

ANNUAL REPORT

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SATYENDRA NATH BOSE NATIONAL CENTRE FOR BASIC SCIENCES

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Block JD, Sector III, Salt Lake
Calcutta 700 091, India

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CALCUTTA

ANNUAL REPORT

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OBJECTIVES

The S. N. Bose National Centre for Basic Sciences was established in June 1986 as a registered society functioning under the umbrella of the Department of Science and Technology, Government of India. Its objectives are :

to foster, encourage and promote the growth of advanced studies in selected branches of basic sciences;

to conduct original research in theoretical and mathematical sciences and other basic sciences in frontier areas, including challenging theoretical studies of future applications;

to provide a forum for personal contacts and intellectual interaction among scientists within the country and also between them and scientists abroad;

to train young scientists for research in basic sciences.

CONFERENCES/WORKSHOPS/SYMPOSIA

1. National Symposium on Modern Trends in Structure-Activity Relationship Studies of Drug related Compounds (June 18 and 19, 1995) at Shillong.

SNBNCBS and Lady Keane College, Shillong, organized this discussion in Chemistry. Dr. A. K. Bhattacharya of Lady Keane College was the convener. There were 21 registered participants, and many participants came from universities and research centres in the north eastern states. Speakers in this meeting included J. K. Dattagupta and R. Majumder (SINP), D. Mukherjee, D. Majumder, S. Ray and J. S. Mohanty (IACS), B. Banerjee, (IICB), I. Ghosh (ARCI) and S. A. Kulkarni (Poona University).

2. International Conference on Dynamics of Complex Systems (Satellite meeting to STATPHYS-19) (August 6 to 11, 1995), SNBNCBS, Calcutta.

Organised by the Centre in collaboration with the School of Physical Sciences (JNU), this was the first conference at its new campus at JD Block, Sector III, Salt Lake, Calcutta 700 091. The number of registered participants was 73 from India, and 17 from abroad plus 17 from the Centre's academic members. The convener and secretary were Prof. S. Dattagupta (JNU) and Dr. S. Puri (JNU), respectively. The conference Chairman was Prof. C. K. Majumdar (SNBNCBS). Among the invited speakers were R. Bausch (Dusseldorf), D. Dhar (Bombay), H. Muller-Krumbhaer (Juelich), H. E. Stanley (Boston), R. B. Stinchcombe (Oxford) and L. X. Turski (Warsaw). R. B. Stinchcombe and J. Kertesz (Hungary) were visiting India on INSA Exchange of Scientist Programme. The proceedings of the meeting were published in Physica A (Pub. B10).

3. Condensed Matter Days at Bhubaneswar (Aug 29-31, 1995)

The condensed matter physicists in eastern India (West Bengal, Orissa and north eastern states) have started this meeting, which has now become an annual affair. Dr. A. Banerjee and Dr. R. P. Datta of SNBNCBS attended the meeting at Bhubaneswar.

4. Training programme for ECRA-I (Nov 6-11, 1995)

For research workers interested in the Eastern Centre for Research in Astrophysics (ECRA), a week long lecture programme was organized at the Centre's new campus. Lectures were given by A. K. Sen, T. K. Das, A. Dasgupta, S. Raha, K. Kar, B. Basu, M. R. Gupta and A. Bandyopadhyay. The meeting was attended by about 10 research workers from and around Calcutta. On the last day the preliminary results on the total solar eclipse on October 24, 1995 were presented by T. K. Das, S. Chintalpudi and C. K. Majumder.

5. International Symposium on M. N. Saha, S. N. Bose and N. R. Sen held at the Asiatic Society (Nov 28-30, 1995)

The meeting was held at the Asiatic Society and the Birla Planetarium organized mainly by the Indian Astronomical Society and the Asiatic Society. Lecturers

included H. Banerjee, C. K. Majumdar and Chandra Das from the Centre. Speakers emphasised the influence of these scientists in the field of particle physics, astrophysics and general relativity. Several scientists from France, Canada, Denmark and Bangladesh participated in the meeting.

6. Fourth Workshop in High Energy Particle Physics/Phenomenology (WHEPP-4) (Jan 2-14, 1996)

The lectures were held in Saha Institute of Nuclear Physics in the first week; the workshop part was held in the Centre's new campus. Five working groups were formed on (i) collider physics, (ii) heavy flavours, (iii) QCD and QGP, (iv) Unification and model building and (v) astroparticle physics and neutrinos. The key note address was given by Prof. J. C. Pati (Maryland, USA). Prominent foreign speakers were : M. Mangano, H. S. Forté and M. Shaposhnikov (CERN). H. Murayama (Berkeley, USA), T. Browder and S. Pakvasa (Hawaii, USA), R. Barbieri (Pisa, Italy), P. Aurenche (LAPP, France), M. Drees (Madison, USA), S. Sarkar and A. Cooper Sarkar (Oxford, UK). Particle physicists from important institutions in India involved in particle physics research, e.g. TIFR, IISc., PRL, Calcutta University, IMAS, MRI, SINP, VECC, Jadavpur University, participated. There were altogether 115 participants from different parts of India and abroad. Some foreign workers who attended WHEPP-2 in Calcutta in 1991 came back for WHEPP-4. The guest house of the Centre was fully used, and its completion was strongly urged.

7. INCURSI-96 (International Conference of International Union of Radio Science) (Jan 16-18, 1996)

This meeting was held at the Science City Complex, and many guests (G. Swarup, M. R. Kundra, R. Sinha, S. Ananthakrishnan, S. C. Dutta Roy, V. P. Kodali and others) were accommodated at the Centre's guest house. The meeting started with a session on J. C. Bose — his original apparatus for generation of millimetre waves was shown to work even after 100 years.

8. 70 Years of Quantum Mechanics and Recent Trends in Theoretical Physics (Jan 29 - Feb 2, 1996)

The meeting was held at ISI, Calcutta. The international meeting was well attended by distinguished scientists from India and abroad - e.g. R. Jackiw, L. O'Raikeartaigh, J. Klauder, J. Mickelson, P. Budinich and N. H. Itagi, B. V. Sreekantan. The 7th S. N. Bose Memorial lecture was given by Prof. B. V. Sreekantan.

9. ECRA training lecture programme II (Jan 29-31, 1996)

The lectures by M. Kundu (Maryland) and A. Ray (TIFR) were well attended but the general attendance was not good. This was followed by a workshop at Kalyani University sponsored by IUCAA (Feb 1-3, 1996), which was well attended.

10. Concept of Reality in Science and Philosophy (Feb 24-25, 1996)

This seminar was held in collaboration with FAMTSIT and PHISPC and was attended by scientists like A. K. Raychaudhuri (PC), P. Bandyopadhyay (ISI), K. C. Gupta (VB), C. K. Raju (NISTAD) and P. Majumdar (Kalyani) and philosophers like



D. P. Chattopadhyay, P. K. Mukhopadhyay (JU), James Morly (St. Joseph College, Connecticut, USA), Navjyoti Singh (Delhi), S. Sarukkai NIAS, Bangalore) and H. Banerjee (JU). The talks were well attended and lively. The summary was given by C. K. Majumdar (SNBNCBS).

S. N. BOSE MEMORIAL LECTURE

The seventh S. N. Bose Memorial Lecture was delivered by Professor B. V. Sreekantan of National Institute of Advanced Studies, Bangalore on January 29, 1996, in the auditorium of the Indian Statistical Institute, the title was : Interaction between theory and experiment in the current century.

SEMINARS ORGANISED AT THE CENTRE

1. Banerjee, Amitava, SNBNCBS, Calcutta : continued lectures on Molecular Dynamics and group discussion on Group Theory in Solid State Physics (April-May, 1995).
2. Datta, Jayati, Jadavpur University, Calcutta : Cost economy in the devices for non-conventional energy sources and their related thermodynamic and kinetic considerations (June 6, 1995).
3. Sengupta, M., NERIST, Arunchal Pradesh : Classical mechanical example of gauge-fixing as choice of coordinate frame (June 19, 1995).
4. Nag, Subhashis, IMAS, Madras : Teichmueller space and Bosonic string theory (July 4, 1995).
5. Majumdar, Parthasarathi, IMAS, Madras : (i) Aspects of High Energy Scattering in Eikonal approximation and beyond (I) and (II); (ii) Naturalness, supersymmetry and duality (colloquium) (July, 1995).
6. Malik, R. P., IMAS, Madras : On q-deformed spinning relativistic particle (July 7, 1995).
7. Ghosh, Sasanka, MRI, Allahabad : Consequences of Non-trivial PPN Parameters (August 3, 1995).
8. Mukherjee, Sugata, SINP, Calcutta : Ab Initio Calcutta of Nano Structure of SI (August 24, 1995).
9. Needs, Richard, Cavendish Laboratory, Cambridge : Origin and Implications of Surface Stress (September 5, 1995).
10. Chakrabarti, Arunava, Scottish Church College, Calcutta : Searching for extended electron states in a loopless fractal (October 17, 1995).
11. Harindranath, A., SINP, Calcutta : Constituent picture from field theory : partons or put-ons (October 31, 1995).
12. Saha, Abhijit, Space Telescope Science Institute, Baltimore : Sizing up the universe : Measuring the Hubble Constant (November 14, 1995).

13. Bhattacharjee, J. K. , IACS, Calcutta : Growth Models (November 14, 1995).
14. Raychudhuri, A., Calcutta University : Neutrinos : The Position Today (November 21, 1995).
15. Verma, R. K. PRL, Ahmedabad : Topological Manifestation in Classical Mechanics (November 24, 1995).
16. Datta, R. P., SNBNCBS, Calcutta : Coupled electron photon transport - a multidimensional discrete ordinates study (December 19, 1995).
17. Mookerjee, A., SNBNCBS, Calcutta : gave a series of lectures of Multiple Scattering theory to JRF students - 2 lectures per week in March, 1996.

VISITORS AT THE CENTRE

1. Dr. A. K. Ganguly, PRL, Ahmedabad : visited the Centre (May, 1995).
2. Dr. Surajit Sen, Dept. of Physics, G. C. College, Silchar, Assam, Mr. Sumanta Tewari, Mr. Indranil Paul and Mr. Suman Banerjee, IIT Kanpur : visited the Centre during the summer for summer projects.
3. Dr. M. Sengupta, NERIST, Arunachal Pradesh : visited the Centre (June 19, 1995).
- 4.5.6. Dr. Subhashis Nag, Dr. Parthasarathi Majumdar and Dr. R. P. Malik, IMS, Madras : visited the Centre (July, 1995).
7. Dr. Sasanka Ghosh, MRI, Allahabad : visited the Centre (August, 1995).
8. Dr. Richard Needs, Cavendish Laboratory, Cambridge : visited the Centre (September 5, 1995)
9. Dr. Abhijit Saha, Space Telescope Science Institute, Baltimore : visited the Centre (November 14, 1995).
10. Dr. R. K. Verma, PRL, Ahmedabad : visited the Centre (November 24, 1995).
11. Professor R. Dasgupta, Project Director, M. P. Council of Science & Technology, Bhopal : visited the Centre (January 24, 1996).

RESEARCH ACTIVITIES AT THE CENTRE

The Centre has active groups in Physics, Applied Mathematics and Theoretical Chemistry.

A. Physics

A detailed analysis of (abelian) duality and bosonisation in arbitrary D-dimensions has been done by R. Banerjee for the massive Thirring and Schwinger models in the large mass limit. These models bosonise to a theory involving a usual gauge field and a (D-2) rank antisymmetric tensor field (Kalb-Ramond field). Conventional results in $D = 2, 3$ are easily reproduced.

Together with N. Banerjee and S. Ghosh (Gobardanga Hindu College) R. Banerjee has investigated the nonabelian bosonisation of the 2+1 dimensional massive Thirring model in the large mass limit in the operator formalism. In the $m \rightarrow \infty$, $g \rightarrow 0$ limit the massive Thirring model gets mapped to the Yang-Mills-Chern-Simons theory. With the same collaborators he has reexamined the relativistic theory of anyons in which the crucial role of constraints has been highlighted.

N. Banerjee and R. Banerjee have developed a generalised embedding for the Proca model. The connection of the Proca field with either the Stueckelberg scalar or a 2-form gauge field has been illuminated.

The Galilean symmetry in a nonabelian Chern-Simons matter system has been examined. Whereas this symmetry is automatically preserved in the gauge independent formalism, some restrictions are necessary on the Green's functions if the computations are done in the symplectic (axial-gauge) approach. A general method of obtaining the spin of abelian or non-abelian Chern-Simons vortices has been developed. Fractional spin is found which is model-independent and agrees with results quoted in the literature (R. Banerjee, P. Mukherjee, ABN Seal College, Cooch Behar).

Renormalization in field theories is usually treated within the context of perturbation theory. Recently, however, there is a great surge of interest in Hamiltonian renormalization in a nonperturbative framework. K. S. Gupta, in collaboration with J. Vary and T. J. Fields (both of Iowa State University) has developed a formalism to apply nonperturbative renormalization methods to effective Hamiltonians. Some simple problems illustrating their scheme have been presented in the first paper in this topic while more elaborate applications of their method to field theories and many body problems are currently under investigation.

HQET (Heavy Quark Effective Field Theory) has become enormously popular in the last few years mainly because it gives an angle to handle some problems in Quantum Chromodynamics. In collaboration with J. Vary, A. A. El-Hady, A. Datta and J. Spence (all of Iowa State University), K. S. Gupta looked into the calculation of some hadronic matrix elements in the semileptonic B decays. Such calculations are very important for prediction of the Cabibbo-Kobayashi-Maskawa matrix element V_{cb} .

LF field theory (Light Front Field Theory) is currently being considered as a major tool for exploring strong interaction and other nonperturbative aspects of field theories. In collaboration with A. Haridranath of SINP, K. S. Gupta has been looking into several aspects of this formalism. In particular, the nature of the constraints in LF QCD is being investigated. This is important for the proper formulation of the Hamiltonian.

V. V. Sreedhar has studied the infra-red limit of non-abelian Chern-Simons gauge theory perturbed by a non-topological, albeit gauge invariant, mass term. He showed that, in this limit, one may construct an infinite class of integrable quantum mechanical models which, for the case of SU(2) group, are labelled by the angular momentum eigenvalue. The first non-trivial example in this class is obtained for the triplet representation and it physically describes the gauge invariant coupling of a

non-abelian Chern-Simons particle with a particle moving on S^3 - the $SU(2)$ group manifold. In addition to this, the model has a fascinating resemblance to the Landau problem and may be regarded as a non-abelian and a non-linear generalisation of the same defined on the three-sphere with the uniform magnetic field replaced by an angular momentum field. Explicit solutions in a closed form in terms of some generalised orthogonal polynomials for some eigenstates of this model were constructed. In doing so, some startling connections with Anderson's chain models which are important in the study of disordered systems in condensed matter physics were unravelled. A method which allows one, in principle, to find the energy eigenvalues corresponding to the above eigenstates of the theory if the Lyapunov exponents of the transfer matrix of the infinite chain model involved are known was also sketched.

In the area of quantum field theory, a study of gauge and shape independence of fractional spin of solitons in (2+1) dimensional $O(3)$ non-linear sigma model with Chern-Simons term was made by A. Roy. An almost similar work is in progress in respect of the Chern-Simons-Higgs model.

