



# JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

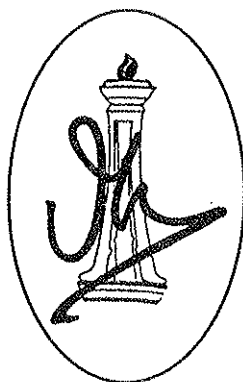
JAKKUR, BANGALORE - 560 064.



## ANNUAL REPORT 1999 -2000

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1999-2000



**JAWAHARLAL NEHRU CENTRE FOR  
ADVANCED SCIENTIFIC RESEARCH**

Jakkur, Bangalore - 560 064.

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# CHAPTER I

## The Centre

### 1. FOREWORD

I have great pleasure in presenting the Annual Report of the Centre for the year 1999-2000.

This year has been of special significance to the Centre since it completed ten years of existence under the dynamic leadership of Prof. C.N.R. Rao, Founder President of the Centre. The Centre has been able to initiate new research areas and build up necessary infrastructure. The Centre continues to consolidate its research activities in a steady manner.

The Centre greatly values its interaction with academics in various universities and other research institutions in India and abroad. It is also establishing new bridges to take up more challenging R&D work in different areas of interest. The Summer Research Fellowship Programme for young students is now in its tenth year. It continues to be an effective medium for exploring young students at an early stage to the methods of research.

With rapid changes occurring in science and technology, it has become necessary for research institutions to attract highly motivated young graduates to science. By organising topical programmes, the Centre is striving to be a unique medium for promoting excellence in science education, so that quality science education is within the reach of all strata in the society. With this end in view, the Centre is constantly looking for new ways to strengthen the Ph.D programme so that a larger number of bright research scholars can be motivated to join the Centre every year.

The Centre has entered into a joint research programme with National Institute of Mental Health and Neuro Sciences (NIMHANS). The existing arrangements for award of degrees with the Manipal Academy of Higher Education (MAHE), Manipal, have been extended; a new programme of M.Sc. (by research) providing opportunities for highly motivated science graduates to take up interdisciplinary research in the areas of engineering and medicine has been introduced recently.

The Honorary Faculty of the Centre act as a large networking of eminent scientists in the country helping in the promotion of research activity and training of young scientists.

The recently established Evolutionary and Organismal Biology Unit and Molecular Biology and Genetics Unit have taken shape and have been strengthened with new young faculty. The Advanced Materials Research Laboratory has come into existence, as also the new HIV Laboratory.

The excellent atmosphere that prevails in the Centre is the result of the fine work of the students, the faculty, the honorary faculty and other members. Special mention should be made to the enormous contributions of Prof. C.N.R. Rao and his continuing interest in building this Centre of Excellence. I wish to acknowledge the help that the Centre has received from its well-wishers and friends.

**V. Krishnan**  
Acting President

## 2. INTRODUCTION

The Jawaharlal Nehru Centre for Advanced Scientific Research was established in 1989 by the Department of Science and Technology, Government of India, to commemorate the birth centenary of Pandit Jawaharlal Nehru, with the main objective of promoting scientific research at the highest level in chosen frontier and interdisciplinary areas of science and engineering. The Centre is registered as a Society under the Karnataka Societies Registration Act and is an autonomous national institution.

The Centre maintains close links and has a special relationship with the Indian Institute of Science (IISc), Bangalore, a renowned institution of advanced training and research. The Centre has its main Campus in Jakkur on the Bangalore-Hyderabad highway, about 11 kms from the Indian Institute of Science campus. Infrastructural facilities established by the Centre at the Indian Institute of Science are used by scientists of both the institutions.

The campus in Jakkur with a congenial atmosphere for research is on a 17.50 acre plot gifted by the Government of Karnataka. At the Indian Institute of Science Campus, the Centre has a Lecture Hall, Visitors' House (JAWAHAR) and Guest Rooms catering to the academic visitors to the Centre and to the Indian Institute of Science.

The Centre has Fellows and full-time faculty in various areas of interest and has distinguished honorary faculty from all over India. Students have been admitted for the Master's and the Ph.D degree Programmes. A programme of M.Sc. (by research) has been introduced from the Academic year 1999 - 2000 for the benefit of highly talented & motivated professional course students.

The Council of Management of the Centre meets twice a year. The General Body meets annually. The Academic Advisory Committee of the Centre meets at least twice a year.

### 3. OBJECTIVES

The objectives of the Centre are:

- To carry out front-line research in selected thrust areas of science and engineering;
- To promote collaborative research with scientists at the Indian Institute of Science and other institutions in the country;
- To provide a national and international forum for in-depth discussions on important scientific topics in areas of vital interest to scientists of the Centre and in the country at large;
- To organize periodic winter and summer schools in certain areas, where young talented scholars would be associated;
- To provide opportunities for talented young students to carry out research projects;
- To provide facilities to visiting scholars and faculty from all over India and abroad, to work for extended periods with the faculty of the Centre;
- To publish monographs and reports on frontier and futuristic areas of science as well as monographs of educational value.



## 4. PROGRESS

The Centre has completed 10 years and has made progress in many directions. Research and academic activities in several areas have picked up momentum. Appointments to the core faculty of the Centre have been made in the areas of Life Sciences, Chemical and Materials Science, Theoretical Sciences and Fluid Dynamics.

The main campus of the Centre at Jakkur houses the various Units and Laboratories, the Library and the Computer Laboratory, a Seminar/Lecture Hall and a Students Hostel, Faculty Offices and the Administration. A new Advanced Materials Research Laboratory (AMRL) with a Conference Hall and an Animal House have been completed during the year 1999-2000.

The Chemical Biology Unit and Condensed Matter Theory Unit of the Centre, a Seminar Hall and an office of the Centre are located on the IISc. Campus. Regular transport between the two campuses is available. Well-furnished accommodation for visitors and seminar participants is available, besides accommodation for students and faculty.

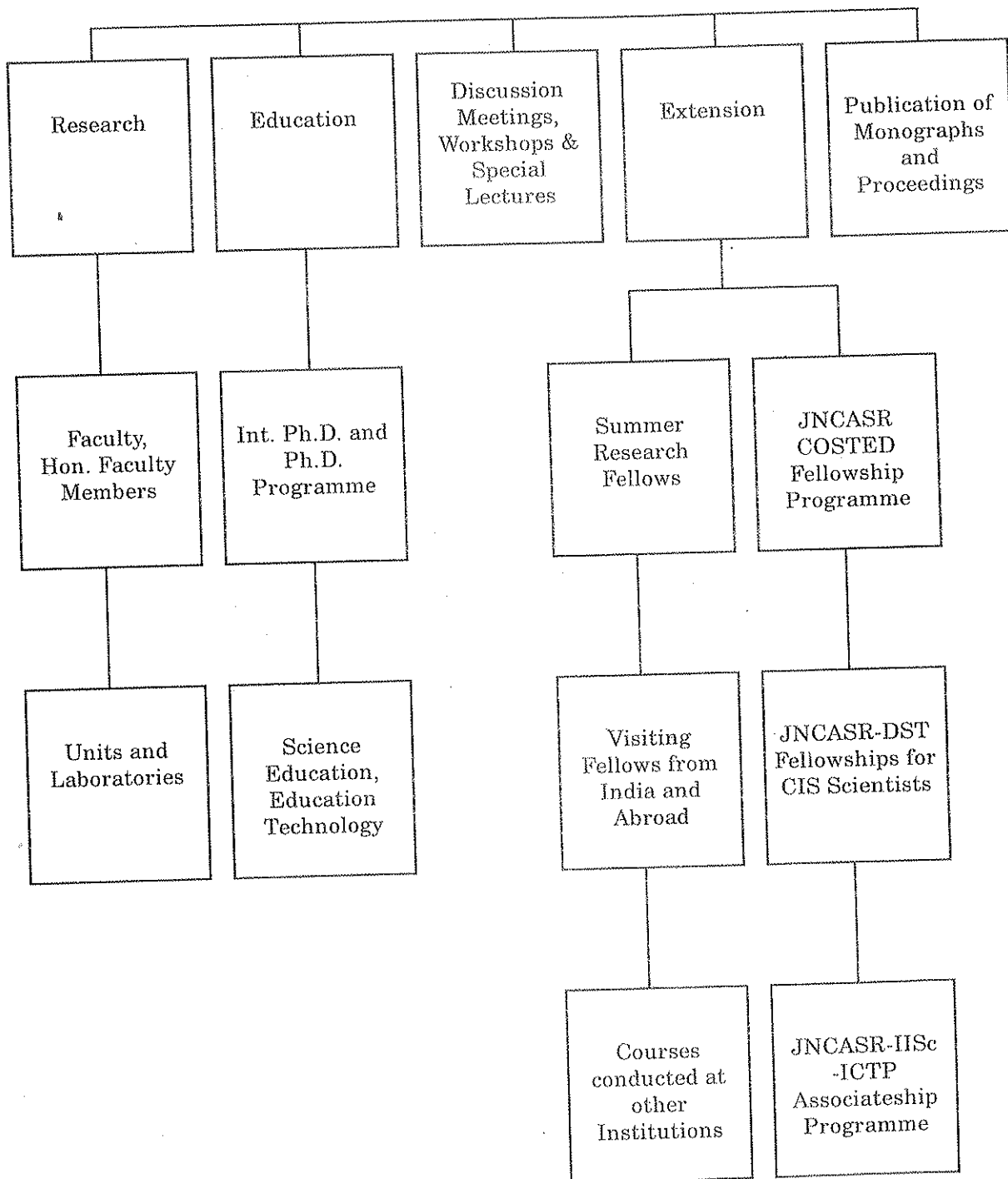
The Centre pursues active research programmes in chosen areas of science and engineering. There are several research students; some registered for the Integrated Ph.D Programme in Chemistry and others for the regular Ph.D Programmes and a few for M.Sc. (by research) in various areas. The Honorary faculty of the Centre continue to play an important role in guiding academic and extension activities.

Since January 1999, 24 Discussion Meetings, 5 Endowment lectures, 7 Colloquia, one Special Colloquium, 35 Seminars and 4 Frontier Lectures were held, either wholly or partially supported by the Centre.

Summer Research Fellowship Programme, Science education programme, National Science Day, Academic Exchange programme, Visiting Scientists, Visiting Research Scholars, Visiting Fellowship programme, Short-term courses, JNCASR-COSTED. International Fellowship programme, JNCASR-DST Coordinated Programmes with National Academy of Science, Khazakistan and Uzbekistan have all been organised successfully and have been appreciated by the various participants.

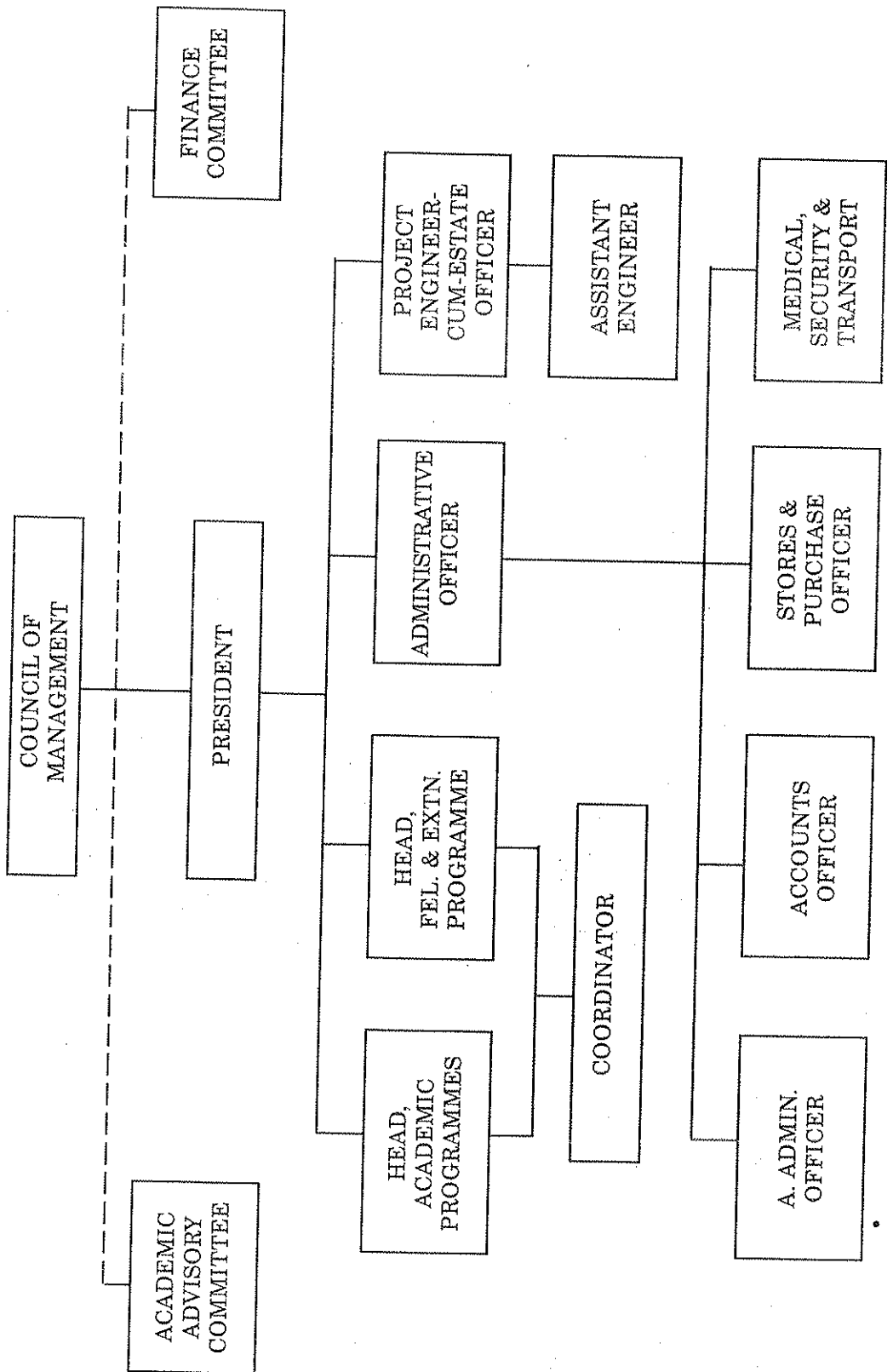
## 5. ACTIVITIES CHART

### JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH



## 6. ORGANISATION CHART

### JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH



## CHAPTER II

### THE ORGANISATION

#### 1. Council of Management

The administration and management of the affairs & finances of the Centre are conducted by the Council of Management. The Council of Management of the Centre meets twice a year.

The following are the members of the Council.

Raja Ramanna  
Chairman  
Council of Management  
JNCASR, Bangalore

Chairman

C.N.R. Rao  
President, JNCASR (upto 31.12.1999)  
Linus Pauling Research Professor,  
JNCASR (from 1.1.2000)

Member

V.Krishnan  
Acting President, JNCASR  
(from 1.1.2000)

Member

V.S. Ramamurthy  
Secretary  
Department of Science and Technology  
New Delhi

Member

S.K. Joshi  
Chairman, Recruitment and  
Assessment Centre,  
DRDO Complex, Delhi

Member

Rahul Sarin  
Joint Secretary & Financial Adviser  
Department of Science and Technology  
New Delhi (upto 25.11.1999)

Member

Arun Sharma Joint Secretary & Financial Adviser Department of Science and Technology New Delhi (from 26.11.1999)	Member
M.M. Sharma Mumbai	Member
S.Varadarajan President, Indian National Science Academy, New Delhi	Member
G. Mehta Director Indian Institute of Science, Bangalore	Member
T.V. Ramakrishnan Indian Institute of Science Bangalore (upto 11.12.1999)	Member
A.K. Sood Indian Institute of Science Bangalore (from 13.12.1999)	
N.Nagaraja Rao Administrative Officer, JNCASR	Secretary

## 2. The Finance Committee

The Finance Committee of the Centre scrutinizes all financial proposals, and makes recommendations to the Council of Management.

