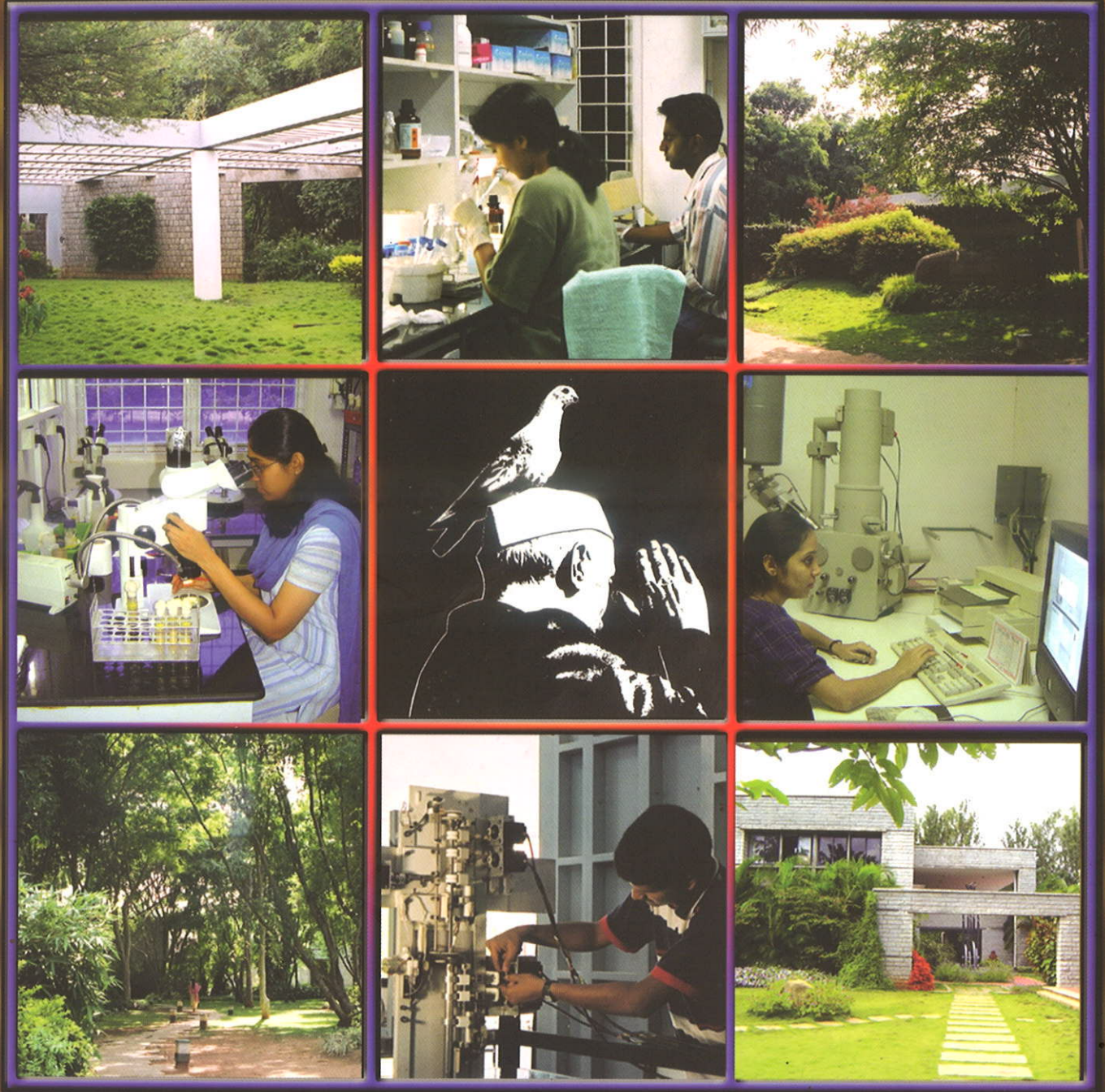




JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

JAKKUR, BANGALORE - 560 064



ANNUAL REPORT 2005 - 2006



ANNUAL REPORT

2005-2006



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

(A Deemed University)

Jakkur, Bangalore – 560 064.

Website : [http:// www. jncasr.ac.in](http://www.jncasr.ac.in)

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The Centre

Foreword

I have great pleasure in presenting the Annual Report of the Centre for the year 2005-2006.

The Centre has grown over the last Sixteen years to become one of the leading institutions in the country for higher learning and research in frontier areas of science and engineering. During this year, significant contributions have been made in research areas of materials sciences, theoretical physics, molecular biology and genetics, evolutionary and organismal biology, chemical biology, engineering mechanics and geodynamics. Many of the contributions of our faculty colleagues and students have received national as well as international recognition. I am happy to share with you that our Founder President and Linus Pauling Research Professor, Prof. C.N.R. Rao has been awarded the National Research Professor, Government of India and Deshikothama Award. It is also heartening to note that several of the research findings in materials sciences and biology have been converted to potential technologies which have now been patented. We are actively pursuing our efforts to attract young faculty members to join different Units of the Centre. In this regard, I am happy to report that two faculty members have joined the Centre during 2005-2006. The publication record showed an impressive increase. Since the recognition of our Centre as a Deemed University by the University Grants Commission, 18 students have obtained Ph.D. Degrees; 4 students M.S (Engg.) and 4 students M S (Int. Ph D) degrees. There has been a steady increase in the number of students joining the research academic programmes of the Centre. With the admission of 33 students for various programmes, the present students strength is 114. A new hostel building to accommodate 70 students has become functional.

In addition to pursuing research in various contemporary areas, the Centre also has several Science Outreach Extensions and Fellowship Programmes. One such activity is the Summer Research Fellowship Programme for young students. During the year, 5,062 applications were received, out of which 168 were offered fellowships. This is one of the highly acclaimed programmes and the students are very appreciative of the benefits which enables them to get inspired towards scientific research at very early stages of their education.

The Project Oriented Chemical Education programme has already made an impact in the student community. Now in its third year, this programme has attracted more attention across the country and the students going through this programme have highly appreciated its structure and content. A similar programme in Biology (POBE) has also been started from this year. Our Honorary Faculty Members, in close association with the Centre have made significant contributions to the various academic and research programmes of the Centre. We acknowledge their participation in training of young students under the Summer Research Programme.

The Centre continues to provide an excellent academic atmosphere for intellectual interaction and pursuit of knowledge which is the result of untiring efforts of students, the faculty and honorary faculty and other members of the Centre. I take this opportunity to thank and acknowledge the enthusiastic help the Centre has received from its well wishers and friends. We look forward to their continued cooperation. The Department of Science & Technology has always positively supported all the academic and developmental activities of the Centre which is greatly appreciated and thankfully acknowledged.

The Centre is in the process of finalising the proposal for the Eleventh Plan period and this will enable us to start many new initiatives.

M R S RAO
President

INTRODUCTION

The Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, a premier research institute in the country, was established in the year 1989, the birth centenary year of Pandit Jawaharlal Nehru, by the Department of Science and Technology. The objectives of the institute are to pursue and promote scientific research and training at the highest level in the frontier and interdisciplinary areas of science and engineering. The number of publications in international journals of repute and the filing of patents is steadily increasing year by year. The Centre, which is just Sixteen years old, is creating news regularly in the scientific world with its breakthrough discoveries. The Centre has collaborations with several national and international institutions. In recognition of the achievements of the Centre, the Ministry of Human Resource Development (GOI) has accorded it the status of a Deemed University, to enable the Centre to train quality manpower. The faculty members of the Centre have received national and international recognition, foremost among these being National Research Professor, Government of India, and Deshikothama award to its Honorary President, Prof C N R Rao. Prof Rao is also presently the Chairman of the Scientific Advisory Council to the Prime Minister. Several faculty members of the Centre are Fellows of National and International science and engineering academies.

Prof. C N R Rao, the founder of the Centre, held the office of President from 1989 to 1999. Prof V Krishnan, who succeeded him, served as its President from 2000 to 2003. Prof M R S Rao is presently the President of the Centre.

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.

PROGRESS

The Centre has completed sixteen years with several memorable and exciting moments. The main campus at Jakkur now 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 Chemical Biology Unit and the Condensed Matter Theory Unit are located at the IISc Campus which also houses the Centre's Administrative Office with a seminar hall, a well-furnished accommodation for academic visitors and a Visitor House for students and the R & D assistants. New Faculty appointments have been made in some research areas. While the new Biology Building and Students Hostel were fully functional, new buildings for Nanoscience Centre and Engineering Mechanics Unit will be ready over the next couple of months, and more buildings are planned. A Centre for Computational Science has been started. Various state-of-the-art infrastructural facilities were upgraded to be commensurate with the increased activities at the Centre.

A new Centre on Nanosciences has been established by the Department of Science and Technology. The Centre has the privilege of having a good quality Library, excellent Computer Laboratory, Lecture Halls, a Chemical Education Laboratory, a Conference Hall, a Seminar Hall, a Poster Presentation Hall, Faculty Offices and the Administrative Office.

The Centre pursues excellence in research and education in frontier and interdisciplinary areas of science and engineering. It provides a stimulating academic environment to talented and motivated students to pursue scientific research. The students strength as on 31st March 2006 was 114. The research training at the Centre has led to the award of 24 Ph D degrees, 15 M S degrees, 4 M S (Engg.) degrees and one M Sc (by research) degree so far.

The research at the Centre attracted national and international media coverage. Research conducted at the molecular virology laboratory of Prof Ranga Udaykumar on the emergence of a recombinant virus strain in HIV-infected individuals in South India has raised fresh concerns about HIV-AIDS infection in India. The development of semiconducting polymer-based position-sensitive detectors by the group of Prof K S Narayan has also attracted attention. These detectors are larger than a centimeter in size and exhibit a spatial resolution of 100nm.

The Centre continues to be active in research at the frontiers of Biology and Materials Science. Recent experiments and simulations of Prof A Joshi and Mr S Dey demonstrated that low but not high levels of migration can stabilize the dynamics of fragmented animal populations, opening up interesting new directions for further studies of dynamics of metapopulations. Prof K S Narayan's invention of photo responsive organic field effect transistor has been awarded a US patent.

The Centre has emerged as a place for interdisciplinary research, with effective interactions among scientists with backgrounds in biology, chemistry, engineering and physics. The JNC community has been working not only in the pursuit of research, but also on dissemination of science-related activities reaching out to the common man.

