	Secured : Rs. 62,91,150.00		
	Unsecured :		
	Considered		
	Good Rs. 14,18,772.93		
	Considered bad or doubtful not provided for Rs. —	77,09,922.93	1,40,89,750.85
97,02,585.69	Excess of Expenditure over Receipts in respect of Grant-in-Aid Schemes	IV	57,96,763.98
1,44,61,300.55	Employees Pension Fund Investment etc. (As per Balance Sheet attached)		1,51,59,545.55
3,87,88,746.17	Employees General Provident Fund Investment etc. (As per Balance Sheet attached)		4,43,27,953.52
23,09,826.26	Employees Contributory Provident Fund Investment etc. (As per Balance Sheet attached)		30,61,880.26
30,57,13,873.28			30,79,80,412.13

Bose
93/1, Acharya Prafulla Chandra Road
Balance Sheet

As at 31st March 2000		Funds and Liabilities	Schedule No.	As at 31st March 2001	
Rs.	P.			Rs.	P.

B/F				34,06,29,086.30	
33,14,25,286.20					

33,14,25,286.20

34,06,29,086.30

Sd/-
S.P. Sit
Accountant
Bose Institute

Sd/-
R. Bhattacharya
A & FO
Bose Institute

Sd/-
S. Pal
Accounts Officer
Bose Institute

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

Institute
Kolkata-700 009
as at 31st March, 2001

As at 31st March 2000		Properties and Assets	Schedule No.	As at 31st March 2001	
Rs.	P.			Rs.	P.

30,57,13,873.28				30,79,80,412.13	
		Excess of Expenditure over Income as per Income & Expenditure Account :			
		Governing Body	Rs. 2,97,587.10		
2,57,11,412.92		Bose Institute Council	Rs. 3,23,51,087.07	3,26,48,674.17	

33,14,25,286.20

34,06,29,086.30

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

Dated : 9 October, 2001

Sd/-
B. N. Singh
Registrar
Bose Institute

Sd/-
Prof. M. H. Engineer
Acting. Director
Bose Institute

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

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

2000 P.	Expenditure	Non-Plan Rs. P.	Plan Rs. P.	Total Rs. P.
	To			
7,33,24,390.22	A. Pay & Allowances (including Pension & Retirement Benefits)	4,08,10,683.05	4,08,09,402.83	8,16,20,085.88
1,13,39,459.70	B. Office Maintenance & other Estab. exp.	59,33,151.67	66,84,280.60	1,26,17,432.27
68,52,206.67	C. Laboratory exp.	—	70,33,673.31	70,33,673.31
	D. Transfer to Fund			
5,12,903.32	For Capital Expenditure	—	27,55,590.00	27,55,590.00
10,00,000.00	For HBL Advance	—	—	—
52,75,224.98	For Deficit meet up Fund	—	47,17,053.26	47,17,053.26
33,04,184.89	Total (A+B+C+D)	4,67,43,834.72	6,20,00,000.00	10,87,43,834.72
8,30,236.00	Excess of Income over Expenditure carried down	—	—	—
1,34,420.89		4,67,43,834.72	6,20,00,000.00	10,87,43,834.72

Institute
Kolkata-700 009

for the year ended 31st March, 2001

1999--2000	Income	Non-Plan	Plan	Total
Rs. P.		Rs. P.	Rs. P.	Rs. P.
	By			
	A. Grants and other Receipts :-			
9,10,00,000.00	Grant from Govt. of India (DST)	3,27,00,000.00	6,20,00,000.00	9,47,00,000.00
16,91,254.00	Service Charges	16,75,232.00	—	16,75,232.00
2,38,488.69	Interest from Bank	2,58,651.08	—	2,58,651.08
18,569.25	Interest on Security Deposit	24,315.50	—	24,315.50
5,00,030.97	Miscellaneous Receipts	2,58,599.30	—	2,58,599.30
30,000.00	Grant from DBT	—	—	—
2,49,484.00	Institute Consultancy	17,500.00	—	17,500.00
39,342.00	Income from Institute car	31,952.00	—	31,952.00
2,500.00	Workshop Consultancy	—	—	—
89,527.00	Sample Testing (RSIC)	58,155.00	—	58,155.00
52,75,224.98	Deficit meet up Fund	47,17,053.26	—	47,17,053.26
	Bid Fees	52,070.00	—	52,070.00
	Instrument usages	1,49,950.00	—	1,49,950.00
	Sale-proceeds	10,000.00	—	10,000.00
9,91,34,420.89		3,99,53,478.14	6,20,00,000.00	10,19,53,478.14
—	Excess of Expenditure over Income Carried down	67,90,356.58	—	67,90,356.58
9,91,34,420.89		4,67,43,834.72	6,20,00,000.00	10,87,43,834.72

Bose

93/1, Acharya Prafulla Chandra Road

Income and Expenditure Account

000	Expenditure	Non-Plan		Plan		Total	
		Rs.	P.	Rs.	P.	Rs.	P.
2,37,945.25	Excess of Expenditure over Income for the year Brought down	67,90,356.58		—		67,90,356.58	
3,90,966.49	Excess of Expenditure Income brought forward	2,55,60,730.49		—		2,55,60,730.49	
28,911.74		3,23,51,087.07		—		3,23,51,087.07	

Sd/-
Accountant
Bose InstituteSd/-
Accounts Officer
Bose InstituteSd/-
Deputy Registrar
Bose InstituteSd/-
Registrar
Bose Institute**Institute**

Kolkata-700 009

for the year ended 31st March, 2001

1999--2000	Income	Non-Plan		Plan		Total	
		Rs.	P.	Rs.	P.	Rs.	P.
1,10,68,181.25	Excess of Income over Expenditure for the year brought down			—			—
2,55,60,730.49	Net Balance transferred to Balance Sheet	3,23,51,087.07		—		3,23,51,087.07	
3,66,28,911.74		3,23,51,087.07		—		3,23,51,087.07	

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

Sd/-
Director
Bose Institute6, Church lane
Calcutta 700 001For RAY & RAY
Chartered AccountantsThe 9th October 2001Sd/-
(N. SAHA)
PARTNER