The constitution of the Finance Committee is as follows:

C.N.R. Rao President, JNCASR (upto 31.12.1999)	Chairman
V. Krishnan Acting President, JNCASR (from 1.1.2000)	

V. Krishnan  
Head, Academic Programmes  
JNCASR (till 31.12.1999)

C.N.R. Rao  
Linus Pauling Research Professor  
JNCASR (from 1.1.2000)

Member

Rahul Sarin,  
Jt. Secretary & Financial Adviser,  
Department of Science and Technology  
New Delhi (upto 25.11.1999)

Arun Sharma  
Joint Secretary & Financial Adviser  
Department of Science and Technology  
New Delhi (from 26.11.1999)

Member

T.V. Ramakrishnan  
Indian Institute of Science  
Bangalore (upto 11.12.1999)

A.K. Sood  
Indian Institute of Science  
Bangalore (from 13.12.1999)

Member

G.K.N. Shastry  
Accounts Officer, JNCASR  
(upto 31.8.1999)

N. Nagaraja Rao  
Incharge Accounts Officer, JNCASR  
(from 1.9.1999 to 1.12.1999)

Member

R.S. Gururaj  
Accounts Officer, JNCASR  
(from 2.12.1999)

N.Nagaraja Rao  
Administrative Officer, JNCASR

Secretary

### 3. The Academic Advisory Committee

The functions of the Academic Advisory Committee include planning execution and coordination of research & other academic activities of the Centre. It also regulates the cause of study, procedure for admission of students, examination etc. It meets at least twice a year. The Committee makes its recommendations to the Council of Management.

The members of the Committee are :

C.N.R. Rao President, JNCASR (upto 31.12.1999)	Chairman
V.Krishnan Acting President, JNCASR (from 1.1.2000)	
V. Krishnan Head, Academic Programmes, JNCASR (till 31.12.1999)	Member
C.N.R. Rao Linus Pauling Research Professor JNCASR (from 1.1.2000)	
Madhav Gadgil IISc, Bangalore (upto 31.12.1999)	Member
S.S. Jha Director, TIFR, Mumbai	Member
N. Kumar Director, Raman Research Institute Bangalore	Member
P. Rama Rao Chairman, Atomic Energy Regulatory Board Mumbai	Member
R.A. Mashelkar Director-General, CSIR New Delhi	Member

R. Narasimha  
Director, NIAS  
Bangalore (upto 31.12.1999)

N. Mukunda  
Head, Fellowships & Extn. Programmes  
JNCASR (from 4.1.2000)

Member

H. Sharat Chandra  
Honorary Professor, JNCASR  
(upto 31.12.1999)

Member

M.R.S. Rao  
Indian Institute of Science  
(from 4.1.2000)

M.K. Chandrashekar  
Professor, JNCASR

Member

N. Nagaraja Rao  
Administrative Officer, JNCASR

Secretary

The faculties are involved in the academic activities of the Centre and assist the Academic Advisory Committee in the discharge of its functions. The last Annual Faculty Meeting was held in November 1999 which included lectures by the faculty on the advances made in various research areas. Two local faculty meetings were also held in August 1999 and December 1999 to review the progress and provide inputs wherever required.

#### 4. Administration

President

**C.N.R. Rao**, D.Sc. (Mysore), Ph.D. (Purdue),  
D.Sc. (h.c.), Hon. F.R.S.C., F.A.Sc., F.N.A., F.R.S.  
(upto 31.12.1999)

Acting President

**V. Krishnan**, Ph.D. (IISc), F.A.Sc., F.N.A.  
(from 1.1.2000)



Head, Academic Programmes

**V. Krishnan**, Ph.D. (IISc), F.A.Sc., F.N.A.  
(upto 31.12.1999)

Head, Fellowships and Extension Programmes

**N. Mukunda**, Ph.D. (Rochester), F.A.Sc., F.N.A.

Administrative Officer

**N. Nagaraja Rao**, M. A. (Mysore), M.B.A. (IGNOU) LL. B., (Bangalore)

Co-ordinator

**W.H. Madhusudan**, Ph.D. (IISc)

Accounts Officer

**G.K.N. Sastry**, B.Sc.(Mysore)  
(upto 31.8.1999)

Accounts Officer

**R.S. Gururaj**, B.Sc. (Mysore), M.PEd (Bangalore)  
(from 2.12.1999)

A. Administrative Officer

**P.N. Rajappa**, B.A., PGDBA (Bangalore)

Secretary to President

**D.V. Seetharaman**

Stores & Purchase Officer

**Sripathy Tirupathy**, M.Com. (Osmania), M.A. (Kakatiya)

Project Engineer - cum - Estate Officer

**S. Chikkappa**, B.E. (Mysore)

Consulting Medical Officer

**Dr. B.S. Subba Rao**, M.B.B.S. (Mysore)

Consulting Lady Medical Officer

**Dr. Kavitha Sridhar**, M.B.B.S.

Honorary Security Officer

**M.R. Chandrasekhar**, B.Sc., LL.B.

## CHAPTER - III

### UNITS AND LABORATORIES

#### 1. Chemistry and Physics of Materials

Research work carried out in this unit pertains to carbon nanomaterials, metal oxides, films, porous solids, conjugated polymers as well as clusters. Single walled and multi-walled carbon nanotubes have been synthesized. Metals and metal oxide rods have been made using carbon nanotubes as templates. Lanthanide manganates and cobaltates have been synthesized using solid state route and their single crystals have been grown by floating zone melting. Thin films of metals and metal oxides have been grown epitaxially employing nebulized spray pyrolysis. These materials were characterized for their electrical, magnetic and colossal magnetoresistive properties. Porous solids of tin, zinc and cobalt phosphates and oxalates exhibiting different pore sizes were synthesized following hydro-thermal method. The structural characterization was carried out using single crystal X-ray diffraction. Raman spectroscopy and Brillouin scattering of charge ordered manganates and bronzes have been carried out. Clusters from organic and inorganic samples were studied by employing a time of flight mass spectrometer. Using wet chemical procedures, magic nuclearity metal clusters have been synthesized and organized into mesoscopic structures. Reactivity of gold based catalysts for pollution control have been investigated using surface techniques. Polymer based conducting materials have been studied for their electronic, optical, photonic properties for device development. Modelling of soft materials as well as surfactant aggregates were carried out using classical, ab-initio and non-equilibrium molecular dynamic simulations.

The following are the members of the Unit:

**Chair**

C.N.R. Rao F.A.Sc., F.N.A., F.R.S.

**Hon. Professor**

A.K. Sood F.A.Sc., F.N.A.

**Faculty Fellows**

S. Balasubramanian Ph.D.

N. Chandrabhas Ph.D.

G.U. Kulkarni Ph.D.

K.S. Narayan Ph.D., Assoc. Prof.

S. Natarajan Ph.D.

A.R. Raju Ph.D.

**Sr. Research Officer**

V.R. Pedireddi Ph.D.

**Research Associates**

E. Balasubramaniam Ph.D.

M. Chandra Sekhar Ph.D.

P. Kumaradhas Ph.D.

Geetha K. Varrier Ph.D.

Rahul Sen Ph.D.

R.S. Singh Ph.D.

P.N. Santosh Ph.D.

**Technical Assistants**

M.K. Ranganathan M.Sc.

V. Sreenath B.E.

S. Srinivas B.E.

Usha Govind Tumkurkar M.Sc.

**R & D Assistants**

C.P. Vinod M.Sc.

## Lab Assistants

Anil Kumar J  
Vasudev B.S.

D.E.E.  
D.E.E.

## 2. Chemical Biology

Selective and competitive inhibition of glycoside processing enzymes is an extremely active area of research as glycosidase inhibitors have considerable therapeutical potential in the management of diabetes, viral infections and cancer among other disorders. A new family of glycosidase inhibitors based on polyhydroxylated hydrindanes, decalins and diquinanes have been conceptualized. These annulated carbosugars have been synthesized through novel stereo-, regio- and enantioselective routes and their inhibition profile against a variety of glycosidases has been evaluated (Tetrahedron Lett. 1999, 40, 9137, 9141).

Several covalently linked bisporphyrins bearing nitroporphyrin and tetraphenyl porphyrin have been synthesized and characterized. The free base, partially and fully metallated bisporphyrins (M = Zn, Cu, Ag and Ni) display unique photoinduced electron and excitation energy transfer reactions depending on the nature of metal ion in these systems.

The biosynthetic precursor for the efrapeptins, a class of F1-ATPase inhibitors has been characterized. A spermidine linked peptide, elvapeptin has been shown to be converted to the peptide bearing a C-terminal diazabicyclo [4.3.0] nonene in the efrapeptins. The characterization of the natural peptides and the chemical conversion has been established by electrospray ionisation mass spectrometry.

A number of new distamycin analogs that lack the leading amide unit at the N-terminus have been synthesized. The double-stranded DNA binding properties of these distamycin analogs have been examined. These oligopeptide derivatives bind in a sequence-specific fashion with ds-DNA and stabilize B-DNA structure even under high salt (4M NaCl) conditions.

An elucidation of determinants of protein stability through genome sequence analysis was carried out. In addition the thermal stability and the ligand binding thermodynamics of the E. coli chaperone SecB were characterized.

A tripodal, bile acid-derived salt has been found to form stable, thermo-reversible gels in predominantly aqueous media. Various properties of these unique gels have been investigated using spectroscopic and other techniques.

The following are the members of the Unit :

#### **Chair**

K.M. Madyastha (till January 11, 2000)	F.A.Sc.
Prof. Uday Maitra (from Jan. 12, 2000)	Ph.D.

#### **Hon. Professors**

P. Balaram	F.A.Sc., F.N.A.
V. Krishnan	F.A.Sc., F.N.A.
G. Mehta	F.A.Sc., F.N.A.

#### **Hon. Faculty**

Raghavan Varadarajan	Ph.D.
Santanu Bhattacharya	Ph.D.

#### **Research Associate**

Shital K. Chattopadyay	Ph.D.
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#### **R & D Assistants**

G.R. Sridhar	M.Sc.
M.V. Uma	M.Sc.

### **3. Condensed Matter Theory**

The Condensed Matter Theory Unit (CMTU) consists of 15 honorary faculty members from different Departments of IISc and several research associates. The members of CMTU are engaged in theoretical research on a variety of topics in the general area of Condensed Matter Physics and Chemistry. During 1999-2000, members of CMTU made important progress on a wide variety of problems in this area. The research topics

pursued by the members of CMTU during this period with support from JNCASR include : d-wave superconductivity in cuprates, interpretation of the Auger process from strongly correlated systems, x-ray absorption in strongly correlated systems, incommensurate one-dimensional correlated electron systems, quasi-one-dimensional frustrated Heisenberg antiferromagnets, equilibrium and dynamical properties of frustrated magnetic systems, properties of the mixed phase of high-T<sub>c</sub> superconductors, analytic and numerical studies of fluid and magneto-hydrodynamic turbulence, orientational and solvation dynamics in complex liquids, spatiotemporal chaos in models for pattern-forming systems, chaos and self-organized criticality in jerky flow, the free-energy landscape of simple liquids near the structural glass transition, mathematical models of network evolution, levitation effect in confined systems, dynamics of molecules confined within zeolites, and dynamics of biomembranes containing mobile, active pumps.

The following are the members of the unit :

#### Chair

Chandan Dasgupta F.A.Sc.

#### Hon. Professors

Biman Bagchi	F.A.Sc., F.N.A.
H.R. Krishnamurthy	F.A.Sc., F.N.A.
N. Kumar	F.A.Sc., F.N.A.
T.V. Ramakrishnan	F.A.Sc., F.N.A.
S. Ramasesha	F.A.Sc.
B. Sriram Shastry	F.A.Sc.

#### Hon. Faculty

G. Ananthakrishna	F.A.Sc.
Binny J. Cherayil	Ph.D.
Diptiman Sen	Ph.D.
Rahul Pandit	F.A.Sc.
Sriram Ramaswamy	F.A.Sc.
K.L. Sebastian	F.A.Sc.
Sanjay Jain	Ph.D.
S. Yashonath	F.A.Sc.

### **Research Associates**

Rajeev Ahluwalia	Ph.D.
S.S. Mandal	Ph.D.
Sitabra Sinha	Ph.D.

### **Research Associates (P)**

Abhishek Dhar	M.Sc.
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## **4. Education Technology**

The CD-ROM titled "Understanding Chemistry" was completed and packaged for release and commercial distribution in July 1999. Based on the feed back received from the 1st release, work on the reprint with improved features (live experiments and 3D animations, extensive glossary and web links to acclaimed scientists) was carried out and the second version was released in March 2000. The book titled "Understanding Chemistry" was designed, formatted and made print-ready for publishing. The book was released in the month of December 1999 for commercial distribution.

Under the science polarization program, a half - day program "A Celebration of Chemistry" was held on February 1, 2000 and February 19, 2000 at Bangalore. About 150 participants (teachers and students) from various schools participated. The program included lectures, demonstrations of live experiments and multimedia presentation etc. A similar program was also held at the INSA premises, Delhi, on March 11, 2000.

The multimedia group of this unit has actively participated in the design, layout and preparation of print-ready brochures brought out by the Centre.

Six Small Scale Chemistry Kit workshops have been conducted for the benefit of school children. (10th - 12th Standards) and school science teachers. The kit would become commercially available soon. Efforts are underway for the design and fabrication of water-testing kit for usage in the fields.

The following are the Members of the unit :

## Chair

V. Krishnan

F.A.Sc., F.N.A.

## Programme Scientist

Jayanthi Chandrasekaran

Ph.D.

## Technical Assistants

D.K. Bhaskar

B.E.

Jatinder Kaur

M.Sc.

## Co-ordinator (Hon)

Indumati Rao

M.A., M.S.

## Multimedia Asst. (Hon)

Sanjay S. Rao

B.Sc.

## 5. Evolutionary & Organismal Biology

The Unit conducts advanced research in Chronobiology, behavioural ecology and sociobiology, evolutionary genetics, evolutionary ecology and biodiversity and undertakes graduate level teaching in some of these subjects.

**Chronobiology Laboratory :** Our experiments on structural and functional aspects of biological clocks in the fruit fly, ants and the field mouse are in progress. We have now initiated experiments with ants (*Camponotus compressus*) to understand the social consequences of circadian rhythms. The circadian rhythms are being assayed in individuals of different castes isolated from the colony. Other sympatric species of ants will also be studied to unravel the circadian organization of social insects. A second chronobiology laboratory is being built.

**Evolutionary Biology Laboratory :** The evolution of life histories is being investigated by examining direct and correlated responses to natural selection on demographic attributes of *Drosophila*. Experimental and theoretical studies are in progress on the dynamic behaviour of very small populations linked by migration (metapopulations) in order to understand the biological causes of demographic stochasticity.