In addition to the regular academic and extension programmes, a new programme "Project Oriented Biological Education" has been initiated. A national examination, JEST, coordinated this year by Prof. G. U. Kulkarni and his team at JNCASR, saw a quantum leap of improvement in its academic quality and formal administration.

A comprehensive and beautifully designed brochure of the Centre was brought out to showcase the activities and strengths of JNCASR to scientific communities in India and abroad.

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.

During the year, the Centre has published two high quality educational monographs, two multimedia packages, two books and about 200 scientific papers.

The Faculty members of the Centre have received a number of national and international awards and recognition for their contribution to the advancement of science and technology. To mention a few, the Knight of the Legion of Honour from France, and National Research Professor award of Government of India by Prof C N R Rao, FICCI Award by Prof M R S Rao, Aryabhata Award by Prof R Narasimha, Shanti Swarup Bhatnagar Award by Prof Tapas Kumar Kundu, B M Birla Award by Prof S Balasubramanian and Outstanding Research Award from DAE by Prof Anuranjan Anand. The honorary fellowship of the Centre was conferred on Prof Arcot Ramachandran and Prof S Varadarajan.

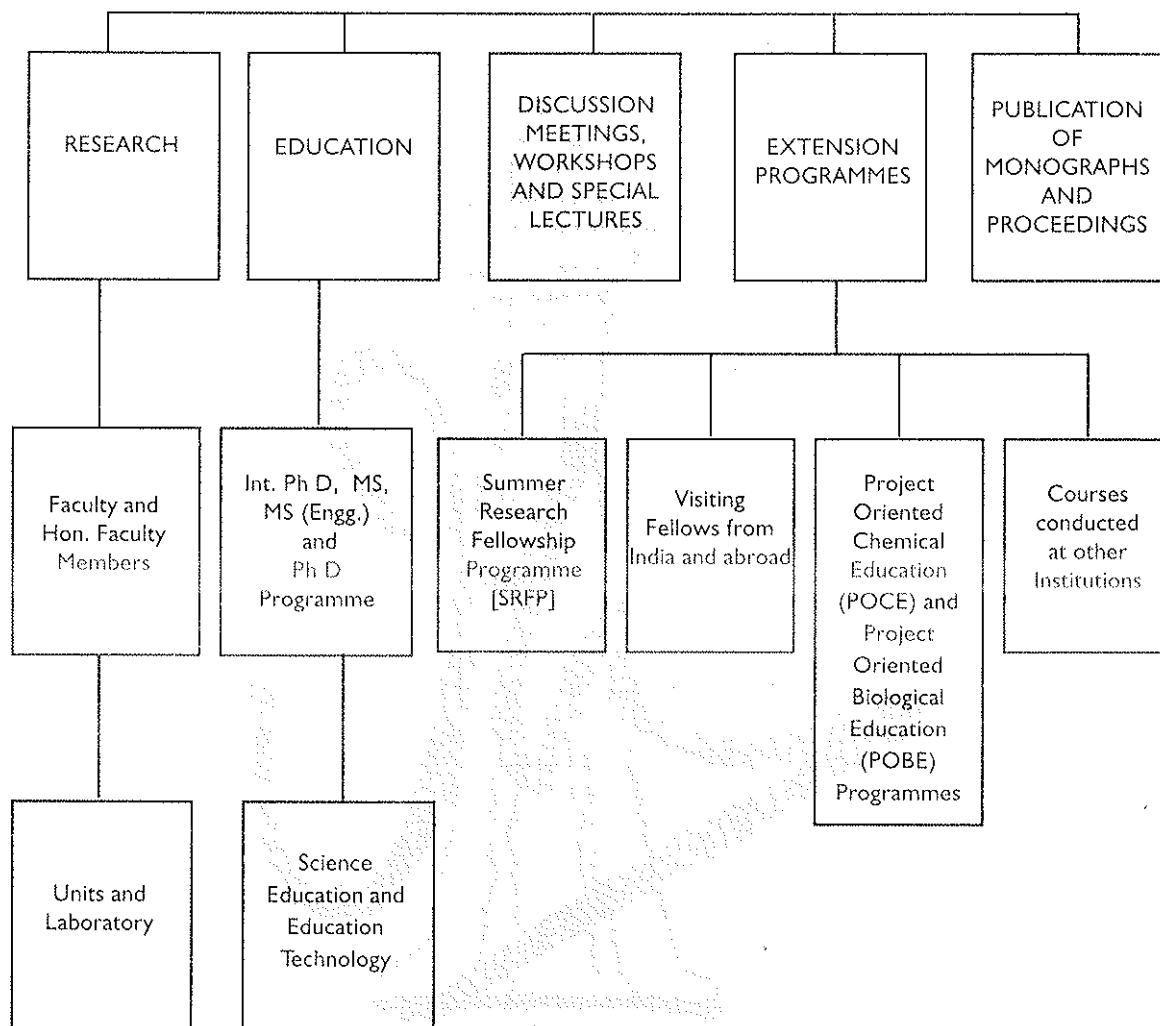
The following patents were filed by the faculty members during the past year:

"1,2,4-Triazolo-1, 3-4-thiadiazole condensed heterocyclic nucleus bearing novel small molecule compounds induce cancer-specific cell death: Lead compounds for anti-neoplastic therapeutics" by Prof Tapas Kumar Kundu et al. "Process for extraction of superior quality plasmid DNA" by Prof Ranga Udaykumar. "Highly specific polyclonal antibodies of individual core histone and uses thereof" by Prof Tapas Kumar Kundu et al.

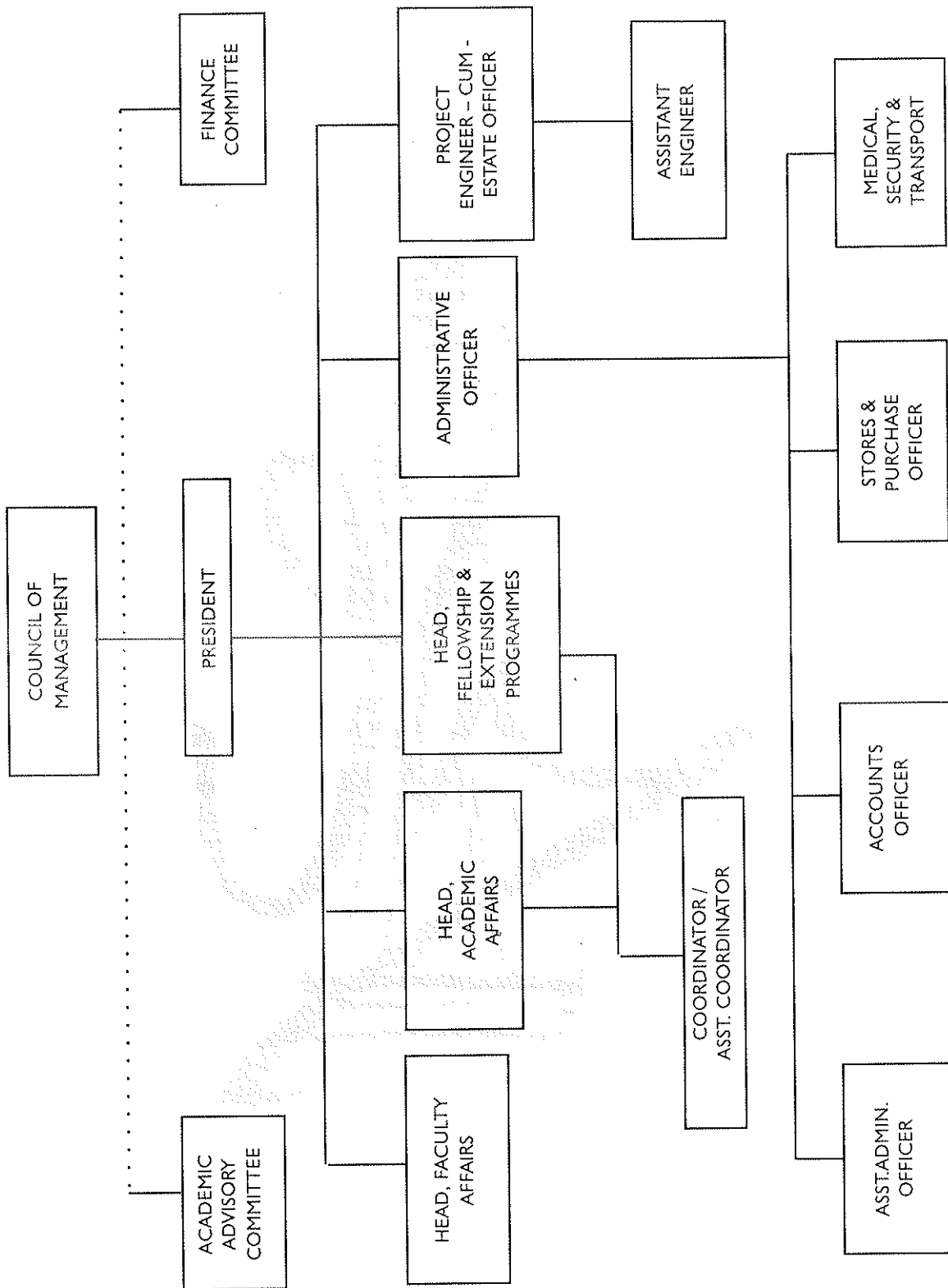
Summer Research Fellowships, Project Oriented Chemical Education Programme, Project Oriented Biological Education Programme, Visiting Fellowships, Extension Programmes and Academic Exchange Programmes of the Centre have attracted wide attention and were highly successful. The new Postdoctoral Fellowship Programme in Nano Science and Technology funded by DST was also successful. Since April 2005, 26 Discussion Meetings/Workshops were conducted, either wholly or partially supported by the Centre. In addition, about 90 seminars were held at the Centre.

ACTIVITIES CHART

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH



ORGANISATION CHART



THE ORGANISATION

I. Council of Management

The administration and management of the affairs and 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.