It has been known for some time that for certain two body scattering processes, at a scale of centre of mass energy of the order of Planck scale or beyond, the relevant S-matrix is exactly tractable yielding nontrivial information about the interaction. These semi-classical calculations are non-perturbative in contrast to the cases (as in quantum gravity) where a perturbation expansion leads to uncontrollable divergences. Example in this direction are : scattering of two spinless massive particles, charge-charge scattering, charge monopole scattering where the second particle approaches the first (target) one at luminal speed. The exact S-matrix result has also been derived from respective quantum field theoretic models in a reduced action. However, the reduced action formulation for the charge-monopole case is yet to be studied. S. Paul and B. Bagchi have first studied the boosted monopole solution in the luminal limit from geometric background. It is shown that a class of one forms on S^3 - is relevant to it under the Hopf map $S^3 \rightarrow S^2$ but only in two circular regions of S^3 . Owing to the fact that the monopole breaks the isotropy of space-time the action formulation of this process has to be done regionwise. This is under consideration.

A nonrelativistic model involving complex scalar fields coupled to abelian Chern-Simons term was analysed by B. Chakraborty and A. S. Majumdar both at the classical and quantum level. The various space-time generations are constructed and the system is shown to be Galilean covariant at the classical and quantum level in the gauge independent Dirac approach. However, the corresponding gauge fixed reduced phase space analysis shows that though the Galilean algebra closes for the classical case, it does not do so at the quantum level because of operator ordering ambiguities. The model therefore serves as an example of inequivalent quantization. A Hamiltonian analysis of the model where nonrelativistic CP model coupled to Hopf term has been performed. A modified spin algebra is obtained. Implications in condensed matter physics are being studied at present. With T. R. Seshadri (MRI)

B. Chakraborty has studied quantum dynamics of the Brans-Dicke field in hyperextended inflationary models. Density perturbations have been calculated.

A consistent relativistic quantum mechanics of spin-0 and spin-1 bosons (both massive and massless) has been developed by P. Ghosh based on the Hamilton-Schrodinger form of the Kemmer equation and the associated constraints. This formulation has immense potential of being used for computing tunnelling times for photons and studying chaotic phenomena in quantum optics by making use of the Bohmian trajectories that can be defined in the formalism.

A new experiment was proposed by P. Ghosh to test further the nature of wave-particle duality of single photon states by making them incident on a birefringent crystal. The experiment is being done by C. S. Unnikrishnan et al at TIFR. The preliminary runs were conducted in October 1995. The results were encouraging and seemed to support the quantum optical predictions. Further runs are being conducted to improve the statistics.

The micromaser action involves pumping of two-level Rydberg atoms in their upper states into a very high Q superconducting cavity at sub-Kelvin temperatures at such a rate that almost one atom is present at any time in the cavity. In addition the flight time through the cavity is the same for every atom. An exact method has been developed by N. Nayak and collaborators for the simulation of the process involving any statistical input of atoms into the cavity. The first phase of the work involved a random arrival of atoms at the cavity as in the experimental setup. One of the key results of the work is that there is no true steady state in this case. However, the photon statistics fluctuates about the distribution functions obtained from a steady-state condition in their previous study. These fluctuations, entirely due to the randomness in the atomic pump, do not permit the cavity field evolve towards a Fock state. This suggests that a regular input of atoms may be a suitable choice for this purpose. This simulation is presently being studied using the Centre's DEC Alpha computer. Nayak has also studied a different problem involving Raman type interaction of two degenerate Rydberg levels of an atom with the single mode of an ideal cavity. The cavity field, initially in a coherent state, evolves to a statistical mixture of two coherent states. The degree of mixing is decided by the initial condition of the atom. The time evolution of the entropy suggests that the field and also the atom are in pure states periodically.

S. Ghoshal (Bhattacharya) studied the semiclassical lineshape theory for a four level system, interacting with two radiation fields. The lineshape shows many interesting features for varying incident powers and detunings. It is also found that the amplification without inversion can be obtained for a particular combination of incident powers and the ratio of infrared transition moments.

A. Mehta has worked on complex systems with a focus on the study of granular materials. A set of coupled nonlinear stochastic equations to model sandpile surface was presented by Mehta, Luck and Needs (Pub A 34); this is being analysed by Mehta and J. K. Bhattacharjee (IACS) and J. M. Luck (Service de Physique Theorique, CE-Saclay). With G. Barker (Institute of Food Research, Norwich, UK), she is developing

a scheme of hybrid granular dynamics. Other work in progress relates to the measurement of surface roughness exponents for a variety of non-equilibrium surfaces (with P. Sen (SINP) and G. Barker) and the modelling of technology propagation in society (with K. Chatterjee (Penn State Univ., USA)).

Heavy ion collisions at intermediate energies have been extensively studied by Boltzmann-Uehling-Uhlenbeck (BUU) approach by S. Chattopadhyay. He is able to reproduce correctly the mean trajectory of the system in the phase space. However, process like multifragmentation or the instability cannot be properly described by such mean or single trajectory calculation. Therefore, in order to have a proper understanding of the reaction dynamics towards fragment formation, a fluctuation collision term is incorporated in the BUU equation so that the evolution of the system can be described within the framework of the Langevin theory. This formalism is rigorously tested and applied to an important scenario to encounter the realistic situation. Work is in progress to perform a 3-D simulation.

Monte-Carlo simulation technique was used by J. Saha to generate cholesteric configuration of freely rotating chiral molecules. For this lattice model system, a method was formulated to calculate the order parameter; the temperature variation of average energy, pitch and order parameter.

A. Mookerjee and his coworkers have carried through the work on phase stability and phase diagram of alloys. Details are described in Research Projects 6, 7 and 8.

P. K. Thakur, CSIR pool officer, and T. Mitra, CSIR SRF have been investigating electron localization aspects through the studies of quantum transmittance in quasi-one dimensional random n-mer models of coupled chains. It has been shown by T. Mitra and P. K. Thakur that the electronic transmittance in two coupled random n-mer chains captures many of the essential features of quantum transport for the corresponding quasi-one-dimensional systems.

R. Chaudhury and D. Gangopadhyay have applied Van der Waerden's Colouring Theorem to a ternary alloy. The result is interesting : in this scheme one can map a ternary alloy onto an effective pure metal. The possibility of the breakdown of the Fermi Liquid picture in two dimensions for dynamically screened interaction and quasi-two-dimensional systems is also being investigated. R. Chaudhury, D. Gangopadhyay and S. K. Paul are also pursuing certain aspects of the Kosterlitz-Thouless vortices. Certain insights have been obtained in the possible functional forms of the Isgur-Wise functions in heavy quark effective theory. Prantick Dey and D. Gangopadhyay are studying these aspects.

R. Chaudhury in collaboration with B. K. Chakraverty (LEPES, CNRS, Grenoble, France) has continued to examine the criteria for formation of fermionic bound state in various spatial dimensions and under various conditions. An analytical expression for threshold value of attractive interaction to form bound state in the asymptotic region i.e. in the regime of crossover from quasi-two dimensional to two-dimensional situation was obtained. The investigation of the dependence of the temperature of formation of real space local fermion pair on the strength of attractive interaction,

is also in progress in collaboration with B. K. Chakraverty. R. Chaudhury has completed the study of the static effect of phase fluctuations in a layered BCS superconductor.

C. Das, CSIR Research Associate, has studied spontaneously generated magnetic field due to wave-plasma interaction using the kinetic theory model; and observed an explicit dependence of self-generated magnetic field on temperature. The change of rate of Landau damping of ion-acoustic modes in contaminated plasma is calculated. Non-linearity in the propagation of whistler mode in the Ionosphere has also been studied.

P. K. Mukhopadhyay started to build up a low temperature condensed matter laboratory at the JD Block campus.

Mossbauer studies with Fe 57 have been carried out on titanium bearing iron compounds and iron-chromium compounds in collaboration with IUC-DAEF (CC).

The observation of the total solar eclipse on October 24, 1995, at Diamond Harbour, West Bengal, was organized by ECRA and coordinated by C. K. Majumdar with participation from INRAPHEL, BI, SINP, OU and IUC-DAEF (CC). The radio sun at 4 GHz was observed with a 12ft dish antenna and its diameter was found to be larger than that of the optical sun by 4%. Data analysis is going on.

B. Applied Mathematics

Progress of work by Sujit K. Bose was maintained in (i) the theory of back-scattering imaging method of Non-Destructive Evaluation of composite laminates, where it has been shown in an example that less than 0.1 MHz is suitable rather than more than 10 MHz frequency used in the methods under development (with consequent unresolved problems), and (ii) Computational Mathematics problem of Finite Part treatment of the hyper singular integral equation occurring in the acoustic scattering or radiation from a hard open surface. New computationally simple integral equations have been derived. In a project oriented research "Vibration Control of Continuous Systems" supported by CSIR, Ganesh C. Gorain, Research Fellow, supervised by Prof. Sujit K. Bose, significant progress has been made. Exact Controllability and Stabilisation theory of a flexible structure (modelling large solar cell arrays) hoisted by a rigid hub at one end of the structure are being developed. The governing equations are Partial Differential Equations with non-standard boundary conditions (neither Dirichlet nor Neumann). Exact controllability means that, for a given time T_0 , one has to find a control function which drives the system to some desired state or rest at the time T . It is treated by the Hilbert Uniqueness Method. Results have been obtained for (i) flexural vibrations for internally undamped structure and (ii) Torsional vibration for internally damped structure. A kindred mathematical problem of stability for the solution of $y'' = \Delta y + \mu \Delta y'$, primes denoting differentiation with respect to time and Δ the Laplacian, in a bounded domain in R^n is also solved.

A 468 DX2 machine with suitable Applied Mathematical system support will be procured.

C. Mathematical Modelling

Estuary Problem : The preliminary study of the tidal flow pattern in the Ganges estuary by Dr. Srilekha Banerjee has been completed and results reported, which clearly show the semidiurnal nature of the tide with a 12 hours cycle.

Numerical Algorithms for parallel processing : Standard numerical techniques are being parallelized using process farming on transputer network. These include methods to solve large system of differential equations, algorithms for handling big matrix operations etc. The speedup and efficiency were tested for various configurations and topologies of the network.

Fluid Flow through a porous medium : A discrete model is being developed to study the oil flow through tight chalk layers with a high porosity. As the computation involves very high CPU time, this is an ideal situation for parallel processing. This work is in collaboration with V. A. Barker of IMM, Denmark.

Studies by S. K. Sharma towards examining the role of various soft particle approximation methods in the context of light scattering by small particles continued. A simple expression for the scattering function was obtained in the main form of the S-approximation for light scattered at perpendicular incidence by an infinitely long circular dielectric cylinder. The resulting expressions for the extinction efficiency and scattered intensity were numerically validated against exact results.

The knowledge of turbidity variation of a dilute suspension with wavelength of light is known to be useful for particle size distribution determination. In this connection Sharma and Roy have recently shown that it is possible to obtain, by the application of the first mean value theorem of integral calculus, simple expressions for the key parameters which characterize any unimodal particle size distribution. They have also obtained a new method, based on the use of Lagrange multipliers, for retrieving the particle size distribution in the suspension. Work on demonstrating the applicability of this approach is in progress.

In the area of classical optics (scattering), a study of S-approximation for Mie scattering was made by them. A new, simplified scalar S-approximation has been developed. This work is accepted for publication in Jour. Mod. Optics A. A study of inverse scattering for the Mie case is in continuation.

1. Roy, A. and Sharma, S. K. : On the validity of soft particle approximations for the light scattering by a homogeneous dielectric sphere - J. Mod. Optics.

Studies by A. Roy in developmental biology and ecology and stability of ecological system having space dependent diffusion co-efficients were done in collaboration with Dr. J. Chattopadhyay of I. S. I. The work has been re-communicated in the Jour. Ecological Modelling.

D. Theoretical Chemistry

In a series of works Gautam Gangopadhyay investigated classically chaotic system. He found a fluctuation-decoherence relationship in a few degree of freedom chaotic system which is analogous to fluctuation-dissipation relation in many body

system. He also investigated the generic quantum features, like evolution of quadrature uncertainties and barrier crossing rate which can be affected by the classical chaos.

He studied the effects of non-Markovian relaxation and multiphonon relaxation mechanism on the model pump-probe experiments and ir-uv sum frequency generation spectroscopies. A study of population trapping in a nonlinear Jaynes-Comings model is also performed.

RESEARCH PROJECTS

1. Nuclear fission and Nuclear Structure Calculations

This Emeritus Scientist's project sponsored by CSIR is operated by Prof. M. K. Pal. A totally antisymmetrized theory for drip-line neutron-halo nuclei has been developed. The wave function of the last loosely bound valence neutron pair coupled to that of the core nucleus has been explicitly antisymmetrized under exchange of every valence neutron with every core neutron. The variational equation for the minimization of total energy can be analyzed to yield in the lowest approximation to a three body equation, which has been solved by many authors for these nuclei. The present theory leads to explicit correction terms in higher order due to the antisymmetrization. A rough order of magnitude estimate reveals that the corrections to the three body solution can be as high as 40 to 50 per cent. Numerical computations have been planned and a paper with the theoretical derivation is nearing completion.

2. Theoretical High Energy Physics

This research project, sponsored by INSA under Senior Scientist Scheme, is operated by Prof. H. Banerjee. He has proposed a model for lattice fermion, which is (i) free from doublers, (ii) hermitian and (iii) chirally invariant. The damage due to the loss of reflection and hypercubic symmetries in the lattice action is repaired, thanks to the epsilon prescription, in the correlation functions. The Ward identities for the U(1) vector and axial vector currents of a gauge theory are reproduced correctly in weak coupling approximation in the continuum limit.

3. Probing the Foundation of Quantum Theory

This project is supported by DST, and Prof. P. Ghose, Dr. D. Home (BI) and Dr. A. Datta (JU) are collaborating on this project. Dr. A. S. Majumdar is a Research Associate working in this project. The project has been examining the following aspects : quantum non-locality, macroscopic limit of quantum mechanics, the measurement problem in the context of quasi-classical gravity, nonlinear modifications of quantum mechanics, signatures of wavefunction collapse in cosmology, and quantization of constrained hamiltonian systems. Two papers were published (Pub A 31 and 32), and the following papers were accepted :

- (i) Chakraborty, B. and Majumdar, A. S. : On Galilean covariance in a nonrelativistic model involving a Chern-Simons term *Annals of Phys. (N.Y.)*;
- (ii) Home, D. and Majumdar, A. S. : Testing a model of wavefunction collapse in the cosmological scenario (*Phys. Lett. A*).

4. Activities of VECC and SNBNCBS on High T_c Superconductivity and Extension to Low Temperature Superconductors.

The project is sponsored by the National Superconductivity Programme (NSP) as a collaborative work of the S. N. Bose National Centre and the Variable Energy Cyclotron Centre (VECC). Polycrystalline Bi-2212 and (Bi_{0.92}Pb_{0.17})₂212 were exposed to alpha irradiation to doses up to 8.14×10^{15} alpha particles/cm². Electrical resistivity (12 K to 300 K) and X-ray diffraction studies were carried out to compare radiation damage in them. For thallium based superconductors alpha irradiation (fluence 2×10^{16} / cm² at 40 MeV) reduces superconducting volume fraction, significantly in Tl-2212 and drastically in Tl-2212. This is found from the specific heat jump. But the onset of T_c as measured by ac-susceptibility is practically unchanged by irradiation. It has been found that the positron lifetimes in pellets of Bi-2212, (Bi,Pb)-2212 and (Bi,Pb)-2223 have a third component which can be attributed to positronium formation in voids in the oxides. This component should be allowed for, in spite of its low intensity to get good values of the usual lifetimes T₁ and T₂ (Pub A 42). Single crystals of Bi-2212 with T_c = 80K were irradiated by alpha particles at VECC; analysis of excess conductivity has shown that the interlayer coupling decreases with increase of irradiation dose.