**Biodiversity Laboratory** : Theoretical; experimental, field and policy research on the biodiversity of India, is in progress. A project called "Lifescape" to generate resource material to monitor biodiversity is also being coordinated.

**Behavioural Ecology Laboratory** : Field and laboratory investigations on the ecology and sociobiology of the queen-less ponerine ant *Diacamma ceylonense* are in progress to understand the evolution altruism and selfishness in insect societies.

#### **Chair**

M.K. Chandrashekar                      F.A.Sc., F.N.A.

#### **Honorary Professors**

R. Gadagkar                                      F.A.Sc., F.N.A.

Madhav Gadgil                                  F.A.Sc., F.N.A.

V. Nanjundiah                                    F.A.Sc.

#### **Faculty Fellows**

Amitabh Joshi                                    Ph.D.

Vijay Kumar Sharma                          Ph.D.

#### **Fellow**

P. Pramod    Ph.D.

#### **Research Associates**

Hans Raj Negi                                      Ph.D.

Suri Venkatachalam                          Ph.D.

#### **R & D Assistants**

Divakar N. Belawadi                            B.E.

Jyothi N. Belawadi                            M.Sc.

M. Rajamani                                        M.Sc.

S. Ravikumar                                      M.Sc.

K. Shankaramurthy                            M.Sc.

#### **Jr. Scientific Asst.**

A.V. Nagarathnamma                          M.Sc.

## 6. Geodynamics

The project on the evolution of the mountain ranges surrounding the Mysore Plateau, the landscape modification and the river responses to movements on faults in the Southern Indian Shield is complete. Two papers have been communicated for publication.

The collaborative neotectonic study in the eastern sector of the Arunachal Himalaya could not be resumed owing to paucity of fund in the collaborating institution - The Wadia Institute of Himalaya Geology (Dehradun).

### Chair

K.S. Valdiya

F.A.Sc., F.N.A.

## 7. Fluid Dynamics

In the area of flow instability and transition, consistent theories for the stability of compressible and three-dimensional boundary layers have been developed. Using a model developed to describe the growth of turbulent spots on an axisymmetric body, it is shown that, contrary to present belief, the effect of heat on transition is consistent with stability results. A study of the stability of miscible two-fluid flow through a channel has led to interesting results with possibilities for flow control.

A wind tunnel is being set-up to conduct fluid flow experiments. One of the major thrusts of this laboratory will be the study of insect-flight dynamics. It is planned to set up a Particle-Image-Velocimetry system in this lab.

In the direct numerical simulation of turbulent flows, our effort has been to simulate an idealised version of a cloud-like flow. This work has led to interesting results on the characteristics of a jet or a plume subjected to local volumetric heat simulating the release of latent heat of condensation in a cloud. The simulations reveal dramatic changes in the concentration and distribution of vortical structures due to heating. The present focus is to investigate the possibility of manipulating coherent structures by exercising flow control through selective heating of the jet (in a band enclosing only the base of the structures).

In atmospheric boundary layers, a novel parameterization scheme has been proposed for low-wind fluxes : this could affect monsoon modelling significantly. A DST-sponsored project on the structure of the atmospheric boundary layer over the monsoon trough has been completed. In a new project we are analysing the structure of convection events as observed at the National MST Radar Facility at Gadanki. The temporal structure of Indian monsoon rainfall has been analysed using wavelets. The analysis reveals seven prominent modes, each of which is characterized by jittery oscillations with periods varying from a little less than 2 years to nearly 80 years.

The following are the members of the unit :

#### **Chair**

R. Narasimha F.A.Sc., F.N.A., F.R.S.

#### **Faculty Fellows**

Amit J. Basu Ph.D.  
Rama Govindarajan Ph.D.  
K.R. Sreenivas Ph.D.

#### **Research Associate**

Sanjeev Rao K. Ph.D.

#### **R & D Assistant**

Rajesh G. M. Tech.

### **8. Molecular Biology and Genetics**

The research activities in MBGU focus on several frontier areas of science and medicine. The progress in each area for the year 1999-2000 is summarized below.

#### **(a) Molecular Parasitology**

Work on *Plasmodium falciparum* biochemistry revolves around parasite heme-biosynthetic pathway, purine salvage pathway, glycolytic pathway, protein biosynthesis and hemoglobin catabolism. The *P. falciparum* gene

from adenylo succinate synthetase gene has been cloned and expressed in an active form in *E. coli*. Various mutants of *P. falciparum* and human HGPRT have been generated with the aim of understanding substrate specificity with this enzyme. A new target unique to the parasite has been identified which has great potential for developing patent-anti-malarials. Cloning of enzymes in heme-biosynthetic pathway and protein synthesis are in progress for detailed studies.

### **(b) Development of DNA vaccines for HIV**

Several eukaryotic expression vectors producing HIV antigens have been constructed or are being constructed. The expression and immunogenicity potential of these vectors will be evaluated in mice and primates. A technique to isolate plasmid DNA has been developed using silica, which has been published (Lakshmi et al., Analytical Biochemistry, 272, 109-112, 1999). A patent has also been filed on this technique.

### **(c) Human Molecular Genetics**

Mutations in ion channels have been shown to cause a large number of neurological genetic diseases. We have analyzed polymorphic glutamine tracts present in a recently cloned human calcium activated potassium channel (hsKCa<sub>3</sub>) gene and association of this polymorphism to schizophrenia and bipolar disorders patients. While no significant correlation was found with respect to susceptibility to these two psychiatric diseases and mutations at hsKCa<sub>3</sub> gene in sporadic cases, patients with family history of the disease had slight increase in the difference of the allele sizes present.

### **(d) Transcription and disease laboratory**

Transcription and disease laboratory has been established to study the role of chromatin remodeling and modification of transcription factors and nonhistone proteins in transcription regulation and diseases (in human). The other important objective of the laboratory is to search for the inhibitors of histone acetyltransferase and deacetylases in natural products (Indian ayurvedic drugs) as potential drugs. Some significant progress have already been made in these lines of research. Acetylation (by p300) and its functional consequences of few human transcriptional coactivator are under investigation. Recombinant, human remodeling factors are being expressed, purified and characterized from both *E. coli* and baculovirus expression system.

### (e) The vascular biology laboratory

Routine culture of mouse cell lines and Embryonic Stem cell culture and differentiation are in process. Molecular and expression analysis of identified gene trap clones initiated. cDNAs corresponding to the gene trap clones are being analyzed. Their expression is being analyzed in differentiating ES cells and in mouse tissue during development by RT-PCR and Northern blot analysis. The corresponding genes will be analyzed by genomic DNA Southern analysis using the cDNA as a probe. The animal house is functional and mouse breeding is being started in the animal house. Infrastructural facilities such as a controlled temperature and clean environment in the animal house will be instituted, so that experiments can be started to generate mouse chimeras.

The following are the members of the unit :

#### Chair

G. Padmanaban F.A.Sc., F.N.A.

#### Honorary Professor

H. Sharat Chandra F.A.Sc., F.N.A.

#### Faculty Fellows

Anuranjan Anand	Ph.D.
Hemalatha Balaram	Ph.D.
Maneesha Inamdar	Ph.D.
Namita Surolia	Ph.D.
Ranga Uday Kumar	Ph.D.
Tapas Kumar Kundu	Ph.D.

#### R & D Assistants

Arvind R.	M.B.B.S.
N.R. Ashok	M.Sc.
Deepak Jain	M.Sc.
Kamalpriya D	M.Sc.
T.R. Nagaraja	M.Sc.
Prashanth Kumar B.R.	M.Sc.

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Rangapriya S.	M.Sc.
Swathi Aiyer	M.Phil.
Soma Ganguly	M.Sc.
Shilpa R.	M.Sc.
Shadrack S.A.	M.Sc.

## 9. Theoretical Science

The following problems in Condensed Matter and Statistical Physics have been pursued and results obtained; Density functional calculations of Structural and vibrational properties of metal surfaces, explanations of anomalous properties in certain cases, inclusion of electronic structure correlation effects particularly in magnetic materials, experimental verification of results on surface anharmonicity in surface alloys; relation between the liquid-gas spinodal and the glass transition locus; liquid-liquid phase transition in supercooled silicon examined by extensive computer simulations; structural changes in supercooled water near dynamical, crossover temperature; Random matrix predictions for topography of potential energy in supercooled liquids.

The following are the members of the unit :

### Chair

N. Mukunda	F.A.Sc., F.N.A.
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### Faculty Fellows

Shobhana Narasimhan	Ph.D.
Srikant Sastry	Ph.D.

### Fellows

Janaki Balakrishnan	Ph.D.
Nivedita Deo	Ph.D.

## 10. Computer Laboratory

The Computer Laboratory embarked upon major expansion of its facilities. It added the Silicon Graphics Power Challenge with R 10000 Processors, with a total shared memory of one Giga byte and a disk space of 45 Giga bytes. This expansion carried the computing power of the laboratory to the Giga FLOP regime. The laboratory also established a microwave link between Jakkur campus and world via a very small aperture terminal (VSAT). This has enabled Jakkur to become an independent node of the ERNET. Besides these major expansions, routine upgradation of smaller systems by adding high-end Indy Workstations to front-end the powerful machines was also carried out. The facilities of the laboratory have been extensively used by various groups of the Centre. Due acknowledgment has been made to the Centre by its users in their research publications to place on record the services of the Computer laboratory.

The following are the members of the unit :

### Head

G.U. Kulkarni (Upto 31.12.1999)	Ph.D.
S. Balasubramanian (from 01.01.2000)	Ph.D.

### Hon. Computer Scientist

K.H. Gowranga	M. Tech.
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### R & D Assistants

T.R. Rajesh Kanna	B.E.
Sanjay Shukla	B.E.

### **Endowed Research Professorships :**

1. Astra Zeneca Research Centre India  
- Astra Chair in Life Sciences  
M.K. Chandrashekar, F.A.Sc., F.N.A.
2. Defence Research and Development Organisation  
- D.S. Kothari Chair  
M.M. Sharma, F.R.S., F.A.Sc., F.N.A.
3. Council of Scientific and Industrial Research  
- S.S. Bhatnagar Chair  
K.S. Valdiya, F.A.Sc., F.N.A.
4. IBM World Trade Corporation  
- IBM Information Technology Chair  
V. Rajaraman, F.A.Sc., F.N.A.
5. Hindustan Lever Ltd.  
- Hindustan Lever Chair  
M.V. George, F.A.Sc., F.N.A. (till Nov. 1999)
6. Gharda Chemicals  
- Gharda Chair  
R. Kumar, F.A.Sc., F.N.A. (till 31.7.2000)
7. Reliance  
Linus Pauling Research Professor  
Prof. C.N.R. Rao, F.A.Sc., F.N.A., F.R.S.  
(from 1.12.99)

### **Senior Associates :**

1. S.N. Balasubrahmanyam, Ph.D. (Honorary)
2. S. Chandrashekar, Ph.D.



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## CHAPTER IV

### ACADEMIC PROGRAMMES

#### PART - I

##### 1. Academic Activities

The Centre has signed a Memorandum of Understanding with the Manipal Academy of Higher Education (MAHE) – a deemed university which enables the Centre to conduct an integrated Ph.D. programme as well as regular Ph.D. programme in science and engineering. The Centre selects candidates on an all-India basis, offers course work (in collaboration with IISc), provides research facilities and administers the programme, while MAHE awards the degrees. The regular Ph.D. programme in science and engineering is available to post-graduates who have successfully completed the GATE/CSIR-NET/UGC/JRF examination. A new programme of M.Sc. (by research) providing opportunities for highly motivated science graduates to take up interdisciplinary research in the areas of engineering and medicine has introduced.

The following student with chemistry background has been admitted for the integrated Ph.D. programme in Chemistry and Physics of Materials for year 1999 - 2000.

Vijaylakshmi S

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For the regular Ph.D. programme, 5 students were admitted for the year 1999 - 2000 to work in the areas indicated against their names :

M. Krishnan	-	Chemistry & Physics of Materials
N. Vinod	-	Fluid Dynamics
Arpita Mukhopadyay	-	Molecular Biology & Genetics
Raghani Pushpa N	-	Theoretical Sciences
Ashwin Sampangiraj	-	Theoretical Sciences

The following student with <sup>1999</sup>medicine background has been admitted for M.Sc. (by research) for the year 1999 - 2000

Praveen Bhat

*Binay Kumar Bhat*

## 2. Discussion Meetings: *U.S.*

The Following discussion meetings have been held since the last Annual Report. *on July & partially supported by the center*

1. Discussion Meeting on Molecular Genetics of Juvenile Myoclonic Epilepsy, (May 8, 1999), Convener : Anuranjan Anand (JNCASR).
2. International Meeting on Transcription Assembly and Protein-nucleic acid interaction, (June 7 - 9, 1999), Conveners : M.S. Shaila (IISc.), V. Nagaraja (IISc).
3. Discussion Meeting on Behavioural Ecology, (July 8 -10, 1999), at Mysore, Convener : R. Gadagkar (IISc)
4. Discussion Meeting on Quantum Computation, (July 19 - 23 1999), Conveners : N. Mukunda, Vijay Chandru (IISc)
5. 5th Biennial Conference on Signal Processing and Communications, (July 21 - 24, 1999) Convener : V.U. Reddy (IISc)
6. Conference on Information Technology for Management Science Applications, July 27 - 28, 1999, Convener : Prof. Vijay Chandru (IISc)
7. Workshop on Protein Structural Bioinformatics and Genomics, August 28, 1999, Convener : Prof. K. Vijaya Raghavan (NCBS, TIFR).
8. National Seminar on Flyash Characterisation and its Geotechnical Applications, August 30, 1999, Convener : Prof. A. Sridharan (IISc)
9. Workshop on Laminar Techniques, September 1, 1999, Convener : Dr. Ranga Udaykumar (JNCASR)
10. Climate and agriculture III : Climate variability and Rice Production, November 2 - 3, 1999, Convener : Prof. Sulochana Gadgil (IISc)
11. Discussion Meeting on Recent Trends in Nonequilibrium Statistical Mechanics, November 15 - 25, 1999, Convener : Rahul Pandit (IISc)
12. Discussion Meeting on The Science of Strongly Correlated Systems, November 26 - 27, 1999, Convener : Prof. D.D. Sarma (IISc)

13. Winter School on Solid State and Materials Chemistry, November 29 - December 4, 1999, Sponsorer : JNCASR.
14. International Meeting on Quantum Probability and infinite Dimensional Analysis, December 14 -18, 1999, Convener : Prof. K.B. Sinha (ISI, New Delhi), Prof. B.V. Rajarama Bhat ( ISI, Bangalore)
15. In service training programme for High School Teachers, December 13 - 22, 1999, Convener : Prof. H.L. Bhat (IISc)
16. Frontier Lectures on Molecular Biology and Genetics, Dec. 15 - 17, 1999 at Mangalore University Sponsors : JNCASR & Mangalore University.
17. 5-day Workshop on Millennium Meting on String Theory, January 3 - 8, 2000, Convener: Prof. Spenta Wadia (TIFR), Dr. Sanjay Jain (IISc)
18. International Workshop on Physics with Trapped Atoms & Ions, January 5 - 7, 2000, Convener : Dr. V. Natarajan (IISc.)
19. Symposium on Modern Trends in Inorganic Chemistry, January 18 - 20, 2000, Convener : Prof. D.N. Satyanarayana (IISc).
20. Second National Symposium in Chemistry, January 27 - 29, 2000, Convener : Dr. J.S. Yadav, (IICT, Hyderabad).
21. International Conference for Science Communicators, January 28 - 30, 2000 at Pune, JNCASR, IUCAA.
22. Symposium on Materials for Chemical Industries & Novel Materials Research, February 3 - 5, 2000, Convener : Prof. L.M. Manocha (MRSI, Baroda).
23. Symposium on Bio Organic Chemistry, February 7 - 8, 2000, Convener : Prof. S. Bhattacharya and Prof. Uday Maitra (IISc)
24. Eighth Annual Meeting of the Molecular Immunology Forum 2000, March 4 - 6, 2000, Convener : Prof. R. Manjunath (IISc).