P Rama Rao ISRO Brahm Prakash Distinguished Professor, ARCI, Hyderabad	Chairman
M R S Rao 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
K P Pandian Joint Secretary & Financial Adviser Department of Science and Technology New Delhi	Member
G Mehta (upto 31.7.2005) Director Indian Institute of Science, Bangalore	Member
P Balaram (from 1.8.2005) Director Indian Institute of Science, Bangalore	
Sinha, B Director, VECC & Saha Institute of Nuclear Physics Kolkata	Member
S Chandrasekaran Indian Institute of Science Bangalore	Member
A N Jayachandra 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:

M R S Rao President, JNCASR	Chairman
C N R Rao Linus Pauling Research Professor JNCASR	Member
K P Pandian Joint Secretary & Financial Adviser Department of Science and Technology New Delhi	Member
S Chandrasekaran Indian Institute of Science Bangalore	Member
Revathi Bedi Finance Officer, JNU New Delhi	Member
R S Gururaj Accounts Officer, JNCASR	Member
A N Jayachandra Administrative Officer, JNCASR	Secretary

3. The Academic Advisory Committee

The functions of the AAC include planning, execution and coordination of research and 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 :

M R S Rao President, JNCASR	Chairman
C N R Rao Linus Pauling Research Professor JNCASR	Member
S Dattagupta (upto 28.2.2006) SNB NCBS, Kolkata.	Member
A K Raychaudhury (from 1.3.2006) Director, SNB NCBS, Kolkata.	Member
Dipankar Chatterji IISc., Bangalore.	Member
N Kumar (upto 28.2.2006) Director, RRI, Bangalore	Member
Rahul Pandit (from 1.3.2006) IISc	Member
P Ramachandra Rao Director, Institute of Armament Technology Pune	Member
S Bhattacharya (upto 28.2.2006) Director, TIFR, Mumbai	Member
T Ramasami (upto 28.2.2006) Director Centre for Leather Research Institute Chennai.	Member
M K Chandrashekar Head, Faculty Affairs, JNCASR	Member
K VijayRaghavan Director NCBS, Bangalore	Member
K S Narayan Head, Academic Affairs, JNCASR	Member
Rama Govindarajan Head, Fellowships & Extn. Programmes, JNCASR	Member
A N Jayachandra Administrative Officer, JNCASR	Secretary

4. Faculties

The faculties are involved in the academic activities of the Centre and assist the Academic Advisory Committee in discharging its functions. The last Annual Faculty Meeting was held in November 2005 which included lectures by the faculty on the advances made in various research areas. Local faculty meetings were held in July 2005 and January 2006 to review the progress and provide inputs wherever required.

5. Administration

President

M R S Rao, Ph D (IISc), F A Sc, F N A, F N A Sc, F T W A S

Head, Faculty Affairs

M K Chandrashekar, Ph D (Madras), D Sc (MKU),
F A Sc, F N A, F T W A S

Head, Academic Affairs

K S Narayan, Ph D

Head, Fellowships and Extension Programmes

Rama Govindarajan, Ph D (IISc), F N A Sc

Warden & Student Counsellor

Hemalatha Balaram, Ph D (IISc)

Associate Warden

S Balasubramanian, Ph D (IISc)

Administrative Officer

A N Jayachandra, B Com (Mysore), ICWA (Inter)

Project Engineer

S Chikkappa, B E (Mysore)

Assistant Administrative Officer

G Jayaram, B Com (Bangalore)

Assistant Coordinator

Princy Jaison Pereira, Ph D (Gujarat)

Accounts Officer

R S Gururaj, B.Sc. (Mysore) M P Ed (Bangalore)

Stores & Purchase Officer

K Bhaskara Rao, M Sc (Hyderabad), M Phil (New Delhi)

Secretary to President

A Srinivasan, B A (Hyderabad)

Junior Engineer (Civil)

Nadiger Nagaraj, DCE

Junior Engineer (Elec.)

Sujeeth Kumar S, DEE

Chief Medical Officer

B S Subba Rao, MBBS (Mysore)

Consulting Lady Medical Officer

Kavitha Sridhar, MBBS (Bangalore)

Honorary Medical Officers

G R Naghabhushan, MBBS (Mysore), FCCP, FCGP, P G Dip in M&CH
L Sharada, MBBS (DGO (Madras))
R K Nivedita, MBBS (Mysore)
C Satish Rao, MBBS (Mysore)

Honorary Security Officer

M R Chandrasekhar, B Sc, LL B (Bangalore)

UNITS, COMPUTER LABORATORY AND ENDOWED RESEARCH PROFESSORS

I. Chemistry and Physics of Materials Unit

The Unit made significant contributions in the area of materials chemistry and physics during this period. In the area of oxides, considerable effort was made to understand electronic phase separation in manganates and cobaltates. Results show the importance of size of the A-site cations and size-disorder. A new biferroic YCrO_3 has been discovered.

Several open-framework structures as well as several hybrid materials have been synthesized and characterized. In particular, these materials make use of sulphate as one of the components to build the structures. Among the carboxylate structures, special mention must be made of the successful synthesis and characterization of amino acid based materials.

A variety of nanomaterials have been synthesized and characterized. In particular, nanowalls GaS and GaSe were prepared for the first time and investigated by a variety of techniques. Mechanical properties of inorganic nanowire – polymer composites have been investigated. The liquid-liquid interphase has been exploited to prepare thin films as well as nanocrystals of materials such as oxides, chalcogenides and metals. The mechanism of formation of the ultrathin films has been investigated. Nanoparticles of several antiferromagnetic oxides have been investigated to find out the nature of magnetism at low temperatures. Activities on experimental nanoscience in many fronts have been carried out. Nanogranular gold films have been prepared by electroless process which have been used as SERS substrates for biomolecules. Metal nanostructures in the form of cups of femtolitre capacity have been synthesized using pulsed laser deposition. The same have been oxidised to form oxide cups. Besides, activities in the field of dip-pen lithography, metal nanocrystals have been extended. Aligned Zn-Al complex spinel oxide nanorods (of dia 150 to 200 nm) with membrane-like morphology were synthesized using porous polycarbonate membrane as the template. The formed nanorods were porous in nature (with pore sizes around 3 nm) and were made up of nanoparticles of size around 10 nm. The nanorods were characterized by XRD, SEM, TEM and nitrogen adsorption techniques. Further, nanoparticles of Ag, Au, Pt, Pd and CdS were stabilized using phyllosilicate clay having amino functional pendants. Aligned, amorphous carbon nanorods were synthesized using glucose as a novel source.

The dielectric properties of $\text{Bi}_{26-x}\text{M}_x\text{O}_{40-y}$ ($\text{M} = \text{Al, Ga, Fe and Co}$) have been investigated. These compounds crystallize in cubic (space group $I 23$) structure with the lattice parameter $a \sim 1.018$ nm. The distribution of M cations in different crystallographic sites have been determined by x-ray diffraction analysis. All these compounds showed a weak polarization. The samples with Fe and Co showed a ferromagnetism as well at room temperature. In order to understand the coexistence of superconductivity and magnetism in $\text{RuSr}_2\text{GdCu}_2\text{O}_8$ (Ru-1212) system, the ferromagnetic unit SrRuO_3 has been investigated by diluting the magnetic Ru ions by Copper. There was a structural transition at 20 % substitution of copper. For 30% the system transformed from the ferromagnetic to a spin glass system. A clear superconductive resistive transition in Ru-1212 for 30 % copper substituted sample was observed. Co(IV) ions were stabilized in the perovskite structure by substituting cerium for strontium in SrCoO_3 . The system $\text{Sr}_{0.9}\text{Ce}_{0.1}\text{CoO}_{2.85}$ became a ferromagnetic metal at 160 K. In this system, the cobalt ions Co(III) and Co(IV) are in the intermediate spin state. Epitaxial thin films of Cu,C-1201 system have been grown by Rf magnetron sputtering which showed a superconducting transition around 15 K.

As proposed earlier, studies on surface enhanced Raman spectroscopy (SERS) on biological systems were initiated. SERS studies have been carried out on p300, a Histone acetyl transferase protein in order to understand drug-protein interaction. Similar studies on SERS on lambda DNA have also been carried out to explore the possibility of its use as a plasmonic biosensor. Raman studies on nanotubes in the presence gold and silver nanoparticles have shown the emergence of a visible fluorescence for the first time. Phase transitions in n-pentane and lead tungstate have been studied using high pressure Raman spectroscopy. Nanotube field effect transistor were designed and were shown to exhibit appreciable changes in the drain source current I_{ds} upon photoexcitation in an environment of semiconducting polymer network. The I_{ds} in dc-mode reveals gate voltage V_g independent characteristics upon photoexcitation. Upon a closer examination from experiments involving a periodic V_g , it is observed that the FET enters into the OFF-state (for $V_g > 0$) and under these conditions the photogenerated charge carriers induce the large increase in I_{ds} in the nanotube channel. Efficient organic/plastic solar cells were studied along with a novel non-lithographic patterning method which is induced by an electric field. The nature of interactions between ethanol and CO_2 has been characterized using simulations via the Car-Parrinello molecular dynamics (CPMD) method, and electron donor-acceptor interactions have been found to be dominant. A theoretical study of the structure and dynamics of the water layer (the hydration

layer) present at the surface of the cationic micelle, decyltrimethylammonium bromide (DeTAB) by using atomistic molecular dynamics simulations was carried out. The structure of a planar liquid-vapor interface of a room temperature ionic liquid, [bmim][PF6] was studied using atomistic molecular dynamics simulations.

The following are the members of the Unit:

Chair

C N R Rao

Ph D, D Sc, F A Sc, F N A,
F R S, F T W A S, Hon F R S C

Associate Professors

S Balasubramanian

Ph D

N Chandrabhas

Ph D

G U Kulkarni

Ph D

K S Narayan

Ph D

Faculty Fellows

M Eswaramoorthy

Ph D

A Sundaresan

Ph D

Technical Officers

V Sreenath (BE), S Srinivas (BE), Usha Govind Tumkurkar (M Phil)

Lab Assistants

J Anil Kumar (DEE), B S Vasudev (BE), Basavraj Devaramani (BE)

Alla Srinivasa Rao (DECE)

Research Associates

Prabhakar Rao K, Vasuda Bhatia

Research Fellows

Kripa Sindhu Sardar, Leonard Deepak, F, Moumita Ghosh, Md. Motin Seikh

R & D Assistants

Hari Krishna S, Harshal S Patil, Hemant Marthand Dixit, Madhu C, Manu Hegde,
Narayanaih Cheedarla, Nirmala P M, Selvi N R, Sheeba Jem I, Ujjal K Gautam,
Yasar K.

2. Education Technology Unit

The Unit has produced and developed CD-ROM's and books in English and other vernacular Indian languages for use in schools as supplementary material. The Learning Science books (Part 1 to 4) were part of the project, Science Outreach Programme supported by the Board of Research in nuclear sciences, Department of Atomic Energy. The Kannada version 'Vignyana Kaliyona' was completed for the Directorate of State Research and Training (DSERT), Government of Karnataka. The Unit has organized many science popularization programs in various parts of the country.