5. Structure-Property Correlation in the Phase-transitions of Metallomesogens (liquid crystals)

The work in this project is done with Prof. M. Bose and Prof. C. K. Majumdar, Ms. J. Saha was SRF. Our previous EPR studies on aryl β diketonates of Cu were confined to the contrasting behaviour of C₈OCu and C₈Cu. With the collaboration of Prof. K. Ohta, our work has been extended to cover C₇Cu, C₆Cu (C_nCu) on the one hand and C₆OCu, C₇OCu, C₁₀OCu and C₁₂OCu (C_nOCu) on the other. Though C₆Cu behaved as the prototype columnar C₈Cu (single exchange - narrowed EPR line), C₇Cu surprisingly behaved like the prototype lamellar C₈OCu (hyperfine structure with quadrupolar forbidden transitions). Further, C₇OCu followed the pattern of C₈OCu, but C₆OCu, C₁₀OCu and C₁₂OCu exhibited the hyperfine quartets but no quadrupolar forbidden transitions. Thus spectra seems to depend on the chain length, which in turn determines its conformation and hence structure. We are trying to determine the conformation of the chains which determine packing : Thus the X-ray structures of C₆Cu and C₇Cu are very different. Though both belong to the triclinic system with z = 1, the 'c' parameter is almost doubled in C₇Cu. Further dynamics in the two compound is very different. Thus C₇Cu has a pretty long ¹H relaxation time T₁ (68.9 m sec) compared to a short T₁ (1.9 m sec) in C₆Cu. Dynamics of the other compounds are being studied. In C_nOCu, only C₇OCu has a lower symmetry, as compared to a much higher symmetry in C₆OCu, C₁₀OCu and C₁₂OCu. X-ray data on these compounds are lacking.

Computer simulation of the EPR spectra (with strong quadrupolar forbidden transitions) for C₈OCu and 2C₈Cu - 2OC₈ (mixed alkyloxy) has provided quadrupolar interaction parameter 'q' for the above two compounds.



Some Ni complexes viz., with aryl β diketone (non-mesogenic) and with N (2-Hydroxy - 4 - n - Hexyloxy benzlidene - 4" - n - dodecylphenylaniline (mesogenic) were interesting. In the solid state, both compounds are diamagnetic. ^1H NMR spectrum of the former in CHCl_3 solution has narrow lines and show well resolved structure. However, the latter compound exhibit rather broad lines or bands, some of which are shifted to higher fields and has been interpreted in terms of solvation effects, leading to paramagnetism.

6. Numerical study of Transition and Noble metal disordered alloys and their phase diagrams

The project is sponsored by the Department of Science and Technology. Prof. A. Mookerjee is the principal investigator, Dr. G. P. Das (BARC) is the co-investigator and Biplab Sanyal is a Junior Research Fellow. The formulation of the augmented space recursion method coupled with the orbital peeling technique has been completed. Effects of local lattice distortion and short range ordering have been studied. Phase stability in a series of transition-noble metal alloys have been studied : CuPd, AgPd, FeTi, CuRh, CuNi. Stable phase of the Aluminides of Fe, Co and Ni have been studied using the concentration wave method. The formulation for disordered ternary alloys have been completed and CuNiZn and CuPdRh ternary alloys have been studied. The stable magnetic phases of AuFe alloys have been studied, with the disordered moment (spin glass) being stable at low concentrations of Fe and the ferromagnetic at high concentrations. The proposed work in the project is nearing completion and the aim is to go beyond and study surface layer stabilities in the remaining period. Most of the above work have been published. The following papers have been accepted :

- (i) Saha-Dasgupta, T. and Mookerjee, A. : Study of the Phase stability in CuRh alloys - J. Phys. Condens. Matter.
- (ii) Dasgupta, I., Saha-Dasgupta, T., Das, G. P. and Mookerjee, A. : Study of the Aluminides of Fe, Co and Ni - J. Phys. Condens. Matter.
- (iii) Sanyal, B., Biswas, P., Saha-Dasgupta, T. and Mookerjee, A : An Augmented Space Recursion Formulation for the Study of Disordered Ternary Alloys - J. Phys. Condens. Matter.

7. Network Program on Metals and Alloys (ICTP Project at Dhaka)

This program is funded by the ICTP, Trieste. Prof. Mesbahuddin Ahmed (Dhaka) is the principal investigator. Prof. A. Mookerjee, Prof. R. Prasad (IITK) and Dr. G. P. Das (BARC) are co-investigators. Prof. Mookerjee collaborated with Prof. Ahmed and B. Sanyal and P. Biswas (SNBNCBS) to set up a formulation to study spectral densities, complex band structures and fuzzy fermi surfaces. The main paper has been published, while the following paper have been accepted :

- (i) Biswas, P., Sanyal, B., Halder, A., Ahmed, M. and Mookerjee, A. : Complex band structure of AgPd alloys - Phys. Rev. B (brief report).

8. Collaborative Programme with Warwick University

As an ongoing collaborative programme with Prof. A. K. Bhattacharyya, Catalysis and Solid State Research Laboratory, University of Warwick, Prof. A. Mookerjee, Dr. A. Banerjee and Dr. R. P. Datta have been doing calculations on the structure and electronic properties of small transition metal clusters. By a semiempirical method, the Equivalent Crystal Theory with the Monte carlo technique, optimised minimum energy structures for Cu and Ni cluster were found. The Linear Combination of Atomic Orbitals (LCAO) method, particularly the parametrisation scheme due to Harrison, was used to calculate the binding energy, density of states and HOMO-LUMO gap of the optimised clusters. The results of our calculations have been communicated in the papers and presentations given below. At present we are involved in the simulated annealing and 'melting' studies on these clusters. The following papers were accepted for publication :

- (i) Datta, R. P., Altekhar, S. D., Ray, A. K. and Morel, J. E. : Coupled Electron Photon Calculations in Two Dimensions - *Phys. Rev. E*.
- (ii) Datta, R. P. Banerjee, A. and Mookerjee, A. : Calculations on Cu clusters : Structure and Energetics - *Ind. J. Phys.*
- (iii) Datta, R. P., Banerjee, A. Mookerjee, A. and Bhattacharyya, A. K. : A Semi-empirical Study of Small Copper Clusters - *Mod. Phys. Lett. B*.
- (iv) Datta, R. P., Banerjee, A., Mookerjee, A. and Bhattacharyya, A. K. : Calculations on Ni clusters : An equivalent crystal theory - *Ind. J. Mod. Phys. B*.

PUBLICATIONS

A. Scientific Journals

1. Bandyopadhyay, A. and Gangopadhyay, G. : Population trapping in the Jaynes-Cummings model with a Kerr nonlinearity in the cavity - *J. Mod. Opt.*, 1996, **43**, 487-507.
2. Banerjee, Amitava : Semi-empirical simulations of solid surfaces and interfaces, *IJPAP*, 1995, **33**, 534-540.
3. Banerjee, N. and Banerjee, R. : Bose symmetry and bosonisation - *Nucl. Phys.*, 1995, **B445**, 516-524.
4. Banerjee, N., Banerjee, R. and Ghosh, S. : Quantisation of second class systems in the Batalin-Tyutin formalism - *Ann. Phys. (NY)*, 1995, **241**, 237-257.
5. Banerjee, N., and Ghosh, S. : Interacting anyons and Darwin Lagrangian, *Phys. Rev.*, 1995, **D52**, 6130-6133.
6. Banerjee, R. : Bosonisation in three-dimensional quantum field theory - *Phys. Lett.*, 1995, **B358**, 297-302.
7. Banerjee, R. : Duality and bosonisation in arbitrary dimensions - *Nucl. Phys.*, 1996, **B465**, 157-174.

8. Banerjee, R. : Geometry and dynamics of the Landau-Lifshitz model of ferromagnetism as a constrained system - *Phys. Lett.*, 1995, **B357**, 163-168.
9. Banerjee, R. and Chakraborty, B. : Formulation of the Landau-Lifshitz model of ferromagnetism as a constrained dynamical system - *Nucl. Phys.*, 1995, **B449**, 317-346.
10. Banerjee, R. and Rothe, H. J. : Batalin-Fradkin-Tyutin embedding of a self-dual model and the Maxwell-Chern-Simons theory - *Nucl. Phys.*, 1995, **B447**, 183-191.
11. Banerjee, R., Rothe, H. J. and Rothe, K. D. : On the equivalence of the Maxwell-Chern-Simons theory and a self-dual model - *Phys. Rev.* 1995, **D52**, 3750-3752.
12. Basu, C. and Thakur, P. K. : Characterisation of the delocalised states in a continuous correlated disorder model - *Physica A*, 1995, **217**, 289-301.
13. Biswas, P., Sanyal, B., Fakhruddin, M., Ahmed, M., Mookerjee, A. and Halder, A. : An Augmented space recursion in the k-space representation - *J. Phys. Condens. Matter*, 1995, **7**, 8569-8575.
14. Bose, S. K. and Dutta, D. : Reflection of P-waves in a pre-stressed dissipative layered crust - *Proc. Indian Acad. Sci. (Math. Sci.)*, 1995, **105** (No. 3, August), 341-351.
15. Bullough, R. K. Bogoliubov, N. M., Nayak, N. and Thompson, B. V : Q-boson and boson cavity quantum electrodynamics : fundamental theory of the micromaser - *J. Quant. Nonlinear Phenomena*, 1995, **2**, 13-29.
16. Chakraborty, B. : Relativistic particles coupled to Chern-Simons term - revisited, *Ann. Phys.* 1995, **244**, 312-339.
17. Chattopadhyay, S. : Inclusion of fluctuation in BUU dynamics : a method of simulation - *Phys. Rev.*, 1995, **C52**, R 480-R484.
18. Chattopadhyay, S. : Spinodal instabilities within Boltzman-Langevin dynamics - *Phys. Rev.*, 1996, **C53**, R 1065-R 1069.
19. Chaudhuri, S., Gangopadhyay, G. and Ray, D. S. : Fluctuation and decoherence in classical chaos : A model study of a Kubo oscillator generated by a chaotic system - *Phys. Rev.*, 1995, **E52**, 2262-2267.
20. Chaudhuri, S., Gangopadhyay, G. and Ray, D. S. : Special issue on Complex systems - *Ind. J. Phys.*, 1995, **69B**, 507-523.
21. Chaudhuri, R. : Schemes for the calculation of the free energy and specific heat for marginal Fermi Liquid in the normal and superconducting phase, *Cand. J. Phys.*, 1995, **73**, 497-504.
22. Chaudhuri, R. and Gangopadhyay, D. : Interacting fermions, scaling and possible departure from Fermi liquid behaviour, *Mod. Phys. Lett.*, 1995, **9B (25)**, 1657-1664.

23. Dasgupta, I., Saha, T. and Mookerjee, A. : An Augmented Space recursive method for the study of alloy phase stability random binary alloys - *Phys. Rev.* 1995, **B 51**, 3413-3421.
24. Dasgupta, I., Saha, T. and Mookerjee, A. : An Augmented Space Recursive Technique for the study of the electronic structure of binary random alloys - *J. Phys. Condens. Matter* 1996, **8**, 1979-1996.
25. Dey, S. and Bose, S. K. : Bed shear in equilibrium scour around a circular cylinder embedded in a loose bed - *Appl. Math. Modelling*, 1994, **18**(May), 265-273 (though of earlier year, received only last year).
26. Dey, S., Bose, S. K., and Sastry, G. L. N. : Clear Water Scour at Circular Piers : A Model - *ASCE J. Hydraulic Engineering*, 1995, **121** (No. 12).
27. Gangopadhyay, G. and Ray, D. S. : The non-Markovian master equation for stochastically perturbed systems : effect on spectral lineshape - *J. Mol. Struct. (Theo. Chem.)*, 1996, **361**, 49-56.
28. Ghose, P. and Home, D. : An analysis of the Aharonov-Anandan-Vaidman model - *Found. of Physics* 1995, **25**, 1105-1108.
29. Ghoshal, S. and Chatterjee, A. : Phonon distribution in a model polariton system, *Phys. Rev.* 1995, **B52**, 982-986.
30. Hassan, S. S., Frege, O. M. and Nayak, N. : Off-resonant squeezed vacuum effects on a driven two-level system absorption and intensity harmonics, *J. Op. Soc. Am.*, 1995, **B12**, 1177-1185.
31. Home, D. and Majumdar, A. S. : An incompatibility between quantum mechanics and classical realism in the strong macroscopic limit - *phys. Rev.*, 1995, **A52**, 4959-4963.
32. Majumdar, A. S., Dasgupta, P. and Saxena, R. P. : Baryogenesis from black hole evaporation - *Int. Jour. Mod. Phys.*, 1995, **D4**, 517-529.
33. Mandal, K. : The role of stress in amorphous magnetic materials, *Jpn. J. Appl. Phys.*, 1996, **35**, 93-96.
34. Mehta, A., Barker, G. C., Luck, J. M. and Needs, R. J. : The dynamics of sandpiles : the coupling roles of grains & clusters, *Physica A*, 1996, **224**, 45-67.
35. Mehta, A., Luck, J. M., and Needs, R. J. : Dynamics of sandpiles : physical mechanisms, coupled stochastic equations and alternative universality classes - *Phys. Rev.*, 1996, **E53**, 92-102.
36. Mookerjee, A. : A first principles technique for the analysis of alloy phase stability in random binary alloys - *Bull. Mat. Sci.* 1995, **18**, 3-15.
37. Mookerjee, A. : Complex Systems : an introduction - *Ind. J. Phys.*, 1995, **69B**, 495-505.
38. Mookerjee, A. : The Spin Glass - *Ind. J. Phys.* 1995, **69B**, 575-599.

39. Mookerjee, A., Dasgupta, I. & Saha, T. : Quantum Percolation, *Int. J. Mod. Phys.*, 1996, **B9**, 2989-3024.
40. Nayak, N. : Influence of reservoir-induced-interactions on the one-photon micromaser action. *Opt. Commun.*, 1995, **118**, 114-122.
41. Saha, T. and Mookerjee, A. : The Effects of local lattice distortion in non-isochoric alloys - CuPd and CuBe - *J. Phys. Condens. Matter*, 1996, **8**, 2915-2927.
42. Sanyal, D., De, U., Mandal, K., Banerjee, D., and Bhattacharya, R. : Positronium formation in (Bi/Bi-Pb)-2212 and -2223 superconductors - *Phys. Lett.*, 1995, **A204**, 305-309.
43. Sen, P., Bandyopadhyay, S. K., Barat, P., Mukherjee, P., Mukhopadhyay, P. K., and De, A. : The study of texturing of BiSrCaCuO and BiPbSrCaCuO superconductors as a function of pelletization pressure - *Physical C*, 1995, **255**, 306-310.
44. Thakur, P. K. and Basu, C. : Existence of cross-over states in electronic transmission due to delta-function potential with inhomogeneous and slowly varying periods - *Physica A*, 1995, **216**, 45-58.