### 3. Lectures and Colloquia :

#### Endowment Lectures :

The Centre organized the following endowment lectures during the period under report:

1. ISRO-Satish Dhawan Lecture by Professor **M.G.K. Menon**, on "**Place for Values in the World of Science**", September 6, 1999.
2. DAE - Raja Ramanna Lecture in Physics by Prof. **B.V. Sreekantan**, on "**Physics, the Universe and consciousness**", October 8, 1999.
3. DAE - Raja Ramanna Prize Lecture in Physics by Prof. **Chandan Dasgupta**, on "**Universal Concepts in the Theory of Glassy Systems**," October 8, 1999.
4. A.V. Rama Rao Foundation Lecture in Chemistry by Prof. **M.M. Sharma**, on "**Innovative Momentum of Chemical Industry**," October 21, 1999.
5. A.V. Rama Rao Prize Lecture in Chemistry by Prof. **Darshan Ranganathan**, on "**Designer Peptides for Supramolecular Tubular Structures**," October 21, 1999.

#### Colloquia

The following Colloquia were held since the last annual report :

1. How brains might interact with specific environments - A case study with bats in Madurai by Prof. Gerhard Neuweiler, University of Munich, Germany, August 13, 1999.
2. Processes of entrainment in turbulent round jets by Dr. Joseph Mathew, October 13, 1999.
3. An unstable ocean-atmosphere coupled mode of climate variability in the Indian Ocean by Prof. B.N. Goswamy, November 3, 1999.

4. Some remarks on thin film, pastes and fluid jets by Prof. D.F. Parker, University of Edinburgh, November 17, 1999.
5. Transient and turbulent flows in the continuous casting of steel by Dr. Sivaraj Sivaramakrishna, University of Illinois, February 2, 2000.
6. A new stability theory for non-parallel compressible boundary layer flow by Dr. Rajeswari Seshadri, JNCASR, February 25, 2000.
7. Modelling of transport phenomena in Laser materials processing by Dr. Pradip Datta, IISc., March 15, 2000.

#### **Special Colloquim :**

**Empirical approach to the theory of Elementary particles and Nuclear Phenomena by Dr. Raja Ramanna, Vice Chairman, IAS, Bangalore, September 3, 1999.**

#### **4. Seminars :**

The Centre conducted the following seminars during the period under report :

1. Division of labour in a lower termite *Reticulitermes Fukienensis*, Dr. Mallikarjun Shakarad, April 15, 1999.
2. Allometric scaling : Common laws for plants and animals ?, Dr. Suri Venkatachalam, JNCASR, April 22, 1999.
3. Flow over a heated underwater body : Laminar to turbulent transition, Dr. Rama Govindarajan, JNCASR, April 23, 1999.
4. Random Matrices, Disorder and Chaos, Dr. Nivedita Deo, JNCASR, May 11, 1999.
5. Brillouin scattering studies in charge Density wave systems :  $K_{0.3}MnO_3$ , Dr. Chandrabhas Narayana, JNCASR, June 17, 1999.
6. Structural characterisation of Ultra-Fine Cobalt and Cobalt Oxide nanoparticles, Dr. Marc Verslt, Toulouse, Cedex, France, August 17, 1999.

7. Dissecting the functional architecture of HIV - 1 reverse transcriptase, Dr. Vinayak R. Prasad, Albert Einstein College of Medicine, New York, USA, August 17, 1999.
8. Particle image velocimetry (PIV): its applications, Dr. K.R. Sreenivas, JNCASR, August 23, 1999.
9. Spin Dynamics : Waiting to exhale, Dr. Srikanth Hariharan, Advanced Materials Res. Inst., Univ. of New Orleans, August 24, 1999.
10. Biophysical applications of Quasielastic and inelastic neutron scattering: Recent advances and New challenges, Dr. H.D. Middendorf, Clarendon Laboratory, University of Oxford, U.K., August 26, 1999.
11. Diversity of Lichens and wildlife conservation issues in Hemis national park in Ladakh, Dr. Hans Raj Negi, JNCASR, September 23, 1999.
12. Role of Melatonin as an internal Zeitgeber for a mamalian system, Dr. Vijay Kumar Sharma, JNCASR, September 30, 1999,
13. Glass transition in two dimensions, Dr. Robin Speedy, Waikane Beach, New Zealand, October 6, 1999.
14. Modelling pathogenesis, Prof. Prabhakar G. Vaidya, NIAS, October 7, 1999.
15. The tropical paper wasp polistes stigma : A case of reverse social evolution, Dr. Mallikarjun Shakarad, JNCASR, October 28, 1999.
16. Phenotypic plasticity and genetic assimilation, Prof. Vidyanand Najundaiah, IISc. November 4, 1999.
17. How do plants make themselves - a molecular genetic analysis of ovule development, Dr. Sureshkumar Balasubramanian, Institute of Plant Biology, University of Zurich, Switzerland, November 12, 1999.
18. Evidence for extracellular communication through proteases in *Aspergillus Flavus*, Dr. Maturu Ramesh, Thermogen Inc., Chicago, IL, USA, November 16, 1999.

19. Song pattern recognition in orthoteran Insects, Dr. Rohini Balakrishnan, IISc., November 25, 1999.
20. The MAR-binding protein SATB1 is cleaved by caspase-6 and dissociates rapidly from chromatin early during T cell apoptosis, Dr. Sanjeev Galande, Lawrence Berkeley National Lab, University of California, Berkeley, USA, December 13, 1999.
21. Regulation of gene expression (in human) by Chromatin remodeling - clue for designing Drugs ?, Dr. Tapas Kumar Kundu, JNCASR, December 21, 1999.
22. Genomic imprinting, Sex determination and Social evolution in the Hymenoptera, Prof. R. Gadagkar, IISc., January 13, 1999.
23. Surface growth and fluid turbulence : Intermittent interfaces ?, Prof. Sankar Das Sarma, University of Maryland, USA, January 18, 2000.
24. Liquid state approach to polyelectrolyte Solutions, Prof. Arun Yethiraj, University of Wisconsin, USA, January 19, 2000.
25. Effect of static magnetic field on the lateral leaf movement in the plant *Desmodium Gyrns*. Prof. Wolfgang Englemann, Univ. of Tuebingen, Germany, and Dr. Vijay Kumar Sharma, JNCASR, January 20, 1999.
26. Towards an integration of systematics and the theory of evolution, Dr. Dominique Homberger, Louisiana State University, USA, February 1, 2000.
27. Cell fate specification in the developing *C. elegans* hermaphrodite vulva, Dr. Bhagwati Prasad Gupta, California Institute of Technology, Pasadena, USA, February 4, 2000.
28. Evolution of Life-time fecundity patterns in *Drosophila Melanogaster*: Constraints on common sensel, Dr. Mallikarjun Shakarad, JNCASR, February 10, 2000.
29. Role of biological clocks in plant-insect interactions, Prof. Wolfgang Englemann, Univ. of Tuebingen, Germany, February 17, 2000.

30. Some recent developments in open-framework phosphates, Prof. Anthony K. Cheetam, University of California, USA, February 22, 2000.
31. Seasonal adjustments of Organisms by using photoperiodism, Prof. Wolfgang Englemann, Univ. of Tuebingen, Germany, February 24, 2000.
32. X-ray and neutron diffraction studies of Zeolites and related materials, Prof. Anthony K. Cheetam, University of California, USA, February 24, 2000.
33. Monitoring medicinal plants of high elevation zones of western Himalayas : A Proposal, Dr. Hans Raj Negi, JNCASR, March 2, 2000.
34. Diapause: the way insects survive harsh conditions, Prof. Wolfgang Englemann, Univ. of Tuebingen, Germany, March 9, 2000.
35. Functions of mouse transforming growth factor- $\beta$ 2 (TGF $\beta$  2) in cardiac development, Dr. M. Azhar, University of Cincinnati Medical Centre, Cincinnati, USA, March 22, 2000.



**Other Lectures :**

Multiscale modelling of dislocations and plasticity by Prof. Ladisals Kubin, CNRS-ONERA, Chatillon Cedex, France, February 3, 2000.

**Frontier Lectures :**

1. **Nuclear doctrine for India** by **Mr. K. Subramanyam**, New Delhi, August 30, 1999.
2. **The light on the horizon changes (New dimensions in the arts)** by **Mrs. Mrunalini Sarabhai**, Darpana Academy of Performing Arts, Ahmedabad, September 20, 1999.
3. **The Razor's Edge : Agonising over Secularism in India** by **Mr. Chidananda Das Gupta**, Writer and Film Director , Calcutta February 28, 2000.
4. **Your eyes and how to protect God's greatest gift** by **Dr. S.S. Badrinath**, Director, Sankara Nethralaya, Chennai, March 29, 2000.

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**EXTENSION ACTIVITIES**

**PART - II**

**1. Summer Research Fellowships/Rajiv Gandhi Science Talent Research Fellowships**

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The Centre offers these fellowships for two summer months to bright undergraduate and graduate students. For the year 1999 - 2000, 120 students were offered fresh fellowships and 41 renewals. Out of this, 10 students were awarded Rajiv Gandhi Science Talent Research Fellowships.

Scientists in 42 institutions across the country listed below have guided these students :

1. ~~Anna University, Chennai.~~ ~~Abba M.E. Society~~ Abba Saheb Gharware College, Pune
2. ~~Dr. B.R. Ambedkar Centre for Bio-medical Research, Delhi~~
3. ~~Banaras Hindu University, Varanasi~~
4. ~~Bhabha Atomic Research Centre, Mumbai~~
5. ~~Centre for Advanced Technology, Indore~~
6. ~~Centre for Biochemical Technology, New Delhi.~~
7. ~~Centre for DNA and fingerprint & Diagnostic, Hyderabad.~~
8. ~~Central Drug Research Institute, Lucknow.~~ CAER, Bihar
9. ~~Central Glass & Ceramic Research Institute, Jadavpur~~
10. ~~Central Leather Research Institute, Chennai~~
11. ~~Defence Metallurgical Research Laboratory, Hyderabad.~~
12. ~~Delhi University, New Delhi.~~ DRDO, Delhi
13. ~~Guru Nanak Dev University, Amritsar.~~
14. ~~Indian Association for Cultivation of Sciences, Calcutta.~~
15. ~~Indian Institute of Astrophysics, Bangalore.~~

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- 16. Indian Institute of Chemical Technology, Hyderabad.
- 17. Indian Institute of Science, Bangalore
- 18. Indian Institute of Technology, Chennai.
- 19. Indian Institute of Chemical Biology, Calcutta
- 20. Indian Institute of Technology, Kanpur.
- 21. Indian Institute of Technology, Mumbai.
- 22. Indian Statistical Institute, Bangalore.
- 23. Indian Statistical Institute, Calcutta.
- 24. Indira Gandhi Centre for Atomic Research, Kalpakkam.
- 25. Institute of Microbial Technology, Chandigarh.
- 26. Jawaharlal Nehru University, New Delhi.
- 27. M.S. University, Baroda.
- 28. Madurai Kamaraj University, Madurai.
- 29. Mehta Research Institute of Mathematics and Mathematical Physics, Allahabad.
- 30. National Aerospace Laboratories, Bangalore.
- 31. National Centre for Biological Sciences, Bangalore.
- 32. National Institute of Immunology, New Delhi.
- 33. National Institute of Mental Health and Neuro Sciences, Bangalore.
- 34. National Chemical Laboratory, Pune.
- 35. National Physical Laboratory, New Delhi.
- 36. Regional Research Laboratory, Trivandrum.
- 37. Saha Institute of Nuclear Physics, Calcutta.
- 38. Tata Institute of Fundamental Research, Bangalore.
- 39. University of Delhi, Delhi.
- 40. University of Mysore, Mysore.
- 41. University of Poona, Pune
- 42. University of Hyderabad, Hyderabad.

IIT, Kharagpur

IIT, Kanpur  
IIT, Mumbai  
IIT, Kharagpur  
IIT, Guwahati  
IIT, Roorkee  
IIT, Varanasi  
IIT, Patna  
IIT, Delhi

IMSc, Chennai

Nagpur  
National Institute of Environmental Engineering and Technology, Nagpur  
Uswania University  
Rajiv Gandhi Institute of Technology, Bhopal  
BITech, Trivandrum

RRL, Jamnagar  
RRI, Bajeel  
PRL, Ahmedabad  
Jawaharlal Nehru Planetarium

Baroda, Bar

UAS, Bangalore

## **Science Education Programme**

Four Workshops on small-scale chemistry experiments were held for the benefit of high school teachers and students on 14.10.99, 14.12.1999, 21.12.1999 and 15.02.2000.

"A Celebration of Chemistry" – a Programme for high school students and teachers was conducted on the following dates :

- 1.2.2000 at IISc., Bangalore
- 19.2.2000 at AMRL Conference Hall, JNCASR, Jakkur
- 11.3.2000 at INSA, New Delhi.

## **National Science Day**

As part of the National Science day celebrations, on February 28, 2000, the following lectures were arranged.

- Lasers by Dr. Chandrabhas Narayana
- The Aerodynamics of Bird & Insect Flight by Dr. K.R. Sreenivas
- The Fascinating world of Honeybees by Prof. R. Gadagkar

In addition to the above, a multimedia presentation was arranged on a variety of topics by the Education Technology Unit of the Centre.

## **2. Academic Exchange Programme :**

As part of the academic exchange programme, the following scientists / scholars carried out collaborative work with scientists of the Centre and the Indian Institute of Science for varying period during the year under report :

### **Visiting Professor**

Prof. Wolfgang Cengelmann  
Univ. of Tübingen  
Germany.

### Visiting Scientists :

Prof. G.R. Govinda Raju  
University of Windsor  
Canada

Dr. Robin Speedy  
Victoria Univ. of Wellington  
New Zealand

Dr. Arun Yathiraj  
University of Wisconsin,  
USA

Dr. Monisha Bose  
Calcutta

### Visiting Research Scholars

Mr. Eno E. Ebenso  
Univ. of Calabar  
Nigeria

Mr. Lambare Guillaume  
ECPM, Strasbourg, France

### Visiting Scholar (TWAS Travel Fellowship)

Mr. Ayi anyama Ayi  
Univ. of Calabar  
Nigeria

### 3. Visiting Fellowships :

The Centre offers Visiting Fellowships to research scientists in educational institutions and R & D Laboratories, tenable for 2-3 months, to work with the faculty of the Centre. The following were offered Visiting Fellowships during 1999-2000 to work at the institutions as indicated below :

1. Dr. H. Ramakrishnaiah : Prof. Madhav Gadgil  
Lecturer in Botany : Centre for Ecological Sciences  
Govt. College for Boys : Indian Institute of Science  
KOLAR - 563 101 : Bangalore - 560 012.
2. Dr. Prafulla K. Jha : Dr. S. Balasubramanian  
Lecturer in Physics : Chemistry & Physics of Mat. Unit •  
M.S. University of Baroda : JNCASR  
Vadodara - 390 002.
3. Dr. Sajo. P. Naik : Prof. C.N.R. Rao  
Dept. of Chemistry : Linus Pauling Research Professor  
St. Xaviers College : JNCASR  
Mapusa, GOA - 403 507.

