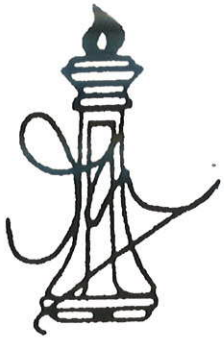
ANNUAL REPORT

2002 - 2003



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
(A Deemed University)
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 2002-2003.

The Centre has grown, over the last decade, to become one of the leading institutions in the country for higher learning and research in frontier areas of science and engineering. Research activities in the areas of materials sciences, theoretical physics, molecular biology and genetics, evolutionary biology, chemical biology, geodynamics and engineering mechanics have continued to make significant progress. I am extremely happy to share that many of the contributions of our faculty colleagues and students are receiving recognition both nationally and internationally. Some of the research activities in material sciences and biology have also yielded potential technologies that can be further developed by industrial partners. Considering our strength in teaching and research, the University Grants Commission has recognized the Centre as a Deemed University and this status will allow us to further grow in our various academic activities. Already 11 students have submitted their theses for Ph.D degree and 2 students have obtained their degree after the Deemed University status. The number of Ph.D students has grown to 70 and it is envisaged that this will grow up to 100 in the next couple of years.

One of the very successful academic programmes of the Centre is the Summer Research Fellowship Programme for young students. During the last year, 3827 completed applications were received of which 132 students were offered the fellowship to spend their summer in laboratories across the country. The students associated with this programme are highly appreciative of the unique opportunity provided to them and get exposed to methods of research at very early stage of their career.

The Honorary faculty of the Centre are contributing significantly to the various academic and research programmes of the Centre and also towards training of young students under the Summer Research Fellowship Programme.

During this year, Prof. C.N.R. Rao, Founder President of the Centre was honoured by the Government of Karnataka with the prestigious award "Karnataka Ratna" on the occasion of Rajyothsava Day which is a matter of great pride to the Centre. The excellent academic atmosphere and the ambience at the Centre is an ideal

place for intellectual interaction and pursuit of knowledge which is the result of the fine work of students, the faculty, the honorary faculty and other members of the Centre. I take this opportunity to acknowledge the help that the Centre has received from its well wishers and friends and look forward for their continued support in the years to come. I would also like to place on record our appreciation to Prof. V. Krishnan, past President for guiding the various activities of the Centre over the last 3 years.

M.R.S. RAO
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 (1989) of Pandit Jawaharlal Nehru with the main objectives of promoting scientific research at the highest level in frontier and interdisciplinary areas of science and engineering. The Centre was registered as a Society under the Karnataka Societies Registration Act and is an autonomous national institution. The Centre was recognised as Deemed University by the University Grants Commission from August 2002.

The Centre has its main campus at Jakkur about 11 km from the Indian Institute of Science, on the Bangalore - Hyderabad highway. The Centre maintains close academic collaboration with the Indian Institute of Science and the infrastructural facilities available at the Centre are used by scientists of both the Institutions.

The beautiful campus amidst sylvan surroundings presently spans about 22 acres of which 15 acres was gifted by the Government of Karnataka and has been functional from 1994. The campus was dedicated to the nation in March 1995 by Shri K.R. Narayanan, the then Vice-President of India. A Student Hostel, some Faculty and Staff Housing are located on this Campus. At the IISc campus, the Centre has a Lecture Hall, Visitor's House (JAWAHAR) and Guest Rooms catering to the academic visitors to the Centre and the IISc.

The Centre has full-time faculty in the areas of its research activities and honorary faculty from all over India. Nearly 70 students are doing research towards regular Ph.D., integrated Ph.D. and M.S (by research) degree programmes.

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.

Prof. C.N.R. Rao, the founder of the Centre, held the office of President from 1989 to 1999. He is Honorary President of the Centre from January 2000. Prof V Krishnan served as the President of the Centre between 2000-2003.

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 now completed thirteen years. It has acquired additional land in the recent past, built more laboratories with excellent infrastructure facilities conforming to the international standards. New Faculty appointments have been made in some research areas. The student strength has reached the projected level. The Centre has been recognised as a Deemed University by the University Grants Commission in August 2002.

The main campus at Jakkur houses The Chemistry and Physics of Materials Unit, Educational Technology Unit, Evolutionary and Organismal Biology Unit, Engineering Mechanics Unit, Geodynamics Unit, Molecular Biology and Genetics Unit, and Theoretical Sciences Unit. The Centre has a good quality Library, excellent Computer Laboratory, a Lecture Hall, a Conference Hall, a Seminar Hall, Faculty Offices and the Administration building.

The Chemical Biology Unit and the Condensed Matter Theory Unit are located on the IISc Campus. On this campus, the Centre also possesses an administrative office with a seminar hall, a well-furnished accommodation for the academic visitors and a Visitor House for the students and the R & D assistants.

The Centre pursues excellence in research and education in frontier and interdisciplinary areas of science and engineering. It provides stimulating academic environment to the talented, motivated students to pursue scientific research. The student strength is presently close to 70. To date, the research training at the Centre has led to the award of seven Ph.D. degrees, eleven M.S. degrees and one M.Sc. (by research) degree.

Some of the recent research achievements (some await IPR) at the Centre include:

- Relationship between fragility configuration entropy and the potential energy landscape of glass forming liquids;
- Polymer based photo-FET;
- Y-shaped Carbon nanotubes;
- Use of Hydroxydiphenyl Ether class of chemicals, as exemplified by Triclosan, as an antimalarial and identification of fatty acid synthesis as its target;
- Defective chemokine activity of the HIV-1 subtype-C Tat protein;
- Modulators (activators/inhibitors) of histone acetyltransferases; and
- Tectonic activities shaping the spatial patchiness in the distribution of global biodiversity.

The Centre is actively pursuing interaction with academic institutions and universities globally. Honorary Faculty Members of the Centre have continued to play an important role in guiding academic and extension activities of the Centre. The campus is lively and vibrant with active support from administrative and scientific staff.

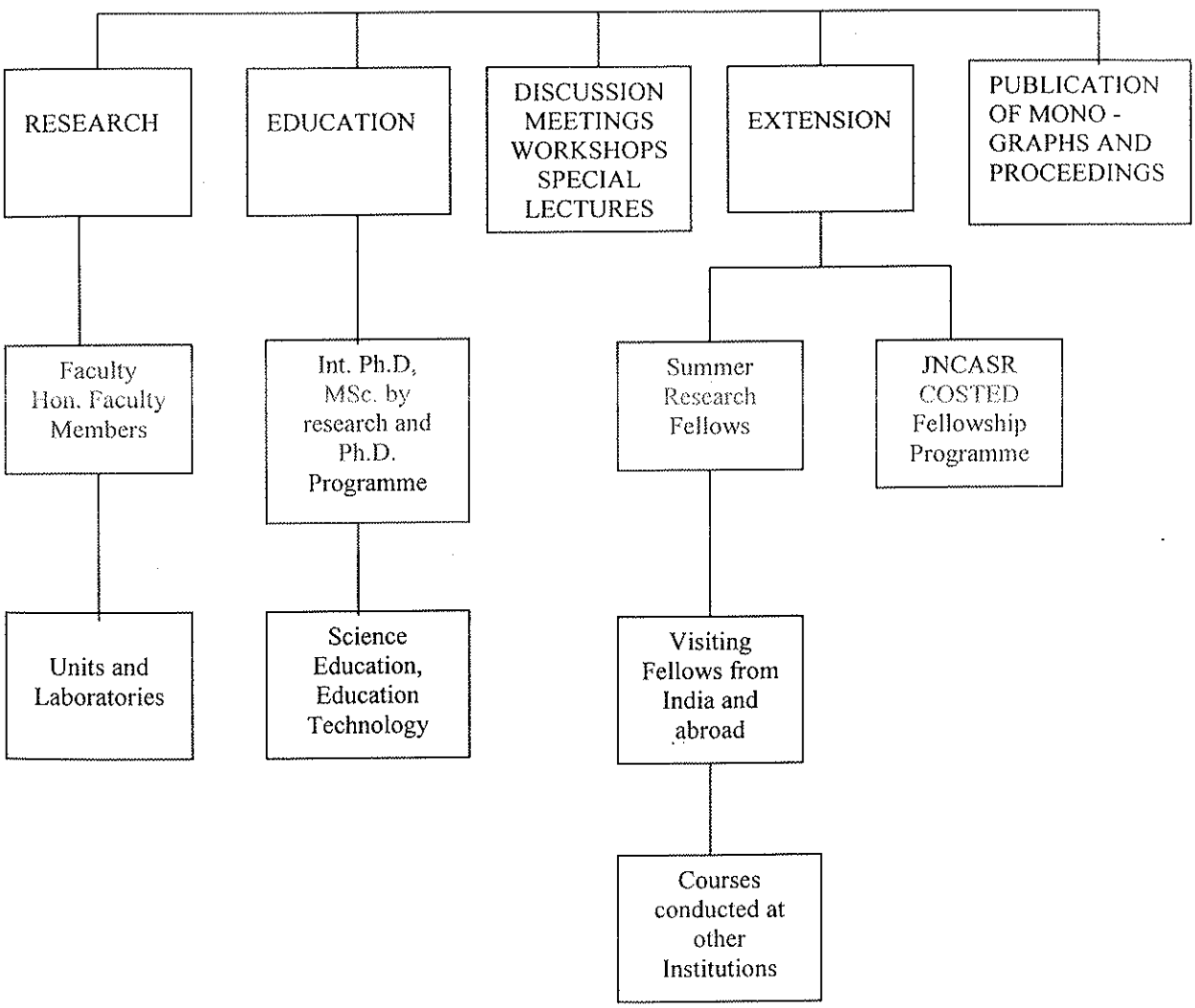
The Centre has published 13 high quality educational monographs, 4 multimedia packages, several books and numerous scientific papers. The Faculty members of the Centre have received

a number of national and international awards and recognitions for their contribution to the advancement of science and technology.