The CD-ROM in Kannada language titled '**Vignyana Kaliyona Samputa 3**' consisting of three modules, **The world of chemistry: Of molecules and materials, Air around us and All about water** containing several topics was completed. The print-ready copy of the book in Kannada **Vignyana Kaliyona Samputa 3** was prepared and formatted by the Unit. The Book and CD-ROM titled Vignyana Kaliyona, Samputa 3 were released at a formal function at JNCASR by Shri. R. Ramalinga Reddy, Hon'ble Minister for Primary and Secondary Education, and Shri. Basavaraj S. Horatti, Hon'ble Minister for Science, Technology & Small savings, Govt. of Karnataka. Students and teachers from Kannada medium schools were invited. A 30 minute multimedia presentation of excerpts from the CD-ROM Vignyana Kaliyona Samputa 3 was presented. Thousand copies of the Book and CD-ROM were handed over to the DSERT. Work on the fourth volume, both as a CD-ROM and as a book comprising two modules each and containing several topics, has begun.

The unit was actively engaged in producing four parts of **Learning Science** books in English as part of the Science Outreach Programme. Each part was completely formatted and all the graphics/visuals used were created using a variety of software. The print-ready copies were completed at ETU and sent for printing. The first part consists of three main topics – **Universe, Solar System and Earth**, the second part titled **The world of physics and energy: Learning physical principles** has two main topics. The third part consists of three topics – **The world of chemistry: Of molecules and materials, Air around us and All about water**.

The fourth in the series deals with **Biology and life** and has two main topics. The four parts were packaged as one unit with the packaging and labeling designed at ETU. Six thousand copies of these packages were made ready.

The Books and CD-ROM's were released by the Hon'ble Minister for HRD Shri. Arjun Singh and Hon'ble Minister of state for Science & Technology & OD, Shri. Kapil Sibal at a function at INSA, New Delhi, on January 5, 2006.

ETU organized a half-day programme as part of the Children's Science Congress conducted by Navodaya Vidyalaya Samiti, Hyderabad region. In the programme, a 30-minute documentary *Lifetime Professor – Prof. C. N. R. Rao* was screened followed by a 1 hour multimedia presentation on excerpts from different modules of the CD-ROM *Learning Science*.

In the area of science popularization, Learning Science programme was conducted at National Science Centre, New Delhi, on 9th February 2006 and at IIT/Kanpur on 11th February 2006. As part of National Science day celebrations, Nehru Science Centre, Mumbai organized a programme *Learning Science* (C. V. Raman Memorial Lecture) on 28th February 2006. About 1500 students attended the programme. A multimedia presentation of excerpts from the CD-ROM '*Learning Science*' was presented by the Unit at all the above programmes. In the programme '*Learning Science*' Prof. C. N. R. Rao gave the theme lecture.

In the programme on Project Oriented Chemical Education, for undergraduate college students, a multimedia presentation from the CD-ROM '*Understanding Chemistry*' was presented by the Unit in May -June 2005.

The fourth volume 'Vignyana Kaliyona Samputa 4' as CD-ROM and book having two main topics has been completed. This volume is about Biology and life. A program for Kannada medium schools was organized and excerpts from this CD-ROM were presented as multimedia presentation.

The following are the members of the Unit:

Incharge	
V Krishnan	Ph D, F A Sc, F N A, F T W A S
Coordinator (Hon)	
Indumati Rao	M A, M S, C E
Technical Officer	
Jatinder Kaur	M Sc
Multimedia Asst. (Hon)	
Sanjay Rao	B Sc, Cert. Multimedia

3. Engineering Mechanics Unit

During the year work was continued on various aspects of stability theory, in particular a method was devised to estimate the streamwise variation of disturbance amplitudes from solutions of minimal composite theory. The work renders this theory complete in two-dimensional flows.

Three different investigations in atmospheric sciences were also completed. One of these was an asymptotic analysis of a simple model for the distribution of temperature above bare soil on calm clear nights. By employing new statistical methods strong evidence was provided for the links between Indian monsoon rainfall and solar activity on decadal time scales. Finally a new scaling based on the sensible heat flux for atmospheric conditions corresponding to weakly forced convection has been proposed, and its value demonstrated by an examination of atmospheric data. This scaling has now been incorporated in an atmospheric general circulation model. It has been shown that it helps predict the track of the Orissa super cyclone of 1999 much more accurately.

In continuation of the work on entrainment processes in free-shear flows, it was demonstrated experimentally how ambient flow field in the vicinity of a jet changes radially inward flow when the ambient viscosity is low to a co-flow when the ambient viscosity is high. This change in a high viscosity medium indicates a decrease in the rate of entrainment and correlates with the disappearance of large eddy structures at the interface. These results indicate how increase in shear layer stability can reduce entrainment in free-shear flows.

The lifted temperature minimum has been simulated in the laboratory. The study also considers the effect of boundary-emissivity.

The ratio between upstroke to down stroke periods for which one can get sustained lift in a single degree of freedom flapping system has been identified.

Work during the past year has tried to evaluate the relative importance of linear instabilities (exponential growth) and transient growth in various flow situations and to assess how well each of these mechanisms will lend itself to flow control. It is found that small levels of wall-divergence in pipes or channels destabilizes the flow enormously, and that the flow is already linearly unstable at Reynolds numbers of order 100 at divergence of about a degree. It has also been shown that viscosity stratification, in heated flow, in two-fluid flow as well as in the flow of shear-thinning fluids, has almost no effect on transient growth. This result is in contrast to our earlier finding of enormous stabilization or destabilization of the linear mode. The results have implications for flow control.

Minimal composite theory methods, using the properties of adjoint operators, have been used in swept flows and in mixing layers to solve the non-parallel stability problem. In particular, we show that the critical Reynolds number in a mixing layer is about 55 in spatially chosen scales. The value quoted so far in text books is 0, which is known to be absurd.

Using the Melnikov technique, it is shown that when a corotating vortex pair is separated by any finite distance "d" from another identical (out-of-phase) pair, the resulting flow is chaotic. The amount of chaos, or equivalently the entrainment in the system, increases as the inverse square of "d" for large "d". It is also shown that viscosity has a tendency to suppress entrainment.

In a collaboration with IISc, it is shown that drag reduction due to polymers in decaying turbulence works differently compared to steady turbulence.

Research efforts at the Unit have also focused on (i) a theoretical description of the effect of hydrodynamic interactions on the behavior of large clusters of sedimenting particles, with application to pollutant and toxin dispersal, gravity currents, and pyroclastic flows and (ii) stability of a homogeneous, dilute, gas-solid suspension, and application of the results to describe the effect of particles on turbulence (2D-coupling).

In CFD the research activities pursued are: development and application of weighted least squares kinetic upwind method, low dissipation modified Courant scheme, Kinetic Upwind Method Avec Rotational Invariance, LSKUM on moving grids, and application of optimal control theory to grid adaptation and low dissipation scheme.

An international collaborative project, Max-Planck-India Partner Group, administered by the Max-Planck Society, Germany has been granted to Dr. Alam and Prof. A. Khalili (Mad Planck Institute of Marine Microbiology, Bremen, Germany) in January 2006. This project is likely to start from late 2006 and will continue for three years.

The following are the members of the Unit :

Chair

R Narasimha Ph D, F A Sc, F N A, F T W A S, F R S

Associate Professor

Rama Govindarajan Ph D, F N A Sc

Faculty Fellows

Meheboob Alam Ph D

K R Sreenivas Ph D

Ganesh Subramanian Ph D

Senior Associate

S M Deshpande Ph D

Research Associates

Sameen A, Vinod N

R & D Assistants

Abhay Gudi, Gayathri S, Mallappa Achanur, Saritha Azad



4. Evolutionary and Organismal Biology Unit

The Evolutionary and Organismal Biology Unit consists of two laboratories doing research and teaching in the following subjects : *chronobiology*, *behavioural ecology and sociobiology*, *evolutionary genetics* and *population ecology*. The research employs *Drosophila melanogaster*, the ant *Camponotus compressus*, and the field mouse *Mus booduga*.

Facilities :

1. Fully computerized insect activity recording systems with hundreds of channels to continuously record locomotor activity of fruitflies, ants and mice.
2. A laboratory to carry out molecular biological work with extensive facilities for RNA and protein estimation.

Research highlights :

Chronobiology Laboratory :

Drosophila melanogaster: Established mRNA of the clock genes *period (per)*, *timeless (tim)*, *clock (clk)* and *cryptochrome (cry)*.

*Lack of a circadian organization has life expectancy consequences in *Drosophila melanogaster*. This is the first unequivocal demonstration that an absence of circadian integrity can shorten life in any organism.

The Unit demonstrated for the first time that in the ant *Camponotus compressus* only major workers (*foragers*) have robust circadian clocks and that minor workers (*nurses*) do not have circadian clocks.

The Unit was the first to report "clocks for sex"; *Camponotus compressus* queens lose their clocks after mating. It also reported the first evidence for *shift work schedules* in forager/worker ants.

Evolutionary Biology Laboratory :

- a) Evolutionary Genetics : Populations of faster developing *Drosophila* have been created through laboratory selection to investigate genetic control of the timing of developmental events.
- b) Population Ecology : Experimental and theoretical studies are in progress to understand better demographic stochasticity of metapopulations. Studies on Indian species of drosophilids are underway to examine the generality of life-history trade-offs.

The following are the members of the Unit:

Chair

M K Chandrashekar Ph D, DSc, FASc, FNA, FTWAS

Honorary Professors

Raghavendra Gadagkar Ph D, F A Sc, FNA., FTWAS

Vidyanand Nanjundiah Ph D, F A Sc, FNA

Associate Professors :

Amitabh Joshi Ph D, F A Sc, F N A Sc

Vijay Kumar Sharma Ph D

Research Associates

Hemavathy, Sujatha Mohanty

R & D Assistants :

Ananda T, Manjunatha S, Mohan J, Shanaz Rahman Lone,
Snigdhadip Dey, Sreeja, Swetha B M,

5. Geodynamics Unit

Project One : *River Response to Neotectonic Activity in Central Kerala*

The reactivation of WNW-ESE and NNW-SSE faults and fractures controlling drainage pattern in central Kerala, manifested itself in strike-slip and oblique-slip movements as evident from (i) swerving of rivers and streams and change of their original meandering system to the one characterized by peculiar loops, (ii) occurrence of earthquakes on or close to the faults, (iii) intermittent subsidence of the floor of the 83- km long NNW-SSE oriented Vembanad Lagoon in which six rivers empty themselves, and (iv) ponding of rivers and their tributaries upstream of the crossing of the active faults as represented by palaeolakes of the past and present-day stagnant bodies of water, some stretching 4 to 7 km upstream of the fault lines.