B. Proceedings of Conferences & Symposia

1. Anderson, O. K., Kumar, V. and Mookerjee, A. : Lecture notes on electronic structure of metals & alloys, *World Scientific*, May 1995.
2. Banerjee, S., Majumdar, C. K. and Barker, V. A. : Simulation of tidal flow in the Ganges estuary - *Advances in Theoretical Physics*, ed. A. P. Pathak, Narosa Publishing House, New Delhi, 1996, 1-10.
3. Biswas, P. : An augmented space recursion in k-space representation, *Current development in Disordered materials*, Kurukshetra University, January 22-24, 1996, D6.
4. Bose, M. : Chain Dynamics from ^{13}C NMR and Spin Dynamics from EPR at the int. *Conf. on Dynamics in Complex Fluids*, SNBNCBS, Calcutta, Aug. 1995.
5. Bose, M. : Li Intercalates of V_2O_5 - high frequency NMR and EPR studies at the *10th Int. meeting on Solid State Ionics*, Singapore, Dec. 1995
6. Bose, M. : Contrasting effects of alkyl and alkoxy substitution in the molecular self-assembly of discotic aryl diketonates of Cu at the *3rd Natl. meeting of ILCS*, Baroda, Sept. 1995.
7. Das, C. : Modification of Damping of Ion acoustic waves due to charged impurities - *Proceedings of National Symposium on Plasma Science*, IITK Nov. 8-10, 1995.
8. Das, C. : Nonlinearity of Whistler mode in the Ionosphere - *Proceedings of the Ninth National Space Science Symposium (NSSS-96)*, Osmania University, Hyderabad, Feb. 6-10, 1996.

9. Das, C. : Study of Inverse Faraday Effect - using kinetic theory model - *Proceedings of International Symposium on M. N. Saha, S. N. Bose and N. R. Sen's contributions to Astrophysics and Impact*, The Asiatic Society, Calcutta Nov. 28-30, 1995.
10. Das, D., Sinha, T. P., Reddy, V. R., Chintalpudi, S. N., and Majumdar, C. K. : Fe Moessbauer studies on non-magnetic part of a green shale rock, *Proc. DAE Sol. St. Phys. Symp. IACS*, Calcutta, Dec. 27-31, 1995, 435.
11. Datta, R. P. : Structure and Electronic Properties of Small Cu Clusters - *Condensed Matter Days*, Inst. of Physics, Bhubaneswar, Aug. 29-31, 1995.
12. Dattagupta, S., Dhar, D. and Puri, S. : Dynamics of Complex Systems (*Proc. Conf. at SNBNCBS, August 6-11, 1995*) in *Physica A (Stat. Theor. Phys.)* vol. 224, nos. 1-2, pp. 11 February, 1996.
13. De, U., Mandal, K., Sanyal, D., Banerjee, D., and Majumdar, C. K. : Comparative radiation damage by alpha particles in Bi 2212 and (Bi, Pb)-2212 oxide superconductors, *Regional Meeting on Rad. Phys.*, BI, Calcutta, Nov. 16-17, 1995.
14. Dey, S. K. and Majumdar, C. K. (Guest Editors) : Mathematical modelling and computations, 22(9) Nov. 1995 (*an issue of Mathematical modelling and computations, editor-in-chief, E. Y. Rodin, Pergamon*).
15. Gangopadhyay, D. : Bogolubov Transformations for Quantum Oscillators - *Fourth Wigner Symposium Proceeding, (Guadalajara, Mexico, August 7-11, 1995)*, *World Scientific*, pp 417-420.
16. Ghoshal, S. and Datta, A. : Lineshape theory and enhancement of refractive index in a three-level system for cw radiation fields, *Proc. Int. Conf. on Spectroscopy : Perspective and Frontiers*, BARC, Bombay, Jan. 3-5, 1996.
17. Mookerjee, A. : *The Dynamical CPA, ICTP/SMR*, 859-1.
18. Mookerjee, A. : The Dynamical CPA in the Hubbard model, *ICTP/SMR*, 859/2.
19. Mukherjee, P. K., Saha, J. and Saha, M. : Critical exponents for the Landau-de Gennes model of the nematic-isotropic phase transition in *Proc. Inter. Symp. Liquid Crystals and Supramolecular Order*, Bangalore, Jan 1996.
20. Mukhopadhyay, P. K. and Chaudhuri, R. : Acoustic propagation and attenuation in Bose glass - *10th Anniversary HTS workshop on Physics, Materials and Applications*, Houston, USA, March 12-16, 1996.
21. Nayak, N. : Steady-state squeezing in the micromaser cavity field, *NASA Conf. Proc.*, No. 3322, 1996, 465-470.
22. Nayak, N., Kremid, A., Thompson, B. V. and Bulloch, R. K. : Nonclassical fields in one-photon micromaser action, in *Quantum Communications and Measurements*, eds. V. P. Belavnik, R. L. Hudson and O. Hirota (Plenum, New York), 1995, 521-529.

23. Sanyal, B. : An Augmented space recursion in k-space representation, *Proc. DAE Sol. St. Symp.*, IACS, Calcutta, Dec. 27-31, 1995, 54.
24. Sanyal, B. : Spectral density and complex band structure of disordered AgPd, *Current developments in Disordered Materials*, Kurukshetra University, Jan. 22-24, 1996, D28.

C. Miscellaneous

1. Ghose, P. : Videshini : Rabindranath O Einstein - *Prama*, 16th Year 4th issue, July-September 1995, 102-112.
2. Ghose, P. : Only Game in Town a review of "Alice in Quantum Land" by Robrt Gilmore (Affiliated East-West Press), *Literary Supplement, the Statesman*, August 12, 1995.
3. Majumdar, C. K. : *Accountability in the university system*, in *Accountability in Scientific Research* (Proc. of a SSV Seminar, April 1992, Society for Scientific Values, New Delhi) 1995, pp 39-48.
4. Majumdar, C. K. : *Alpha irradiation of high temperature superconductors*, in *Topics in Condensed Matter Physics* (editor M. P. Das, Nova Science Pub. Inc., Gormack, NY 11725, 1994) pp. 243-247. (Festschrift to Prof. J. Mahanty of the Australian National University, Canberra, on his 60th birthday).
5. Majumdar, C. K. : *A sobering experience, review of Newton's Principia for the Common Reader*, by S. Chandrasekhar (Oxford University Press 1995) in *The Statesman*, January 5, 1996.
6. Majumdar, C. K. : S. N. Bose : *The Man and his Work*, in *Journal of the Asiatic Society*, vol. XXXVI, no. 4, pp 19-23, 1994.
7. Mehta, A. : *Nick of Time*, in *The Telegraph*, Calcutta, Dec. 1995.
8. Mehta, A. : One for all and all for one - *the story of Bose-Einstein condensation* in *Journal of the Asiatic Society*, Vol. XXXVI, No. 4, pp 69-72, 1994.
9. Mehta, A : *What connects sandpiles, shares and weather*, in *The Telegraph*, Calcutta, Oct. 1995.
10. Mehta, A. : *Withholding no atoms atom*, in *The Telegraph*, Calcutta, Sept. 1995.

D. Ph. D. Theses

1. Saha, T. : *Transport and Phase Stability in disordered Systems*. Awarded Ph. D. degree from Calcutta University (October, 1995). (Guide : Prof. A. Mookerjee).
2. Datta, A. : *Determination of Band Structure of Random Alloys by TB-LMTO-CCPA Method*. Awarded Ph. D. degree from Jadavpur University (December, 1995). (Guide : Prof. A. Mookerjee).
3. Dasgupta, I. : *Electronic Structure and Transport in Quantum Disordered Solids*. Awarded Ph. D. degree from Calcutta University (December, 1995). (Guide : Prof. A. Mookerjee).

E. Honours, fellowships, memberships

1. Dr. R. Chaudhury has been made a member of the Society called "RAYONNEMENT DU CNRS" by the Director General of CNRS and President of the Society.
2. Dr. D. Gangopadhyay has been made a member of the New York Academy of Sciences.
3. Dr. Mrs. Srilekha Banerjee has been made a member of the New York Academy of Sciences.

**Visits by the Centre's Staff to attend
Conferences, Seminars etc.**

1. Banerjee, A. attended Condensed Matter Days at IOP, Bhubaneswar and chaired a session on Nanocrystalline Materials (August 29-31, 1995).
2. Banerjee, H. visited TIFR, Bombay, for a seminar 'Fermions on Lattice' (February 26 - March 2, 1996).
3. Banerjee, R. visited the Heidelberg University (February end to April 1995).
4. Basu Chaudhuri, C. attended DAE Symp. on Sol. St. Phys. at IACS, Calcutta (December 27-31, 1995).
5. Bose, M. attended (i) the 10th International meeting on Solid State Ionics at Singapore in Dec. 1995;
(ii) the 3rd National meeting of Intern. Liq. Crys. Soc. at Baroda in Sept. 1995;
(iii) the Intern. Workshop on Liquid Crystals and Supramolecular Order at Bangalore on Jan 3-5, 1996.
6. Chattopadhyay, S. attended International Nuclear Physics symposium at BARC, Bombay, Dec. 1995.
7. Chaudhury, R. visited at LEPES (CNRS) in Grenoble, France as a Visiting Fellow under Indo-French collaboration on high-temperature superconductivity (October 24, 1994 to April 29, 1995).
8. Das, C. attended the 9th National Space Science Symposium (NSSS-96) at Osmania University, Hyderabad (Feb 6-10, 1996).
9. Das, R. : Attended a Course on Oracle in RCC, Calcutta February 1996.
10. Datta, R. P. attended Condensed Matter Days at IOP, Bhubaneswar (August 29-31, 1995).
11. Gangopadhyay, D. attended the IVth Winger Symposium at Guadalajara, Mexico (Aug 7-11, 1995).
12. Gangopadhyay, G. visited the Institute of Atomic and Molecular Science, Taipei, Taiwan 106 from August 1, 1995, to March 15, 1996.

13. Ghoshal, S. attended the Intl. Conf. on Spectroscopy, Perspectives and Frontiers (INCONS) and BARC, Bombay (Jan 3-5, 1995).
14. Majumdar, Archan S. attended the 5th Intl. Symposium on Quantum Mechanics in HARL, Tokyo, Japan (August 21-24, 1995).
15. Mookerjee, A. (i) visited ICTP, Trieste to conduct the Workshop on Condensed Matter Physics and the Working Group on Surface & Bulk Magnetism (July 1995);
(ii) attended the Symp. on Mathematical Physics at Chittagong, Bangladesh.
16. Nayak, N. attended the 4th Intl. Conf. on Squeezed States and Uncertainty Relations at Shaxxi University, Taiyuan, P. R. China (June 5-8, 1995).
17. Paul, S. attended the 21st CASAM-CU National Research Symposium at Dept. App. Math. (CU) on Mar 28-29, 1996.
18. Sanyal, B. attended DAE Solid State Physics Symposium at IACS, Jadavpur, Calcutta (Dec 27-31, 1995).
19. Sharma, S. K. attended Meeting on Particle Physics at SINP on April 20-21, 1995, on the occasion the 60th birthday of Prof. Haridas Banerjee.

Banerjee, N., Banerjee, R., Sharma, S. K., Nayak, N., Gangopadhyay, D., Dey, P., Chaudhury, R., Das, Chandra, Banerjee, S., Ghoshal, S., Bnerjea, A., Basu Chaudhuri, C., Sanyal, B. Pal, M., Paul, S. and Biswas, P. attended Intl. Conf. on 70 Years of Quantum Mechanics and Recent Trends in Theo. Phys. at ISI, Calcutta (January 29 - February 2, 1996).

SEMINARS/TALKS BY THE CENTRE'S STAFF

1. Dutta, R. P. : Properties of small Cu clusters (co-author Datta, R. P. and Mookerjee, A.) presented at Condensed Matter Days, IOP (August 30, 1995).
2. Banerjee, H. (i) Bosons in Particle Physics - invited talk at the Intl. Symp. on M. N. Saha, S. N. Bose and N. R. Sen at Asiatic Society, Calcutta (November 28-30, 1995);
(ii) Fermions on Lattice invited lecture at the Intl. Conf. on 70 Years of Quantum Mechanics and Recent Trends in Theoretical Physics at ISI, Calcutta (February 1, 1996);
(iii) Fermions on Lattice at TIFR, Bombay (March 1, 1996).
3. Biswas, P. : Spectral density and complex band structure of disordered AgPd at IACS, Calcutta (December, 1995).
4. Bose, M. : (i) Magnetic resonance studies of ω -Li_x V₂ O₅;
(ii) High frequency FTNMR and EPR studies of Li_x V₂ O₅ system at the 10th Intl. Conf. on Sol. St. Ionics at Singapore (December 3-8, 1995).
5. Chakraborty, B. : On certain aspects of the Heisenberg model, at IACS, Calcutta (February 1996).

6. Das, C. : (i) Nonlinearity of Whistler Waves in Ionosphere at National Space Science Symposium NSSS-96, Osmania University, Hyderabad (February 9, 1996).
 (ii) Behaviour of wave induced plasma as non-permanent magnetic material at BARC, Bombay (March 20, 1996).
7. Das, R. : Education Technology with Special reference to Computers : its application in the field of Education and Training of visually handicapped students at Narendrapur Blind Boys' Academy (March 27, 1996).
8. Datta, R. P. : Structure and Electronic Structure of small Cu Clusters (co-author Banerjee, A. and Mookerjee, A.) at Condensed Matter Days (August 29-31, 1995)
9. Gangopadhyay, D. : (i) Interacting fermions, scaling and possible departure from fermi liquid behaviour at IACS, Calcutta (June 27, 1995);
 (ii) Bogolubov transformations for quantum oscillators at the IVth Winger Symposium, Guadalajara, Mexico (Aug 7-11, 1995);
 (iii) Introduction to Renormalization Group, Scaling and Interacting Fermions, Generalizing Maximal Symmetry in the presence of Torsion, at Howard University, Washington, DC, USA, (Aug 15-21, 1995).
10. Ghose, P. : (i) Testing Wave particle duality at TPSC National Seminar on Recent Advances in Theoretical in theoretical Physics at University of Hyderabad (April 7, 1995);
 (ii) What is a phenomenon ? - Meeting on Particle Physics at SINP, Calcutta to celebrate the 60th birthday of Prof. H. Banerjee (April 20-21, 1995).
 (iii) The Mysteries of the Quantum World to students of the science journalism course organised by the Ind. Sci. News Assocn. (May 18, 1995).
 (iv) S. N. Bose based on the video cassette "S. N. Bose Scientist with a Mission" to students of the one year course on History of Science, Asiatic Society (May 22, 1995).
11. Ghoshal, S. : Lineshape theory and enhancement of refractive index in a multiple coupled three-level system at Physics Dept., Calcutta University (May 25, 1995).
12. Gupta, K. S. : V and Isgur-Wise Function from Bethe-Salpeter Equations at the WHEPP-4 workshop at SNBNCBS, Calcutta (January 1996).
13. Majumdar, A. S. : (i) Extended inflation from higher dimensional theories of gravity, at Relativity and Cosmology research Centre, JU (April 17, 1995);
 (ii) Some models of measurement and possibility of experimental verification at Hitachi Advanced Research Laboratory, Saitama, Japan (August 25, 1995).
14. Majumdar, C. K. : (i) The River (the Hooghly Estuary Problem) at Central University of Hyderabad (April 7, 1995);

- (ii) Moessbauer Spectra of Fe minerals at SINP, Calcutta on the 60th birthday celebration for Prof. H. Banerjee (April 20, 1995);
 - (iii) The River (The Hooghly Estuary Problem via Parallel Computation) at BARC, Bombay (May 10, 1995);
 - (iv) The life and works of Prof. Joseph Needham, talk at the seminar on the subject at the Asiatic Society, Calcutta (May 22, 1995);
 - (v) Aesthetic Motivations in Science - talk at Intl. Symp. on M. N. Saha, S. N. Bose and N. R. Sen at Asiatic Society, Calcutta (November 28, 1995);
 - (vi) Recent developments in Bose-Einstein Condensation - invited talk at DAE Sol. St. Phys. Symp. at IACS, Calcutta (December 27, 1995).
 - (vii) Simulation of Tidal Flow in the Ganga Estuary at CASAMCU (March 28, 1996).
14. Mehta, A. : (i) Colloquium - The Dynamics of Sand at SINP, Calcutta (December, 1995);
- (ii) Dynamics of Sand at IACS, Calcutta (December, 1995);
 - (iii) Nonequilibrium aspects of Type II Superconductors, at Brewster, New Hampshire (September, 1995);
 - (iv) Stochastic Dynamics of Mesoscopic systems, at Bonn. Germany (August 1995);
 - (v) Making, shaking and breaking sandpiles, series of lectures at the symp. for Soft Condensed Matter, SINP, (March 1996).
15. Mookerjee, A. : (i) A series of lectures on the Dynamical CPA and the Hubbard Model in the ICTP, Trieste (June-July, 1995);
- (ii) Series of lectures on Magnetism of Surfaces and Interfaces at SNBNCBS, Calcutta (September, 15, 1995);
 - (iii) Alloy Phase Stability - invited talk at DAE Sump. at IACS, Calcutta (December 27-31, 1995);
 - (iv) Alloy Phase Stability and Alloy Design and Complex Systems invited talk at Chittagong, Bangladesh (January 1996);
 - (v) Quantum Percolation at SINP, Calcutta (March 26, 1996).
16. Nayak, N. : Steady-state squeezed in micromaser cavity field at the FICSSUR-95 at Shanxi University, Taiyuan, P. R. China (June 5-8, 1995).
17. Saha, J. : series of lectures on Phase Transitions and Critical Phenomena, at Dept. of Physics, Calcutta Univ. (December 1995 - February 1996).
18. Sanyal, B. : Augmented space recursion in k-space representation at IACS, Calcutta (December 27-31, 1995).
19. Sharma, S. K. : Light Scattering in the eikonal approximation, a meeting on Particle Physics at SINP, Calcutta (April 21, 1995).