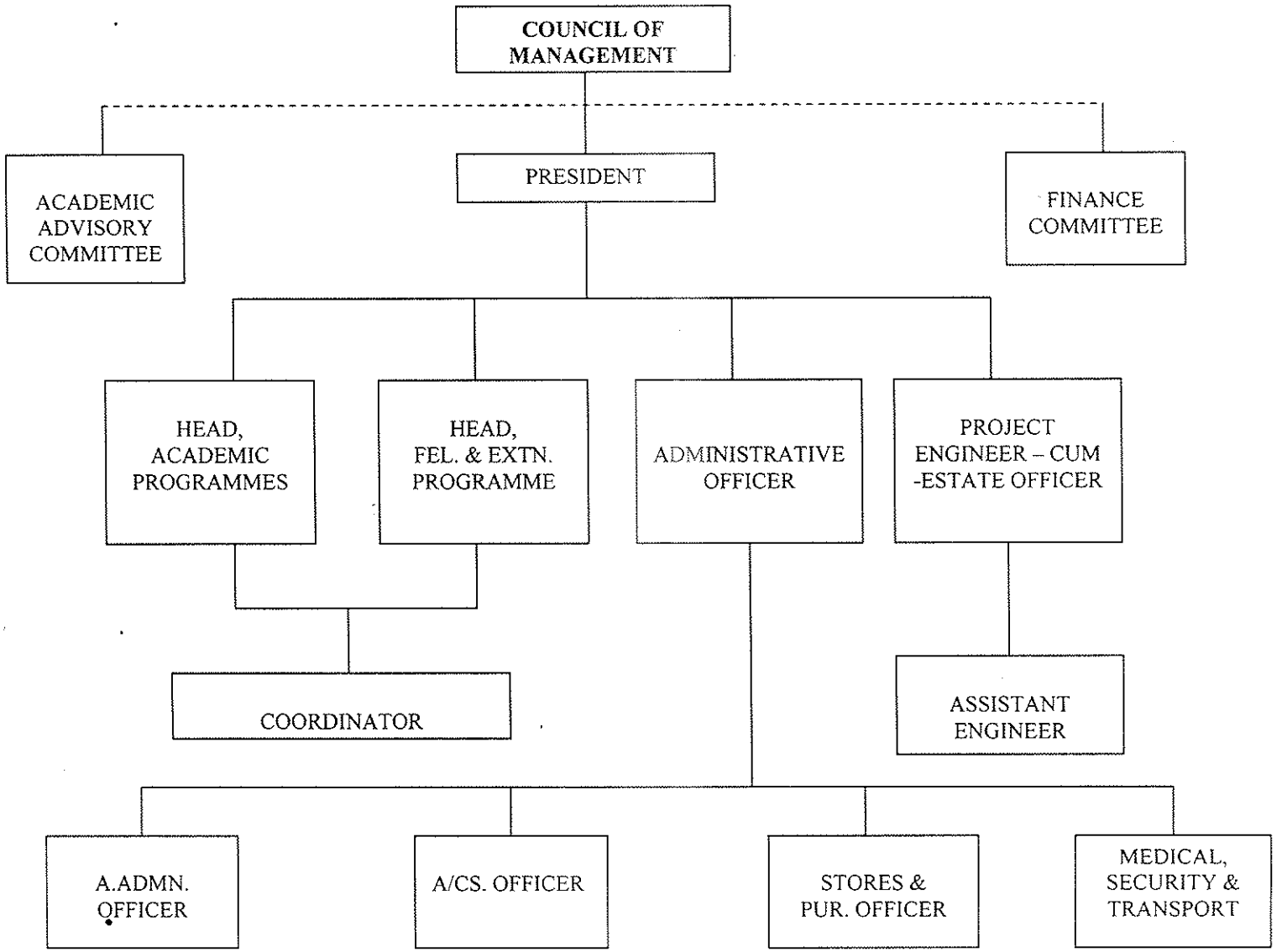
Summer Research Fellowships, Visiting Fellowships, Extension Programmes and Academic Exchange Programmes of the Centre have attracted wide attention. Since January 2002, twenty Discussion Meetings/Seminars/Workshops were conducted, either wholly or partially supported by the Centre.

5. ACTIVITIES CHART

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH



6. ORGANISATION CHART



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
V. Krishnan President, JNCASR	Member
V.S. Ramamurthy Secretary Department of Science and Technology New Delhi	Member
C.N.R. Rao Linus Pauling Research Professor JNCASR	Member
S.K. Joshi National Physical Laboratory New Delhi	Member
Arun Sharma Joint Secretary & Financial Adviser Department of Science and Technology New Delhi	Member
M.M. Sharma Mumbai	Member
S. Varadarajan New Delhi	Member

G. Mehta Director, Indian Institute of Science, Bangalore	Member
A.K. Sood Indian Institute of Science Bangalore	Member
N. Nagaraja Rao (up to 31.7.2002) Administrative Officer, JNCASR	Secretary
B.N. Gurjar (1.8.2002 to 3.9.2002) Administrative Officer I/C	Secretary
A.N. Jayachandra (from 3.8.2002) Administrative Officer	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:

V. Krishnan President, JNCASR	Chairman
C.N.R. Rao Linus Pauling Research Professor JNCASR	Member
Arun Sharma Joint Secretary & Financial Adviser Department of Science and Technology New Delhi	Member
A.K. Sood Indian Institute of Science Bangalore	Member
R.S. Gururaj Accounts Officer, JNCASR	Member

N. Nagaraja Rao (up to 31.7.2002) Administrative Officer, JNCASR	Secretary
B.N. Gurjar (1.8.2002 to 3.9.2002) Administrative Officer I/C	Secretary
A.N. Jayachandra (from 3.9.2002) Administrative Officer	Secretary

3. The Academic Advisory Committee

The functions of the AAC include planning, execution and coordination of research & other academic activities of the Centre. It also regulates the courses 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 :

V. Krishnan President, JNCASR	Chairman
C.N.R. Rao Linus Pauling Research Professor JNCASR	Member
Debashish Mukherjee IACS, Kolkata.	Member
Dipankar Chatterji IISc., Bangalore.	Member
N. Kumar Director, RRI, Bangalore	Member
P. Rama Rao Vice Chancellor, UOH, Hyderabad ISRO Brahm Prakash Distinguished Professor, ARCI, Hyderabad	Member
P. Ramachandra Rao (from 13.8.2002) Vice-Chancellor, BHU Varanasi	Member
N. Mukunda Head, Academic, Fellowships & Extn. Programmes, JNCASR	Member

M.R.S. Rao IISc., Bangalore	Member
K. VijayRaghavan, Director NCBS, Bangalore	Member
N. Nagaraja Rao (up to 31.7.2002) Administrative Officer, JNCASR	Secretary
B.N. Gurjar (1.8.2002 to 3.9.2002) Administrative Officer I/C	Secretary
A.N. Jayachandra (from 3.9.2002) Administrative Officer	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 2002 which included lectures by the faculty on the advances made in various research areas. Local faculty meetings were held in July 2002 and January 2003 to review the progress and provide inputs wherever required.

4. Administration

President
V. Krishnan, Ph.D. (IISc), F.A.Sc., F.N.A.

Head, Academic, 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) (up to 31.7.2002)
LL. B., (Bangalore)

A.N. Jayachandra, B.Com. (Mysore Univ.) (from 3.9.2002)

Administrative Officer I/C

B.N. Gurjar, B.Com., LL.B.(Bangalore). (1.8.2002 to 3.9.2002)

Coordinator
W.H. Madhusudan, Ph.D. (IISc) (up to 30.9.2002)

K. Srihari, Ph.D. (Bangalore Univ.) (from 1.10.2002)

Warden & Student Counsellor
K.R. Sreenivas, Ph.D(IISc) (up to 15.9.2002)

Chandrabhas Narayan, Ph.D. (IISc) (from 16.9.2002)

Associate Warden
Chandrabhas Narayana, Ph.D. (IISc) (up to 15.9.2002)

Vijay K. Sharma, Ph.D. (from 16.9.2002)

Accounts Officer
R.S. Gururaj, B.Sc. (Mysore) M.PEd (Bangalore)

Assistant Administrative Officer
B.N. Gurjar, B.Com., LL.B.(Bangalore) (up to 31.7.2002)

Secretary to President
A. Srinivasan, B.A.(Hyderabad)

Asst. Stores & Purchase Officer
K. Bhaskara Rao, M.Sc.(Hyderbad), M.Phil (New Delhi)

Project Engineer
S. Chikkappa, B.E. (Mysore)

Junior Engineer
Nadiger Nagaraj, DCE

Consulting Medical Officer
B.S. Subba Rao, M.B.B.S. (Mysore)

Consulting Lady Medical Officer
Kavitha Sridhar, M.B.B.S.

Honorary Medical Officers
P.H. Prasad, B.Sc., M.B.B.S (Karnatak), FCCP
G.R. Naghabhushan, M.B.B.S (Mysore), FCCP, FCGP, P.G. Dip in M&CH
L. Sharada, M.B.B.S. (DGO (Madras)
R.K. Nivedita, M.B.B.S. (Mysore)
C. Satish Rao, M.B.B.S. (Mysore)

Honorary Security Officer
M.R. Chandrasekhar, B.Sc., LL.B.

CHAPTER III

UNITS AND LABORATORIES

UNITS

1. Chemistry and Physics of Materials

The unit has made outstanding contributions in the area of materials chemistry during the year 2002-2003. Novel chemical approaches have been employed for the synthesis of nanotubes, nanowires and nanorods of many important inorganic materials. Epitoxial growth of important semiconducting GaN films and their luminescence properties have been extensively investigated. Thin films and single crystals of lanthanide manganates, cobaltates and other related solids have been studied for their electrical, magnetic and magnetoresistance properties. Studies on the physics of conducting polymers, organic semicondictors, nanosystems and electronics of biomolecules were pursued with studies on devices such as organic field effect transistors (FET), light emitting diodes (LED) and photodiodes. Atomistic computer simulations of organic assemblies such as micelles were performed. Ultathin organic films on graphite surface, vibrations dynamics and phase behavior of polyethylene oxide (PEO) were studied using molecular dynamics simulations. Extensive studies on the synthesis and structures of new inorganic solids with extended networks have been carried out. Electronic density distribution in the aromatic rings has been examined using high resolution X-ray diffraction data. Surface enrichment in binary and ternary liquid mixtures of alcohol-water has been studied through analysis of vapor jets. Metal nanocrystals coated with PVP-polymer, nanoparticles have been prepared and studied for their unusual luminescent properties using UV-vis spectroscopy. An in-built Raman spectrometer has been used to investigate the SiC and $NbSe_2$ and related nano structures. Birllouin scattering studies have been carried out on manganates and cobaltates.

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.

Associate Professors

G.U. Kulkarni	Ph.D.
K.S. Narayan	Ph.D.
S. Natarajan	Ph.D.
A.R. Raju	Ph.D.

Faculty Fellows

S. Balasubramanian	Ph.D.
N. Chandrabhas	Ph.D.

Technical Officer

V. Sreenath	B.E.

Technical Assistants

S. Srinivas	B.E.
Usha Govind Tumkurkar	M.Phil.

Lab Assistants

J. Anil Kumar	DEE.
B.S. Vasudev	DEE.
Basavraj Devaramani	DEE
Alla Srinivasa Rao	DECE

R & D Assistants

Basavaraj Katageri V
Birendra Singh
Geopaul
Harsha P
Intyaz Pasha
Manoj A G
Pranab Kumar Mukherjee
Sudheendra L
Vinmathi Vanitha

2. Chemical Biology

Total synthesis of the novel angiogenesis inhibitors epoxyquinols A and B, epi-otteliones and the first total synthesis of the novel triquinane natural products pleurotellol and pleurotellic acid have been accomplished.

A large number of mutants of the CcdB protein have been constructed in order to understand the molecular basis of temperature sensitivity. The wild type protein has been subjected to detailed thermodynamic analysis by DSC and isothermal denaturation studies. In addition a gradient PCR screen was developed for identification of site directed mutants.

The syntheses of new dimeric and trimeric oligopeptides related to Distamycin have been completed. These molecules demonstrate improved binding to AT-specific tracts of DNA. Further studies with these novel peptides are in progress. New Cu (II)-chelating ligand amphiphiles have been developed, and their esterolytic capacities in cationic micelles have been investigated. It was found that certain twisted aromatics, such as, 9-Anthryl and 1-Pyrenyl Terpyridines organize them into multi-directional 'ladder-like' motifs in their crystalline state. These molecules also act as ratiometric water sensors in solution and aggregates.

A number of phosponic acid analogs of natural bile acids have been synthesized, and their aggregation/gelation properties investigated. A rare bile acid (isolated in 2002 from the Shoebill Stork, *Balaeniceps rex*) has been synthesized from chenodeoxycholic acid.

The following are the members of the Unit:

Chair

Uday Maitra	F.A.Sc.

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., F.A.Sc.
Santanu Bhattacharya	Ph.D., F.A.Sc.

R & D Assistant

Manjula N

3. Condensed Matter Theory

The members of CMTU were engaged in theoretical research on a variety of topics in the general area of Physics and Chemistry of Condensed Matter systems. Some of the research topics being pursued by the members of CMTU with support from JNCASR are listed below.

- Dynamical cluster approximation for strongly correlated electronic systems.
- Study of a spintronic material, *Mn*-doped *GaAs*, in the nanometric size regime.
- Statistical mechanics of vortex lines in high-T_c superconductors in the presence of pinning.
- Study of martensitic transformations.
- Statistical mechanics of equilibrium, semiflexible polymers.
- Laser-induced freezing in colloidal systems.
- Modeling of the growth of thin films under chemical vapour deposition and molecular beam epitaxy.