Project Two : *Neotectonics of the Trans-Himadri Fault in Central Himalaya*

(Field work in the Eastern Dhauli River revealed evidence of spectacular uplift and resultant blockage and formation on 11-km long lake in the river valley)

The Trans-Himadri Fault zone is 20 km wide zone of complicated structural architecture characterized by NNE-verging sigmoidal backfolds with subhorizontal cleavage and broken by a multiplicity of sympathetic and antipathetic faults. These faults register large uplift in the Dhauli Valley, where granitic-migmatic components of the basement complex have been spectacularly squeezed up and the detached sedimentary pile has slipped downslope, toppling northwards.

Project Three : *Book Writing - The Making of India: Geodynamic Evolution*

The following Chapters were written during the period of report: (1) Proterozoic Eastern Ghat Mobile Belt (2) Southern Gradulite Terrain (3) Intracratonic Purana Basin in Peninsular India (4) Early Proterozoic in Himalaya (5) Later Proterozoic in Himalaya, and (6) Himalayan Province between Pan-African and Hercynian Tectonic Upheavals. Chapters prepared with full complements of diagrams.

Chair
K S Valdiya

Ph D, F A Sc, F N A, F N A Sc, F T W A S

6. Molecular Biology and Genetics Unit

The central theme of research activity of this Unit is Biology of Diseases. The different areas under this broad discipline being pursued are : (a) Infectious Diseases like Malaria and AIDS (b) Chromatin Remodelling and Transcriptional Regulations in relation to Cancer (c) Developmental Biology and Genetics in relation to Angiogenesis, Deafness and Epilepsy. The Unit during the last two years has expanded both in terms of various research activities and physical infrastructure like additional laboratory space and sophisticated equipments like Multiphoton Confocal Microscopy, CD Spectropolarimeter etc.

Chromatin Biology Laboratory

Global chromatin remodeling is an important event during mammalian spermatogenesis, particularly with respect to (a) genetic recombination at the pachytene interval and (b) final stages of spermiogenesis. There are several diseases associated with spermatogenesis resulting in infertility as a consequence of defective genetic recombination as well as chromatin packaging during the final stages of sperm development.

Both these aspects, namely, genetic recombinations during meiotic prophase and chromatin remodeling during spermiogenesis are being studied. Recently a meiotic recombination hot spot in the mouse genome which also encodes a non coding polymerase II transcribed RNA has been characterized. It has now been observed that this 2.4 kb transcript is processed through the microRNA pathway to generate 80 nt intermediate species in the nucleus. It has now been attempted to demonstrate the generation of the classical 22 nt microRNA.

It has been shown earlier that TP2 which appears during later stages of spermiogenesis is a zinc finger protein having DNA condensing properties and binds GC rich sequences both *in vitro* and *in vivo*. It has now been characterized the import pathway for TP2 in haploid spermatids and has clearly been shown that importin 4 is involved in this nuclear import. It has also been observed that TP2 gets acetylated and methylated. The biological significance of these posttranslational modifications is now being addressed.

Transcription and Disease Laboratory

It has been discovered in this Laboratory that human histone chaperone NPM1 activates the acetylation dependent chromatin transcription and itself get acetylated specifically by p300 with functional consequences. It has been found that human histone deacetylase (HDAC) relocalises from cytoplasm to nucleus with increase in grade of WHO classified glial tumors, which may explain a correlation between the chromatin modification and prognosis of the disease. This data may also be useful as diagnostic marker. A small molecule natural compound as a specific inhibitor of arginine methyltransferase has been discovered and that this would be the only known inhibitor of arginine methyl transferase activity.

Molecular Parasitology Laboratory

Major focus of the lab during the year was to biochemically characterize some of the enzymes of *Plasmodium* FAS II pathway and also to analyse the structure—function relationship of these proteins. The b-Ketoacyl reductase as well as holo-Acyl Carrier Proteins (ACP) were expressed in *E.coli*, the enzyme kinetics as well as the trafficking of these proteins to the 'apicoplast' were studied. Mutational analyses were carried out with these proteins to find out the role of various amino acids essential for the activity as well as the interaction of these proteins with other players of the pathway. The NMR structure of *Plasmodium* holo-ACP was solved in collaboration with Dr. Siddhartha Sarma of IISc.

Protein Engineering Laboratory

Hypoxanthine guanine phosphoribosyltransferase (HGPRT) and adenylosuccinate synthetase (ADSS), enzymes involved in purine salvage and nucleotide biosynthesis were investigated further. Studies in the Laboratory have shown for the first time that long range interactions involving non-active site residues play a dominant role in determining oxopurine base specificity in HGPRTs. The mechanism for activation of PfHGPRT was elucidated and shown the active form to be metastable. From a hyperthermophilic organism ADSS was characterized and shown that *M. jannaschii* ADSS is a tetramer, an oligomeric state not observed in other ADSS. The kinetic mechanism deduced is also unique to this enzyme unlike those reported for mesophilic enzymes.

Molecular Virology Laboratory

A novel and efficient protein purification strategy has been developed for HIV-1 subtype-C Tat. Tat prepared this way showed important structural and functional differences between subtypes-B and C. A molecular clone of HIV-1 was

isolated and characterized at molecular and biological levels. This clone demonstrated unique properties in containing a non-typical kappa B binding site, full-length Rev and a capability to use several coreceptors including CXCR4 and CCR5.

Work is to begin on evaluating the efficacy of an Indian native system of medicine as a potential intervention strategy for HIV. This is the first human clinical trial of this nature to be conducted in India.

Human Molecular Genetics Laboratory

Studies on genetic basis of congenital deafness is one of the major focus of research in the human molecular genetics laboratory of the unit. Deafness is one of the most common sensory disorders in humans. Profound hearing loss occurs in one in 1000 children, most often due to genetic mutations. Mutational analysis of several deafness genes and whole genome-wide scanning of appropriate families to identify novel genes in the process of hearing were carried out.

In a multicentric collaborative effort, involving AYJNIHH, Mumbai, ALMPGIBMS, Chennai, MAMC, Delhi and JNCASR, Bangalore, about 500 families with two or more members showing severe-to-profound sensorineural hearing loss were identified. These families are being analyzed to understand genetic complexities of deafness in Indian populations. In the first phase of the work, a 3-step protocol to analyze 12 deafness genes (*Cx-26*, *Cx-30*, *Cx-43*, *TMCI*, *TMPRSS3*, *MYO6*, *MYO15*, *MYO7A*, *HAR*, *CDH23*, *CLDN14* and *PDS*) is implemented which involves direct sequencing of four of the genes and genetic linkage followed by mutational screening for the remaining ones. In 300 families analyzed so far, mutations at the *Cx-26* gene account for the maximum proportion (~25%) of deaf individuals whereas *Cx-30* and *Cx-43* make no contribution. A number of families, wherein linkages to the *TMCI*, *TMPRSS3*, *HAR* and *CDH23* genes has been found, is being analyzed for identification of pathogenic mutations. Concurrently, cell biological and biochemical studies on the specific novel mutations to obtain an understanding of the manner in which these mutations may be affecting the normal auditory physiology, are undertaken.

Towards isolation of novel deafness genes, genome-wide two- and multi-point mapping studies on a set of multiple-affected families were being conducted. In one such study involving a large multiple-affected family, a novel genetic locus on the chromosome 18 has been identified, and additional interesting observations made in another family affected with recessive, profound sensorineural deafness wherein an unusual, long-range gene regulatory mechanism seem to govern expression of an already known deafness-causing gene.

Vascular Biology Laboratory

Using a functional genomics approach in ES cells and comparative analysis of gene expression patterns, novel genes involved in cardiovascular development have been identified. A comparative approach using embryonic stem cell models, mouse developmental biology and transgenics, and *Drosophila* genetics was undertaken to decipher the roles of novel genes expressed early in the cardiovascular and hematopoietic systems. The novel OCIA domain family was identified and its members, *asrij* and *padosan*, which are endocytic molecules were characterized. To study *asrij* regulatory elements, its promoter was identified and transgenic mice carrying *asrij* upstream sequence was generated. The *asrij* promoter is GC rich and can drive reporter gene expression in the heart and blood vessels of transgenic mice. Analysis of *asrij* expression has been extended to human ES cells. Available human embryonic stem cells has been acquired and successfully expanded at JNCASR. Cells were characterized for their marker gene expression patterns. Protocols for differentiation of human ES cells into embryoid bodies are being currently standardized.

To extend the work to clinical applications, our identified genes are being studied using human ES cells and tumor models. *asrij* and *rudhira* are both expressed in human embryonic stem cells. Their role in ES cell pluripotency and differentiation into cardiovascular lineages is being currently investigated. The role of these genes is being analyzed using various genetic and cell biology techniques. As the identified genes are conserved in humans and already implicated in cancer, they are good candidates to study in the context of various angiogenic tumors and in neoplasms. This would give insight into human cardiovascular and hematopoietic development, aid in understanding tumor angiogenesis and facilitate therapeutic design.

Molecular Mycology Laboratory

Before joining, Dr. Sanyal was working at the University of California, Santa Barbara where he had cloned and characterized centromeres of the human fungal pathogen, *Candida albicans*. Various cis-acting, trans-acting and epigenetic factors that are involved in centromere structure and function in *C. albicans* are being studied presently. Homologues of three important evolutionarily conserved kinetochore protein families have been identified in *C. albicans*. Biochemical and genetic approaches to identify interacting factors of these three proteins are being employed. Identification of kinetochore proteins with no human homologue can be used as targets to develop safer species-specific drugs to treat candidiasis.