THEORETICAL PHYSICS SEMINAR CIRCUIT

Prof. C. K. Majumdar and Prof. P. Ghose attended the Annual Meeting of TPSC Conveners at the University of Hyderabad (April 6, 1995).

The following scientists under TPSC programme gave seminars :

1. Dr. Anu Venugopalan, School of Physical Sciences, JNU : A Model for Quantum Measurement at SNBNCBS, Calcutta (April 6, 1995).
2. Dr. Janaki Balakrishnan, Dept. of Physics and Astrophysics, Univ. of Delhi : An Improved Effective Potential at SNBNCBS, Calcutta (April 25, 1995).
3. Prof. B. Sriram Shastry, IISc., Bangalore : The S_1/r 2S Family of Many Body Systems : Integrability and Relations to Quantum Chaos at SNBNCBS, Calcutta (May 12, 1995).
4. Dr. Purusottam Ray, IMS, Madras : Dynamical Aspects of Fracture Propagation at SNBNCBS, Calcutta (May 30, 1995).
5. Dr. Sasanka Ghosh, MRI, Allahabad : Consequences of non-trivial PPN parameters at SNBNCBS, Calcutta (August 3, 1995).
6. Dr. V. Subrahmanyam, ICTP, Trieste, Italy and Max-Planck Inst., Dresden, Germany : Effective Chiral Hamiltonian for Heisenberg spin systems (August 16, 1995).
7. Dr. B. Chakraborty, SNBNCBS, Calcutta : Resolution of Momentum problem in Landau-Lifshitz model of continuum ferromagnets in a gauge independent manner at IISc., Bangalore and IMS, Madras.
8. Dr. B. Chakraborty, SNBNCBS, Calcutta : On momentum and angular momentum problem in Landau-Lifshitz model of ferromagnetism at MRI, Allahabad.
9. Dr. Srabani Roy, MRI, Allahabad : (i) Ultrafast solvation in dipolar liquids; (ii) Ionic mobility in dipolar solvents at IACS, Calcutta (September 22, 1995).
10. Prof. Alok K. Majumdar, Dept. of Physics, IIT Kanpur : Quantum interference effects in bulk disordered alloys at SNBNCBS (December 11, 1995).
11. Prof. Pankaj Jain, Dept. of Physics, IIT Kanpur : Quantum color transparency and nuclear filtering at SNBNCBS, Calcutta (December 14, 1995).
12. Prof. Ashoke Sen, MRI, Allahabad : Recent developments in string theory at SNBNCBS, Calcutta (December 21, 1995).
13. Prof. Surya P. Tewari, University of Hyderabad : Topological Phase Interferometer - an optical switch and its uses at SNBNCBS, Calcutta (January 17, 1996).
14. Dr. Sauray Das, IMS, Madras : The eikonal as a probe to Planck scale physics at SNBNCBS, Calcutta (January 30, 1996).

15. Prof. Varun Sahni, IUCAA, Pune : Dynamical and Statistical Aspects of the Large Scale Structure of the Universe at SBNBCBS, Calcutta (February 19, 1996).
16. Dr. Sukanya Sinha, IUCAA, Pune : Noise and Dissipation in Semiclassical Gravity at SBNBCBS, Calcutta (March 14, 1996).
17. Dr. Monoranjan Guchait, TIFR, Bombay : Supersymmetries Particle Searches at Tevatron at SBNBCBS, Calcutta (March 22, 1996).
18. Dr. J. S. Prakash, IOP, Bhubaneswar : Generating Function for SU (3) Matrix Elements at SBNBCBS, Calcutta (March 26, 1996).

The Calcutta Centre Sub-Committee of the TPSC programme met on 28 June, 1995 to select the new speakers for the year 1995-96.

A meeting of the members of the Calcutta Sub-Committee was held on 26.10.95 in the new Campus of the Centre to discuss on the proposed speakers for the year 1996-98.

The annual meeting of the Conveners was held in the The IISc., Bangalore during 2-4 November, 1995 to discuss and select new TPSC speakers for the period 1996-98. The need for expansion of the TPSC programme is gaining ground. Requests from different research institutes (some in the north-eastern states) for inclusion in the programme were received and considered favourably. Some amount of increase in the TPSC budget was proposed by the Conveners.

Prof. P. Ghose went on Sabbatical leave for six months. Dr. N. Nayak, Reader in Physics had taken over the charge of Convener, TPSC, Programmes.

EDUCATIONAL ACTIVITIES

Dr. C. K. Majumdar taught part of the Solid State Physics (special paper) in the combined M. Sc. classes of Calcutta University and Presidency College, Calcutta, during September 1995 to May 1996. B. Sanyal, R. P. Datta, S. Ghosh, P. Biswas, A. Mehta, A. Mookerjee, A. Banerjee, S. Banerjee, C. Basu Chaudhuri, and T. Mitra attended and contributed to the weekly Seminar on Soft Condensed matter organised by Bose Institute, Calcutta.

LIBRARY

The S. N. Bose National Centre library moved into the new building in its campus at JD Block, Sector III, Salt Lake during the second half of 1995. It has now enough space to make expansion possible. The technical processing of library books are being carried out by using a 286-MINICOMP Personal Computer, supplied with an EPSON FX-1000 printer. Two softwares dBASE III and Word Perfect 5.1 are being used for the library work; the former is used for technical processing and database management for library books, the latter for preparing the Annual Report and other word-processing work. A new computer HP 715 has been procured; it will be used for networking in the library and in future networking with the network CALIBNET of the science libraries of Calcutta. However, proper software has to be chosen and installed for this purpose.

The library now subscribes to the following journals :

A. Foreign Journals

1. Computer Journal
2. Computers in Physics (AIP)
3. Economic Theory
4. Journal of Modern Optics
5. International Journal of Modern Physics A
6. Journal of Physics A : Mathematics and General
7. Modern Physics Letters A
8. Modern Physics Letters B
9. Monthly Notices of Royal Society of Astronomy
10. Nature
11. Physical Review A
12. Physical Review B
13. Physical Review C
14. Physical Review D
15. Physical Review E
16. Physical Review Letters
17. Physics Letters A
18. Physics Letters B
19. Physics Reports
20. Review of Modern Physics

B. Indian Journals

1. Bulletin of Material Science
2. Current Science
3. Indian Journal of Pure & Applied Physics
4. Journal of Astrophysics & Astronomy
5. Journal of Bioscience
6. Journal of Genetics
7. Pramana
8. Proc. Ind. Acad. of Sc. (Chemical Sciences)
9. Proc. Ind. Acad. of Sc. (Earth & Planetary Sciences).
10. Proc. Ind. Acad. of Sc. (Engineering Sciences)-Sadhana
11. Proc. Ind. Acad. of Sc. (Mathematical Sciences).

The library added 67 new books to its collection in 1995-96. Preprints received from more than 25 research institutes were displayed and preserved in the Preprint library. The library also received in the electronic mail information bulletins such as C-Alert, High Tcupdate, Atom-Ph, and Quan-Ph.

The library offers xerox facilities on a regular basis to its users during seminars, symposia and other academic activities. Because the load was increasing the library was given a xerox machine Modi Xerox model 1038 for its use; the older model 1025 is now used mostly for office work.

In view of the limited subscription to foreign journals in the library, the Centre sought and procured the help of the Indian National Scientific Documentation Centre (INSDOC) for providing its users with xerox copies of papers from different foreign scientific periodicals.

COMPUTER CENTRE

The Computer Centre has undergone a complete transformation and a thorough upgradation since it moved to the new campus in the JD Block, Salt Lake in September 1995. In March '95 after due deliberations, the Computer Committee selected three systems for our Centre. These were one DEC Alphastation 250 4/266 system, one Silicon graphics system and one HP 715/100 system. The first was one for heavy and fast computation, the second for graphics and the third for the library : hopefully they will be in a local area network in the Centre.

The installation of the Alpha station necessitated some relaying of the power cables and reinstallation of the switch boards by CMC engineers, who had earlier prepared the Site and made the electrical installation. In November '95 the DEC Alpha system was made operational with its terminals and a Laser Printer. After this networking plan for the HP 9000 system, line printer and a venturis PC with additional Cache and Pathworks Client with CDROM Drive has been worked on. This system was extensively used by scientists of this centre and also some scientists from India and abroad during WHEPP 4 meeting where some extra facilities were provided on a short term basis.

The regular e-mail facilities to the World wide network through ermet with its resource centre at VECC Calcutta are also provided through the HP 9000 system. From April to June 1995, Mrs. R. Das served as post master. From July 1995, Dr. Mrs. S. Banerjee has been in charge of the e-mail facilities. The hardware has been looked after by Mrs. R. Das; the Centre would require more people especially if it has to run 24 hours in the new situation for the management of Computer Centre.

Mrs. R. Das has been associated with the project BRAILESCRIPT as a co-investigator. This project is being carried out in collaboration with the Computer Science and Engg. Department, Jadvapur University and the Blind Boys' Academy, Ramkrishna Mission, Narendrapur to provide computerised braille transcription from ordinary English text with provision for extension to other Indian Vernaculars.

The Teachers' Training Programme was satisfactorily completed during April to September 1995; the lectures were held in the new campus from July 1995 onwards.

The lectures were given by C. K. Majumdar with assistance from Mrs. R. Das and Dr. Mrs. S. Banerjee during the practical and problem sessions.

A set of Braille books made in our project was exhibited in Calcutta Book Fair during January and February, 1996. The prototype of the Braille Transcriptor system was exhibited in the International exhibition INDIA INTERCHMART held in February 1996 at Pragati Maidan at New Delhi. Mrs. R. Das participated as a Judge during the Computer Day Celebration of the Computer Society on 14.12.95. She delivered lectures on Education Technology with special reference to Computer for children in the Blind Boys' Academy, Narendrapur on 27.3.96. She also attended ORACLE course at Regional Computer Centre, Calcutta in the month of February, 1996. It is hoped that the Centre would someday benefit from the CALIBNET (net work for the libraries) in Calcutta.

Dr. Mrs. S. Banerjee has been developing parallel programming with transputers : the system needs upgrading now.

CONSTRUCTION OF THE NEW CAMPUS

Land measuring 15 acres situated in Block JD, Sector - III, Salt lake, Calcutta 700 091 was earmarked for the above purpose in phases. The first phase comprising of a part of the Main Building, a part of the Guest House and one block of Essential Staff Quarters is essentially over. This phase included the following :

- (a) Library and Computer building;
- (b) A four storied Guest House Complex consisting of forty eight rooms duly furnished;
- (c) A three storied Essential Staff Quarter having twelve independent flats;
- (d) An underground water reservoir to cover the entire campus;
- (e) An overhead tank for supply of water in the entire campus;
- (f) A transformer building; and
- (g) Paved roads linking the aforesaid buildings.

The following infrastructural facilities in relation to Phase-I construction have been provided :

- (a) Iron removal plant;
- (b) Water chlorination;
- (c) Central Airconditioning system;
- (d) Fire alarm detection system;
- (e) Provision for security check;
- (f) Computer airconditioning; and
- (g) Generator facilities;

The shifting in the new premises has been completed and all the hired premises from which the Centre was operating earlier have been de-hired.

MEETING OF THE GOVERNING BODY AND VARIOUS COMMITTEES (1995-96)

Governing Body

The Governing Body of the Centre held its tenth and eleventh meeting on 5 June, 1995 and 11 March, 1996 respectively at the Office of the Secretary, Department of Science & Technology, New Delhi.

Academic Programme Advisory Committee

The Academic Programme Committee meeting of the Centre was held on 3 July, 1995 and 29 February, 1996.

Finance Committee

There was no meeting held during the subject period.

Construction Committee

It met on 4.9.95; this was its last meeting. It has been renamed Building Committee in the Byelaws of the Centre and reconstituted.

Building Committee

There was no meeting held during the subject period.

GOVERNING BODY

During the period under review/report, the Governing Body of the Centre consisted of the following members :

- | | |
|---|--|
| 1. Professor P. Rama Rao
Chairman
(upto June, 1995) | Secretary
Department of Science and
Technology, Government of India,
New Delhi. |
| Professor V. S. Ramamurthy
Chairman
(Since July 1995) | Secretary
Department of Science and
Technology, Government of India,
New Delhi. |
| 2. Professor S. K. Joshi
Member | Director-General
Council for Scientific and
Industrial Research
New Delhi. |
| 3. Professor Mihir Chowdhury
Member | Indian Association for the Cultivation
of Science, Calcutta. |
| 4. Professor N. Mukunda
Member | Indian Institute of Science
Bangalore |

- | | |
|---|---|
| 5. Shri S. B. Krishnan
Member | Joint Secretary and
Financial Advisor
Department of Science & Technology,
New Delhi. |
| 6. Shri N. Krishnamurthi
Member | Chief Secretary
Government of West Bengal
Calcutta. |
| 7. Professor C. K. Majumdar
Member | Director
S. N. Bose National Centre
for Basic Sciences
Calcutta |
| 8. Shri Abhijit Gupta
Non-member Secretary | Administrative Officer
S. N. Bose National Centre
for Basic Sciences
Calcutta |

ACADEMIC PROGRAMME ADVOSORY COMMITTEE

During the period under review/report, the Academic Programme Advisory Committee of the Centre consisted of the following members :

1. Professor N. Mukunda, JNCASR, New Delhi (Chairman)
2. Professor M. Chowdhury, IACS, Calcutta (Member)
3. Professor N. Sathyamurthy, IIT Kanpur (Member)
4. Professor P. K. Maitra, TIFR, Bombay (Member)
5. Professor R. Sinha, NCRA, Pune (Member)
6. Professor C. K. Majumder Director, SNBNCBS (Member)
7. Professor S. K. Bose, SNBNCBS (Member)
8. Professor A. Mookerjee, SNBNCBS (Member)
9. Dr. N. Nayak, SNBNCBS (Member)
10. Dr. S. K. Sharma, SNBNCBS (Member)

Professor Partha Ghose went on leave from February 1, 1996, and Dr. N. Nayak was nominated in his place.