Research Facilities

Network of workstations, personal computers and peripherals.

The Condensed Matter Theory Unit (CMTU) consists of 16 honorary faculty members (15 from different Departments of Indian Institute of Science, and one from Raman Research Institute) and several research associates. This unit receives support from JNCASR in the form of funds for research associates and visitors, computational facilities and a contingency grant for day-to-day expenses and domestic travel.

The following are the members of the unit:

Chair

H R Krishnamurthy	F A Sc., F N A

Hon. Professors

Biman Bagchi	F.A.Sc., F.N.A., F T W A S
Chandan Dasgupta	F.A.Sc.
N. Kumar	F.A.Sc., F.N.A., F T W A S
T.V. Ramakrishnan	F.A.Sc., F.N.A., F T W A S
S. Ramasesha	F.A.Sc.
D.D. Sarma	F.A.Sc., F.N.A.
B. Sriram Shastry	F.A.Sc., F N A., F T W A S

Hon. Faculty

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

Research Associate

Girish Setlur

R & D Assistants

Apratim Chatterji
Buddhapriya Chakrabarti
Radhika A Varier
Rajesh Karan
Ronojoy Adhikari
Syed Raghib Hassan

4. Education Technology

The CD-ROM titled 'Rasayana shastrada Arivu' with Kannada voice over and script was completed and replicated for the Karnataka Government for use in Kannada medium schools. This CD-ROM has three chapters from the CD-ROM 'Understanding Chemistry' translated into Kannada. The CD-ROM was formally released by the Hon. Minister for Primary and Secondary Education, Prof. B.K. Chandrashekar

A Kannada book on the solar system was completed for publication by the DSERT.

The two volume CD-ROM titled Learning Science Volume 1&2 was completed and replicated. M/s Macmillan India Ltd. is marketing these as a set containing both volume 1&2. The target group for this CD-ROM is middle school students and teachers (source material). A demo cum release of the Learning Science vol1&2 was held during the TWAS meeting at New Delhi in October 2002.

The program 'Celebration of Chemistry' was held in Trivandrum in July 2002, in Kolkata in January 2003 and in Bangalore in February 2003. The program was filmed by the Vega group for webcasting.

The unit participated in a programme on Science education held at INSA, New Delhi in May 2002. ETU participated in the parallel session for children at the 90th Indian Science Congress 2003 held in Bangalore. A one hour multimedia presentation comprising of excerpts from `Learning Science' was shown to school children.

A CD-ROM in Hindi called `Rasayan Vigyan Samajna' was taken up for development by ETU. A CD-ROM titled `Bhugola Parichaya' covering various topics in geography in kannada for DSERT was taken up by ETU in March 2003.

The following are the members of the unit :

Chair

N. Mukunda	FA.Sc., F.N.A.

Professor

V. Krishnan	F A Sc., F N A

Technical Assistant

Bhaskar, D K	B E
Jatinder Kaur	M.Sc.

Co-ordinator (Hon)

Indumati Rao	M.A., M.S., C E

Multimedia Asst. (Hon)

Sanjay Rao	B Sc., Cert. Multimedia

R & D Assistant

Gurubasavaraj P M

5. Evolutionary and Organismal Biology

The EOBU carries out advanced research in two laboratories.

1. **Chronobiology** : *Drosophila melanogaster*: a) establishment of mRNAs of the closk genes *period (per), timeless (tim), Clock (clk)* and *chryptochrome (cry)* oscillate woth a 24-hour periodicity in this fly.

   b) Lithium treated flies showed reduced activity but an increase in period length of the circadian rhythm in their locomotory activity in DD. This period-lengthening effect occurs at concentrations similar to plasma levels of lithium used in treatment of patients with bipolar disorder.

   c) Activity rhythms of an ant *Camponotus compressus* : first report on preliminary data indicating that major workers (foragers) have robust circadian clocks, whereas minor workers (nurses) do not have circadian clocks.

2. **Evolutionary Biology:** Evolutionary Genetics: Populations of faster developing *Drosophila* have been created in the laboratory through selection and are being used to study the genetic control of the timing of developmental events.

   Population Ecology: Experimental and theoretical studies are in progress to better understand dynamic behaviour and demographic stochasticity of metapopulations.

The following are the members of the unit :

Chair

M.K. Chandrashekaran	Ph D, D Sc, F A Sc, F N A

Honorary Professors

Raghavendra Gadagkar	Ph D, F A Sc, F N A
Vidyanand Nanjundiah	Ph D, F A Sc, F NA

Associate Professor

Amitabh Joshi	Ph D, F A Sc

Faculty Fellow

Vijay K Sharma	Ph D

Jr. Scientific Assistant

A.V. Nagarathnamma	M Sc

R & D Assistants

Akarsh, C R
Anubhuti Goel (JRF)
Byregowda, V (JRF)
Febitha, K K
Ganesan, S V
Hari Kishore, A
Madhusudhana, L (JRF)
Soumya, L
Sriranjani
Vallikiran, M

Lab Assistants

Deepika N S
Padmanaba C R
Purushothama, L
Ramya S
Veena, B

6. Engineering Mechanics

The members of the unit actively involved in the following Research activities during the period.

A new and fast code for obtaining radiant fluxes and cooling rates in the atmosphere, all the way from the surface to 100 km in altitude, has been completed. The code is based on a band model for radiation.

A study on limiting velocities below which convection laws are valid has just been completed.

Work on connections between solar process parameters and Indian monsoon rainfall is continuing.

In a 2D boundary layer, it was shown that a direct connection exists between the pattern of the dominant secondary modes in the unstable laminar boundary layer and the measurements of intermittency (fraction of time that the flow is turbulent) in the region of transition to turbulence downstream. A mechanism for observed subtransitions was proposed based on expected mergers of turbulent spots.

In collaboration with scientists at the Weizmann Institute in Israel and in Rome, a shell model for homogeneous isotropic turbulence in dilute polymeric flows was used to show that a necessary condition for drag reduction would be a tilt in the turbulence enerrgy spectrum, relative to that proposed by Kolmogorov for Newtonian fluids.

Preliminary flow visualization results were obtained for the model mimicking insect flight. Flow visualization pictures indicate that it is possible to generate lift in a one-degree freedom system. Results from the double diffusive finger system suggest that it could be a plausible mechanism for producing columnar-basalt structure from molten lava. Study of turbulent entrainment in free-shear flows is in progress.

A new faculty member, Dr. Meheboob Alam, joined the Unit. His expertise is in the areas of granular flow, microhydrodynamics and rheology.

The following are the members of the unit :

Chair

R. Narasimha — Ph D, F A Sc, F N A, F R S

Associate Professor

Rama Govindarajan — Ph D

Faculty Fellows

Meheboob Alam	Ph D
K. R. Sreenivas	Ph D

Research Associate

K. Sanjeev Rao

R & D Assistants

Amith Kumar Khatri

Faraz Mehdi
Vijayakumar K Chikodi

7. Geodynamics

The thrust of research endeavours is the studies on tectonic movements that have taken place in the Late Quaternary time. Mainly field-based, the investigations relate to reactivation of older faults and fissures, rapid rise of mountain ranges, drainage development including formation and disappearance of lakes in essentially riverine regimes, reshaping of landscape, and geomorphic rejuvenation of older mature topography. The neotectonic studies aim at gaining insight into the mechanism of recent movements — the quickened pace of which generates hazardous events — and obtaining information on climate changes in the past 50,000 years.

The focus of attention is on the Biligirirangan-Mahadeshwaramalai Range, Nilgiri Hills and Central Sahyadri-Western Ghat terrain in South Indian Shield in the south and the Konkan Coast in Maharashtra and on the Almora-Nappe Range in Central Himalaya in the north.

Chair

K.S. Valdiya — F.A.Sc., F.N.A. , F N A Sc., F T W A S

8. Molecular Biology and Genetics

Research at the Molecular Biology and Genetics Unit, JNCASR is broadly centered on areas of basic biology related to human health and disease. The 7 laboratories in this Unit conduct research in the areas of human molecular genetics (Anuranjan Anand), vascular biology and angiogenesis (Maneesha Inamdar), molecular virology (Ranga Uday Kumar), molecular parasitology (Namita Surolia), chromatin remodelling (Tapas Kumar Kundu) and protein engineering and parasite biochemistry (Hemalatha Balaram)

Analysis of the genetic basis of non-syndromic hearing loss (NSHL) gives cues to unique physiology of the human auditory system and helps define genes functioning almost exclusively in the cochlea. Our work on NSHL has led to the identification of *Cx26* gene mutations as being one of the common causes of deafness. Second main focus of the lab is on genetics of juvenile epilepsy, which is a common and multifactorial brain disorder. An analysis of the four known susceptibility loci is being conducted on the affected families. The efforts on analysis of NSHL and juvenile epilepsy, in this lab have led to the development of skills and infrastructure that could be used to undertake screening of additional neurological genetic disorders.

The aim of the Vascular Biology laboratory is to analyze pathways involved in vascular development, towards a comparative analysis of the origins and functions of circulatory systems in vertebrate and invertebrate models. These studies will provide tools to analyze the large variety of human cardiovascular disorders. Studies so far have led to the identification of two novel, evolutionarily conserved genes, *asrij* and *rudhira*, using embryonic stem (ES) cell-derived embryoid bodies and mouse models. Both genes express in undifferentiated ES cells and are later regulated in a stage- and tissue-specific manner to show predominant vascular expression. Asrij expression in mouse embryonic mesodermal clusters precedes that of the earliest vascular precursor marker Flk-1 (VEGFRII). Rudhira is a WD40 domain protein that is down- regulated in cancer cell lines and maps to breakpoints of hematological neoplasms.

The focus of The Molecular Virology Laboratory is to study the molecular, immunological and pathogenic properties of the Indian viruses of HIV. The laboratory is also involved in engineering, evaluating and optimizing DNA vaccines by the strategy of incorporating molecular adjuvants. The laboratory has active collaborations with several biotechnology industries in India and is engaged in developing molecular and immunologic diagnostic strategies for HIV and other viruses.

The research activities of the molecular parasitology laboratory are focused on detailed study of structure-function relationship of enzymes of Type II Fatty Acid Synthesis of *Plasmodium falciparum* for developing new and more effective antimalarials. Also efforts to delineate the process of targeting of various nuclear encoded, plastid targeted proteins are being extensively pursued.

Studies on chromatin remodeling have led to the identification of two domains of the chromatin- associated protein, HMGB-1, that are essential for the activation of p53 function. Studies on histone acetyl transferase p300 have led to the discovery of a small molecule activator and a natural inhibitor of this enzyme.

Towards understanding of the biochemistry of the metabolic pathways in *P. falciparum*, various parasite enzymes have been subjected to structure-function analysis. This has led to the solving of the crystal structure of the parasite adenylosuccinate synthetase at 2Å resolution. Examination of the structure has helped in understanding the unique kinetic mechanism of the parasite enzyme. Mutational analysis on *P. falciparum* hypoxanthine guanine phosphoribosyltransferase has demonstrated that the active form of the enzyme is a metastable state.

The unit has 19 students currently in its rolls. Over the past one year, one student has obtained Ph.D. degree, three students have submitted their thesis and one has delivered the thesis colloquium.

The following are the members of the unit :

Chair

Dipankar Chatterji	F.N.A.Sc, F.A.Sc., F.N.A.

Honorary Professor

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

Associate Professors

Hemalatha Balaram	Ph.D
Namita Surolia	Ph.D, F A Sc

Faculty Fellows

Anuranjan Anand	Ph.D.
Maneesha Inamdar	Ph.D.
Ranga Uday Kumar	Ph.D.
Tapas Kumar Kundu	Ph.D.