The following are the members of the Unit:

Chair

M R S Rao

Ph D, F A Sc, F N A, F N A Sc, F T W A S

Honorary Professors

Dipankar Chatterji

Ph D, F N A Sc, F A Sc, F N A

H Sharat Chandra

Ph D, F A Sc, F N A

Associate Professors

Anuranjan Anand

Ph D

Hemalatha Balaram

Ph D

Namita Surolia

Ph D, F A Sc

Ranga Uday Kumar

Ph D

Tapas Kumar Kundu

Ph D

Faculty Fellow

Kaustuv Sanyal

Ph D

Maneesha Inamdar

Ph D

Research Associates

Jayashree Ladha, Mantelingu K, Shipra Agrawal, Swaminathan V

R & D Assistants

Ajeesh B R, Aparna A Kamath, Ashoka D, Ashok Reddy, Ashish Kapoor, Avinash, Balaji Oleti Amarnath, Balasiddiah A, Badi Sri Shailaja, Bopanna, Brahmanaspati G Sastry, Hari Kishore A, Kadekar Sandeep, Kavitha Siva, Kiran Kumar Nakka, Mahesh E, Manjunath, S, Manjunatha M, Manjunatha Prabhu, Meenakshi Sharma, Mohan V, Museer Ahmad Lone, Naga Shankar G, Nandasree, Nirakar Sahoo, Radhika A Variier, Raghavendra A S, Ram Shankar Mani, Raspudin S, Sanapa Hari Krishna, Sankar Ganesh A, Sandeep K, Satish V, Shilpa N, Shlini P, Siddhartha Paul, Siddappa, Sowmya Prabhu, Srilekha Devi, Sujay T M, Sukanya M S, Suma B S, Suresh Babu V, Syed Sajad Hussain, Veda Murthy B M, Venkatraman.

7. Theoretical Sciences Unit

In the Theoretical Sciences Unit (TSU), tools of theoretical and computational physics and chemistry to address, explain and understand the rich diversity we observe in the physical world have been used. Knowledge thus gained is aimed to design new materials with desired properties, and to study the behaviour of matter under conditions that are difficult or impossible to achieve in a laboratory.

Some examples of recent and ongoing work include the following: general principles by which glass-formers can be classified; a comprehensive argument that explains why some nanoclusters melt at higher temperatures than bulk crystals, even though for others the opposite is true; search for molecules which can function both as nano-transistors and as memory devices; and design better piezoelectric materials that are environmentally friendly; a variety of exact and approximate many-body techniques have been used to study quantum magnetism, and optical and transport properties of organic molecules and conjugated polymers, and other low-dimensional systems; explored defibrillation via the elimination of spiral turbulence in mathematical models for cardiac arrhythmias; and systematised the nature of dynamic multiscaling in fluid and passive-scalar turbulence.

A variety of approaches have been used to look at the kinds of questions mentioned above, including classical and quantum mechanical treatments of condensed matter theory and statistical mechanics, such as ab initio density functional theory, quantum many body theory, dynamical mean field theory, quantum chemistry, molecular modeling, molecular dynamics and Monte Carlo simulations, and numerical solutions of complicated, nonlinear partial differential equations. Analytical calculations are combined with extensive state-of-the-art computation. The techniques have a wide range of applicability, not just to inanimate matter, but also to biological systems.

Some of the systems that have been of recent interest to us are: organic molecules, polymers, colloids, glass-forming liquids, network-forming liquids, complex fluids and soft-matter systems, simple, noble and transition metals and their surfaces, transition metal oxides, ferroelectrics, magnetic and dilute magnetic semiconductors, Kondo insulators, heavy fermion metals, nanoclusters, nanotubes, nanowires, fullerenes and biomolecular systems, and cardiac tissue. The range of phenomena which are studied is similarly comprehensive: relaxation processes, phase transitions, phase transformation kinetics, transport, vibrations, excitations, charge transfer, surface reconstruction, catalysis, turbulence, and spatiotemporal chaos. Specific themes and properties of interest include metal-insulator transitions, magnetic phase transitions, phase transitions in liquids, the glass transition, melting in nanoparticles, stability and excitations in solids, electronic transport, bonding, structure and thermodynamics of biomolecules, properties of relaxor ferroelectrics, piezoelectricity, turbulence in fluids, passive-scalar systems, magnetohydrodynamics, and cardiac arrhythmias.

For a detailed description of the research activities mentioned above the reader should consult the papers listed in publications.

The members of the TSU are also engaged in several collaborative research projects with colleagues in several institutes in India and abroad. Some Conferences have been organised during this period by members.

The following are the members of the Unit:

Chair

Rahul Pandit Ph D, F A Sc

Associate Professors

Shobhana Narasimhan Ph D

Srikanth Sastry Ph D

Swapan K Pati Ph D

Umesh V Waghmare Ph D

Fellow

N S Vidhyadhiraja Ph D

Research Associate

Jayati Sarkar, Neils L Ellegaard, Pinaki Chaudhuri, Sheelan Sengupta (P)

R & D Assistants

Abdul Rehaman M S, Moumita Maiti, Viswas V.

8. Chemical Biology Unit

Every residue of the 101 amino acid *E. coli* toxin CcdB was substituted with Ala, Asp, Glu, Lys and Arg using site directed mutagenesis. The activity of each mutant in vivo was characterized as a function of CcdB transcriptional level. The mutation data suggest that an accessibility value of 5% is an appropriate cutoff for definition of buried residues. At all buried positions, introduction of Asp results in an inactive phenotype at all CcdB transcriptional levels. The average amount of destabilization upon substitution at buried positions decreases in the order Asp>Glu>Lys>Arg>Ala. Asp substitutions at buried sites in two other proteins, MBP and Thioredoxin were also shown to be severely destabilizing. Ala and Asp scanning mutagenesis, in combination with dose dependent expression phenotypes was shown to yield important information on protein structure and activity. These results also suggest that such scanning mutagenesis data can be used to rank order sequence alignments and their corresponding homology models, as well as to distinguish between correct and incorrect structural alignments. With continuous reductions in oligonucleotide costs and increasingly efficient site-directed mutagenesis

procedures, comprehensive scanning mutagenesis experiments for small proteins/domains are quite feasible.

The total syntheses of over a dozen molecules of varying degree of complexity have been accomplished. These molecules exhibit activities ranging from the inhibition of angiogenesis to promotion of apoptosis. Some of these natural products are of great contemporary interest and the activities in this area will be strengthened in the coming months.

A general strategy for the design of PET-based sensors immobilized on polymer beads has been developed and it has been demonstrated to sense potassium and sodium ions in aqueous media. A bile acid derived 'adaptive' dendron has been constructed.

Microcalorimetric and Conductivity studies with Micelles prepared from Multi-headed Pyridinium Surfactants have been carried out. Synthesis, aggregation and transfection properties of cationic oxyethylene lipids have been studied. Synthesis and characterization of novel cationic lipid and cholesterol coated nanoparticles and their interactions with dipalmitoyl phosphatidylcholine membranes have been analyzed.

The following are the members of the Unit:

Chair

Uday Maitra

Ph D, FA Sc.

Professor

V Krishnan

Ph D, F A Sc, F N A, F T W A S

(Hindustan Lever Research Professor)

Hon Professors

P Balaram

Ph D, F A Sc, F N A, F T W A S

G Mehta

Ph D, F A Sc, F N A, F T W A S

Hon Faculty

Raghavan Varadarajan

Ph D, F A Sc

Santanu Bhattacharya

Ph D, F A Sc

Research Associate

Prithwiraj De, Uday Kumar Kundu

R & D Assistant

Suguna, P

9. Condensed Matter Theory Unit

Significant Research Accomplishments: The members of the Condensed Matter Theory Unit (CMTU) are engaged in theoretical research on a wide variety of topics in the general area of Condensed Matter Science. During the period from 2005-06, they achieved significant progress on several problems in this area in which support from JNCASR has been acknowledged, and these are summarized below. More details can be gleaned from the publications listed below.

Electronic structure and properties, especially in Strongly Correlated Electronic Systems:

The theory for doped manganites exhibiting colossal magnetoresistance developed recently in the orbital liquid regime has been extended to half doped manganites which exhibit charge, orbital and antiferromagnetic order, and helps to understand several features of the doping and magnetic field induced insulator-metal transitions in these materials.

From detailed and extensive investigation of magnetic structures in complex oxide systems it has been established that the ferromagnetism is driven by a novel mechanism in three disparate systems, namely double perovskite oxides (such as Sr₂FeMoO₆), dilute magnetic semiconductors (such as Mn-doped GaAs) and pyrochlore (such as Ti₂Mn₂O₇).

In the area of semiconducting nanoparticles, very high quality samples with a high degree of coherence and luminosity were synthesised; it was also possible to demonstrate white light emission from such nanoparticles by bandgap engineering.

In the area of conducting polymers, a new class of highly conducting polyaniline with possibly the highest intrinsic conductivity of all polyaniline systems so far has been discovered; these have been shown to have extraordinary thermal stability, suggesting a bright technological future. Furthermore, it has been possible to demonstrate highly conducting and transparent conducting polymer systems.

Soft Condensed Matter and Nonequilibrium Statistical Physics :

Significant advances have been made in the understanding of the following:

Equilibrium properties of vortex matter in superconductors with different kinds of pinning; crystallization and glass formation in hard-sphere colloids.

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 and passive-scalar turbulence. Magnetohydrodynamic turbulence and drag reduction by polymer additives in turbulent fluids have been studied for the case of decaying turbulence.

Spiral turbulence in models for cardiac arrhythmias has been studied with a view to developing low-amplitude defibrillation techniques and understanding the effects of conduction inhomogeneities.

The statistical mechanics of models for semiflexible equilibrium polymers and bosonic Hubbard models have been studied by using Monte-Carlo, mean-field and density-matrix renormalization-group methods.

It has been shown that a widely-accepted cutoff perturbative mechanism for the "mode-coupling glass transition" is wrong and that the true explanation must involve instantons.

Molecules that could exhibit interesting mechanical motion, because of their fluxionality have been investigated. This includes fluxional motion in Fe(CO)₃ - hypostrophene complexes as well as other systems. A force approach investigation of (QCO)⁺ to understand the nature of binding in non-classical carbonyls has been carried out. The buckling of a nanorod and its dynamics has also been studied. Much of this work is described in an invited review on molecular mechanical devices.

The existence of a diffusivity maximum for solute diffusing in a solvent when the size of the solute is varied has been reported. The existence of Levitation Effect in simple liquid mixtures is therefore demonstrated. Levitation Effect seems to provide the right theoretical basis for the conductivity maximum of ions diffusing within polar solvents.