#### 4. Short-term Courses :

The Centre supports short-term courses of 2-3 days duration offered by the Honorary Faculty, along with other resource persons for a series of lectures in chosen areas at a host University.

The following course was conducted since the last annual report.

**Frontier Lectures in Condensed Matter Physics** by Prof. Chandan Dasgupta and Prof. Rahul Pandit, 16- 18, Dec, 1999 at Swamy Ramanand Teerth Marathwada Univ., Nanded , Maharastra.

#### 5. International Programmes :

##### i) JNCASR-COSTED International Fellowships Programme

Under this programme International Fellowships are awarded to scientists from developing countries in Asia (other than India), Africa and Latin America. This enables scientists to participate in short term research programme in Physical, Chemical and Biological sciences. The fellowships are for 3 months duration and for a maximum of ten participants in a year, of which six will carry travel grants.

The following were awarded fellowships during the year :

Dr. (Mrs.) O. Fadina  
Dept. of Crop Protection &  
Environmental Biology  
University of Ibadan  
Ibadan, Nigeria.

Dr. Benjamin Mensah  
Dept. of Zoology  
University of Cape Coast  
Ghana.

Dr. Lareef Mohamed Zubair  
Institute of Fundamental Studies  
Sri Lanka.

Dr. Aidroos Hasan  
University of Aden  
Maalla - Aden, Yemen.

Dr. Pradeep Pradhan  
Tribhuvan Univ., Nepal.

Mr. R.M.S. Bandara  
National Building Research  
Organisation, Sri Lanka.

Dr. Emad Badawi  
Physics Dept. El-Minia Univ.,  
Egypt

**ii) JNCASR-DST Coordinated Programme with National Academy of Sciences, Kazakhstan and Uzbekistan**

Under this programme, scientists from various Kazakh and Uzbek Institutions are offered three months placements in chosen Indian institutions to enable them to work under the guidance of scientists/faculty.

The following scientist participated in this programme during the year :

Ms. Valentina M. Pochtennaya  
Almaty State University  
Kazakhstan

## CHAPTER V

# RESEARCH PROGRAMMES

### 1. Research Areas

There are ongoing research programmes in several frontier, inter-disciplinary areas of science and engineering. The main areas of research interest at present are :

- ❖ Atmospheric Sciences and Theoretical Fluid Mechanics
- ❖ Condensed Matter Theory
- ❖ Ecology and Biodiversity
- ❖ Physics and Chemistry of Materials including Surface Science, Molecular Electronics, Nanomaterials and Carbon Structures
- ❖ Emerging areas of Computer Science
- ❖ Gene Targeting, Gene Therapy and Molecular Parasitology
- ❖ Human Genome
- ❖ Geodynamics
- ❖ Theoretical Sciences
- ❖ Chemical Biology

### 2. Research Facilities

The Centre has the following state-of-art facilities in some focused areas in science and engineering. The following major equipments are functional:

- Scanning Electron Microscope (LEICA)
- X-ray Diffractometer (SEIFERT)
- Scanning Tunneling Microscope/Atomic Force Microscope
- High Resolution 300 KV Transmission Electron Microscope (JEOL)
- A custom built high resolution electron spectrometer with ultra high-vacuum ESCA, VEELS, LEED and STM/AFM attachments (OMICRON)
- Esterline Augus A620 x 20 channel Event Recorder
- Photomultiplier Unit



- Monochromator with interference filters, neutral density filters
- Thermohygrograph and field binoculars
- TGA/DTA (Metlar)
- A custom built cluster unit
- Single crystal X-ray diffractometer with CCD Camera
- 15 tesla Cryocooled Superconducting Magnet (Cryo Industries of America)
- Floating Zone Melting Crystal Growths (NEC, Japan)
- Indigenously built Cluster Source Apparatus
- Brillouin Spectrometer
- Magnetometer (VSM) and Faraday Balance
- Mossbauer Spectrometer
- Computational facilities that include Silicon Graphics Power Challenger with 4 parallel processors, a Hewlett-Packard Kclass-II with 4 CPUs and a large number of Silicon Graphics Workstations and Indy and O<sub>2</sub>.

### 3. Research Support

2000 - 2001  
Chitra

The following are some of the areas, for which research support has been provided by the Centre since the last annual report.

- Molecular Interactions vital for cell Survival : Prof. V. Nagaraja
- Cytochrome c mediated apoptosis and  
Cell death; In vivo and in vitro folding of  
cytochrome c by NMR and optical methods : Prof. K. Vijay Raghavan
- Quantum Optics : Prof. R.M. Godbole/  
Prof. N. Mukunda
- Synthetic Organic Synthesis : Prof. G. Mehta
- Problems of dynamical aspects of Portevin  
Le-Chatelier effect : Prof. G. Ananthakrishna
- Synthesis of colloidal oxide particle : Dr. Ram Seshadri

#### 4. Sponsored Research

1. Investigator : **R. Narasimha**  
 Title : Direct Numerical Simulation of Flow  
 Funding Agency : Pratt & Whitney Group, USA  
 Duration : 3 years
2. Investigator : **K.S. Narayan**  
 Title : Indo-Israeli Project *titk*  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
3. Investigator : **Namita Surolia**  
 Title : Characterisation, Cloning and Regulation of eIF-2 $\alpha$   
 and its kinase from *Plasmodium falciparum*  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
4. Investigator : **S. Balasubramanian**  
 Title : Molecular Modelling of Discoid Amphiphilic  
 Aggregates.  
 Funding Agency : Council of Scientific and Industrial Research  
 Duration : 3 years
5. Investigator : **Anuranjan Anand**  
 Title : Genetic Variations in Neurotransmitter Genes  
 in Schizophrenia  
 Funding Agency : Council of Scientific and Industrial Research  
 Duration : 3 years
6. Investigator : **Hemalatha balaram**  
 Title : Development of *Plasmodium falciparum*  
 hypoxanthine Phosphoribosyl transferase  
 and haemoglobinase as targets.  
 Funding Agency : Council of Scientific and Industrial Research  
 Duration : 2 years
7. Investigator : **Vijay Kumar Sarma**  
 Title : Investigating the circadian organization  
 of the fruitfly *Drosophila melanogaster*  
 Funding Agency : Indian National Science Academy  
 Duration : 3 years

8. Investigator : **Anuranjan Anand**  
 Title : Molecular Genetic basis of Juvenile Myoclonic Epilepsy.  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
9. Investigator : **Ranga Udaykumar**  
 Title : Construction of Analysis of Eukaryotic Expression of TAT protein of HIV - I/II  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
10. Investigator : **Hemalatha Balaram**  
 Title : Elucidation of the Purine Salvage Pathway in plasmodium Falciparum  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
11. Investigator : **M.K. Chandrashekar**  
 Title : Light of the Circadian Rhythms in Drosophila and ants.  
 Funding Agency : Department of Science & Technology  
 Duration : 3 years
12. Investigator : **Namita Surolia**  
 Title : Elucidation of ALA Synthesis & its regulation In Human Malarial parasite  
 Funding Agency : Council of Scientific and Industrial Research  
 Duration : 9 months
13. Investigator : **K.S. Narayan**  
 Title : Absorption Photoconduction and Emission in Certain polymeric systems.  
 Funding Agency : Council of Scientific and Industrial Research  
 Duration : 2 years
14. Investigator : **V. Rajaraman**  
 Title : The development of modular self study material in basics of information technology  
 Funding Agency : Infosys  
 Duration : 3 years

15. Investigator : **R. Narasimha**  
Title : Development of practical method for transition prediction  
Funding Agency : ARDB  
Duration : 2 years
16. Investigator : **R. Narasimha**  
Title : Commercial Airplane Group, the being company Aerodynamics studies  
Funding Agency : Boeing Company, Seattle, USA  
- 3 years -
17. Investigator : **Prof. C.N.R. Rao**  
Title : CSIR Centre of Excellence in Chemistry  
Funding Agency : Council for Scientific & Industrial Research  
Duration : 10 years 6

## CHAPTER VI

### PUBLICATIONS

#### 1. Research Publications:

##### UNITS :

##### i) Chemistry and Physics of Materials Unit

1. A Brillouin scattering study of the quasi-one-dimensional blue bronze,  $K_{0.3}MoO_3$  P. Murugavel, **Chandrabhas Narayana**, Ajay K. Sood, and **Rao, C.N.R.**, Journal of Physics : Condensed Matter 12, L225-L231 (2000).
2. Structural phase transition in adipic acid, Gopalan, R.S., Kumaradhas P. and **Kulkarni, G.U.**, J. Solid State Chem. 148, 129-134 (1999).
3. A charge density study of the effect of irradiation on the  $\alpha$ -form of p-nitrophenol, Kumaradhas, P., Gopalan, R.S. and **Kulkarni, G.U.**, Proc. Indian Acad. Sci.-Chem. Sci., 111, 569-579 (1999).
4. Investigation of bonding in the solid state using experimental charge density, **Kulkarni, G.U.**, J. Indian Inst. Sci., 79, 17-30 (1999).
5. Flexibility of the Cu(110)-O structure in the presence of pyridine, Carley, A.F., Davies, P.R., Jones, R.V., **Kulkarni, G.U.**, and Roberts, M.W., Chem. Commun., 687-688 (1999).
6. Oxygen chemisorption at Cu(110) at 120 K: dimers, clusters and mono-atomic oxygen states. Carley, A.F., Davies, P.R. **Kulkarni, G.U.**, and Roberts, M.W. Catal. Lett. 58, 93-97 (1999).
7. Facile C-O bond scission in alcohols on Zn surfaces, Harikumar, K.R., Vinod, C.P., **Kulkarni, G.U.**, and **Rao, C.N.R.**, J. Phys. Chem. B, 103, 2445-2452 (1999).

8. The structure of sulfur adlayers at Cu(110) surfaces : an STM and XPS study, Carley, A.F., Davies, P.R., Jones, R.V., Harikumar, K.R., **Kulkarni, G.U.**, and Roberts, M.W., Surf, Sci, 447, 39-50 (2000).
9. An indigenous cluster beam apparatus with a reflection time-of-flight mass spectrometer, Raina, G., **Kulkarni, G.U.**, Yadav, R.T., Ramamurthy, V.S., and **Rao, C.N.R.**, Proc. Indian Acad. Sci.-Chem. Sci., 112, 1-13 (2000).
10. Structural aspects of chemisorption at Cu(110) revealed at the atomic level, Carley, A.F., Davies, P.R., Jones, R.V., Harikumar, K.R., **Kulkarni, G.U.**, and Roberts, M.W., Topics in Catal., 11/12, 299 (2000)
11. Effect of size on the coulomb staircase phenomenon in metal nanocrystals, Thomas, P.J., **Kulkarni, G.U.**, and **Rao, C.N.R.**, Chem., Phys. Lett., 321, 163-168 (2000).
12. Metal nanoparticles and their assemblies, **Rao, C.N.R.**, **Kulkarni, G.U.**, Thomas, P.J., and Edwards, P.P. Chem. Soc. Rev., 28, 27-35 (2000).
13. Interaction of carbon monoxide with Cu-Pd and Cu-Ni bimetallic clusters, Vinod, C.P., Harikumar, K.R., **Kulkarni, G.U.**, **Rao, C.N.R.**, Topics in Catal., 11/12, 293-298 (2000).
14. An experimental charge density study of aliphatic dicarboxylic acids, Gopalan, R.S., Kumaradhas, P., **Kulkarni, G.U.**, and **Rao, C.N.R.**, J. Mol. Struct., 521, 97-106 (2000).
15. Nonequilibrium molecular dynamics, Reviews in Computational Chemistry, Mundy, C.J., **Balasubramanian, S.**, Bagchi, K., Tuckerman, M.E., Martyna, G.J., and Klein, M.L., Editors, Lipkowitz, K.B., Boyd, D.B., Volume 14, 291-398 (2000).
16. Novel properties exhibited by films of gold nanoparticle-polythiophene blends, Vijaya Sarathy, K., and **Narayan, K.S.**, Current Science, 77, 678 (1999).
17. Nanocrystalline Titanium dioxide dispersed Semiconducting Polymer Photodetectors, **Narayan, K.S.**, and Singh, B., Appl. Phys. Lett., 74, 345, (1999).
18. Thermally induced DC Transport Studies of Benzimidazo-benzophenanthroline (BBL) a Ladder Type Polymer, **Narayan, K.S.**, Alagiriswamy, A., and Spry, R.J., Phys. Rev. B, 59 (1999).

19. Dual Function Hybrid Polymer-Nanoparticle Devices, **Narayan, K.S.**, Manoj, A.G., Nanda, J., and Sarma, D.D., *App. Phys. Lett.* 74, 871 (1999).
20. Determination of Trap states in ladder type polymers, A., Alagiriswamy, A., and **Narayan, K.S.**, *Synthetic metals*, Proceedings of International Conference on Optical Probes of Conjugated Polymers and Photonic Crystals, Salt Lake City, Utah (2000).
21. Novel fluorescence and morphological structures in gold nanoparticle-polyoctylthiophene based thin films, Vijaya Sarathy, K., **Narayan, K.S.**, Jeongyong Kim, and Jeffrey O. White, *Chemical Physics Letters*, 318/6, 543 (2000).
22. Effect of substitution of  $Mn^{3+}$  by  $Ni^{3+}$  and  $Co^{3+}$  on the charge-ordered states of the rare earth manganates,  $Ln_{0.5}A_{0.5}MnO_3$ , Vanitha, P.V., Singh, R.S., **Natarajan, S.**, and **Rao, C.N.R.**, *Solid State Commun.*, 109, 135-140 (1999).
23. Open-Framework Zinc Phosphates Synthesized in the Presence of Structure-directing Organic Amines, Chidambaram, D., Neeraj, S., **Natarajan, S.**, and **Rao, C.N.R.**, *J. Solid State Chem.*, 147, 154-169 (1999).
24. Three-dimensional Open-Framework Zinc Phosphates with the Structure-Directing Organic Amines Acting as Ligands, Neeraj, S., **Natarajan, S.**, and **Rao, C.N.R.**, *New J. Chemistry*, 23(3) 303-308(1999).
25. A novel Open-Framework Zinc Phosphate with Intersecting Helical Channels, Neeraj, S., **Natarajan, S.**, and **Rao, C.N.R.**, *Chem. Commun.*, 165-166 (1999).
26. A Zinc Phosphate Possessing Ladder-like Layers Made up of 3-and 4-Membered Rings and Infinite Zn-O-Zn chains, Neeraj, S., **Natarajan, S.**, and **Rao, C.N.R.**, *Chem. Mater.*, 11, 1390-1395 (1999).
27. Synthesis and Structural Characterization of a New Layered Aluminophosphate intercalated with Triply protonated Triethylenetetramine  $[C_6H_{21}N_4][Al_3P_4O_{16}]$ , Yao, Y.-W., **Natarajan, S.**, Chen, J.S., and Pang, W.-Q., *J. Solid State Chem.*, 146, 458-563 (1999).