Research Associates

K. Balasubramanyam	Ph D
Srinivas H	M B B S.

Veterinarian

Vasanth Kumar S P	B V Sc

R & D Assistants

Anil Kumar Ojha
Ankita Prakash
Annapurna, B C
Anuradha, N
Bimba Jain
Chitra Rajgopal
Christopher, P G
Deetha, T D
Divya, A T
Hari Kishore
Manvendra Kumar Singh
Marthandan, M
Mohan Kumar, K M
Mohd Altaf Bhat
Nagendran, R
Priyaranjan Pattanaik
Ranjith Prasad Anand
Ravishankar, H M
Sandeep Paul
Sangeetha, K R
Sankarganesh, A
Santosh, G
Saravandan, S
Siddappa, N B
Sucheta Murthy
Toby Joseph

9. Theoretical Sciences

The varieties of dynamic multiscaling in fluid turbulence have been elucidated by a detailed study of time-dependent structure functions in shell models for fluid turbulence. Decaying magnetohydrodynamic turbulence and spiral turbulence in models for cardiac arrhythmias have also been studied. The statistical mechanics of models for semiflexible equilibrium polymers and bosonic Hubbard models has been studied by using Monte-Carlo and density-matrix renormalization-group methods.

A liquid-liquid phase transition has been demonstrated in supercooled silicon. Associated with the transition, preliminary evidence has been obtained to show the existence of a negative pressure critical pont. The liquid-liquid transition also marks a change from metallic to non-metallic (semi-metal) behavior (with U. V. Waghmare). Low temperature dynamical behaviour in a model glass forming liquid has been analyzed to show that there is a crossover to an Arhenius regime, but previous expectations of teh relationship between dynamical behaviour and configurational entropy remain valid.

Based on ab initio studies of IV-VI chalcogenides, the LO-TO splitting has been identified as a single parameter that gives a measure of tendency of a polar insulator to undergo metal-nonmetal and structural phase transitions. Structure-property relationship of the multiferroic BiFeO3 in bulk and epitaxially grown thin film forms has been explained theoretically, which helped understand experimental studies. Effects of nano-scale order and vacancies on the diffuse phase transition in relaxor ferroelectrics simulated with ab initio models.

The validity of continuum elasticity theory for heteroepitaxial growth has been investigated by performing ab initio calculations on the Ag/Pt(111) system. Experiments have suggested that continuum elasticity theory fails catastrophically for such systems; however we find that the discrepancy is small and can be explained by charge transfer. The origins of the stability of small metal clusters have been investigated (with U.V. Waghmare). The melting of small Sn clusters has been investigated; our results support experimental observations that these clusters melt at a higher temperature than the bulk, which disagrees with earlier predictions.

The spatial electrostatic potential profile for an interacting wire sandwitched between two Jellium electrodes has been deduced solving Schrodinger and Possion equations self-consistently. Some of the interesting features in I-V characteristics have been explained using one-electron formalism and instabilities in the system. We have also been modelling the capabilities of various nanostructures for their successful applications as active components in molecular electronic devices. Structure-property relationships of the paranitroaniline based molecular systems have been investigated. Based on the results, we suggest molecular assemblies where the nonlinear optical coefficients can be maximized. We have been able to explain the reasons behind the gigantic nonlinear

absorption coefficients and extremely fast response time observed in a series of oxide insulating materials, based on quantum many-body calculations. We have also been modelling new materials for application in all-optical switching. Quantum chemical calculations have been performed for a thorough characterizations of the various intermediates in the proton pump cycle of the retinal Schiff base in the Halo bacterium salinarium. The role of proton is found to be significant in complete pump cycle.

The following are the members of the unit :

Chair

Rahul Pandit	F.A.Sc.

Associate Professor

Shobhana Narasimhan	Ph.D.

Faculty Fellows

Srikant Sastry	Ph.D.
Swapan K. Pati	Ph.D.
Umesh V. Waghmare	Ph.D.

LABORATORIES

1. Computer Laboratory

- Email and web servers of the centre have been enhanced to keep up with growth in the number of users.
- Most of the general purpose PC's in the central facility have been upgraded with new CPU's, memory and hard disks, recycling some of the old hardware.
- Supported a launch and subsequent maintenance of the Boston Area Science Calendar (BASC) from Jan 1, 2003.
- Upgradation of the internet link through leased BSNL telephone lines and VSNL from 64 kbps to 1 Mbps.
- A survey of computing hardware and software needs of the JNCASR users completed and a proposal for the upgradation of infrastructural facilities for the next five years submitted.

The following are the members of the unit :

Head

Umesh V. Waghmare Ph.D.

R & D Assistants

Rajesh Kanna T R
Shithal T K

Endowed Research Professors :

1. AstraZeneca Research Centre India
   - Astra Chair in Life Sciences
   M.K. Chandrashekaran, 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. (up to 2.2.2003)

5. Hindustan Lever Ltd.
   - Hindustan Lever Chair
   R. Kumar, F.A.Sc., F.N.A. (up to 31.7.2002)
   A. Chakravorty, F.A.Sc., F.N.A.

6. Reliance
   Linus Pauling Research Professor
   Prof. C.N.R. Rao, F.A.Sc., F.N.A., F.R.S.

7. Department of Atomic Energy
   - Vikram Sarabhai Chair
   S.K. Joshi, F.A.Sc., F.N.A.

CHAPTER IV

ACADEMIC PROGRAMMES

PART – I

1. Academic Activities

The Centre offers regular Ph D., Integrated Ph D and M Sc (by research) degree programmes in Science and Engineering. The Integrated Ph D programme is available to those with a B Sc degree. The Centre selects candidates on an Il-India basis, offers course work (in collaboration with IISc) provides research facilities, administers the programme and award the degree. After 3 years of successful completion of the Integrated Ph D programme, candidates are awarded a Master's degree. The Ph D degree is awarded after a period of research and acceptance of a thesis. The regular Ph D programme in science and engineering is available to post-graduates who have successfully completed GATE/CSIR-UGC-JRF/NET examinations. Graduates in Engineering/Medicine are admitted for the M Sc (by research) programme. Students in Physics are also admitted through JEST.

During the year 2002-2003, two students for the Integrated Ph.D., 17 students for the Ph.D. programme and one student for M Sc (by research) were admitted to work in the areas indicated below:

1. Chemistry & Physics of Materials

Integrated Ph D

Arun N
Kalyanikutty K P

Ph D

Moumita Saharay
Ved Varun Agrawal
Kavitha G
Dinesh Kabra
Sukhendu Mandal
Thirumurugan A

2. Evolutionary & Organismal Biology
Ph D

Sutirth Dey

3. **Molecular Biology & Genetics**

Ph D

Aparna G
Sonali Mehrotra
Chandiram Das
Debjani Das
Rahul Modak
Anand Kumar K

4. **Theoretical Science**

Ph D

Bhaswati Bhattacharyya
Mousumi Upadhyay
Prasenjit Ghosh
Debabrata Parigrahi

The following student with engineering background has been admitted to Engineering Mechanics Unit for M.Sc (by research) for the year 2002-2003.

Antina Ghosh

The Ph.D. degrees have been awarded to the following students:

K Vijayasarathy
V Sheeba
I N Sujay Subbaiah

The M S Degree (Int. Ph D) has been awarded to Vijayalakshmi on successful completion of course work, project and comprehensive examination.

2. Discussion Meetings / Workshops

The following discussion meetings / workshops have been held since the last Annual Report:

1. Frontier lectures in Chemistry, April 8-9, 2002 at Siliguri, Sponsors: JNCASR and North Bengal Univ., Darjeeling.

2. Seminar on Evolutionary Biology, June 18, 2002, Convener: Prof. M.K. Chandrashekaran (JNCASR) and Prof. Amitabh Joshi (JNCASR).

3. Summer Course on understanding science, June17-28, 2002, Convener: Prof. R. Narasimha (NIAS).

4. Workshop on 'Issues in Human Health requiring active collaboration between basic and Medical scientists', July 3, 2002, Convener: Dr. T.C. Anand Kumar (Bangalore)

5. Seminar on Structural dynamics in Civil Engineering, July 18-19, 2002, Convener: Prof. B.K. Raghu Prasad (IISc).

6. Symposium on Plant Cell and Signalling, July 19-20, 2002, Convener: Prof. C. Jayabhaskaran (IISc).

7. AIDS Research: A Workshop, July 20-26, 2002, Convener: Prof. R. Nayak (IISc).

8. Workshop on Adaptation and time and Annual symposium of the Indian Society for Chronobiology, 27 August – 4 September 2002, Conveners: Dr. Vijay Kumar Sharma (JNCASR) and Prof. A. Joshi (JNCASR).

9. Human Disease Gene Mapping, September 15-20, 2002, Convener: Dr. Anuranjan Anand (JNCASR).

10. Consortium of Management Studies in Management Research (COSMAR) – 2002, September 20-21, 2002, Convener: Prof. N.J. Rao (IISc).

11. International Symposium on Recent Advances in Inorganic Materials, December 11-13, 2002, Convener: Prof. D. Bahadur (IIT, Mumbai).

12. International Symposium on Spectroscopy, Structure and Dynamics, December 12-13 2002, Convener: Prof. D. Mukherjee (IACS, Kolkata).

13. Symposium on Dielectric and Feroelectrics, December 16-18 2002, Convener: Prof. S.B. Krupanidhi (IISc).

14. Inservice Training Programme for High School Science Teachers, December 20-29, 2002, Convener: Prof. H.L. Bhat (IISc).

15. Ninth International symposium on Particles, Strings and Cosmology, January 3-8, 2003 at Mumbai, Convener: Prof. D.P. Roy (TIFR, Mumbai).

16. 17th International symposium on Glycoconjugates (GLYCO XVII), January 12-16, 2003, Convener: Prof. A. Surolia (IISc).

17. Workshop for College Chemistry Teachers, January 29-31, 2003, Conveners: Prof. M.V. George (RRL) and Prof. C.N.R. Rao (JNCASR).

18. First RNA Group Discussion Meeting, February 1-2, 2003, Convener: Prof. Umesh Varshney (IISc).

19. Symposium on Recent Development in NMR Methodology and Symposium on Magnetic Resonance, February 3-6, 2003, Convener: Prof. K.V. Ramanath (IISc).

20. Mahabaleshwar Seminar on Modern Biology, 23 February – 1 March, 2003, Convener: TIFR, Mumbai.

21. Workshop on Learning from India's Development Experience in ICT, March 3-5, 2003, Convener: Prof. K.B. Akhilesh (IISc).

22. Workshop on Parallel Computing, March 27-31, 2003, Convener: Prof. Debashis Mukherjee (IACS, Kolkata).

3. Colloquia / Lectures

Fluid Dynamics (at IISc Campus held during April 2002- March 2003)

1. Reclaminarization experiments on a convex surface by Dr. R. Mukund, NAL, Bangalore, April 16, 2002.

2. Universal behaviour of entrainment due to coherent structures in turbulent shear flows by Dr. Rama Govindarajan, JNCASR, April 17, 2002.

3. Shear localization in granular flows: Analysis using a frictional Casserat model by Prof. Prabhu R. Nott, IISc., Bangalore, April 24, 2002.

4. Limitations of RANS approach by Prof. E.G. Tulapurkara, IIT, Madras, May 1, 2002.

5. The Polymer and the Flow by Prof. K.R. Sreenivasan, Yale University, USA, July 10, 2002.

Colloquia at Jakkur Campus held since the last annual report

1. *The plate tectonicsrevolution: Psychology of research or logic of discovery* by Prof. Vinod K. Gaur, Indian Institute of Astrophysics & CMMACS, Bangalore, July 24, 2002.