The following are the members of the Unit:

Chair

H R Krishnamurthy Ph D, F A Sc, F N A

Hon. Professors

Biman Bagchi Ph D, F A Sc, F N A, F T W A S

Chandan Dasgupta Ph D, F A Sc, F N A

N Kumar Ph D, F A Sc, F N A, F T W A S

S Ramasesha Ph D, F A Sc.

D D Sarma Ph D, F A Sc, F N A

Hon Faculty

G Ananthakrishna Ph D, F A Sc

Binny J Cherayil Ph D

Diptiman Sen Ph D, F A Sc

Rahul Pandit Ph D, F A Sc, F N A

K L Sebastian Ph D, F A Sc

Sriram Ramaswamy Ph D, F A Sc

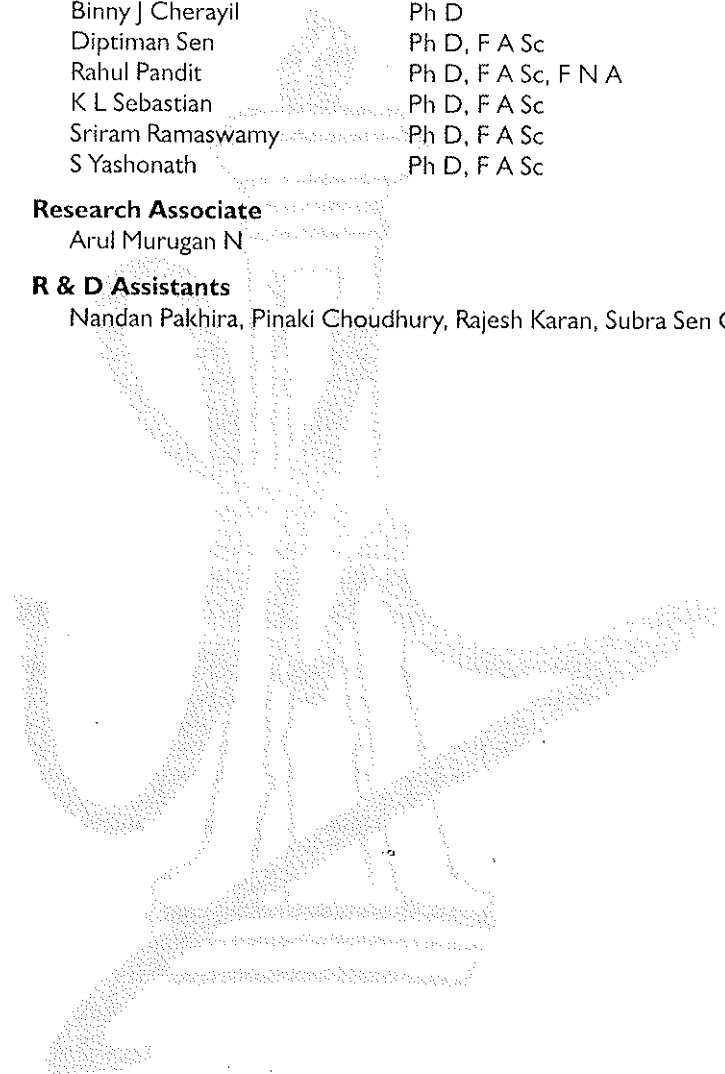
S Yashonath Ph D, F A Sc

Research Associate

Arul Murugan N

R & D Assistants

Nandan Pakhira, Pinaki Choudhury, Rajesh Karan, Subra Sen Gupta



10. Computer Laboratory

Activities in the Computer Lab involve (a) regular day-to-day maintenance and repair of computers and local network across the Centre (b) keeping the presence of the centre on the web up-to-date (c) help users of the central computing facility with computing, printing and other peripheral facilities and (d) maintain backups and network security measures.

In addition, new features are introduced at this laboratory to keep up with evolving changes in computing technology. The following are the highlights during this year:

- A distributed memory (42 GB) high-performance computing cluster with 42-opteron cpus is functional.
- Enhancement of the online UPS and air-conditioning of the central facility by a factor of 2 has been completed to keep up with growth in high-performance computers.
- Acquired lincses for MS Windows XP and Office 2003 software for windows PCs of many users in the Centre.
- Decision taken to change the facility management contract (FMC) to Locuz.
- Assistance in setting up of the JEST servers and firewall.
- Initialized the procedure for upgradation of the internet link to 4 Mbps.
- LAN connectivity extended to nano building

The following are the members of the Laboratory:

Head

Umesh V Waghmare Ph D

R & D Assistants

Preetham, Shithal T K, Vikas Mohan Bajpai (Jr.R&D)

Endowed Research Professors

D S Kothari Chair

M M Sharma, F R S, F A Sc, F N A

Hindustan Lever Chair

A Chakravorty, F A Sc, F N A
V Krishnan, F A Sc, F N A, F T W A S

Linus Pauling Research Professor

C N R Rao, F A Sc, F N A, F R S, F T W A S, Hon.F R S C

Vikram Sarabhai Research Professor

B M Deb, F A Sc, F N A, F T W A S

ACADEMIC PROGRAMMES

I. Academic Activities

The Centre offers regular Ph D., Integrated Ph D, M S and M S (Engg.) degree programmes in Science and Engineering. The Integrated Ph D programme (Chemical Sciences) is available to those with a B Sc degree. The regular Ph D programme is available to graduates and post-graduates in science and engineering, who have successfully completed GATE/UGC-CSIR-NET, JRF, ICMR JRF/JEST/equivalent examinations. The Centre selects candidates on an all-India basis, offers course work, provides research facilities, administers the programme and awards the degree.

(a) Research Admissions

During the year 2005-2006, 33 students (two for Integrated Ph D, 24 students for the Ph D and seven students for M S(Engg.)) were admitted in the following Units:

Sl. No	Units	Programme	Name of students
1	Chemistry & Physics of Materials	Int. Ph D Ph D M S (Engg.)	Neenu Varghese, Shrinwantu Pal Rakesh V, Shipra, Dinesh Jagadeesan, Katla Sai Krishna Naga Venkata Ramesh, Leela Srinivas Panchakarla
2	Evolutionary & Organismal Biology	Ph D	Koustubh M Vaze, Sudeshna Das
3	Molecular Biology & Genetics	Ph D	Bharat S, Jayasha Shandilya, Mamta Jain, Mangaiarkarasi A, Renjini R, Ruthrotha Selvi V B Vikru, Surbhi Dhar, Nishtha Pandey, Anil Kumar
4	Theoretical Science	Ph D M S (Engg.)	Sasmita Mohakud, Anil Kumar, Sudipta Dutta, Moumita Maiti, Himadri Barman, Mighfar Imam Tiju Thomas
5	Engineering Mechanics	Ph D M S (Engg.)	Harish N Dixit, Sai Krishnaswamy C Kaushik Srinivasan, Rajapandian A, Ratul Dasgupta, Ashish Malik, Priyanka Shukla

(b) Degrees awarded

Details of degrees awarded during the year are as given below:

Sl. No	Units	Degree	Name of students
1	Chemistry and Physics of Materials	Ph D M S (Int.Ph D)	Gautam Gundaiah, Krishnan, M Arun N, Kalyanikutty K P
2	Evolutionary and Organismal Biology	Ph D	Prasad N G
3	Molecular Biology & Genetics	Ph D	Mohd Jamal Dar
4	Engineering Mechanics	M S (Engg.)	Antina Ghosh

2. Discussion Meetings / Workshops

The following discussion meetings/workshops were supported by the Centre during 2005-2006.

Indo-UK Stem Cell Workshop, JNCASR and NCBS, April 4 – 11, 2005, Dr Maneesha Indamdar (JNCASR), Prof K VijayRaghavan (NCBS), Prof Azim Surani (CSCL).

Workshop on the Ideas of Science in Heggodu, April 12-14, 2005 Prof Srikanth Sastry and Prof R Narasimha (JNCASR).

Scientific Computation, Numerical Analysis and Application. (Workshop 2), July 4- 15, 2005, Prof G Rangarajan, (IISc)

25th International Symposium on Shock Waves (ISSW25) July 17-22, 2005, Prof K P J Reddy (IISc).

International Conference Scientific Computation, Numerical Analysis and Application, July 18 –21, 2005, Prof G Rangarajan, (IISc)

National Symposium on Structural Dynamics, Random Vibration and Earthquake Engineering, July 22-23, 2005, Prof B K Raghuprasad (IISc)

National Conference on Case Studies in Geotechnical Engineering (Geopractice 2005), July 25-26, 2005, Prof G L Sivakumar Babu (IISc)

International Conference on the Statistical Mechanics of Plasticity and Related Instabilities, August 29- September 2, 2005, Prof S B Krupanidhi (IISc)

International Symposium on Consortium of Students in Management Research (COSMAR) 2005-, September 22-24, 2005, Prof N J Rao (IISc)

Workshop on Chemistry of Materials, October 1 – 3, 2005, Prof C N R Rao (JNCASR)

Frontier Lectures in Chemistry at BHU, October 16-18, 2005, Prof C N R Rao and Prof V Krishnan (JNCASR)

Science, Technology and Development, October 28, 2005, Prof N J Rao (IISc)

Twentyfirst International Workshop on tRNA, December 2-7, 2005, Prof Umesh Varshney (IISc)

Structural Engineering Convention – 2005 (SEC-2005), December 14-16, 2005, Prof B K Raghuprasad (IISc)

Education, Research & Universities, December 28, 2005 – January 17, 2006, Dr K Kasturirangan (NIAS)

International Symposium on Organic Chemistry – Today & Tomorrow, January 5-7, 2006, Prof Uday Maitra and Prof Santanu Bhattacharya (IISc)

Recent Developments in Metal Oxides and Related Materials, January 9 – 11, 2006, Prof S Natarajan (IISc)

School on Computational Methods for Materials Science, January 18 – 21, 2006, Prof S Balasubramanian and Dr Umesh V Waghmare (JNCASR) and Prof Richard Catlow (UCL, London).

Symposium on Recent Trends in Research on Spectroscopy and Related Fields, January 18-20, 2006, Profs T Ganguly and K Rai Dastidar (IACS, Kolkata).

Mahabaleshwar Seminar - From Molecules to Networks and Behaviour, January 2006, Prof K S Krishnan (TIFR, Mumbai)

High School Science Teachers programme at Kolar District, January 3-12, 2006, Prof Arun M Umarji (IISc).

Workshop for college chemistry post-graduate students and teachers, January 23-25, 2006, Prof S Chandrasekaran (IISc) and Dr Suresh Das (RRL Trivandrum).