28. New Open-Framework Layered Tin(II) Phosphates Intercalated with Amines, Vaidhyanathan, R., and **Natarajan, S.**, *J. Mater. Chem.*, 9, 1807-1812 (1999).
29. Synthesis and Structure of a New Open-Framework Tin(II) Phosphate,  $[C_3N_2H_{12}][Sn_4P_3O_{12}]H_2O$ , Possessing One-dimensional Channels, **Natarajan, S.**, *J. Solid State Chem.*, 148, 50-55 (1999).
30. Layered Tin(II) Oxalates Possessing Large Apertures, **Natarajan, S.**, Vaidhyanathan, R., **Rao, C.N.R.**, Ayyappan, S., and Cheetham, A.K., *Chem. Mater.*, 11, 1633-1639 (1999).
31. Hybrid Framework Iron (II) Phosphate-Oxalates, Choudhury, A., **Natarajan, S.**, and **Rao, C.N.R.**, *J. Solid State Chem.*, 146, 538-545 (1999).
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33. A Pillared Iron Phosphate with Large Voids, exhibiting Spin-Crossover, Choudhury, A., **Natarajan, S.**, and **Rao, C.N.R.**, *Chem. Commun.*, 1305-1306 (1999).
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35. A Synthetic Iron Phosphate Mineral, Spheniscidite,  $[NH_4]^+[Fe_2(OH)(H_2O)(PO_4)_2]H_2O$ , Exhibiting Reversible Dehydration, Choudhury, A., and **Natarajan, S.**, *Proc. Ind. Acad. (Chem. Sci.)*, 111, 627-637 (1999).
36. Unusual Dual Role of the Organic Amine in an Open-framework Structure, Vaidhyanathan, R., **Natarajan, S.**, and **Rao, C.N.R.**, *J. Mater. Chem.*, 9, 2789-2794 (1999).
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38. A Hybrid Open-Framework Structure : Synthesis and Structure of an Iron Phosphate Oxalate,  $[C_{10}N_4H_{28}][Fe_2(HPO_4)_3(C_2O_4)_2]$ , Choudhury, A., and **Natarajan, S.**, *J. Mater. Chem.*, 9, 3113-3118 (1999).
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41. Effect of substituting  $Ru^{4+}$  and other tetravalent ions in the B-site of rare earth manganates on the magneto-transport properties and charge-ordering, Vanitha, P.V., Anthony Arulraj, **Raju, A.R.**, and **Rao, C.N.R.**, *Comp. Rend Acad. Sci., Paris. (Ser IIC)*, T2, 595-601 (1999).
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43. Preparation and Characterization of thin films of ZnO:Al by Nebulized Spray Pyrolysis, Chandra Sekhar, M., Selim, M.S., and **Raju, A.R.**, *Mate. Chem., Phys.* (2000) communicated.
44. Silica fibre-composites obtained using long-chain carboxylic acid as templates, Sudheendra, L., and **Raju, A.R.**, *Bull. Mater. Sci.*, 22, 101-104 (1999).
45. Nonlinear electric field conduction and broad band noise in the charge-ordered rare earth manganate  $Nd_{0.5}Ca_{0.5}MnO_3$ , Guha, A., Ghosh, A., Raychaudhuri, A.K., Parashar, S., **Raju, A. R.**, and **Rao, C.N.R.**, *Appl. Phys. Lett.*, 75, 3381-3383 (1999).
46. A study of ferroelectric thin films deposited on a  $LaNiO_3$  barrier electrode by nebulized spray pyrolysis, Murugavel, P., Rajat Sharma, **Raju, A.R.**, and **Rao, C.N.R.**, *J. Phys. D: Appl. Phys.*, 33, 10 (2000).

47. Electric-field-induced melting of the randomly pinned charge-ordered states of rare-earth manganates and associated effects, **Rao, C.N.R.**, **Raju, A.R.**, Ponnambalam, V., Sachin Parashar, and Kumar, N., Phys. Rev. B 61, 594-598 (2000).
48. High Magnetic Fields and Oxide Single Crystals, **Raju, A.R.**, J.I.I.Sc., 79 (1999).
49. Bonding of monazite to  $\text{Al}_2\text{O}_3$  and  $\text{TiO}_2$  ceramics, Sudheendra, L., Ranganathan, M.K., and **Raju, A.R.**, Materials Science and Engineering, A281, 259-262 (2000).
50. A novel hybrid layer compound containing silver sheets and an organic spacer, **Rao, C.N.R.**, Ranganathan, A., Pedireddi, V.R., and **Raju, A.R.**, Chem. Commun., 39-40 (2000).
51. CMR and related properties of single crystals of cation-doped  $\text{LaMnO}_3$ , Sudheendra, L., **Raju, A.R.**, and **Rao, C.N.R.**, Inter. J. Inorg. Mater., 2000 (communicated).

## (ii) Condensed Matter Research Unit

52. Emergence and growth of complex networks in adaptive systems, **Jain, S.**, and Krishna, S., Computer Physics. Comm. Vol 121-122, 116-121 (1999).
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57. Metal-insulator transition in a degenerate Hubbard model, Priya Mahadevan and **Sarma, D.D.**, Phys. Rev. B, 59, 1739 (1999).
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59. Photoelectron spectroscopic study of CdS nanocrystallites, Nanda, J., Kuruvilla, B.A., and **Sarma, D.D.**, Phys. Rev. B, 59, 7473 (1999).
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62. Spectroscopic investigations of the electronic structure and metal-insulator transitions in a Mott-Hubbard system,  $\text{La}_{1-x}\text{Ca}_x\text{VO}_3$ , Maiti, K., and **Sarma, D.D.**, Phys. Rev. B., 61, 2525 (2000).
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64. Calculation of X-ray absorption spectra from strongly correlated systems, Priya Mahadevan and **Sarma, D.D.**, Phys. Rev. B, 61, 7402 (2000).
65. The Crystallization and Vitrification of Living Polymers, Menon, G.I., and **Pandit, R.**, Phys. Rev. E, 59, 787 (1999).
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67. Spiral Turbulence : From the Oxidation of CO on Pt(110) to Ventricular Fibrillation, Pande, A., Sinha, S., and **Pandit, R.**, Journal of Indian Institute of Science, 79, 31 (1999).
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69. Mean-field theory of charge ordering and phase transitions in the colossal magnetoresistive manganites, Mishra, S.K., **Pandit, R.**, and Satpathy, S., J. Phys. Condens. Matter, 11, 8561 (1999).
70. Inequivalence of ensembles in a driven diffusive system, Acharyya, M, Basu, A., **Pandit, R.**, and Ramaswamy, S., Phys. Rev. E, 61, 1139 (2000).
71. Spatiotemporal Chaos and Nonequilibrium Transitions in a Model Excitable Medium, Pande, A., and **Pandit, R.**, Phys. Rev. E, to appear, 61, 1 June (2000) issue.
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### (iii) Evolutionary & Organismal Biology Unit

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85. Timely administration of melatonin accelerates re-entrainment to phase shifted light dark cycles in the field mouse *Mus booduga*, **Sharma, V.K.**, Singaravel, M., Subbaraj, R, and **Chandrashekar, M.K.**, *Chronobiol. Internat*, 16, 163-170 (1999).

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229. Collective behaviour and diversity in economic communities: Some insights from an evolutionary game, in *Econophysics: An Emerging Science*, Borkar, V.S., Jain, S., and **Rangarajan, G.**, eds. Kertesz, J., and Kondor, I., Kluwer Academic, Dordrecht, 1999 (in press).
230. Symplectic integration using solvable maps, **Rangarajan, G.**, and Sachidanand, M., *Journal of Physics A: Mathematical and General*, 33, 131 (2000).
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240. Net cloud radiative forcing at the top of the atmosphere in the Asian monsoon region, Rajeevan, M., **Srinivasan, J.**, *Journal of Climate*, 13, 650 - 657 (2000).

#### 4. Books & Publications :

1. Lal, M., Kulkarni, B.D., Cates, M., and **Mashelkar, R.A.**, (Eds.) *Structure and Dynamics in the Mesospheric Domain*, Royal Society Imperial College press (1999).
2. **Mustansir Barma**, (Ed.), *Nonequilibrium Statistical Systems*, *Current Science*, Vo. 77, No. 3 (1999).
3. **Narlikar, J.V.**, *Motion and Gravity*, Book in the Exploratory Series, Shekar Phatak & Associates, Pune (1999).
4. **Narlikar, J.V.**, *Quasars and active galactic nuclei : an introduction* (co-author : Ajit K. Kembhavi), Cambridge University Press, Cambridge (1999).
5. **Narlikar, J.V.**, *Seven wonders of the Cosmos*, Cambridge University Press, Cambridge (1999).
6. **Narlikar, J.V.**, *A different approach to Cosmology*, (co-authors : Geoffrey Burbidge and Fred Hoyle), Cambridge University Press, Cambridge (2000).

7. **Rajaraman, V.**, Supercomputers, Universities Press, Hyderabad, Feb. (1999).
8. **Rajaraman, V.**, and Siva Ram Murthy, C., Parallel Computers - Architecture and Programming, Prentice Hall of India, New Delhi, March (2000).
9. **Valdiya K.S.**, Himalaya : Emergence and Evolution, University Press Publication (submitted to press)
10. **Vijayan, M.**, Yathindra, N., Kolaskar, A.S., (Eds.) Perspectives in Structural Biology, A volume in honour of G.N. Ramachandran, Indian Academy of Sciences, Bangalore and Universities Press, Hyderabad (1999).

#### **5. Special Issue of the Journal of the Indian Institute of Science :**

Life History Evolution in the Laboratory	-	Amitabh Joshi
Crystal Growth by Floating Zone Method	-	A.R. Raju
Novel Targets for Antimalarial Drug Development	-	Namita Surolia
Oily Streaks, Elastic & Flow in Lamellar Liquid	-	Sriram Ramaswamy
Fluorescence Resonance Energy Transfer and GeneticSuppressions : Two distant methods to Determine Protein - Protein contacts	-	Dipankar Chatterji

#### **6. Proceedings of Discussion Meetings :**

Third Asian Computational fluid dynamics conference vol. 1 and vol. 2, Prahlad, T.S., et. Al., editors, NAL (1998).

Signal Processing and Communications 5th Biennial Conference proceedings, Makur, Anamitra and Srinivas, T.V., (1999).

## CHAPTER VII

### AWARDS/DISTINCTIONS

The following Faculty and Honorary Faculty Members of the Centre have won various distinctions and awards both at the national and international level in recognition of their research and developmental work:

#### Awards

Prof. **G.S. Agarwal** : Jawaharlal Nehru Birth Centenary Lecture  
Hon. Professor Award for the Year 2000, Indian National  
Science Academy Third World Academy of  
Science Lecturer to China

Prof. **S. Chandrasekhar** : "Chevalier in the Order of the Palmes  
Hon. Professor Academique": Title Conferred by the French  
Government (1999).

Prof. K.R. Ramanathan Memorial Lecture at  
P.R.L., Ahmedabad (1999).

Prof. **B.M. Deb** : INSA Professor Sadhan Basu Memorial  
Hon. Professor Lecture, 1999

Prof. **R. Gadagkar** : Third World Academy of Sciences Award in  
Hon. Professor Biology - 1999

C.P. Alexander Memorial Lecturer, Univ. of  
Delhi, (2000).

Prof. **Gangan Prathap** : Distinguished Alumnus Award of IIT, Madras,  
Hon. Professor 1999



Prof. **N.K. Ganguly**  
Hon. Professor

Dr. P.N. Chuttani Oration at Science City,  
Calcutta, 1999, Indian Society of  
Gastroenterology

Dr. Yellapragada SubbaRow Memorial Lecture,  
1999

12th J.C. Ray Oration at Indian Institute of  
Chemical Biology, Calcutta, 1999

5th Dr. B. Mukherjee Memorial Lecture at  
Central Drug Research Institute, Lucknow,  
1999

B.C. Guha Memorial Lecture, 1999-2000

VPCI Oration, 1999, Vallabhabhai Patel Chest  
Institute

10th Foundation Day Oration, 1999, JNCASR,  
Bangalore

Distinguished Career Award, 2000, SASAT

Dr. **K. Kasturirangan** :  
Hon. Professor

Outstanding Achievement in Indigenisation  
Award of the Lakshmikanthammal Education  
Trust, Chennai (1999)

Vidya Ratna National Award of Subbaram  
Trust, Bangalore (1999).

Shri Murli M. Chugani Memorial Award for  
Excellence in Applied Physics of Indian  
Physics Association (1999).

H.K. Firodia Award for Excellence in Science  
& Technology by H.K. Firodia Memorial  
Foundation (1999).

IGU Millenium Award by Indian Geophysical  
Union (1999)

M.N. Saha Birth Centenary Award for 1999-2000 Conferred by 87th Indian Science Congress (2000)

**"Padma Vibhushan"** National Recognition by the Govt. of India (2000)

Prof. **N. Kumar** : C.V. Raman Centenary Award for 1999  
Hon. Professor

Dr. **Maneesha S.Inamdar** : Associate, Indian Academy of Sciences  
Faculty Fellow (1999-2002)

Prof. **R.A. Mashelkar** : **"Padmabhushan"** award National recognition  
Hon. Professor by the Govt. of India (2000).

Material Scientist of the year 2000, Materials Research Society of India.

Doctorate of Science (honoris causa), Guwahati Univ., 2000

Prof. **J.V. Narlikar** : Vidnyanamitra Award from Snehavardhan  
Hon. Professor Prakashan, Pune, 1999

Dnyan Vidnyan Award from Jyeshth Nagarik Sansad, Ahmednagar, 1999

Kolhapur Bhushan Award from the Kolhapur Municipal Corporation, Kolhapur, 1999

Prof. **C.N.R. Rao** : Hallim distinguished Lecturer, Korean  
President, JNCASR Academy of Science & Technology (1999)  
(till 31.12.1999) Commander of the National Order of Lion,  
Linus Pualing Research Senegal (1999)  
Professor (from 1.1.2000) Honorary Visiting Professor,  
Banaras Hindu University (1999)

Centenary Lectureship & Medal, Royal Society of Chemistry, London (2000)

Prof. **A. Surolia** : Sir Edward Mellanby Memorial Lecture 2000  
Hon. Professor (CDRI)

Prof. **K.S. Valdiya** : Millennium Award for outstanding  
Professor contributions in Earth Science Education from  
Indian Geophysical Union (1999).