2. Study on Large-Eddy Simulation Methods for Engineering Applications by Dr. S. Vengadesan, Amrita Institute of Technology and Science, Coimbatore, August 7, 2002.

3. Mixing of Transversely Injected Jets into a Crossflow under Low-Density Conditions by Dr. R.I. Sujith, IIT Madras, August 28, 2002.

4. Fluid Mechanics of Granular Flow and Mixing: Focus on Surface Flows by Prof. D.V. Khakhar, IIT, Mumbai, October 9, 2002.

5. Low Energy Buildings: Alternative Cooling Strategies to Air Conditioning by Prof. Paul Linden, University of California, USA, January 7, 2003.

6. Particle Segregation in Sheared Suspensions by Prof Prabhu R Nott, IISc, Bangalore. January 29, 2003.

7. New Relaxation Schemes for Compressible Flows by Dr Raghurama Rao, IISc, Bangalore. February 26, 2003.

8. On Meshless Methods for Solution of Incompressible Flows in Complex Geometries" by Prof Pratap Vanka, Univ. of Illinois at Urbana, Champaign, USA. March 12, 2003.

9. Rheology and Microstructure in Sheared Bidisperse Granular Media" by Dr Meheboob Allam, JNCASR, Bangalore. March 19, 2003.

Frontier Lectures

Knowledge, Intelligence and Wisdom by Prof. P. Krishna, Ex-Rector, Rajghat Education Centre, Varanasi, January 22, 2003.

Special Lectures

RAJIV GANDHI SCIENCE & TECHNOLOGY LECTURE

Light and Life by ***Prof. Ahmed H. Zewail***, Nobel Laureate, California Institute of Technology, Pasadena, USA, October 17, 2002.

MICHAEL FARADAY LECTURE

The femtosecond Realm by ***Prof. Ahmed H. Zewail***, Nobel Laureate, California Institute of Technology, Pasadena, USA, October 18, 2002.

Endowment Lectures

ISRO-SATISH DHAWAN Lecture

"Globalisation and Development" by Prof. Deepak Nayyar, Vice Chancellor, University of Delhi, April 5, 2002.

A.V. RAMA RAO FOUNDATION LECTURES IN CHEMISTRY

Some reflections and a few results by ***Prof. A. Chakravorty***, IACS, Kolkata, August 21, 2002.

Density functional theory in Chemistry by ***Dr. Swapan K. Ghosh***, BARC, Mumbai, August 21, 2002.

DAE-RAJA RAMANNA LECTURE IN PHYSICS

Quantum Zeno Effect: c-Axis transport in high-Tc layered materials by ***Prof. N. Kumar***, RRI, Bangalore, October 11, 2002.

C.N.R. RAO ORATION AWARD LECTURE

On Genetic aspects on Non-Syndromic deafness in Humans by ***Dr. Anuranjan Anand***, JNCASR, August 14, 2002.

4. Seminars

1. Ill-posedness and regularization in dynamic friction by Dr. K. Ranjith, Caltech, USA, April 4, 2002.

2. Nutrition and development of reproductives in a lower termite by Dr. Mallikarjun Shakarad, Poornaprajna Inst. of Scientific Research, Bangalore, April 4, 2002.

3. Interfacial (Electro) chemistry using modified surfaces by Dr. S. Sampath, IISc., April 12, 2002.

4. Pressure andTemperature dependence of viscosity and diffusion coefficients of a glassy binary mixture by Dr. Arnab Mukherjee, IISc., May 2, 2002.

5. Cincinnata controls leaf curvature by modifying progression of cell cycle arrest front during development by Dr. Utpal Nath, Jhoninnes Centre, UK, July 9, 2002.

6. Advances in surgical management of Brain Tumors by Prof. A.S. Hegde, Satya Sai Inst. For Higher Medical Sciences, Bangalore, July 18, 2002.

7. Order, Fluctuations and Instabilities in Suspensions of self-propelled particles: Living Liquid Crystals by Dr. Sriram Ramaswamy, IISc, August 5, 2002.

8. The mixed phase of disordered type-ii superconductors by Gautam Menon, Inst. of Mathematical Sciences, Chennai, August 9, 2002.

9. VLSI Limits by Dr. Navkanth Bhat, IISc., September 20, 2002.

10. The Insulator Superconductor Transition as a Paradigm in Two Dimensional Physics Prof. N. Chandrasekhar, IISc, October 4, 2002.

11. Multiscale modeling of soft matter systems by Prabal K. Maiti, California Institute of Technology, USA, October 30, 2002.

12. Mechanism of Protein Synthesis in Ribisome: Molecular Modelling study by Dhananjay Bhattacharya, Saha Institute of Nuclear Physics, Kolkata, November 7, 2002.

13. The Study of the local and global geometrical structure of atomic computer models by the Voronoi-Delaunay method by Dr. Vladimir Volodhin, Institute of Chemical Kinetics and Combustion of Siberian Branch of Russian Academy of Science, Novosibirsk, November 12, 2002.

14. A new class of magnetic materials: Sr2FeMoO6 and related compounds by Prof. D.D. Sarma, SSCU, IISc, November 26, 2002.

15. Application of Molecular Modelling in Chemical and materials Research by Dr. Andreas Bick, Accelrys Inc., December 5, 2002.

16. Viscoelastic properties of a tissue-surface mimetic system studied by two-colour RICM by Dr. Kheya Sengupta, Technische Universitaet Muenchen, Germany, December 10, 2002.

17. Learning Science by Prof. C.N.R. Rao, JNCASR, December 16, 2002.

18. Anisotropic Nanoparticles by Prof. Reinhard Nesper, ETH Zurich, January 10, 2003.

19. Biologically constrained models of networks of and in neurons by Dr. Upinder S. Bhalla, National Centre for Biological Physics, January 21, 2003.

20. Spinice and Other Frustrated Systems on the Pyrochlore Lattice" by Prof B Sriram Shastry, IISc, Bangalore, February 4, 2003.

21. Creating Biofunctional Interfaces with Peptide Lipid Conjugates" by Prof Matthew Tirrell, Univ. of California, Santa Barbara, February 10, 2003.

22. Polymer Dynamics in Linear Mixed Flows" by Prof Binny J Cherayil, IISc Bangalore, February 11, 2003.

23. Free Electron Lasers: Widely Tunable Classical Laser" by Dr Srinivas Krishnagopal, CAT, Indore, February 13, 2003.

24. Entropic Bottlenecks, Non-exponentiality and Fragility of a Glass Forming Liquid: A New Mesoscopic Model by Prof Biman Bagchi, IISc, Bangalore, February 18, 2003.

25. Melting and Vibrational Dynamics of Poly Ethylene Oxide by Mr M Krishnan, JNCASR, Bangalore, February 25, 2003.

26. Linear Thermodynamic Response for Markov Inherent Dynamics by Mr Niels L Ellegaard, Roskilde University, Denmark, March 4, 2003.

27. Statistical Geometry of Disordered Particle Packings by Dr Srikanth Sastry, JNCASR, Bangalore, March 11, 2003.

28. Unconventional Electronic and Magnetic Properties of Nano-Graphite by Prof Enoki, Tokyo Institute of Technology, Tokyo, March 12, 2003.

29. Low Reynolds Number Mixing in a Curved Channel by Prof Pratap Vanka, Univ. of Illinois at Urbana, Champaign, USA, March 18, 2003.

30. Coarse Graining Molecular Dynamics by Dr Vijay Shenoy, IISc, Bangalore, March 18, 2003.

31. Universal Ac-conduction in Disordered Solids: The Random Energy Barrier Model" by Dr Thomas Schroeder, Nordita, March 25, 2003.

EXTENSION ACTIVITIES

PART – II

1. Summer Research Fellowships/ Department of Science Technology Fellowships/ Rajiv Gandhi Science Talent Research Fellowships

The Centre offers these fellowships for two summer months to bright undergraduate and graduate students. For the year 2003, 132 students were offered fresh fellowships and 37 renewals. Out of this, 50 students were awarded Department of Science Technology Fellowships and 10 students were awarded Rajiv Gandhi Science Talent Research Fellowships.

Scientists in nearly 40 institutions across the country listed below have guided these students:

1) Banaras Hindu University, Varanasi
2) Bhabha Atomic Research Centre, Mumbai
3) Bose Institute, Kolkata
4) Centre for Artificial Intelligence & Robotics, Bangalore
5) Centre for Cellular Molecular Biology, Hyderabad
6) Centre for DNA Fingerprinting & Diagnostics, Hyderabad
7) Central Food Technological Research Institute, Mysore
8) Central Glass & Ceramics Research Institute, Kolkata
9) Central Leather Research Institute, Chennai
10) Defense Research & Development Organisation, Delhi
11) Harish-Chandra Research Institute, Allahabad
12) Indian Association for the Cultivation of Science, Kolkata
13) Indian Institute of Astrophysics, Bangalore
14) Indian Institute of Chemical Biology, Kolkata
15) Indian Institute of Chemical Technology, Hyderabad
16) Indian Institute of Science, Bangalore
17) Indian Institute of Technology, Chennai
18) Indian Institute of Technology, Delhi
19) Indian Institute of Technology, Kanpur

20) Indian Institute of Technology, Kharagpur

21) Indian Institute of Technology, Mumbai

22) Indian Statistical Institute, Bangalore

23) Indian Statistical Institute, Kolkata

24) Institute of Microbial Technology, Chandigarh

25) Inter-University Centre for Astronomy and Astrophysics, Pune

26) Jawaharlal Nehru University, New Delhi

27) Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore

28) National Aerospace Laboratory, Bangalore

29) National Centre for Biological Sciences, Bangalore

30) National Chemical Laboratory, Pune

31) National Institute of Immunology, New Delhi

32) National Institute of Mental Health and Neuro Sciences, Bangalore

33) National Institute of Nutrition, Hyderabad

34) Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram

35) Raman Research Institute, Bangalore

36) Tata Institute of Fundamental Research, Mumbai

37) University of Agricultural Sciences, Bangalore

38) University of Delhi, South Campus, Delhi

39) University of Hyderabad, Hyderabad

Science Education Programme

The Celebration of Chemistry was organized on February 5, 2003. This programme was attended by high school students and teachers. Prof C N R Rao delivered introductory lecture on the multimedia package "Understanding Chemistry" followed by excerpts from the CD-ROM.

National Science Day

The National Science Day was celebrated on 25th February 2003. About 50 students and 18 teachers from Govt. High School, IISc Campus; Mallya Aditi International School, Yelahanka; and students from schools around the Centre have participated. The following lectures were delivered by the Hon. Faculty and Faculty of the Centre:

- "50 years of DNA" by Prof V Nanjundiah
- "Modern Biotechnology (gene therapy and human cloning): A double-edged sword" by Dr Ranga Uday Kumar

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 periods during the year under report :

Visiting Professor

Prof K V Ramanujachary
Rowan University
New Jersey, USA.

Visiting Scientist

Dr Thomas Schroeder
NORDITA

Visiting Fellow

Dr Lekha Nair
Jamia Milia Islamia University
NEW DELHI

Visiting Scholars

Mr Niels L Elligard,
Roskilde University
DENMARK

Mr B Benjamin
University of Orsay
FRANCE

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 2002 - 2003 to work at the institutions as indicated below:

Name & Address	**associated with**
Dr Sushil Kumar University of Agricultural Sciences and Technology JAMMU	Prof V Nagaraja Dept of Microbiology & Cell Biology Indian Institute of Science Bangalore 560 012
Dr (Mrs) G D Bajju University of Jammu JAMMU	Prof V Krishnan Dept. of Inorganic & Physical Chemistry Indian Institute of Science Bangalore 560 012
Dr S Kumaresan Manonmaniam Sundaranar University TIRUNELVELI.	Prof C N R Rao Chairman, CPMU JNCASR Bangalore 560 064

4. 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 carry travel grants.