STAFF OF THE CENTRE AS ON 31 MARCH, 1996.

Academic

Dr. Chanchal Kumar Majumdar	Director
Dr. Sujit Kumar Bose	Professor
Dr. Partha Ghose	Professor/Academic Programme Coordinator
Dr. Abhijit Mookerjee	Professor
Dr. Subodh Kumar Sharma	Reader

Dr. Nilkantha Nayak	Reader
Dr. Rabin Banerjee	Reader
Dr. Anita Mehta	Reader
Dr. Debashis Gangopadhyay	Fellow
Dr. M. Mathur	Fellow
Dr. (Mrs.) Srilekha Banerjee	Fellow
Dr. Samir K. Paul	Fellow
Dr. K. S. Gupta	Fellow
Dr. Ranjan Chaudhury	Lecturer
Dr. Pratip Mukhopadhyay	Lecturer
Dr. Amitava Banerjee	Lecturer
Dr. Gautam Gangopadhyay	Lecturer
Mrs. Rina Das	Scientific Officer (Computer)
Dr. Biswajit Chakraborty	Post Doctoral Fellow
Mr. Subharadip Ghosh	JRF
Scientists on Projects	
Prof. Majoj Kumar Pal	Emeritus Scientist, CSIR
Prof. Monisha Bose	Co-principal Investigator in a DST Project
Prof. Haridas Banerjee	INSA Senior Scientist
Shri Abhijit Datta	Research Scholar (awarded Ph. D.)
Dr. Prabhat Kumar thakur	Pool officer , CSIR
Dr. Kalyan Mandal	SRF, DST Project (Resigned on 21.7.95)
Shri Tapas Mitra	SRF, CSIR
Shri P. Biswas	SRF, CSIR (from 1.1.96).
Ms. Indrani Basu	JRF (resigned on 31.5.95)
Dr. Radhika Prasad Datta	Research Associate Univ. of Warwick Project
Dr. Priyatosh Datta	Research Associate, CSIR (resigned on 24.5.95)
Dr. Chandra Das	Research Associate, CSIR
Ms Jayashree Saha	SRF, DST Project
Dr. Archan S. Majumdar	Research Associate, DST Project
Shri Prantick Dey	JRF, CSIR
Shri Gancsh Ch. Gorlan	JRF, CSIR
Ms. Chhanda Basu Chaudhuri	JRF, CSIR
Shri Biplab Sanyal	JRF, DST Project

Shri Ajay Chakraborty	JRF, CSIR (Joined on 8.8.95)
Shri Nityananda Das	JRF, CSIR (Joined on 27.9.95)
Dr. Sarmistha Ghoshal	Visiting Scientist
Dr. Naryan Bandyopadhyay	Visiting Scientist
Dr. Shilbadra Chattopadhyay	Visiting Scientist
Dr. V. V. Sreedhar	Visiting Scientist
Dr. S. K. Venkatesan	Visiting Scientist
Administrative, Technical and Auxiliary	
Shri Abhijit Gupta	Administrative Officer
Dr. Santi Gopal Basu	Librarian
Shri Apurba Kanti Sarkar	Administrative Assistant Accounts
Shri D. P. Banerjee	Office Superintendent
Shri Sunish Kumar Deb	Stenographer
Shri Sukanta Mukherjee	Assistant (General)
Shri Tapan Kumar Sen	UDC
Shri Jaydeep Kar	Junior Assistant
Shri Prosenjit Talukdar	Junior Assistant
Shri Sanad Kumar Shukla	Junior Assistant
Shri Santosh Kumar Singh	Junior Assistant
Shri Gopal Chandra Ghosh	Driver
Shri Pradip Kumar Bose	Helper
Shri Partha Chakraborty	Helper
Personnel on Campus Constructions	
Shri Samar Sur	Sub-Assistant Engineer
Shri Aditya Pal Chowdhury	Project Assistant

BUDGET SUMMARY

(1995— 96)

The funds come from the Department of Science and Technology, New Delhi. The following is the summary of the budget estimates of the year 1995-96 :

(Amount in Rs./Lakh)

	Actuals	Budget Estimate	Revised Estimate
	1994-95	1995-96	1995-96
Non-Plan	29.70	41.08	20.00*
Plan	160.64	319.41	200.00*
Total	190.34	360.49	220.00*

* The shortfall in the non-plan budget is usually met from interest earned on fixed deposits, but is too large here. The extract from the minutes of the Finance Committee meeting on 4.4.1996 is relevant : "The Director pointed out that the Centre had moved to the new campus and expenditure in certain heads (e.g. telephone, electricity) in the non-plan headings showed sudden increase because of this change, and certain heads became unnecessary. The net result was sudden disproportionate increase in the non-plan budget in RE 1995-96 and BE 1996-97. The committee appreciated that such difficulties would arise in the transition period and to sort out the problem in BE 1996-97 went through the budget heads". Some heads were moved over to Plan budget and the shortfall brought down.

Abreviation

ARCI	=	Astra Research Centre of India, Bangalore
BARC	=	Bhabha Atomic Research Centre, Bombay
BI	=	Bose Institute, Calcutta
CERN	=	European Organization for Nuclear Research
CSIR	=	Council of Scientific & Industrial Research
CU	=	Calcutta University
DAE	=	Department of Atomic Energy
DST	=	Department of Science & Technology, New Delhi
ECRA	=	Eastern Centre for Research in Astrophysics
FAMTSIT	=	Foundation and Methodology of Theoretical Sciences in the Indian Tradition, Jadavpur University
IACS	=	Indian Association for the Cultivation of Science, Calcutta
ICTP	=	International Centre for Theoretical Physics, Trieste
IICB	=	Indian Institute of Chemical Biology, Calcutta
IISc	=	Indian Institute of Science, Bangalore
IITK	=	Indian Institute of Technology, Kanpur
ILCS	=	International Liquid Crystal Society
IMAS	=	Institute of Mathematical Sciences, Madras
IMM	=	Institute of Mathematical Modelling, Denmark
INRAPHEL	=	Institute of Radiophysics & Electronics, CU
INSA	=	Indian National Science Academy, New Delhi
IOP	=	Institute of Physics, Bhubaneswar
ISI	=	Indian Statistical Institute, Calcutta
IUCAA	=	Inter-university Centre in Astronomy & Astrophysics
IUC-DAEF	=	Inter University Centre for Department of Atomic Energy Facilities, Indore & Calcutta
JNU	=	Jawaharlal Nehru University, New Delhi
JU	=	Jadavpur University, Calcutta
LAPP	=	Laboratoire de Physique des Particules
MRI	=	Mehra Research Institute, Allahabad

NIAS	=	National Institute of Advanced Studies
NERIST	=	North-East Reg Inst of Sc. & Tech, Itanagar
NISTADS	=	National Institute of Science, Technology and Developmental Studies
PC	=	Presidency College, Calcutta
PHISPC	=	Project in History of Indian Science, Philosophy and Culture
PRL	=	Physical Research Laboratory, Ahmedabad
SINP	=	Saha Institute of Nuclear Physics, Calcutta
SNBNCBS	=	S. N. Bose National Centre for Basic Sciences
TIFR	=	Tata Institute of Fundamental Research, Bombay
UGC	=	University Grants Commission, New Delhi
VB	=	Visva Bharati, Santiniketan
VECC	=	Variable Energy Cyclotron Centre, Calcutta

AUDITORS' REPORT

To
The Director
Satyendra Nath Bose National Centre for Basic Sciences,
Block JD, Sector-III,
Salt Lake,
Calcutta-700 091.

We have audited the attached Balance Sheet as at 31st March 1996 of Satyendra Nath Bose National Centre for Basic Sciences and the annexed Income and Expenditure Account for the year ended 31st March 1996, we report as follows :

1. a) Depreciation on fixed assets has not been ascertained and charged in the accounts since inception - refer to Note Nos. 1(a) and 2 of Schedule 16.
- b) Capital work-in-progress has not been separately disclosed - refer to Note No. 1 (b) of Schedule 16.
- c) Liquidated damages/penalty not imposed on the contractors and Bonus provided in the accounts as the jobs not completed and final bills yet to be submitted/approved - refer Note No. 1(j) of Schedule 16.
- d) Adjustments not made, if any, that may be required after completion of physical verification of fixed assets - (refer Note No. 5 of Schedule 16) and assets lying with third parties awaiting confirmation (refer Note No. 7 of Schedule 16).
- e) Provision not made in the Accounts for —
 - i) Old advances of Rs. 43,400;
 - ii) Municipal Tax of Rs. 1,37,682;
 - iii) Lost draft of Rs. 8,099 (refer to Note No. 13 of Schedule 16).
- f) Stock of printing & stationery as on 31st March, 1996 overvalued by Rs. 4,259.
- g) Licence fees and Electricity charges not recovered from the persons to whom staff quarters have been allotted - amount indeterminate (Refer to Note No. 14 of Schedule 16).
- h) Confirmation of balances as on 31st March, 1996 has not been obtained from parties to whom advances were made (Refer to Note No. 15 of Schedule 16).
- i) Leave encashment is accounted for on cash basis. (Refer 1(k) of Sch. 16).

2. All files and papers relating to construction of the buildings could not be produced to us - refer to Note No. 12 of Schedule 16.
3. Writ Petition under Article 226 of the Constitution of India has been filed before the Hon'ble High Court, Calcutta by an employee against the 'Centre' and others for certain alleged irregularities in connection with construction of buildings of the 'Centre'. As the matter is sub judice, the effect, if any, of the proceedings on the accounts of the 'Centre' is indeterminate.
4. Subject to paragraphs 1(a) to 1(i), 2 and 3 above, and to the best of our information and explanations given to us, in our opinion, the said Balance Sheet and the Income and Expenditure Account read together with Schedule 1 to 16 reflect a true and fair view —
 - i) in case of Balance Sheet as to the state of affairs of the 'Centre' as at 31st March, 1996,

and
 - ii) in case of the Income and Expenditure Account as to the excess of Income over Expenditure for the year ended 31st March, 1996.

Calcutta, 14th Oct 1996

For Mookherjee, Biswas & Pathak
Chartered Accountants
(S. K. Pathak)
Partner

**SATYENDRA NATH BOSE NATIONAL
BLOCK - JD , SECTOR-III,
Balance Sheet as at**

As at 31st March 1995 Rs.	FUNDS & LIABILITIES	Schedule	Rs.
	CAPITAL FUND		
	Balance as per last A/c.	8,73,15,386	
8,73,15,386	<i>Add:</i> Grant-in-aid received from Govt. of India for non- recurring expenses	<u>1,71,86,757</u>	10,45,02,143
	GENERAL FUND :		
	Balance as per last A/c	65,32,505	
65,32,505	<i>Add:</i> Excess of Income over Expenditure for the year transferred from Income & Expenditure Account	<u>3,31,664</u>	68,64,169
	OTHER FUNDS :		
	Computer Fund :		
	Donation received from J. Bose as per last A/c	3,25,001	
3,25,001	<i>Add:</i> Received during the year	<u>25,000</u>	3,50,001
7,500	Library Fund (Donation)		7,500
6,221	Corpus Fund		6,221
2,17,527	Gratuity Fund		2,52,311
14,63,318	Employees' Provident Fund		19,29,605
	Project Fund :		
	Balance as per last A/c	28,49,279	
28,49,279	<i>Add:</i> Excess of Income over Expenditure for the Year transferred from Income & Expenditure Account	<u>2,35,410</u>	30,84,689
<u>9,87,16,737</u>	Carried Forward		<u>11,69,96,639</u>

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
31st March, 1996

As at 31st March 1995 Rs..	PROPERTIES & ASSETS	Schedule	Rs.
7,96,08,180	FIXED ASSETS : At Cost/Capitalised value	5	9,31,51,106
	INVESTMENTS :		
	General Fund Investment		
45,99,610	Fixed Deposit with Schedule Banks	6	21,70,732
	Gratuity Fund Investments		
1,62,414	Fixed Deposit with Indian Overseas Bank, Salt Lake Branch		1,62,414
	Provident Fund Investment :		
12,33,472	Fixed Deposit with Indian Overseas Bank, Salt Lake Branch		14,63,472
	CURRENT ASSETS & LOANS AND ADVANCES		
	a) Current Assets		
	Interest Accrued on Investments :		
84,201	General Fund		1,92,766
18,821	Gratuity Fund		34,231
1,46,714	Provident Fund		2,84,314
60,197	Stock of Printing & Stationery		70,353
	Cash & Bank Balances :		
287	Cash in hand		3,388
52,87,639	Cash at Bank with Schedule Banks in Current Account	7	1,26,61,675
	b) Loans & Advances		
24,294	Advance to Employees from Provident Fund		3,919
5,39,368	Security and Other Deposits		4,69,568
5,29,274	Advances recoverable in cash or in kind or for value to be received	8	3,89,059
80,62,469	Advances to Suppliers & Contractors	10	83,31,540
	Brought Down		
<u>10,03,56,940</u>	Carried Forward		<u>11,93,88,537</u>

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Balance Sheet as at**

As at 31st March 1995 Rs.	FUNDS & LIABILITIES	Schedule	Rs.
9,87,16,737	Brought Down		11,69,96,639
	CURRENT LIABILITIES & PROVISIONS :		
	a) Current Liabilities		
2,04,976	Liabilities for expenses	1	3,02,876
1,15,974	Other Liabilities	2	1,02,832
11,03,807	Deposits from Contractors	3	13,77,784
2,15,446	Sundry Creditors for Capital Expenditure	4	6,08,406
	b) Provision	NIL	
<u>10,03,56,940</u>	TOTAL :		<u>11,93,88,537</u>

* Notes on Accounts — Schedule 16

* The Schedules referred to above form an integral part of the Balance Sheet

In terms of our attached report of even date.
For MOOKHERJEE, BISWAS & PATHAK
Chartered Accountants
S. K. PATHAK
Partner

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
31st March, 1996

As at 31st March 1995		PROPERTIES & ASSETS	Schedule		
Rs.	P.			Rs.	P.
10,03,56,940		Brought Down		11,93,88,537	

<u>10,03,56,940</u>	TOTAL :	<u>11,93,88,537</u>
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(A MOOKERJEE)
Professor

(C. K. MAJUMDAR)
Director

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Income & Expenditure Account for**

EXPENDITURE	Schedule	Figures for the ended		For the year ended	
		31st March, 1996		31st March, 1995	
		Project Account	General Account	Project Account	General Account
Salaries & Allowances and Employees Benefits	11	4,06,925	33,60,160	2,28,516	24,39,393
Other Expenses	12	6,520	42,32,571	7,256	33,28,404
Maintenance Expenses	13	—	10,74,469	12,000	3,72,959
Stipend to CSIR Fellows		3,53,873	—	2,24,919	—
RSIC Charges		11,429	—	2,270	—
Travel		46,301	—	63,689	—
Contingency & Raw Materials		2,13,517	—	2,87,605	—
Audit Fee		—	7,500	—	7,250
Refund of Grants-in-Aid		—	—	3,409	—
Excess of Income over Expenditure for the year carried down		2,35,410	3,59,344	4,80,844	4,53,446
		<u>12,73,975</u>	<u>90,34,044</u>	<u>13,10,508</u>	<u>66,01,452</u>
Adjustment relating to prior period	14	—	76,377	—	—
Excess of Income over Expenditure transferred to Balance Sheet/General Fund		2,35,410	3,31,664	4,80,844	4,56,226
		<u>2,35,410</u>	<u>4,08,041</u>	<u>4,80,844</u>	<u>4,56,226</u>

Notes on Accounts -Schedule 16

The Schedules referred to above form an integral part of the Income and Expenditure Account

In terms of our attached report of even date.