### Editorial Boards

Prof. **G.S. Agarwal** : Advisor - "Optics Communications"  
Hon. Professor Honorary Editor of JOPB : Quantum  
Semiclassical Optics

Prof. **Biman Bagchi** : Advances in Chemical Physics (John Wiley)  
Hon. Professor Phys Chem Comm (Royal Chemical Society,  
London)  
Journal of Molecular Liquids (Elsevier)

Prof. **Gangan Prathap** : Editor, SADHANA  
Hon. Professor

Member, Int. Jr. of Computational Engineering  
Science

Prof. **N. Sathyamurthy** : Editor, Proceedings of Indian National Science  
Hon. Professor Academy

### Fellowships

Dr. **Amitabh Joshi** : Fellow, Institute of Advanced Studies, Berlin,  
Faculty Fellow 2000-01

Prof. **S.Chandrasekaran** : Fellow, Third World Academy of Sciences,  
Hon. Professor Trieste, Italy

Prof. **Chandan Dasgupta** : Fellow, Indian National Science Academy,  
Hon. Professor 1999

- Prof. **Gangan Prathap** : Fellow, Indian National Science Academy,  
Hon. Professor 1999
- Prof. **N.K. Ganguly** : Fellow, Indian National Science, New Delhi.  
Hon. Professor  
Fellow, Indian Academy of Sciences,  
Bangalore.  
Fellow, National Academy of Medical Sciences,  
New Delhi.  
Fellow, National Academy of Science, Allahabad  
Fellow, Indian School of Applied Immunology  
& Allergy, New Delhi
- Prof. **S.S. Jha** : Fellow, Third World Academy of Sciences,  
Hon. Professor Triesty, Italy
- Prof. **C.N.R. Rao**  
President, JNCASR  
(till 31.12.1999)  
Linus Pualing Research  
Professor (from 1.1.2000)  
Honorary Fellowship,  
Jawaharlal Nehru Centre for  
Advanced Scientific Research (1999)  
Honorary Fellowship, Indian Society (1999)

### Memberships

- Prof. **M. Barma** : Member, IUPAP Commission on Statistical  
Hon. Professor Physics
- Prof. **N.K. Ganguly** : Council Member, Federation of Immunological  
Hon. Professor Societies Of Asia-Oceania (FIMSA) for  
2000-2003.  
Member, WHO, Scientific and Technical  
Advisory Committee for a period of three years  
w.e.f. 1st January 2000.
- Dr. K. Kasturirangan** : Chairman, Review Committee of DST (1999)  
Hon. Professor  
Member, National Coordination Committee on  
Education, Industry and Research constituted  
by Ministry of HRD (1999).

Member, CII - National Information Technology Council 1999.

Chairman, Board of Governors of Indian Institute of Technology, Madras (2000).

Life Member, Indian Science Congress Association (2000).

**Dr. Maneesha S. Inamdar :**  
Faculty Fellow

Member, Indian Society of Developmental Biologists 2000 - 2002.

**Prof. R.A. Mashelkar :**  
Hon. Professor

Life Member, Senate of the University of Roorkee, 1999

General President, Indian Science Congress, 1999-2000.

**Prof. M. Vijayan**  
Hon. Professor

Re-elected to the Council of the International Union of Pure & Applied Biophysics

Elected to the Asia-Pacific International Molecular Biology Network (A-IMBN)

### Prizes and Medals

**Prof. D. Chatterji**  
Hon. Professor

Millennium medal in Indian Science Congress - 2000

**Prof. B.M. Deb**  
Hon. Professor

Chemical Research Society of India Silver Medal 2000

**Prof. P.T. Manoharan**  
Hon. Professor

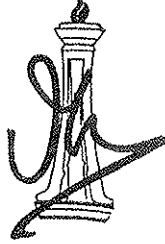
The Chemical Research Society of India Medal (2000) For extensive and outstanding research in Chemistry.

**Prof. Chandan Dasgupta :**  
Hon. Professor

DAE-Raja Ramanna Prize, 1999

**CHAPTER VIII**

**FINANCIAL STATEMENTS**



**NAME** : **JAWAHARLAL NEHRU CENTRE FOR  
ADVANCED SCIENTIFIC RESEARCH**

**ADDRESS** : **JAKKUR POST, BANGALORE 560 064**

**YEAR ENDED** : **31ST MARCH 2000**

**ASSESSMENT YEAR** : **1999-2000**

**P. V. PRABHU & CO.,**  
**CHARTERED ACCOUNTANTS**  
Panduranga Nilaya  
No. 91/1, 1st Floor, 2nd Main,  
Venkataramappa Block, Govindarajnar,  
BANGALORE 560 040

**M/s P. V. PRABHU & CO.**

CHARTERED ACCOUNTANTS

"Panduranga Nilaya"

No. 91/1, I Floor,

II Main, Venkatramappa Block

Govindaraj Nagar

Bangalore 560 040

## AUDIT REPORT

We have examined the Balance Sheet of JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH, Jakkur Campus, Jakkur, Bangalore 560 064, as on 31st March 2000 and the Income and Expenditure Account for the year ended on that date which are in agreement with the Books of Account maintained by the said Centre.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit and in addition the certificate from the bankers regarding the cash balance obtained and verified. In our opinion, proper books of accounts have been kept by the Centre, so far as it appears from our examination of the books of accounts.

In our opinion and to the best of our information and according to the explanations given to us, the said accounts give a true and fair view subject to stating of fixed assets at their acquisition cost without depreciation being state :

- (i) In the case of Balance Sheet of the state of affairs of Jawaharlal Nehru Centre for Advanced Scientific Research as at 31st March 2000.

AND

- (ii) In the case of the Income and Expenditure Account of the excess of Expenditure over Income for the year ended on that date.

For **P. V. Prabhu & Co.,**  
CHARTERED ACCOUNTANTS

Place : Bangalore

Date : 31.8.2000

Sd/-  
(Nagaraja)  
Partner

## BALANCE SHEET AS ON 31st MARCH 2000

1998-99		LIABILITY		1999-2000		1998-99		ASSETS		1999-2000	
Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.
28,20,17,590	66	32,17,78,712	66	28,20,17,590	66	28,20,17,590	66	FIXED ASSETS			
3,41,79,930	00	3,41,79,930	00	3,41,79,930	00	3,41,79,930	00	SCHEDULE 2			
98,78,095	00	98,78,095	00	98,78,095	00	98,78,095	00	(AS PER CONTRA)			
26,20,413	00	26,47,113	00	26,20,413	00	26,20,413	00	J.N.CENTRE		32,17,78,712	66
						10,92,194	00	CARBON &			
								NANO-MATERIALS		3,41,79,930	00
								PHYSICS & CHEMISTRY			
								OF MATERIALS		98,78,095	00
								CLUSTER STUDIES		26,47,113	00
								ADVANCES & DEPOSITS: (SCH-3)			
								PROFESSORSHIP ENDOWMENT			
								FUND INVESTMENTS (SCH-4)			
								CLOSING BALANCES			
								BANK-AC.NO.13474 : CANARA BANK		10,03,978	87
								BANK-AC.NO.15889 : CANARA BANK		25,62,646	71
								BANI-AC.NO. 18520 : CANARA BANK		95,29,728	05
								BY CASH - JNC		26,745	00
								BY CASH - SCHEMES		6,648	00
								DEFICIT : AS PER INCOME &			
								EXPENDITURE ACCOUNT - JNC			
								TOTAL			
35,80,31,753	67			35,80,31,753	67	35,80,31,753	67			1,31,29,746	63
										90,87,191	58
										4,19,280,405	87

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants

Sd/-

**V. KRISHNAN**  
Acting President

Sd/-

**R.S. GURURAJ**  
Accounts Officer

Sd/-  
**(Nagaraja)**  
Partner

Place: Bangalore  
Date : 31.8.2000



# INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31.03.2000

1998-1999		EXPENDITURE		1999-2000		1998-1999		INCOME		1999-2000	
Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.
9,74,837	83	To Op Balance JNC		1,01,81,889	58	7,77,00,000	00	BY G-I-A DST - JNC		8,00,00,000	00
<b>RECURRING EXPENDITURE</b>											
1,05,49,409	00	TO SALARY & HONORARIA	1,17,37,318	00		14,05,524	00	INTEREST		6,47,177	00
4,38,783	00	TO MEDICAL REIMBURSEMENT	3,21,970	00		63,458	25	BY INT. ON TERM DEPOSIT JNC		1,58,635	00
1,07,040	00	TO BONUS	1,07,609	00				BY INT. ON SB ACCOUNT JNC			
94,364	00	TO STAFF TRAINING	15,000	00							
30,113	00	TO RETIREMENT BENEFITS	1,14,123	00							
14,500	00	TO L T C	14,403	00							
		TO LEAVE ENCASHMENT	9,437	00							
40,845	00	TO UNIFORMS	4,201	00	1,23,19,860	00					
7,11,760	00	TO PRINTING & STATIONARY	6,47,992	00		5,62,805	00	OTHER RECEIPTS		5,11,834	00
3,01,787	00	TO POSTAGE	3,11,485	00		28,367	00	BY JAWAHAR RECEIPTS		26,612	00
5,15,126	00	TO TELEPHONE, TELEX & FAX	4,52,973	00		47,021	00	BY GUEST ROOM RCPTS		29,173	00
12,109	00	TO BANK CHARGES	3,909	00		74,320	00	BY GUEST ROOM CONS. RCPT		1,20,000	00
13,50,701	50	TO CONVEYANCE & TRANSPORT	13,66,120	00		85,169	50	BY MISC. RCPTS		2,49,781	00
63,272	00	TO PETROL, OIL & LUBRICANT	56,478	00		1,23,462	00	BY LICENCE PEES		1,50,332	00
59,417	00	TO BOOK BINDING	66,615	00		59,113	00	BY MEDICAL CONTRIBUTIONS		76,566	00
15,968	00	TO NEWS PAPER & MAGAZINES	16,314	00		63,316	00	BY ELEC & WATER CHARGE RCPTS		588,018	00
11,536	00	TO MISC. EXPENSES	39,942	00		23,765	00	BY ANNUAL FEES - PHD			
3,62,528	00	TO COUNCIL & OTHER MEETINGS	5,54,811	00						12,22,316	00
8,70,165	00	TO SECURITY SERVICES	8,65,350	00							
		TO LEGAL EXPENSES	25,000	00							
16,000	00	TO AUDIT PEES	16,800	00							
92,907	00	TO MEMBERSHIP PEES	13,100	00							
53,260	00	TO GUEST HOUSE CONSUMABLES	44,443	00							
41,644	00	TO FREIGHT & CLEARING CHARGES	8,756	00							
28,225	00	TO CANTEEN SUBSIDY	21,916	00							
1,43,027	00	TO INSURANCE	16,324	00	45,32,529	00					

## INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31.03.2000

1998-1999		EXPENDITURE		1999-2000		1998-1999		INCOME		1999-2000	
Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.
57,14,006	00	TO ELEC. & WATER CHARGES	76,47,713	00	76,47,713	00					
4,13,513	00	TO CPF CONTRIBUTION	5,40,081	00							
35,398	00	TO INT ON SUBSCRIPTION	1,54,367	00							
3,00,000	00	TO GRATUITY FUND									
89,905	00	TO ADVERTISEMENTS	1,74,027	00	6,94,448	00					
2,35,913	00	TO DOMESTIC TRAVEL EXPENSES	1,71,116	00	1,74,027	00					
1,61,419	00	TO FOREIGN TRAVEL EXPENSES	10,245	00							
25,38,794	00	TO BUILDING MAINTENANCE	26,92,225	00	1,81,361	00					
4,94,388	00	TO GARDEN MAINTENANCE	6,32,171	00							
21,59,900	00	TO EQUIPMENT MAINTENANCE	17,85,344	00							
3,85,277	00	TO GUEST HOUSE MAINTENANCE	2,10,885	00							
23,090	00	TO VEHICLE MAINTENANCE	30,318	00							
50,240	00	TO OFFICE MAINTENANCE	2,64,633	00							
48,781	00	TO CANTEEN MAINTENANCE	1,04,647	00							
9,88,005	00	TO ELEC. & WATER MAINTENANCE	9,84,409	00	67,04,632	00					
3,24,687	00	TO COSTED PROGRAMME	5,17,731	00							
17,87,790	00	TO DISCUSSION MEETINGS	16,49,868	00							
15,000	00	TO RESEARCH SUPPORT									
1,38,789	00	TO PUBLICATIONS	82,770	00							
19,30,915	00	TO PHD PROGRAMME	18,12,012	00							
3,06,844	00	TO SRF P 1998	53,848	00							
18,888	00	TO CTSSSP 1998	3,510	00							
1,80,444	00	TO SRF P 1999	3,14,318	00							
		TO S R F P 2000	2,04,769	00							
63,18,279	00	TO CONSUMABLES LAB	42,78,912	00	46,38,826	00					
7,534	00	TO CONSUMABLES ADV. TECH LAB			42,78,912	00					
3,86,69,177	42	TO SURPLUS C/O			3,06,73,930	42					
<b>8,02,36,320</b>	<b>75</b>	<b>TOTAL Rs</b>			<b>8,20,28,128</b>	<b>00</b>				<b>TOTAL Rs</b>	<b>8,20,28,128</b>
							<b>75</b>				<b>00</b>



# INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31.03.2000

## CLUSTER STUDIES

1998-99		EXPENDITURE		1999-2000		1998-1999		INCOME		1999-2000	
Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.
		RECURRING EXPENDITURE									
59,131	00	1,56,987	00	1,56,987	00						
		TO CONSUMABLES		1,45,649	00	4,49,834	00	BY OP-BALANCE		3,02,636	00
3,90,703	00	TO SURPLUS C/O									
4,49,834	00	TOTAL Rs.		3,02,636	00	4,49,834	00	TOTAL Rs.		3,02,636	00
		NON RECURRING EXPENDITURE									
26,20,413	00	TO SC. EQUIP CLUSTOER STUDIES TO EXCESS OF INCOME OVER EXP.		26,700	00	3,90,703	00	BY SURPLUS B/F		1,45,649	00
				1,18,949	00	22,29,710	00	BY EXCESS OF EXPN. OVER INCOME			
26,20,413	00			1,45,649	00	26,20,413	00			1,45,649	00

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants

Sd/-  
(Nagaraja)  
Partner

Sd/-  
V. KRISHNAN  
Acting President

Sd/-  
R.S. GURURAJ  
Accounts Officer

Place: Bangalore  
Date : 31.8.2000

## SCHEDULE No. 1 CREDITORS

No.	Particulars	Rupees	Ps.	Rupees	Ps.
A	<u>SECURITY DEPOSIT/EMD</u>				
1.	MUNISWAMY R.	10,542	00		
2.	DODDAMANE BROTHERS	7,775	00		
3.	HARISH KUMAR	6,575	00		
4.	KUMAR ELECTRONICS	15,65,974	00		
5.	TOMAS AND CO.	19,019	00		
6.	WCI SHIPPING CORPN	10,000	00		
7.	SRINIVASAMURTHY N.M.	1,375	00		
8.	BABU TRADERS	1,000	00		
9.	CHANDRASHEKAR M.P.	10,800	00		
10.	RAMESH Y.	18,450	00		
11.	DIVAKAR N.	5,45,552	00		
12.	BABU RAJU K.	1,51,818	00		
13.	VINAYAKA ENTERPRISES	2,700	00		
14.	INDIRA ELECTRICALS	18,000	00		
15.	M.S. MAINTENANCE	19,419	00		
16.	KRISHNAKUMAR V.	2,10,865	00		
17.	BIT BYTE COMPUTERS	5,948	00		
18.	DIESEL TECH ENGINEERS	120	00		
19.	VENKATA REDDY Y.S.	1,73,117	00		
20.	PURUSHOTHAM RAJU	10,800	00		
21.	RAVI CONSTRUCTIONS	52,117	00		
22.	B & B ESTATES AND INFRASTRUCTURE	10,800	00	14,42,766	00
B	<u>OUTSTANDING LIABILITIES</u>				
1.	IT-TDS	10,597	00		
2.	AUDIT FEES PAYABLE	16,000	00		
3.	CPF CONTRIBUTION	6,94,448	00		
4.	KST-TDS	683	00		
5.	Dr. NAMITHA SUROLIA	2,000	00		
6.	Dr. RAJU A.R.	500	00		
7.	Dr. KULKARNI G.U.	7,500	00		
8.	Dr. AMITABH JOSHI	5,000	00		
9.	Dr. GUPTA C.D.	2,000	00		
10.	Dr. YADAV R.T.	1,407	00		
11.	Dr. KRISHNAN V	1,500	00		
12.	Dr. RAMA GOVINDARAJAN	3,000	00		
13.	Dr. SRINIVAS K.R.	2,500	00	7,47,135	00