The following were awarded fellowships during the year:

Mrs Nirmal Ravimannan
University of Jaffna
SRI LANKA

Ms Gertrude N Kiwanuka
Mbarara University of Science & Technology
UGANDA

Mr Anakalo A Shitandi
Egerton University Njoro
KENYA

Dr Babolola J O
University of Ibadan
NIGERIA

Dr Alimoh Helen Alabi
University of Ibadan
NIGERIA

Dr Anahit Simonyan
Institute of Geophysics and Engg.
ARMENIA

Mr Okorie Fidelis Chinozor
University of Lagos
NIGERIA

CHAPTER V

RESEARCH PROGRAMMES

1. Research Areas

There are ongoing research programmes in several frontier, interdisciplinary 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 equipment were acquired during the year :

- ABI Prism Genetic Analyser
- Nanoscope Multimode Scanning Probe Microscope
- -86 degree C Upright Freezer
- U.V. Visible Spectrophotometer
- Fast Performance Liquid Chromatograph (FPLC) System
- Fluorescent Radioisotope Science Image System
- CO2 Incubator
- -80 degree C Deep Freezer – 8 nos.
- Glove Box
- HPLC Pumping System with accessories
- Measuring microscope
- Freezer Dryer CFC
- Alpha Server ES40 Computer system
- Sorvall RC 50 Plus 220/50 Hz. Super speed Refrigerated Centrifuge
- Liquid Nitrogen Facility 1000 Litres capacity
- PERKIN ELMER Opto Electronics Silicon Photon counting module
- HITACHI Fluorescence Spectrometer

- Gene AMP PCR System 9700 Gold Plated
- French Press
- VC 130 Ultra Sonic Processor
- VC 750 Ultra Sonic Processor
- Optical Chopper 4Hz.
- Floor Model Refregerated Incubator Shaker
- THORLABS Laser Diodes
- Twins 10Hz. Double Pulse Laser System
- LEICA DM IRB Fluorescence Microscope with digital imaging system
- Scanning Tunnelling Microscope

3. Sponsored Research

1. Investigator : Vijay Kumar Sarma
   Title : Investigating the circadian organization of the fruitfly *Drosophila melanogaster*
   Funding Agency : Indian National Science Academy
   Duration : 3 years

2. Investigator : Anuranjan Anand
   Title : Molecular Genetic basis of Juvenile Myoclonic Epilepsy.
   Funding Agency : Department of Science & Technology
   Duration : 3 years

3. Investigator : Rama Govindarajan
   Title : Numerical Simulation of Turbulence & Transition for flow around Arbitrary shaped underwater bodies
   Funding Agency : Naval Research Board
   Duration : 3 years

4. Investigator : Amitabh Joshi
   Title : Empirical Investigation of Adaptation to different light Regimes in laboratory population of *Drosophila Melanogaster*
   Funding Agency : DST
   Duration : 3 years

5. Investigator : Tapas Kumar Kundu
   Title : Mechanism of Transcription Regulation by Human SWI/SNF complex and Histone Acetylation/ Deacetylation
   Funding Agency : CSIR
   Duration : 3 years

6. Investigator : C.N.R. Rao
   Title : Materials based on transition metal oxides
   Funding Agency : DAE (BRNS)
   Duration : 4 years

7. Investigator : C.N.R. Rao
   Title : Storage of Hydrogen using graphitic Nano fibres
   Funding Agency : DST
   Duration : 2 years

8. Investigator : C N R Rao
   Title : Collaborative projects between JNCASR & DRDO
   Funding Agency : DRDO
   Duration : 4 years

9. Investigator : Ranga Uday Kumar
   Title : Development of Indigenous Diagnostic ELISA Kits based on Capsid Antigen capture Assay for HIV - 1 and HIV - 2
   Funding Agency : DST
   Duration : 2 years

10. Investigator : K.N. Ganeshaiah
    Title : A Digitized Inventory of Plant Resources other than Medicinal species
    Funding Agency : DBT
    Duration : 3 years

11. Investigator : Maneesha Inamdar
    Title : Signalling Mechanisms in the Development of Blood vessels
    Funding Agency : CSIR
    Duration : 3 years

12. Investigator : Rama Govindarajan
    Title : Flow Stabilization and Destabilization using viscosity Stratification as a Flow Control Option
    Funding Agency : DRDO
    Duration : 2 years

13. Investigator : K.S. Narayan
    Title : Polymer based image sensors and optical detectors
    Funding Agency : MIT
    Duration : 2 years

14. Investigator : Tapas Kumar Kundu
    Title : Transcription regulation through the Acetylation of Human HMG Proteins and its Link to Cancers.
    Funding Agency : DAE
    Duration : 3 years

15. Investigator : Namita Surolia
Title : Fatty acid biosynthesis in Malaria Parasite Plasmodium falsiparum as Target for developing novel anti-Malarials.
Funding Agency : DBT
Duration : 3 years

16. Investigator : K.S. Narayan
Title : Studies on mechanism of photo current generation in Bacteriorhodhopsin films
Funding Agency : DRDO
Duration : 2 years

17. Investigator : Maneesha S Inamdar
Title : Functional analysis of identified gene trap clones in blood vessel formation studies on embryonic stem cells and chimeric mice.
Funding Agency : DST
Duration : 3 years

18. Investigator : Hemalatha Balaram
Title : Plasmodium falciparum hyposanthine guanine phosphoribosyltransferase and adenylosuccinate Synthetic: Targets for antimalarial drug development.
Funding Agency : DBT
Duration : 3 years

19. Investigator : S Natarajan
Title : Synthesis and structural characterisation of new open Framework materials
Funding Agency : DST
Duration : 3 years

20. Investigator : Tapas Kumar Kundu
Title : Screening of cancers manifesting altered histone Acetyl-transferases (HATs) & (HEACs) function & Search for inhibitors of these enzymes in natural Products as therapeutic agents
Funding Agency : DST
Duration : 3 years

21. Investigator : S Natarajan
Title : Investigation on synthesis structure & mechanism of Formation of materials with framework architecture
Funding Agency : DST
Duration : 3 years

22. Investigator : Namita Surolia
Title : Design Synthesis & evolution of Novel anti malaraial Agents that target enoyl-ACP reductase (Fabl) of Plasmodium falciparum
Funding Agency : Shantha Biotechnics Pvt. Ltd., Hyderabad
Duration : 2 years

23. Investigator : Tapas Kumar Kundu
Title : Role of positive cofactor 4 (PC4) in Transcriptional Regulation diseases
Funding Agency : DST
Duration : 3 years

24. Investigator : G U Kulkarni
Title : Investigation of properties and phenomena exhibited by Nano-materials, nano-fabrication, lithography & related aspects
Funding Agency : DST
Duration : 3 years

25. Investigator : Swapan K Pati
Title : Prediction of new organic chromophore and biochromo-Phore optical limiters
Funding Agency : CSIR
Duration : 3 years

26. Investigator : Rama Govindarajan
Title : Secondary Instabilities of Viscosity-stratified flows
Funding Agency : DRDO
Duration : 2 years

27. Investigator : K R Sreenivas
Title : Research Infrastructure for high precision measurements in Fluid Mechanics
Funding Agency : DRDO
Duration : 2 years

28. Investigator : Anuranjan Anand
Title : Molecular genetic basis of hot water epilepsy
Funding Agency : ICMR
Duration : 3 years

CHAPTER VI

PUBLICATIONS

1. Research Publications

(i) Chemistry and Physics of Materials Unit

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2. Carbon nanotubes from organometallic precursors, **C.N.R. Rao** and A. Govindaraj, *Acc. Chem. Res.* **35**, 998 (2002).

3. Basic building units and self assembly in inorganic, open architectures, in *Frontiers in Solid State Chemistry,* **C.N.R. Rao**, World Scientific, PP-12 (2002).

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6. Nanostructured Advanced Materials: Perspectives and Directions, J. Jortner and **C.N.R. Rao**, *Pure Appl. Chem.* **74**, 1491 (2002).

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15. A Raman study of CdSe and ZnSe structures, P.V. Teredesai. F.L. Deepak, A. Govindaraj, A.K. Sood and **C.N.R. Rao**, *J. Nanosci. Nanotech.* **2**, 495 (2002).

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17. Synthesis and characterization of silicon carbide, silicon oxynitride and silicon nitride nanowires, G. Gundiah, G.V. Madhav, A. Govindaraj, Md. Motin Sheikh and **C.N.R. Rao**_*J. Mater. Chem.* **12**, 1606 (2002).

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32. Three-dimensional open-framework transition metal selenites, A. Choudhury, U. Kumar and **C.N.R. Rao**, *Angew. Chem. Intnl. Ed.* **41**, 158 (2002).

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203. Generalized Turing patterns and their selective realization in spatiotemporal systems, **G. Rangarajan,** Y. Chen and M. Ding, *Physics Letters A*, **v. 310**, 415 (2003).

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3. Books and Publications

Books authored/edited

C.N.R. Rao and W. Jones : Supramolecular Organization and Materials Design, (Eds.) Cambridge University Press (2002)

Vinod, C.P., **Kulkarni, G.U**. and Rao, C.N.R : Nanoscale catalysis by gold,. in *Surface Chemistry and Catalysis* (Eds. A. Carley, P. Davies, G. Hutchings & M. Spencer), Kluwer Academic/Plenum Publishers, 2002, p. 191-206.

Kulkarni, G.U., Thomas, P.J. and Rao, C.N.R : Mesoscale self-assembly of metal nanocrystals into ordered arrays and giant clusters, in "Supramolecular Materials Design, Cambridge University Press 2002, p.265.

Prof M K Chandrshekaran : Time in the Living World (A monograph with 81 text figures). M/S with referees (Universities Press).

S.A. Khan and **R.A. Mashelkar :** "Intellectual Property and Competitive Strategies in the 21st Century", by, Kluwer Publications, 2003

G. Rangarajan and M. Ding (editors), Processes with Long Range Correlations: Theory and Applications (Springer-Verlag, Berlin, 2003).

4. Special Issue of the Journal of the Indian Institute of Science

Subunit heterogeneity in reconstituted and hybrid hemoglobins	P T Manoharan
Identity, energy, environment and dynamics of interfacial water Molecules in a micellar solution	S Balasubramanian
Clocks and Societies	V K Sharma
How the fly makes its muscles	K Vijayaraghavan
The energy landscape approach to the study of glass forming liquids and the glass transition	Srikanth Sastry
Blood relatives: Genes involved in the circulatory system of mice and flies	Maneesha S Inamdar

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 development work:

Awards & Honours

Prof C N R Rao

Foreign Fellow, The Royal Society of Canada (2003)

GAUSS Professorship, The Academy of Sciences, Gottingen, Germany (2003).

Mentor of Science, Gold Medal, Indian Science Congress (2003)

Foreign Member, Bangaladesh Academy of Sciences

Honorary Member, Carribean Academy of Sciences

Prof. Debashis Mukherjee

S K Mitra Gold Medal, Indian Science Congress, Bangalore, 2003

Prof. J. Gopalakrishnan

A V Rama Rao Foundation Prize in Chemistry for 2003

CRSI Silver Medal

Prof. E.D. Jemmis

Andhra Pradesh Scientist Award-2003, Andhra Pradesh Council of Science and Technology, Hyderabad.