For MOOKHERJEE, BISWAS & PATHAK
Chartered Accountants
S. K. PATHAK
Partner

Calcutta, 14 October 1996

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 064
the year ended 31st March, 1996

INCOME	Schedule	Figures for the ended		For the year ended	
		31st March, 1996		31st March, 1995	
		Project Account	General Account	Project Account	General Account
Grant-in-aid received					
Non-Plan		—	25,00,000	—	21,00,000
Plan		—	61,13,243	—	36,96,750
Interest on Fixed Deposits			3,54,147	—	7,76,901
Miscellaneous Grant-in-aid received					
For Projects		9,06,503	—	9,91,554	—
For CSIR Fellows		3,67,472	—	3,18,954	—
Miscellaneous Income	15	—	66,654	—	27,801
		<u>12,73,975</u>	<u>90,34,044</u>	<u>13,10,508</u>	<u>66,01,452</u>
Excess of Income over Expenditure for the year brought down		2,35,410	3,59,344	4,80,844	4,53,446
Adjustment relating to prior period	14	—	48,697	—	2,780
		<u>2,35,410</u>	<u>4,08,041</u>	<u>4,80,844</u>	<u>4,56,226</u>

(A. MOOKERJEE)
Professor

(C. K. MAJUMDAR)
Director

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Receipts and Payments Account**

Figures for the previous year		RECEIPTS		
Project Account Rs.	General Account Rs.		Project Account Rs.	General Account Rs.
		OPENING CASH & BANK BALANCES		
11,27,914	9,10,184	Indian Overseas Bank	5,27,351	42,59,634
	2,84,157	United Bank of India		3,26,503
	1,387	Cash - in - hand		287
		Grants-in-Aid		
	1,40,00,000	For Plan Expenditure		2,33,00,000
	21,00,000	For Non-Plan Expenditure		25,00,000
		Misc. Grant-in-Aid		
3,19,041		For CSIR Fellows	3,67,472	
9,91,554		For Projects	9,06,503	
		Encashment of Fixed Deposits		
	41,25,454	Indian Overseas Bank		24,28,878
	44,77,220	United Bank of India		—
	81,500	Earnest Money from Contractors		
		Security Deposit from		
	6,84,115	Contractors		2,73,977
		Recovery of Advances from		
	7,66,505	Suppliers	86,718	7,29,813
		Recovery of Advances from		
	74,45,114	Contractors		34,47,598
		Recovery of Advance from		
	1,00,000	Architect		—
		Recovery of other Advances		
	7,920	Festival Advance		7,440
	—	Advance to Staff		2,41,589
	—	P Biswas	5,400	—
	—	National Academy of Sciences		70,688
	—	ECRA		13,010
	—	JNC Bangalore		72,816
		National Board of Higher		
	3,253	Mathematics		—
	—	Sanko Chowdhury		20,000
<u>24,38,509</u>	<u>3,49,86,809</u>	Carried Forward	<u>18,93,444</u>	<u>3,76,92,233</u>

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
for the year ended 31st March, 1995

Project Account		General Account		PAYMENTS	Project Account		General Account	
Rs.	P.	Rs.	P.		Rs.	P.	Rs.	P.
		Figures for the previous year						
2,26,679		20,92,901		Salaries, Allowances & Employees' Benefits				
		72,177		Salary & Allowances	4,06,925	28,64,630		
				Wages		1,32,250		
				Employer's Contribution to Provident Fund		1,02,919		
		77,324		Medical Expenses		86,437		
		62,391		Leave Travel Concession		11,498		
		20,280		Other Expenditure				
				Electricity Charges		5,28,538		
		49,749		Hire Charges of Transport		1,02,857		
		93,773		Hire Charges of Generators		41,160		
		50,050		Rent of Office Premises		2,43,331		
		3,14,600		Office Contingency Expences		1,56,388		
		48,290		Printing & Stationery		1,94,932		
		1,17,016		Postage & Telegrams	3,000	61,906		
		47,771		Insurance		1,739		
		15,477		Telephone & Trunk Calls		2,21,405		
		1,26,545		T.A../D.A. to Non-Academic Staff		780		
		4,569		T.A../D.A. to Academic Staff (Indian)		31,880		
		20,198		T.A../D.A. to Academic Staff (Abroad)		92,340		
		79,518		Meeting Expenses		1,18,343		
		44,514		Bank Charges	3,520	15,998		
368		4,880		Seminar and Other Academic Exps.		8,82,734		
		8,75,457		Accommodation for Visiting Scientists		20,000		
		27,500						
<u>2,27,047</u>		<u>42,44,980</u>		Carried Forward	<u>4,13,445</u>	<u>59,12,065</u>		

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Receipts and Payments Account**

Figures for the previous year		RECEIPTS	Project Account Rs.	General Account Rs.
Project Account Rs.	General Account Rs.			
24,38,509	3,49,86,809	Brought Forward	18,93,444	3,76,92,233
		Deposits and Adjustable Rent Received		
		Deposit from N Nayak		200
		Deposit from R Chaudhury		12,000
		Adjustable Rent		2,950
		Other Recoveries		
	30	Insurance Premium	—	—
	—	Deposit for Rent		82,000
		Recoveries Provident Fund		
	45,084	Account (Net)		4,514
		Employees' Contribution to		
		Provident Fund (Net)		1,039
	89,413	Deductions of Taxes (Net)		26,379
	25,000	Donation Received from J Bose		25,000
		Miscellaneous Income		
	10,085	Income from Guest House		56,065
	—	Sale of Books		4,800
	1,786	Other Receipts		4,664
	8,680	Income from Seminar Proceedings		
	7,250	Contribution for S. N. Bose		—
		Birth Centenary		—
	8,58,574	Interest from Fixed Deposits		2,45,582
	6,221	Corpus Fund		—
	—	Received from General Account	2,00,751	
<u>24,38,509</u>	<u>3,60,38,932</u>	Carried Forward	<u>20,94,195</u>	<u>3,81,57,426</u>

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
for the year ended 31st March, 1996

Figures for the previous year		PAYMENTS	Project Account Rs.	General Account Rs.
Project Account Rs.	General Account Rs.			
2,27,047	42,44,980	Brought Forward	4,13,445	59,12,065
	2,08,227	Visiting Member Fellowship		3,21,005
	20,770	Director Research Expenses		949
	60,265	Academic Staff Research Exps.		38,803
	31,000	Publication of Seminar Proceedings		30,000
	280	Library General Expenses		2,000
	5,76,800	T.A./D.A. To TPSC Speakers		6,88,926
	1,98,268	E - Mail		1,10,787
	1,72,918	S N Bose Birth Centenary Furnishing Accommodation for		78,585
	3,74,485	Visiting Scientists		70,012
	—	Legal Expenses		3,465
	—	Water Supply		13,773
	—	Movement Expenses		9,600
	25,470	Maintenance Expenses Repairs to Equipment		972
	28,636	Car Maintenance		21,546
	10,355	Office Maintenance		74,529
12,000	2,41,485	Computer Maintenance		3,34,815
	23,610	POL		41,017
	—	Building Maintenance		208
	—	Security Maintenance		3,74,169
	—	Maintenance of Iron Removal Plant		21,774
	—	Electrical Maintenance		1,68,305
	1,02,880	Library Books		1,54,053
	5,43,772	Library Journals		8,28,450
<u>2,39,047</u>	<u>68,64,201</u>	Carried Forward	<u>4,13,445</u>	<u>92,99,808</u>

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Receipts and Payments Account**

Figures for the previous year		RECEIPTS	Project Account Rs.	General Account Rs.
Project Account Rs.	General Account Rs.			
24,38,509	3,60,38,932	Brought Forward	20,94,195	3,81,57,426

24,38,509

3,60,38,932

Carried Forward

20,94,195

3,81,57,426

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
for the year ended 31st March, 1996

		Figures for the previous year		PAYMENTS	Project Account		General Account	
					Rs.	P.	Rs.	P.
Rs.	P.	Rs.	P.		Rs.	P.	Rs.	P.
2,39,047		68,64,201		Brought Forward	4,13,445	92,99,808		
				Equipment				
		1,373		Small Equipment		26,815		
		12,430		Office Equipment		1,70,709		
		5,97,221		Computer Accessories		1,98,049		
		—		Library Computer		26,32,249		
				Academic Staff Research Equipment		15,800		
				Land and Buildings				
		47,150		Campus Beautification		44,257		
		2,02,91,144		Construction of Buildings		62,10,686		
				Furniture and Fixtures				
6,800		5,98,246		Office Furniture		2,96,173		
		28,375		Library Furniture		31,242		
		—		Lecture Room Furniture		6,18,044		
		—		Guest House Furniture		10,60,780		
				Advance to Contractors & Suppliers				
		14,24,366		Building Contractors		8,00,000		
25,467		4,42,313		Other Suppliers		35,83,199		
		2,00,000		Architect		1,50,000		
				Other Advance				
		7,200		Festival Advance		7,200		
		1,408		Advance against L.I.C. (Net)		16,405		
		72,816		J N C Bangalore		—		
		70,688		National Academy of Sciences		—		
		30		Insurance Premium Receivable		—		
		33,718		Refund of Contribution on I.C.T.P.		—		
61,619		1,08,119		Staff Advance		2,35,345		
				Deposits				
		500		Deposit for Rent		12,200		
		4,37,328		Security Deposit with W.B.S.E.B.		—		
		6,207		Refund of Security Deposits		—		
		—		Refund of Deposit		—		
		—		A Mookerjee		18,000		
		10,000		Refund of Earnest Money Deposit		—		
<u>3,32,933</u>		<u>3,12,54,833</u>		Carried Forward	<u>4,13,445</u>	<u>2,54,26,961</u>		

**SATYENDRA NATH BOSE NATIONAL
BLOCK JD, SECTOR-III,
Receipts & Payments Account**

Figures for the previous year				RECEIPTS				
Project Account		General Account			Project Account		General Account	
Rs.	P.	Rs.	P.		Rs.	P.	Rs.	P.
24,38,509		3,60,38,932		Brought Forward	20,94,195		3,81,57,420	

<u>24,38,509</u>	<u>3,60,38,932</u>	TOTAL :	<u>20,94,195</u>	<u>3,81,57,426</u>
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Calcutta, 14 October 1996

For MOOKHERJEE, BISWAS & PATHAK
Chartered Accountants
S. K. PATHAK
Partner

CENTRE FOR BASIC SCIENCES
Salt Lake, Calcutta 700 091
for the year ended 31st March, 1996

Figures for the previous year				PAYMENTS	Project Account		General Account	
Project Account		General Account			Rs.	P.	Rs.	P.
Rs.	P.	Rs.	P.					
3,32,933		3,12,54,833		Brought Forward	4,13,445		2,54,26,961	
				Other Payments				
		33,411		Project Accounts			88,708	
		1,04,825		Outstanding Liabilities- Revenues	1,800		1,77,473	
		8,365		Outstanding Liabilities - Adhoc Bonus			10,479	
		—		Outstanding Liabilities - Capital			2,12,216	
		51,074		Gratuity Fund Investment			—	
		—		Payment of Taxes			37,710	
2,38,514		—		Prior Period (Net)			76,327	
20,125				Stipend to CSIR Fellows	3,52,748			
2,270				Travel	46,301			
				RSIC Charges	11,429			
1,69,394				Contingency and Raw Materials	2,12,517			
10,54,325				Equipment	6,47,211			
90,188				Payment to General Account	31,696			
3,409				Refund of Grant-in-Aid				
				Closing Cash & Bank Balances				
5,27,351		42,59,634		Indian Overseas Bank	3,77,048		63,16,002	
		3,26,503		United Bank of India			58,08,162	
		287		Cash in hand			3,388	
<u>24,38,509</u>		<u>3,60,38,932</u>		TOTAL :	<u>20,94,195</u>		<u>3,81,57,426</u>	

(A. MOOKERJEE)
Professor

(C. K. MAJUMDAR)
Director

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 1

	31.03.1996	31.03.1995
	Rs.	Rs.
LIABILITIES FOR EXPENSES		
T.A./D.A. to TPSC Speakers	—	5,211
Furnishing Accommodation for Visiting Scientists	—	70,163
Rent for accommodation for Visiting Scientists	—	2,500
Electricity Charges	73,082	—
Salary and Allowances	30,473	34,405
Medical Expenses	39,606	26,453
Maintenance of Iron Removal Plant	2,397	—
Maintenance of Computers	15,900	—
Printing and Stationery	6,500	775
T.A./D.A. to academic Staff (India)	7,105	—
Electrical Maintenance	17,000	—
Hire Charges of Generators	—	4,550
Academic Staff Research Expenses	34,480	—
Publication of Seminar Proceedings	5,000	—
Postage and Telegrams	3,025	1,570
Hire Charges of Transport	—	4,320
Legal Expenses	1,080	—
Meeting Expenses	8,248	—
Wages	2,151	6,646
Water Supply	962	—
Rent for Office Premises	—	10,400
Audit Fee	7,500	7,250
Bonus	19,686	10,479
Rent of Leasehold Land	27,681	18,454
A/c. Projects		
Contingency-Certification fees payable to Auditor	1,000	—
Contingency - CSIR	—	1,800
	<u>3,02,876</u>	<u>2,04,976</u>

SCHEDULE—2

OTHER LIABILITIES

Contractors' Income Tax	12,366	15,165
Employer's Income Tax	61,149	35,201
Landlord's Income Tax	—	26,405
Contractors' Sales Tax	2,307	10,813
Employees' Professional Tax	2,260	1,829
Employees' Contribution to Provident Fund	1,039	—
Adjustable Rent	5,150	2,200
Deposit from A Mookerjee	—	18,000
Deposit from N Nayak	1,650	1,450
Deposit from R Chaudhury	12,000	—
CMC Ltd.	4,911	4,911
TOTAL :	<u>1,02,832</u>	<u>1,15,974</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 3

	31.03.1996 Rs.	31.03.1995 Rs.
DEPOSITS FROM CONTRACTORS		
A) Earnest Money Deposit		
Pradhan and Associates	60,000	60,000
Nabin Designers and Constructors (P) Ltd.	20,000	20,000
Larica (India) Pvt. Ltd.	5,000	5,000
	<u>85,000</u>	<u>85,000</u>
B) Security Deposit		
Pradhan and Associates	3,23,994	2,21,877
Nabin Designers and Constructors (P) Ltd.	5,52,159	4,85,166
Ghosh Bose & Associates	1,26,769	1,26,769
CMC Ltd.	1,79,440	1,79,440
Asco Strumech (P) Ltd.	10,714	5,555
TIL Ltd.	40,638	—
Larica (India) Pvt. Ltd.	8,740	—
B P Constructions	330	—
Otis Elevators Ltd.	50,000	—
	<u>12,92,784</u>	<u>10,18,807</u>
Total (A) + (B)	<u>13,77,784</u>	<u>11,03,807</u>

SCHEDULE — 4

SUNDRY CREDITORS FOR CAPITAL EXPENDITURE

Campus Beautification	3,222	3,230
Construction of Building	3,08,206	2,12,216
Library Computer	2,66,978	—
A/c. Projects Equipment	30,000	—
	<u>6,08,406</u>	<u>2,15,446</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 5

FIXED ASSETS

Name of Block of Assets	Balance as on 01.04.95 Rs.	Addition during the year Rs.	Adjustment during the year Rs.	Balance as on 31.03.96 Rs.
a) General Account				
Office Equipment	2,43,535	—	—	2,43,535
Guest House Furniture	4,48,137	10,60,781	—	15,08,918
Small Equipment	2,04,924	1,97,523	—	4,02,447
Books & Journals	24,94,336	9,82,503	—	34,76,839
Directors' Research Equipment	2,48,192	—	—	2,48,192
Boundary Wall	10,38,937	—	—	10,38,937
Computer & Accessories	11,84,787	1,98,050	—	13,82,837
Construction of Buildings	5,71,14,716	65,18,892	—	6,36,33,608
Computer	13,08,681	—	—	13,08,681
Campus Land * (See note below)	1,09,50,694	—	—	1,09,50,694
Air Condition Machinery	1,09,475	—	—	1,09,475
Campus Beautification	2,73,265	47,479	—	3,20,744
Office Car (WNW 8486)	1,04,794	—	—	1,04,794
UPS	2,17,685	—	—	2,17,685
Academic Staff Research Equipment	59,498	15,800	—	75,298
Library Computer	—	28,99,227	—	28,99,227
Furniture & Fixture	13,74,914	9,45,459	—	23,20,373
	<u>7,73,76,570</u>	<u>1,28,65,714</u>	<u>—</u>	<u>9,02,42,284</u>
b) Projects Account :				
Equipment	22,17,730	6,77,212	—	28,94,942
Books & Periodicals	7,080	—	—	7,080
Furniture & Fixture	6,800	—	—	6,800
	<u>22,31,610</u>	<u>6,77,212</u>	<u>—</u>	<u>29,08,822</u>
TOTAL : (a) + (b)	<u>7,96,08,180</u>	<u>1,35,42,926</u>	<u>—</u>	<u>9,31,51,106</u>

* Note : Refer to Note 3 of Schedule 16.