## SCHEDULE No. 1 CREDITORS

No.	Particulars	Rupees	Ps.	Rupees	Ps.
<b>C</b>	<b>OTHERS</b>				
1.	IISC - CEMENT	4,08,179	45		
2.	CAUTION MONEY DEPOSIT	1,55,970	00		
3.	DST/INT/IL TP	4,18,803	00		
4.	IUPAC	2,16,713	00		
5.	LINUS PAULING	6,60,402	00		
6.	DST-POTABLE WATER	93,000	00		
7.	INSA	1,40,800	00		
8.	INDO FRENCH CPAR	39,375	00	21,33,242	45
<b>D</b>	<b>L/C CREDITORS</b>				
1.	SUNDRY CREDITORS - SUSPENSE	92,904	00		
2.	SUNDRY CREDITORS - EMD/SD	1,24,124	00		
3.	SUNDRY CREDITORS - LC'S	50,00,000	00	52,17,028	00
	<b>TOTAL - CREDITORS A+B+C+D</b>	<b>52,17,028</b>	<b>00</b>	<b>95,40,171</b>	<b>45</b>
	<b>SCHEME BALANCES</b>				
1.	RGF INNOVATIVE IDEAS	2,62,426	00		
2.	RGF SUMMER PROGRAMME	80,000	00		
3.	CSIR-PROF K.S. VALDIA	15,830	05		
4.	INSA	42,054	00		
5.	NAL-PROF R. NARASIMHA	88,269	00		
6.	IIM-PROF V. NANJUNDAIAH	23,815	00		
7.	AIRFORCE - DR. K.S. NARAYAN	17,763	00		
8.	MONTBLEX/DST/PROF. R. NARASIMHA	1,577	00		
9.	IAS - LIFESCAPE	52,045	00		
10.	DST/ELF-2/DR. NAMITA SUROLIA	1,44,231	00		
11.	CSIR - SAJI VARGHESE	15,904	00		
12.	EMR-DR. NAMITHA SUROLIA	7,450	00		
13.	CSIR/98/DR. K.S. NARAYAN	94,704	00		
14.	DST/INDOISRAEL/DR. K.S. NARAYAN	1,61,658	00		
15.	BOEING - R. NARASIMHA	3,37,205	00		
16.	DST/SRFP-98	50,000	00		
17.	CSIR/98/DR. HEMALATHA BALARAM	61,754	00		
18.	DST/EPSPF/98/DR. HEMALATHA BALARAM	4,02,295	00		
19.	DST/MKC/LCRD	14,72,266	00		
20.	CSIR/LAKSHMI R	5,553	00		
21.	CSIR / SUJAYA SUBBAIAH	2,795	00		

## SCHEDULE No. 1 CREDITORS

No.	Particulars	Rupees	Ps.	Rupees	Ps.
22.	CSIR/N. G. PRASAD	16,569	00		
23.	CSIR/ GVNGS/DR. ANURANJAN ANAND	45,459	00		
24.	UTC/P&W/USA-PROF. R. NARASIMHA	1,10,996	00		
25.	UGC/A.G. MANOJ	70,400	00		
26.	INFOSYS - PROF. RAJARAMAN	4,30,439	00		
27.	CSIR/MMDAA/DR.S. BALASUBRAMANIAN	6,13,324	00		
28.	INSA/DR. V.K. SHARMA	17,959	00		
29.	CSIR R. JAYALAKSHMI	5,011	00		
30.	NAL/ARDB/DR. RAMA GOVINDRAJAN	22,093	00		
31.	ARDB/DPMT/PROF. R. NARASIMHA	10,63,725	00		
32.	DBT/DR. RANGA UDAYA KUMAR	26,73,941	00		
33.	DBT/MGBJME/DR. ANURANJAN ANAND	20,67,891	00		
34.	SCHOOL CHEMISTRY KIT	1,200	00		
35.	CSIR / COE / PROF. CNR RAO	11,50,885	00		
36.	DR. V.K. SHARMA	4,937	00		
	<b>TOTAL</b>			<b>1,16,34,423</b>	<b>05</b>

Place: Bangalore  
Date : 31.8.2000

Sd/-  
**R.S. GURURAJ**  
Accounts Officer

Sd/-  
**V. KRISHNAN**  
Acting President

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants  
Sd/-  
**( Nagaraja )**  
Partner

## SCHEDULE No. 2 Fixed Assets

No.	Name of the Asset	As on 31.03.1999		Additions during the year		As on 31.03.2000	
		Rs.	Ps.	Rs.	Ps.	Rs.	Ps.
<b>A</b>							
1.	Land at Jakkur Granted by Govt. of Karnataka Free of Cost 1.37 Acres						
2.	Buildings	7,96,58,165	26			7,96,58,165	26
3.	Infrastructure	2,49,32,945	32	34,08,234	00	2,83,41,179	32
4.	Off. Equip/Appliances	35,99,495	63	72,400	00	36,71,895	63
5.	Science Equipments	8,77,74,156	47	1,36,41,591	00	10,14,15,747	47
6.	Furniture	48,60,194	87	13,45,761	00	62,05,955	87
7.	Vehicles	7,72,304	10			7,72,304	10
8.	Library Books	40,05,014	21	4,99,553	00	45,04,567	21
9.	Library Journals	1,20,98,827	80	33,42,517	00	1,54,41,344	80
10.	JNC/HOSTEL Block Building	1,02,58,574	00	18,54,707	00	1,21,13,281	00
11.	Building New Lab	1,68,02,743	00	55,21,104	00	2,23,23,847	00
12.	Computer	61,95,329	00			61,95,329	00
13.	Animal House Building	24,75,144	00	15,57,693	00	40,32,837	00
14.	Staff Housing	13,82,135	00	18,21,186	00	32,03,321	00
15.	Additional Land - Jakkur			66,05,521	00	66,05,521	00
16.	Sci.Equip - Adv Tech Lab	2,02,02,565	00			2,02,02,562	00
17.	Sci. Equipment Magnet	70,00,000	00	90,855	00	70,90,855	00
	<b>TOTAL A</b>	<b>28,20,17,590</b>	<b>66</b>	<b>3,97,61,122</b>	<b>00</b>	<b>32,17,78,712</b>	<b>66</b>
<b>B</b>							
1.	Core Group on Carbon and Nano Materials Sci. Equipments - CNM	3,41,79,930	00			3,41,79,930	00
	<b>TOTAL B</b>	<b>3,41,79,930</b>	<b>00</b>			<b>3,41,79,930</b>	<b>00</b>
<b>C</b>							
1.	Unit of Physics and Chemistry of Materials Sci. Equipments	98,69,295	00			9,86,925	00
2.	Furniture	8,800	00			8,800	00
	<b>TOTAL C</b>	<b>98,78,095</b>	<b>00</b>			<b>98,78,095</b>	<b>00</b>
<b>D</b>							
1.	Cluster Studies Sci. Equipments	26,20,413	00	26,700	00	26,47,113	00
	<b>TOTAL - D</b>	<b>26,20,413</b>	<b>00</b>	<b>26,700</b>	<b>00</b>	<b>26,47,113</b>	<b>00</b>

Place: Bangalore  
Date : 31.8.2000

Sd/-  
**R.S. GURURAJ**  
Accounts Officer

Sd/-  
**V. KRISHNAN**  
Acting President

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants  
Sd/-  
**(Nagaraja)**  
Partner



### SCHEDULE No. 3 : ADVANCES & DEPOSITS

No.	Particulars	Rupees	Ps.	Rupees	Ps.
<b>A</b>	<b>DEPOSITS</b>				
1.	S.CRS. DEPOSIT	2,61,025	00	2,61,025	00
<b>B</b>	<b>LOANS &amp; ADVANCES</b>				
1.	ASIATIC INDL. GASES	13,500	00		
2.	Dr. NARAYAN K.S.	5,000	00		
3.	NAGARAJA RAO	1	00		
4.	Dr. HEMALATHA BALARAM	4,750	00		
5.	Dr. NATARAJAN	5,000	00		
6.	SRIPATHY TIRUPATHY	16,780	00		
7.	Dr. AMIT J. BASU	5,000	00		
8.	CYLINDER DEPOSIT	10,000	00		
9.	MIGA GASES (P) LTD.	2,000	00		
10.	P.N. RAJAPPA	2,000	00		
11.	Dr. RAJARAMAN V.	2,000	00		
12.	Dr. GADKAR R.	10,000	00		
13.	MAHUSUDAN W.H.	1,407	00		
14.	Dr. NARASIMHA R.	6,575	00		
15.	MOUDGAL N.R.	5,000	00		
16.	JAYANTHI C.	5,000	00		
17.	Dr. NANJUNDAIAH	5,000	00		
18.	ITTYACHEN M.A.	15,000	00		
19.	SAJI VARGHESE	6,000	00		
20.	UMAPATHY S.	5,000	00		
21.	RAHUL PANDIT	2,000	00		
22.	ASIATIC INDL GASES	5,000	00		
23.	SINHA K.B.	550	00		
24.	SAC (C) CNR	26,834	00		
25.	JNC STUDENTS RES	7,087	00		
26.	ISRO/RAMANATHAN R.N.	32,014	00		
27.	SRIDHARAN A.	10,000	00		
28.	KUNTHALA JAYARAM	32,500	00		
29.	Dr. SHARMA V.K.	4,937	00		
30.	MYS UNIVERSITY	1,17,200	00		
31.	Dr. MANEESHA INAMDAR	6,397	00		
32.	Dr. APOORVA PATEL	5,000	00		
33.	GAYATHRI B. KALIYA	75,000	00		
34.	MANGALORE UNIVERISTY	22,000	00		
35.	LTC ADVANCE	21,081	00		
36.	CPF RECEIVABLE	11,229	00		
37.	USIF (S&T) USA RN	2,476	00		

### SCHEDULE No. 3 ADVANCES & DEPOSITS

No.	Particulars	Rupees	Ps.	Rupees	Ps.
38.	DST/HB/EPSPPF/98	874	00		
		5,07,192	00	5,07,192	00
1	PERMANENT IMPREST			25,500	00
1.	FESTIVAL ADVANCE			93,900	00
				8,87,617	00

Place: Bangalore  
Date : 31.8.2000

Sd/-  
**R.S. GURURAJ**  
Accounts Officer

Sd/-  
**V. KRISHNAN**  
Acting President

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants  
Sd/-  
**( Nagaraja )**  
Partner

## SCHEDULE No. 4 - Professorship Endowments

No.	Particulars	Rupees	Ps.	Rupees	Ps.
1.	IBM PROFESSORSHIP FUND	10,29,289	46		
2.	HINDUSTAN LEVER PROFESSORSHIP FUND	16,87,867	68		
3.	GHARDA PROFESSORSHIP FUND	6,75,835	38		
4.	ASTRA RESEARCH CENTRE PROFESSORSHIP FUND	9,97,424	00		
5.	DAE VIKRAM SARABHAI PROFESSORSHIP FUND	13,92,125	70		
6.	DRDO D.S. KOTHARI PROFESSORSHIP FUND	15,45,250	00		
7.	CSIR BHATNAGAR PROFESSORSHIP FUND	15,82,376	00		
8.	SHANTA SEETHARAMAIAH FUND	1,56,218	12		
9.	JNC CORPUS FUND	73,70,330	47		
10.	JNC CNR CORPUS FUND	2,61,631	00		
11.	JNC ROYALTY FUND	1,20,378	90		
12.	BAPU NARAYANSWAMY PRIZE FUND	61,240	00		
13.	DEPARTMENT OF SPACE FUND	16,44,313	00		
14.	RAMARAO A.V. LECTURES - FUND	5,76,543	00		
15.	ISRO MULTIMEDIA PACKAGE	8,55,987	00		
16.	ISRO SATISH DHAWAN LECTURE	4,50,493	00		
17.	RELIANCE INDUSTRIES	60,00,000	00		
18.	DAE RAJARAMANNA LECTURE	5,04,555	00		
19.	TATA EDUCATION TRUST	25,91,154	00		
				<b>2,95,03,011</b>	<b>71</b>
	<b>DEPOSIT ENDOWMENT PROFESSORSHIP FUND</b>				
1.	ICICI	25,90,000	00		
2.	IDBI	36,00,000	00		
3.	HDFC	38,50,000	00		
4.	BEML	5,00,000	00		
5.	CRB CAPITAL	12,000	00		
6.	CANARA BANK	1,06,40,000	00		
7.	IFCK	4,00,000	00		
8.	STEEL AUTHORITY OF INDIA	8,00,000	00		
9.	UTI	20,00,000	00		
10.	IDBI FLEXI BONDS	6,00,000	00		
11.	NTPC LTD.	2,00,000	00		
12.	SYNDICATE BANK	25,00,000	00		
				<b>2,76,92,000</b>	<b>00</b>

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants  
Sd/-  
(Nagaraja)  
Partner

Place: Bangalore  
Date : 31.8.2000

Sd/-  
**R.S. GURURAJ**  
Accounts Officer

Sd/-  
**V. KRISHNAN**  
Acting President

## CPF AND GRATUITY FUND STATEMENT AS ON 31.03.2000

Particulars	Rs.	Rs.	Particulars	Rs.	Rs.
Opening Balance	18,01,322		Canara Bank	12,65,000	
Subscriptions during the year	10,96,516		ICICI	1,00,000	
Interest on subscriptions	2,59,911		IFCI	1,00,000	
Total	<u>31,57,749</u>		IDBI Flexi bonds	22,00,000	
Less withdrawals	1,23,676		KBJNL	2,00,000	
			UTI	<u>4,00,000</u>	42,65,000.00
CONTRIBUTION			Cash at Bank		
Opening balance	13,11,226		SB A/C NO. 17513		
Contribution during the year	5,15,251		Canara Bank, IISc branch		8,87,212.00
Interest on total contributions	1,54,367		Interest receivable - KBJNL		16,486.00
Total	<u>19,80,844.00</u>		Contribution receivable from JNC		<u>6,83,219.00</u>
Gratuity fund					
<b>Total</b>		<b>58,51,917.00</b>			<b>58,51,917.00</b>

As per our report of even date  
for M/s P V Prabhu & Co.  
Chartered Accountants

Sd/-  
(Nagaraja)  
Partner

Sd/-  
V. KRISHNAN  
Acting President

Sd/-  
R.S. GURURAJ  
Accounts Officer

Place: Bangalore  
Date : 31.8.2000