Dr K Kasturirangan

Rathindra Puraskar for the year 1999 by Visvabharati, Santiniketan on 6.4.2002

V Krishnamurthy Award for Excellence by Centre for Organisation Development, Hyderabad on 13.7.2002

G M Modi Science Award, 2002 by Gujar Mal Modi Science Foundation, New Delhi on 9.8.2002

Award of 'Officer of the legion d'honneur' BY President of the French Republic at New Delhi on 6.9.2002

Bhoovigyan Ratna Award from Bhoovigyan Vikas Foundation, New Delhi on 20.12.2002

8th National Science & Technology Award for Excellence by the Jeppiaar Educational Trust, Chennai on 13.3.2003-10-01

6th Ram Mohan Puraskar 2003 award by Ram Mohan Mission, Calcutta on 22.5.2003-10-01

Doctor of Science (Honoris Causa) Degree of Calcutta University, Kolkata on 5.4.2002

Doctor of Science (Honoris Causa) Degree of Indira Gandhi National Open University (IGNOU), New Delhi on 22.2.2003

Prof G U Kulkarni

Chemical Research Society of India Medal, 2003

Prof P.T. Manoharan:

Lifetime achievement Award from the Alpha Group of Institutions

Prof R A Mashelkar

Honorary Doctorates in Science and Engineering:

- University of Wisconsin, USA (2002)
- University of Allahabad, Allahabad (2002)
- Banaras Hindu University, Varanasi (2002)
- Tilak Maharashtra Vidyapeeth, Pune (2002)

Awards:

- World Federation of Engineering Organization Medal of Engineering Excellence (2003);
- Devi Ahilya National Award (2003);
- A.V. Rama Rao Research Foundation Award (2003);
- RMK Engineering Award (2003);
- ASSOCHAM New Millennium Innovation Award (2003);
- Maharashtra Bhushan Award (2003);

- ❖ Bharat Ratna Dr. M. Visvesvaraya Memorial Award (2002);
- ❖ Hari Om Ashram Senior Scientist Award (2002);
- ❖ Lal Bahadur Shastri National Award (2002);
- ❖ IMC Juran Quality Medal (2002);
- ❖ HRD Excellence Award (2002) in the CEO (Non-Corporate) Category by National HRD Network;
- ❖ Dadabhai Naoroji Memorial Award (2002);
- ❖ Priyadarshani Global Award (2002) by Priyadarshani Academy.

Prof. Raghavendra Gadagkar

Public Lecture in London, India Day, Royal Society of London, December 2002.

Plenary Lecture, German Zoological Society, Halle, Germany, 2002.

Plenary Lecture, 14th Congress of the Entomological Society of South Africa, University of Pretoria, South Africa, July 2003.

Prof. M M Sharma

Honorary Doctorate of Bundelkhand Univ, Jhansi
Lifetime achievement award, Indian Institute of Chemical Engineers
Lifetime Emeritus Professor of eminence by Mumbai Univ

Prof Seyed E. Hasnain

Keynote Speaker at the Opening Ceremony of Eighth Annual Health Sciences Poster Day, Kuwait University, Kuwait, 2003

Dr. S. Varadarajan

S.S. Bhatnagar award for Biological Sciences, 2002

Editorial Boards

Prof Syed E Hasnain

- ♦ Member, Journal of Bioinformatics (2003 -)
- ♦ Member, Journal of Biosciences (2001-04)
- ♦ Member, International Journal of Human Genetics (2000 -)

Fellowships

Prof. Amitabh Joshi:

Elected Fellow of the National Academy of Sciences, India, Allahabad (2002)

Prof. P.T. Manoharan:

Lifetime achievement Award from the Alpha Group of Institutions

Elected Fellow of theThird World Academy of Sciences (FTWAS)

Prof R A Mashelkar

Foreign Associate, National Academy of Engineering, USA (2003)

Prof. Raghavendra Gadagkar

Distinguished Visiting Scholar, University of Pretoria, South Africa, July 2003.

Prof G Rangarajan

Fellow, National Academy of Sciences, India

Dr Umesh V Waghmare

Visiting Scientist, Physics Department, Rutgers University, Piscataway, New Jersey (USA)

Visiting Scientist, National Institute of Standards and Technology, Gaithersburg, MD 20899 (USA)

Visiting Scientist, Institute for Materials Research, Tohoku University, Sendai, 980-8577 (Japan)

Memberships

Prof. Debashis Mukherjee

Elected Member, Third World Academy of Science

P.T. Manoharan:

Vice President, Chemical Research Society of India

R A Mashelkar

Chairmanship/Membership of National Level High-Powered Committees/Bodies:

- ❖ Chairman, High Powered Committee on National Auto Fuel Policy
- ❖ Chairman, Expert Committee on drug regulatory structure and spurious drugs (2003)
- ❖ Chairman, National Quality Council of India (2002)
- ❖ Chairman, Scientific Advisory Committee on Hydrocarbons, Ministry of Petroleum & Natural Gas (2002)

International Bodies/Committees:

- ❖ Chairman, CSIR (South Africa) International Review Committee (2003);
- ❖ One Man Committee to review WIPO's World Wide Academy (2003);
- ❖ Member, Research Advisory Committee, Department of Chemistry, Imperial College of Science & Technology, UK (2003);
- ❖ Member, Consultative Group on Agricultural Research (CGIAR) Working Group on Science Council, World Bank (2002);
- ❖ Member, Review of Chemistry Research in UK Universities (2002).

Prof. Raghavendra Gadagkar

Non-Resident Permanent Fellow, Wissenschaftskolleg (Institute for Advanced Study) zu Berlin, 2002-2007.

Member, Board of Reviewing Editors, *Science*, American Association for the Advancement of Science (2003-present)

Prof. Seyed E Hasnain

Membership of Peer Review Committees

Acadenies

- Council of the Indian National Academy of Sciences (INSA), New Delhi (2002=05)
- Foreign Secretary of the National Academy of Sciences, India (NASI), 2002
- Council of the National Academy of Sciences, India (NASI), 2001-02
- Sectional Committee for Biochemistry and Biophysics, INSA, 2001-02

- Sectional Committee for Multidisciplinary Sciences, INSA, 2001

- Sectional Committee for General Biology, Indian Academy of Sciences (IAS), Bangalore 2000, 2001

Research Advisory/Academic Committees/Board of Governors

Hospitals/Medical Research Centres

- Tata Memorial Centre (TMC), Mumbai
- Cancer Research Institute (CRI), Mumbai
- PD Hinduja National Hospital and Research Centre, Mumbai
- Mahatma Gandhi National Institute of Research & Social Action, Hyderabad, 2003
- L V Prasad Eye Institute, Hyderabad
- Owaisi Hospitals, Hyderabad
- Global Hospitals, Hyderabad
- Mahavir Institute of Medical Sciences, Hyderabad
- Institute of Liver and Biliary Sciences, Delhi
- All India Institute of Medical Sciences, New Delhi

Research Institutions

- Regional Medical Research Centre for Tribals, Jabalpur, 2003
- Indian Immunologicals Ltd.,. Hyderabad, 2003
- Bose Institute, Kolkata, 2003
- Indian Institute of Technology, Mumbai, 2001-03
- Chairman, PARC, Central Forensic Science Laboaroty, Kolkata
- Member, Apex Programme Support Activity, IISc, Bangalore.

Research Foundations/Trust

- Hyderabad Eye Research Foundation, Hyderabad, 2002-2005.

Universities

- Indian School of Business (ISB), 2003
- Jamia Hamdard, New Delhi 2000 –

Project/Performance Review Committees

- Member, Apex Committee and Joint Working Group, Indo-US VAP
- UGC Evaluation Committee for Deemed University, 2002
- Task Force on Human Genetics, DBT, 2001 –
- Management Advisory Committee (MAC), Dept of Science & Tech., Govt. of India, 1998 –
- Task Force on Basic Sciences, Dept of Biotech, Govt. of India, 1997 –
- Program Advisory Committee (PAC) for Molecular Biology, Dept of Science & Tech., Govt. of India, 1992-94, 1995-97, 2001-03.

- TDB (Technology Development Board), Dept. of Science & Tech., Expert Committee
- IDBI (Industrial Development Bank of India) Project Evaluation Committee

Biotechnology Advisory Committees

- Government of Andhra Pradesh
- Government of Gujarat
- Government of Kerala

Umesh V Waghmare

Associate, Indian Academy of Sciences, Bangalore (2001-03)

CHAPTER VIII

FINANCIAL STATEMENTS

NAME	:	**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH**
ADDRESS	:	**JAKKUR POST, BANGALORE 560 064**
YEAR ENDED	:	**31ST MARCH 2003**
ASSESSMENT YEAR	:	**2003-2004**
AUDITORS	:	**G.R. VENKATANARAYANA** CHARTERED ACCOUNTANTS No. 618, 75th Cross, 6th Block, Rajajinagar Bangalore 560 010. Phone: 3404921 Fax:3500525 e-mail:grvenkat@vsnl.com

G. R. VENKATANARAYANA
CHARTERED ACCOUNTANTS
No. 618, 75th Cross, 6th Block,
Rajajinagar, Bangalore - 560 010
Phone : 3404921, 56692877
Fax : 3500525 email : grvenkat@vsnl.com

Partners :
G. R. Venkatanarayana, B.Com., F.C.A.,
G. S. Umesh, B.Com., F.C.A.,

AUDITORS' REPORT

We have examined the Balance Sheet of JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH, Jakkur Complex, Jakkur, Bangalore – 560 064 as at 31st March 2003 and also the Income & Expenditure Account for the year ended on that date. These financial statements are the responsibility of the Institution's Management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. These Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from materials misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit proves a reasonable basis for our opinion.

(a) We have obtained all the information and explanations, which, to the best of our knowledge and belief were necessary for purposes of our audit.

(b) In our opinion, proper books of account, as required by law, have been kept by the institution so far as appears from our examination of such books.

(c) The Balance Sheet and the Income & Expenditure Account referred to in this report is in agreement with the books of account.

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G.R. VENKATANARAYANA * Chartered Accountant * BANGALORE

G. R. VENKATANARAYANA
CHARTERED ACCOUNTANTS
No. 618, 75th Cross, 6th Block,
Rajajinagar, Bangalore - 560 010
Phone : 3404921, 56692877
Fax : 3500525 email : grvenkat@vsnl.com

Partners :
G. R. Venkatanarayana, B.Com., F.C.A.,
G. S. Umesh, B.Com., F.C.A.,

(d) In our opinion and to the best of our information and according to the explanations given to us, subject to notes on accounts and accounting policies stated which are not in conformity with Accounting Standards issued by the Institute of Chartered Accountants of India,viz., AS – 6 [Depreciation Accounting], AS – 9 [Revenue Recognition] & AS – 15 [Accounting for Retirement Benefits in the Financial Statements of Enterprises], the said accounts give a true and fair view:

(i) Insofar as it relates to the Balance Sheet, of the state of affairs of the Company as at 31st March 2003.

(ii) In the case of Income & Expenditure Account, of the excess of Income Over Expenditure for the year ended on that date.

for M/S G R VENKATANARAYANA
Chartered Accountants

(G R VENKATANARAYANA)
Partner

M/s. G.R. VENKATANARAYANA
Chartered Accountants
618, 75th Cross, 6th Block,
Rajajinagar, BANGALORE - 560 010.