SCHEDULE — 6

GENERAL FUND INVESTMENT

Fixed Deposit with —

a) Indian Overseas Bank, Salt Lake Branch, Calcutta	14,45,000	38,73,878
b) United Bank of India Mayukh Bhawan Branch, Calcutta	7,25,732	7,25,732
	<u>21,70,732</u>	<u>45,99,610</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 7	31.03.1996	31.03.1995
	Rs.	Rs.
CASH AND BANK BALANCES :		
Cash at Bank with Schedule Banks' in Current Account		
a) Indian Overseas Bank, Salt Lake Branch :		
General Fund Account	63,16,002	42,59,634
Project Fund Account	3,77,048	6,07,698
Provident Fund Account	1,60,463	93,804
b) United Bank of India, Mayukh Bhawan Branch :		
General Fund Account	58,08,162	3,26,503
TOTAL :	<u>1,26,61,675</u>	<u>52,87,639</u>

SCHEDULE — 8

SECURITY AND OTHER DEPOSITS		
a) Security Deposits		
West Bengal State Electricity Board	4,54,318	4,54,318
Department of Telecommunication	1,600	1,600
	<u>4,55,918</u>	<u>4,55,918</u>
b) Deposit for Rent		
N Dasgupta	—	18,000
Rama De	1,650	1,450
K Pal Chowdhury	—	5,000
T B Dey	—	33,000
J B Bhowmik	—	26,000
S Sen	12,000	—
	<u>13,650</u>	<u>83,450</u>
Total (a) + (b)	<u>4,69,568</u>	<u>5,39,368</u>

SCHEDULE — 9

LOANS AND ADVANCES		
Advances recoverable in cash or in kind or for value to be received		
* Recoverable expenses on Seminar (PATPAA)	10,000	10,000
Prepaid expenses	2,27,181	1,95,403
Staff Advances	1,03,975	1,10,219
Advance against LTC	20,813	4,408
Festival advance	2,680	2,920
* Rabin Banerjee	13,181	13,181
* S Manna	4,500	4,500
* Indian Physical Society	6,729	6,729
ECRA	—	13,010
Sanko Chowdhury	—	20,000
National Academy of Sciences	—	70,688
J N C Bangalore	—	72,816
P Biswas - Project Account	—	5,400
* Outstanding over one year	<u>3,89,059</u>	<u>5,29,274</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 10

	31.03.1996 Rs.	31.03.1995 Rs.
ADVANCES TO SUPPLIERS & CONTRACTORS		
a) General Account		
Wipro Informatic	83,319	—
Godrej & Boyce Mfg. Co. Ltd.	22,12,950	—
Manna Marine Service	2,200	—
Pertech Computer Ltd.	1,82,200	—
Digital Equipment (India) Ltd.	1,21,331	—
Onwards Technologies Ltd.	98,000	—
Jubilee Enterprise	4,095	—
Trisita Corporation	77,000	—
Pradhan Associates	68,313	22,66,454
West Bengal State Electricity Board	34,27,604	34,27,604
Allied Publishing Agency	8,02,104	4,42,313
Ghosh Bose & Associates	2,50,000	1,00,000
Nabin Designers and Constructors (Pvt.) Ltd.	10,02,424	14,51,880
Asco Strumech (P) Ltd.	—	37,500
Otis Elevators Ltd.	—	2,50,000
	<u>83,31,540</u>	<u>79,75,751</u>
b) Project Accounts		
Advance Micronic Devices	—	14,443
Jubilee Enterprise	—	12,275
Pertech Computers Ltd.	—	60,000
	<u>—</u>	<u>86,718</u>
Total (a) + (b)	<u>83,31,540</u>	<u>80,62,469</u>

SCHEDULE — 11

SALARIES & ALLOWANCES & EMPLOYEES & BENEFITS

Salary and Allowance	28,95,103	21,27,332
Wages	1,34,401	78,823
Employer's Contribution to Provident Fund	1,02,919	77,324
Medical Expenses	1,26,042	88,843
Adhoc Bonus	19,686	10,499
Leave Travel Concession	11,498	20,280
Interst on Provident Fund (Deficit)	47,889	—
Provision for Gratuity	22,622	36,292
	<u>33,60,160</u>	<u>24,39,393</u>
Projects Accounts		
Salary & Allowances	4,06,925	2,28,516
	<u>4,06,925</u>	<u>2,28,516</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 12	31.03.1996	31.03.1995
	Rs.	Rs.
OTHER EXPENSES :		
Electricity Charges	6,01,620	49,749
Hire Charges of Transport	1,02,857	98,093
Hire Charges of Generators	41,160	54,600
Rent of Office Premises	2,43,331	3,25,000
Office Contingency Expenses	1,56,388	48,290
Printing & Stationery	1,91,275	1,03,508
Postage & Telegrams	64,931	49,340
Insurance	13,523	15,784
Telephone & Trunk Calls	2,21,405	1,26,545
TA/DA to non-Academic Staff	780	4,569
TA/DA to Academic Staff (India)	38,985	20,198
TA/DA to Academic Staff (Abroad)	92,340	79,518
Meeting Expenses	1,26,591	44,515
Bank Charges	15,998	4,880
Seminar & Other Academic Expenses	8,82,734	8,75,457
Accommodation for Visiting Scientists	20,000	30,000
Visiting Member Fellowship	3,21,005	2,08,227
Director Research Expenses	949	20,769
Academic Staff Reserch Expenses	73,283	60,265
Publication of Seminar Proceedings	35,000	31,000
Library Expnses	2,000	280
TA/DA to TPSC Speakers	6,88,926	5,82,011
E-Mail	1,10,787	1,98,268
Lease Rent	9,227	9,227
S. N. Bose Birth Centenary	78,585	1,72,918
Furnishing Accommodation for Visiting Scientists	70,012	1,15,393
Legal Expnses	4,545	—
Water Supply	14,734	—
Movement Expenses	9,600	—
	<u>42,32,571</u>	<u>33,28,404</u>
Project Accounts :		
Bank Charges	3,520	368
Postage & Telegrams	3,000	6,888
	<u>6,520</u>	<u>7,256</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 13

	31.03.1996	31.03.1995
	Rs.	Rs.
MAINTENANCE EXPENSES		
Repairs to Equipment	972	25,470
Car Maintenance	21,546	28,636
Office Maintenance	74,529	10,355
Computer Maintenance	3,52,552	2,,84,888
POL	41,017	23,610
Building Maintenance	208	—
Security Maintenance	3,74,169	—
Maintenance of Iron Removal Plant	24,171	—
Electrical Maintenance	1,85,305	—
	<u>10,74,469</u>	<u>3,72,959</u>
Project Accounts		
Computer Maintenance	—	12,000
	<u>—</u>	<u>12,000</u>

SCHEDULE — 14

	Debit		Credit	
	For the year ended 31.03.95	For the year ended 31.03.95	For the year ended 31.03.96	For the year ended 31.03.96
	Rs.	Rs.	Rs.	Rs.
Prior Period Adjustment A/c				
Audit Fees	—	—	50	—
Leave Travel Concession	3,643	—	—	—
Adhoc Bonus	14,992	—	—	2,755
TA/DA to Academic Staff	42,000	—	—	—
Provision for Gratuity	—	—	3,248	—
Academic Staff Research Expenses	15,742	—	—	—
Computer Maintenance	—	—	45,399	—
Salaries & Allowances	—	—	—	25
	<u>76,377</u>	<u>—</u>	<u>48,697</u>	<u>2,780</u>

SCHEDULE — 15

	31.03.1996	31.03.1995
	Rs.	Rs.
MISCELLANEOUS INCOME		
Income from Guest House	57,190	10,085
Sale of Books	4,800	—
Other Receipts	4,664	1,786
Income from Seminar Proceedings	—	8,680
Contribution for S. N. Bose Birth Centenary	—	7,250
	<u>66,654</u>	<u>27,801</u>

**SATYENDRA NATH BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

SCHEDULE — 16

NOTES ON ACCOUNTS

1. Significant Accounting Policies

- a) Fixed Assets are stated at the cost of acquisition exclusive of freight and clearing charges without making any provision for depreciation.
- b) All Capital Works-in-Progress including buildings under construction, plant & machinery, equipment pending installation and architect's fees are directly debited to the respective assets heads instead of segregating the total amount between work completed and Capital work-in-progress.
- c) Construction of Building Account is debited on passing of the running account bills of the contractors after adjustment of advances paid, if any.
For other suppliers/service agencies payments against pro-forma bills are debited to Advance Account and charged to Assets on receipt of the final bills.
- d) Assets purchased for Projects out of grant of the Govt. of India are shown separately in the Balance Sheet. On completion of the projects, Govt. of India has the discretion to gift the assets to the Centre or transfer such assets to any other institution as considered appropriate. Pending exercise of such option by the Govt. of India, adjustments are not made in the Accounts.
- e) Subscriptions paid for Library Journals upto the end of the financial year are capitalised and subscriptions paid for the subsequent financial year, if any, is shown under Advances.
- f) Grants from the Department of Science & Technology, Govt. of India are accounted for on cash basis.
- g) Surplus of Grants received from Govt. of India for both Non-Plan and Plan Recurring Expenditure during the financial year is transferred to General Fund Account.
- h) Out of the total grant of Plan Expenditure, the amount budgeted for Plan-Recurring Expenditure is accounted for in the Income and Expenditure Account.
- i) Engineering maintenance stores items of the General Account and Stores and Consumables of the Project Account are charged in full in the accounts in the year of purchase.
- j) Liquidated Damages/Penalty/Bonus are accounted for on cash basis after completion of the jobs and submission of final bills.
- k) Guest House Income and Leave Encashment are accounted for on cash basis.

- l) Gratuity liability is not determined by actuarial valuation. However, liability for gratuity is estimated on the basis of guidelines of Central Govt. and provided for in the Accounts.
2. No depreciation has been provided in the Accounts [(Refer to Accounting Policy No. 1(a)].
3. Campus Land

Land allocated by Govt. of West Bengal free of cost to the Dept. of Science & Technology, Govt. of India who transferred this parcel of land by Deed of Gift to the Centre 10.0017 acres

Lease granted by Salt Lake Reclamation & Development Circle, Govt. of West Bengal for 999 years to the Centre 5.0384 acres

Total : 15.0401 acres

Rs. Rs.

Premium for leasehold land for 5.0384 acres of land paid by the Centre 60,694

Paid by DST GoI 36,29,920 36,90,614

Value of land capitalised :

Lease Premium paid by the Centre 60,694

Notional Value applying the rate of premium for leasehold land with credit to Capital Fund 1,08,90,000

1,09,50,694

4. Fixed Assets of Rs. 9,31,51,106 as disclosed in the Balance Sheet includes Library Books & Journals valued at Rs. 34,76,839 (previous year Rs. 24,94,336).
5. Physical verification of the movable fixed assets of the Centre is under process and adjustments, if any, will be made in the Accounts on completion of such physical verification. 2 nos. room air conditioners valued at Rs. 51,590 are lying unused since March, 1992. The Centre has decided to install these two room airconditioners in due course.
6. Progressive total as on 31.3.96 for certain items of fixed assets in the Register of Fixed Assets for General Account is under preparation. Itemwise value of the assets is not entered in the Register of Fixed Assets for both General and Project Accounts.
7. Movable fixed assets lying with third parties awaiting confirmation :

General Account :	Director's Research Equipment	Rs. 1,61,702
	Academic Staff Research Equipment	Rs. 53,359
Project Account :	Superconductivity Project	Rs. 4,39,974

8. In terms of Accounting Policy Clause 1(d) no adjustments have been made in the Accounts in respect of two completed Projects viz. "Superconductivity" and "Quantum Transmittance" pending exercise of discretion by the Govt. of India.
9. Gratuity Fund balance as on 31.3.96 is Rs. 2,52,311 (previous year Rs. 2,17,527) out of which Rs. 1,62,414 (previous year Rs. 1,62,414) is invested in the Fixed Deposit with Indian Overseas Bank, Salt Lake Branch, and the balance Rs. 89,897 (previous year Rs. 55,113) is lying in the Current Account of the General Fund in the Indian Overseas Bank, Salt Lake Branch.
10. Provident Fund of the Centre has been approved by the Govt. of India under the Provident Fund Act, 1925 on 19.12.94 with effect from 1st March, 1991 subject to certain 'stylistic changes'.
Pending constitution of the Board of Trustees, the control over the funds including investment and its encashment and administration is being exercised by the Centre.
11. Bye-Laws of the Centre have been approved by the Ministry of Science & Technology, Govt. of India in July 1995 subject to certain 'stylistic changes'.
12. Consequent upon the order of the Hon'ble Calcutta High Court, the Police authorities seized all the files and papers relating to construction of the buildings of the Centre and as such the relevant records could not be produced to the Auditor.
13. No provisions have been made in the Accounts for :
 - (a) Old Advances of Rs. 43,400 as the amounts are expected to be recovered from the concerned persons.
 - (b) Municipal Tax of Rs. 1,37,682 as the amount is disputed.
 - (c) Lost bank draft of Rs. 8,099 issued in favour of Professor N Mukunda — as the amount will be realised from the Bank after completion of the formalities for cancellation of Bank Draft.
14. Recovery of Licence Fees and Electricity charges from the persons to whom staff quarters have been allotted has not been made.
15. Balance confirmation certificates at the end of the year have not been obtained from parties to whom advances were made.
16. Previous year's figures have been regrouped/re-arranged wherever necessary to conform to the current year's presentation.