Place: Bangalore
Date : 26-09-2003

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
BALANCE SHEET AS AT 31st MARCH 2003

Description	Schedules	Current year	Previous year
LIABILITIES			
Capital fund	1	442614491.66	413614920.66
Reserves and Surplus	2		
Earmarked and Endowment funds	3	44167368.41	39646693.42
Secured loans and borowings	4		
Unsecured loans and borrowings	5		
Deffered credit liabilities	6		
Current liabilities and provisions	7	9461832.45	5520034.45
Other funds-Cluster studies		39541.00	39541.00
Scheme account balances		28830503.14	34782551.98
TOTAL		**525113736.66**	**493603741.51**
ASSETS			
Fixed assets	8	442614491.66	413614920.66
Investments-from earmarked/endow funds	9	35902000.00	31324600.00
Investment - others	10	21970000.00	
Current assets, loans,advances etc.	11	20166099.82	42672867.42
Miscellaneous expenditure to the extent not written off or adjusted			
Deficit as per income & exp. account (- Rs.5991353.43 + Rs.1530208.25)		4461145.18	5991353.43
TOTAL		**520652591.48**	**487612388.08**

for M/s.G.R.Venkatanarayana
Chartered Accountants

(G.R.Ventakanarayana)
Partner

R.S.Gururaj
Accounts Officer

Prof.M.R.S.Rao
President

Place: Bangalore
Date : 26.09.2003

M/s. G.R. VENKATANARAYANA
Chartered Accountants
618, 75th Cross, 6th Block,
Rajajinagar, BANGALORE - 560 010.

PROF. M.R.S. RAO
PRESIDENT
JAWAHARLAL NEHRU CENTRE FOR
ADVANCED SCIENTIFIC RESEARCH
(A DEEMED UNIVERSITY)
JAKKUR P.O.
BANGALORE - 560 064. INDIA

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 MARCH 2003

Description	Schedule	Current year	Previous year
Income			
Income from sales/services	12		
Grants/Subsidies	13	90903292.00	71000000.00
Fees/subscriptions	14		
Income from investments	15		
Income from royalties publications etc.	16	1166437.00	1074439.25
Income earned - interest	17	989567.70	1032278.00
other income	18	424777.00	829883.07
Provision for earlier years written back			10000000.00
Total		**93484073.70**	**83936600.32**
Expenditure			
Establishment expenses	20	26979515.00	22792259.00
Other adiministrative expenses	21	35974779.45	30640587.67
Expenditure on grants/subsidies etc	22		
Interests	23		
Depreciation (net total at the year end)			
Total		**62954294.45**	**53432846.67**
Balance being exess on income over Exp.		30529779.25	30503753.65
Transfer to specilal reserves			
Transfer to/from General reserves			
Non-recurring expenditure		**28999571.00**	**26900548.00**
Balance being surplus carried to corpus/capital fund		**1530208.25**	**3603205.65**
Significant accounting policies(Enclosed)	24		

for M/s.G.R.Venkatanarayana
Chartered Accountants

(G.R.Ventakanarayana)
Partner
Place: Bangalore
Date : 26.09.2003

M/s. G.R. VENKATANARAYANA
Chartered Accountants
618, 75th Cross, 6th Block,
Rajajinagar, BANGALORE - 560 010.

R.S.Gururaj
Accounts Officer

Prof.M.R.S.Rao
President
PROF. M.R.S. RAO
PRESIDENT
JAWAHARLAL NEHRU CENTRE FOR
ADVANCED SCIENTIFIC RESEARCH
(A DEEMED UNIVERSITY)
JAKKUR P.O.
BANGALORE - 560 064. INDIA

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

JAKKUR CAMPUS, JAKKUR P.O.
BANGALORE 560 064, INDIA

Accounting Policies and Notes on the Accounts for the year 2002-03

1. The fixed assets are stated at cost. The Centre has not provided depreciation on fixed assets, since they are created out of Grant in Aid funds.

2. The Gratuity & leave encashment to the staff members is accounted as and when it is paid.

3. Investments of the Centre are stated at cost. The interest on investment is accounted as and when they are received from the concerned banks and financial institutions.

4. The foreign currency transactions are translated at the rates prevailing on the date of transaction.

5. Previous years figures have been regrouped and reclassified to conform to current year's figures.

6. The Centre has put in to operation a system whereby the accounting standards with respect to the above are brought in conformity with the mandatory accounting standards recommended by the institute of Chartered Accountants of India.

R.S.Gururaj.
Accounts Officer.

For M/s G.R.Venkatanarayana
Chartered Accountants

G.R.Venkatanarayana
Partner

M/S. G.R. VENKATANARAYANA
Chartered Accountants
618, 75th Cross, 6th Block,
Rajajinagar, BANGALORE - 560 010.

Prof.M.R.S.Rao
President

Place: Bangalore
Date : 26.09.2003

Phone: Off: (080) 8462750-57 ● Fax: (080) 8462766 ● Cable: NEHRUCEN ● E-mail: admin@jncasr.ac.in

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 1 Corpus/Capital Fund	
1	Balance as at the beginning of the year	366866881.66
2	Addition to fixed assets	28999571.00
3	Add/ded: balance of the net income/exp	
4	Carbon Nano Materials	34182430.00
5	Physics and Chemistry of Materials	9878095.00
6	Cluster studies	2687514.00
	TOTAL	**442614491.66**

R.S.Gururaj
Accounts Officer

R S GURURAJ
Accounts Officer
Jawaharlal Nehru Centre
For Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 3 Earmarked / Endowment Funds	
1	Opening balance of the funds	39646693.42
2	Addition to funds/donations/grants/royalties	2166276.84
3	Addition to funds-income from investments made	3266808.15
4	Addition to funds - other funds	1349.00
5	Funds-Utilisation/expenditure towards objectives of funds	**-913759.00**
	TOTAL	**44167368.41**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
for Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 7 Current liabilities and provisions	
1	Sundry creditors EMD	536221.00
2	Sundry creditors CMD	80685.00
3	Sundry creditors	9055576.45
4	Other current liabilities	-210650.00
	TOTAL	**9461832.45**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
for Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 8 Fixed Assets	
1	Land - Free hold	12636515
2	Buiildings on free hold land	79658165.26
3	Plant/Machinery/Equipments	126116759.47
4	Vehicles	1694263.10
5	Furniture and fixtures	9767460.87
6	Office equipment	4464082.63
7	Computer/peripherals	8170138.00
8	Electrical installations	1520115.00
9	Library books	6468233.21
10	Library journals	29537229.80
11	Tubewells and water supply	94039.00
12	Infrastructure facility	31364201.32
13	Hostel building	15570835.00
14	New lab building	25377072.00
15	Animal house	5425605.00
16	Staff housing	4118031.00
17	ETU building	1754632.00
18	ETU College	4835658.00
19	Equipments Carbon & Nano Materials	34182430.00
20	Equipments Physics and Chemistry of Materials	9878095.00
21	Equipments Cluster studies	2687514.00
22	Equipments Advance Technology Lab	20202562.00
23	Equipment Magnet	7090855.00
	TOTAL	**442614491.66**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
for Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 9 Investments & Earmarked/Endw Funds	
1	ICICI	2300000.00
2	IDBI	6200000.00
3	HDFC	7050000.00
4	CRB CAPITAL	12000.00
5	CANARA BANK	18540000.00
6	UTI	1200000.00
7	IDBI FLEXI BONDS	600000.00
	TOTAL	**35902000.00**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
For Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of balance sheet as at 31st March 2003

	Description	31.03.2003
	Schedule 10 Investments - Others	
1	Fixed deposits with banks - Canara Bank	10000000.00
2	Fixed deposits with banks - Canara Bank (Schemes)	6970000.00
3	Fixed deposits with banks - SBI (Schemes)	5000000.00
	TOTAL	**21970000.00**

R.S.Gurunaj
Accounts Officer

Jawaharlal Nehru Centre
For Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of balance sheet as at 31st March 2003

	Description		31.03.2003
	Schedule 11 Current Assets, Loans, Advances etc.,		
1	Inventories-Cement drawn from IISc		294182.00
2	Other advances		69601.00
3	Cash balance in hand -	JNCASR	70612.00
		Schemes	73967.00
4	Cash at bank		
		JNCASR - Canara Bank	9980896.43
		Schemes - Canara Bank	5688914.54
		Schemes - State Bank of India	3683178.70
5	Advances to staff		128215.00
6	Contingent Advances		137666.15
7	Other advances - Schemes		38867.00
	TOTAL		**20166099.82**

R.S.Gururaj
Accounts Officer

For Advanced Research
BANGALORE

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 13 Grants/subsidies	
1	Grants - DST	87500000.00
2	Grants - Discussion meetings/Seminars	2974558.00
3	Grants - Travel grants	428734.00
	TOTAL	**90903292.00**

R.S.Gururaj
Accounts Officer

For Advanced Research
BANGALORE-560 064

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 16 Income from royalties,etc.,	
1	Income from other sources	1166437.00
	TOTAL	**1166437.00**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
For Advanced Scientific Research
Jakkur Post
BANGALORE - 560 064, INDIA

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 17 Interest earned	
1	From Term deposits	233733.00
2	From SB acounts with nationalised banks	37262.00
3	From SB accounts and Deposits - Schemes	718572.70
	TOTAL	**989567.70**

R.S.Gururaj
Accounts Officer

Jawaharlal Nehru Centre
For Advanced Scientific Research
Jakkur Post
BANGALORE-560 064, INDIA.

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 18 Other income	
1	From other miscellaneous income	424777.00
	TOTAL	**424777.00**

R.S.Gururaj
Accounts Officer

Jawa...
For Advanc...
Jakkur ...
BANGALORE 560 ...

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 20 Establishment expenses	
1	Salaries	19998776.00
2	Wages	4014696.00
3	Allowances	777138.00
4	Bonus	149049.00
5	Contribution to CPF	1073814.00
6	Other expenditure	966042.00
	TOTAL	**26979515.00**

R.S.Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of Income and expenditure
for the period 01/04/2002 to 31/03/2003

	Description	31.03.2003
	Schedule 21 Other Administrative expenses	
1	Electricity & Power	7098135.00
2	Water charges	1729776.00
3	Insurance	177968.00
4	Repairs & maintenance	3572801.00
5	Rents,rates & taxes	36341.00
6	Vehicles running & maintenance	1747955.00
7	Postage, telephone & communication	2938402.00
8	Printing & stationery	1616907.00
9	Travelling and conveyance	1927565.00
10	Expneses on Seminars/workshops/discussion meetings	3268211.00
11	Subscriptions	14764.00
12	Fees	150835.00
13	Hospitality expenses	53908.00
14	Professional charges	613136.00
15	Canteen subsidy	251465.00
16	Frieght & forwarding	93107.00
17	Laboratory Consumables	8321125.00
18	Advertisement & Publicity	1327688.00
19	Other miscellaneous expenses	1013090.45
20	Audit fees	21600.00
	TOTAL	**35974779.45**

R.S.Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
CPF AND GRATUITY FUND STATEMENT AS ON 31.03.2003

Particulars	Rs.	Rs.	Particulars	Rs.	Rs.
Opening Balance	5530416		Canara Bank	6618000	
			ICICI	100000	
Subscriptions during the year	2185835		IDBI Flexi bonds	3400000	
			KBJNL	200000	
Interest on subscriptions	359554		UTI	400000	
					10718000.00
Total	8075805				
			Cash at Bank		
Less withdrawals	-1299602		SB A/C No.17513		
		6776203.00	Canara Bank,IISc branch		1262518.00
Less IT		-36122.00			
		6740081.00			
CONTRIBUTION					
Opening balance	3547974				
Contribution during the year	737072				
Interest on total contributions	308946				
Total	4593992	4593992.00	Deficit on interest payment 2002-03		767632.00
Less withdrawals					
Gratuity fund		1414077.00			
Total		**12748150.00**			**12748150.00**

R.S.GURURAJ
ACCOUNTS OFFICER

PROF.M.R.S.RAO
PRESIDENT

for M/S G.R.VENKATANARAYANA
CHARTERED ACCOUNTANTS

(G.R.VENKATANARAYANA)
PARTNER

M/s. G.R. VENKATANARAYANA
Chartered Accountants
618, 7Cth Cross, 6th Block,
Rajajinagar, BANGALORE - 560 010.

Place: Bangalore
Date : 26.09.2003