Seventeenth AGM of the Materials Research Society of India, February 13-16, 2006, Dr Poonam Tandon, (Lucknow University)

Flow Control and Diagnostics, February 19-22, 2006, Dr Sajeer Ahmed (NAL).

International Symposium on Glycans on Proteins and Lipids: Implications in Cellular Functions and Evolution and Workshop on Molecular Characterization of Glycoproteins & Glycolipids & Their Interactions with Lectins and Receptors, February 22-26, 2006, Prof A Suroolia (IISc)

Conference and Workshop on Analyses & Applications, March 14-23, 2006, Prof G Rangarajan (IISc).

3. Colloquia

The Engineering Mechanics Unit organised following colloquia on **Fluid Dynamics** this year:

Arrested coarsening in binary fluid mixtures: Shear flow and nano-colloidal additives, Dr. Ronojoy Adhikari, University of Edinburgh, UK, August 17, 2005

Reverse heat transfer over the Arabian Sea due to natural aerosols and hydrodynamic instability, Prof. G. S. Bhat, IISc, Bangalore, August 31, 2005

Formulation of the problem of sonic boom by a maneuvering aerofoil as a one parameter family of Cauchy problems, Prof. Phoolan Prasad, IISc, Bangalore, September 14, 2005.

A mathematical model of explosive growth of a vapour bubble, Dr. Kausik S. Das, University of Strathclyde, Glasgow, Scotland, September 19, 2005

Density measurements using the background oriented Schlieren technique, Dr L Venkatakrishnan, National Aerospace Laboratories, Bangalore, September 28, 2005.

Grid-free methods for compressible flows, Dr C Praveen, National Aerospace Laboratories, Bangalore, November 9, 2005.

Double diffusive finger convection, Dr K R. Sreenivas, JNCASR, November 30, 2005.

Boundary layer stability in flow past a cylinder: Effects of transverse curvature, Dr N Vinod, JNCASR, January 25, 2006.

Effect of wall heating on instability and transient disturbance growth in channel flow, Dr A Sameen, JNCASR, February 1, 2006.

Weighted least squares kinetic upwind method through matrix conditioning, Prof S M Deshpande, Senior Associate, JNCASR, February 7, 2006.

Dynamics of Foams, Dr Kapilanjana Krishan, School of Physics, Georgia Institute of Technology, USA, February 28, 2006.

Numerical mathematics, Prof A S Vasudevamurthy, TIFR, Bangalore, March 1, 2006.

Transitions on swept leading edges, Prof Roddam Narasimha, Chairman, Engineering Mechanics Unit, JNCASR, March 22, 2006.

Dynamics of smectite clay filled systems, Dr Yogesh M Yoshi, IIT Kanpur, March 29, 2006.

4. Special Lectures :

Rajiv Gandhi Science & Technology Lecture (11th in the series) :

The coming revolutions in fundamental physics, Prof David Gross, Nobel Laureate, Director, Institute of Theoretical Physics, University of California, Santa Barbara, USA, February 6, 2006.

The Isaac Newton Lecture:

String theory and the coming revolutions of fundamental physics, Prof David Gross, Nobel Laureate, Director, Institute of Theoretical Physics, University of California, Santa Barbara, USA, February 7, 2006.

Patenting inventions around the world, Mr R Muralidharan, Trade Mark and Patent Attorney, M/s Krishna and Saurastri Associates, Bangalore, March 23, 2006.

5. Endowment Lectures

DAE-Raja Ramanna Endowment Lectures In Physics:

Dynamics of Surfactant Solutions : Superdiffusion and Rheochaos, Prof A K Sood, Indian Institute of Science, Bangalor May 4, 2005.

Liquid Crystals made of Banana shaped Molecules, Prof N V Madhusudana, Prof & Dean, Raman Research Institute, Bangalore, May 4, 2005.

C N R Rao Oration Award Lecture :

Malaria :Understanding Plasmodium falciparum biochemistry, Prof Hemalatha Balaram, JNCASR, August 10, 2005.

Prof. V. Ramalingaswami Memorial Lecture:

Mutation, Recombination and Evolutionary Biotechnology, Prof Miroslav Radman, Professeur et Directeur, Faculte de Medicine - Necker, Universite Paris, Paris, France, December 21, 2005.

ISRO-Satish Dhawan Lecture:

Growth, Equity and Poverty : What are the Prospects, Shri Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, Government of India, December 27, 2005.

A V Rama Rao Foundation Lectures in Chemistry:

Studies on the synthesis of Thiasugars, Prof S Chandrasekaran, Indian Institute of Science, Bangalore, February 16, 2005.

Understanding the growth process of semiconducting nanoparticles, Prof D D Sarma, Indian Institute of Science, Bangalore, February 16, 2005.

6. Lectures delivered at the Annual Faculty Meeting by Faculty/Hon. Faculty

Multiferroic oxides - Dr A Sundaresan

Ultra-low dimensional ferroelectrics - Prof S B Krupanidhi

Linear and nonlinear causality measures – Prof G Rangarajan

Mycobacterium tuberculosis : Molecular epidemiology new diagnostics and drug discovery - Dr Syed E Hasnain

Rafts, nanoclusters and endocytic pathways of GPI-anchored proteins – Dr Satyajit Mayor

7. Seminars

The following seminars were held during 2005-2006:

HIV drug resistance : Trials, tribulations.... and triumphs, Dr Anita Shet, Rockefeller University, USA, April 1, 2005.

Vortex Methods for 2D incompressible fluid flow simulations, Dr Prabhu Ramachandran, Indian Institute of Technology, Madras, April 6, 2005.

Nonequilibrium dynamics in the complex Ginzburg-Landau equation, Prof Sanjay Puri, Jawaharlal Nehru University, Delhi, April 7, 2005.

Rayleigh-Benard convection near critical point, Prof J K Bhattacharya, Indian Association for Cultivation of Science, Kolkata, April 11, 2005.

A robust primate social niche emerges from conflict management and network structure, Dr Jessica Flack, Santa Fe Institute, USA, April 15, 2005.

Rainfall in a critical atmosphere, Dr Ole Peters, Santa Fe Institute, USA, April 15, 2005.

Significance of Einstein's Work on Brownian Motion, Prof N D Hari Dass, Institute of Mathematical Sciences, Chennai, April 21, 2005.

Scattering, bound states and thermal rates: a spectral filter approach, Dr Amrendra Vijay, University of Houston, Texas, USA, May 13, 2005.

Alpha barrel assists beta barrel, Dr M V Krishnasastriy, National Centre for Cell Science, Pune, May 13, 2005.

Biomimneralization: An inspiration for Biomimetic/Bio-inspired materials synthesis, Dr Ajikumar Parayil, Singapore-MIT Alliance, Singapore, May 25, 2005.

Change in face and phase in Oncology, Prof K S Gopinath, Bangalore Institute of Oncology, Bangalore, May 27, 2005.

Conductivity in the insulating phase of regular and disordered granular metal arrays, Dr Vikram Tripathi, Cambridge University, UK, May 27, 2005.

Multiscale simulations in nano-structured materials, Dr Saroj K Nayak, Rensselaer Polytechnic Institute, New York, June 17, 2005.

Materials Science Software, Dr Mori, Accelrys, Japan, July 1, 2005.

Physics of semiconductor nanostructures and ballistic electrophotonics, Prof Venkatesh Narayanamurti, Harvard University, July 8, 2005.

Transport phenomena in (charged) colloids: A hybrid MD-LB method with hydrodynamic interactions, Dr Apratim Chatterjee, Johannes-Gutenberg-Universitaet, Mainz, Germany, July 20, 2005.

Polymers as biomaterials: Tissue engineering and drug delivery applications, Dr Dharendra S Katti, Indian Institute of Technology Kanpur, July 22, 2005.

*Variety is the spice of life: Natural variation in flowering responses of *Arabidopsis thaliana**, Dr Sureshkumar Balasubramanian, Max-Planck Institute for Developmental Biology, Germany, July 29, 2005.

Small brains, smart minds: Vision, navigation and "cognition" in honey bees, Prof M V Srinivasan, Australian National University, Australia, August 8, 2005.

Dynamics of area preserving polymer rings, Dr Arti Dua, Max Planck Institute for Polymer Research, Mainz, August 16, 2005.

Separating the brain from the heart, Prof Prabhakar G Vaidya, NIAS, Bangalore, August 25, 2005.

How many wasps to pollinate figs? Resolving the concept of mutualism, Prof K N Ganeshaiah, UAS, Bangalore, September 1, 2005.

Photoemission electron microscopy (PEEM), Dr Stefan Heun, Laboratorio Nazionale TASC INFN-CNR, Italy, September 8, 2005.

An ergodic scheme for the vortex discretized flows, Dr Bharat Khushalani, University of Southern California, September 9, 2005.

Understanding the regulatory roles of transcription factors with unidentified functions, Prof Akira Ishihama, Hosei University, Japan, September 14, 2005.

Oxide multiferroics: Design, structure and properties, Dr Mangala Prasad Singh, Laboratoire CRISMAT, France, September 16, 2005.

Immune response and evasion during viral infection, Dr Anindya Dasgupta, Howard Hughes Medical Institute, Yale University School of Medicine, USA, September 19, 2005.

Computational studies of chemical and biological systems: A molecular dynamics perspective, Dr Satyavani Vemparala, University of Pennsylvania, Philadelphia, September 19, 2005.

Transport and optical properties of heavy electron materials: Theory and experiment, Prof David E Logan, Oxford University, UK, September 21, 2005.

Dissecting metabolome diversity and chemical complexity of Myco-bacterium tuberculosis Dr Rajesh Gokhale, National Institute of Immunology, New Delhi, September 21, 2005.

Importance of materials science in the development of novel antimicrobial silver films as therapeutic agents for wound dressings, Dr Sudhi Sant, Twin Technologies Inc, USA, September 22, 2005.

Modulating magnetic behavior in organic and inorganic compounds: A synthetic perspective, Dr Prasanna Ghalsasi, University of Wyoming, USA, September 26, 2005.

Electrical hyperexcitation of neuronal membranes uncouples oscillations in the circadian pacemaker circuit, Dr V Sheebha, New York University, USA, September 29, 2005.

Entrainment: From the FRQ-less clock in Neurospora to social jet-lag in humans, Prof Till Roenneberg, Ludwig-Maximilians-University, Germany, October 6, 2005.

Computational physical chemistry and molecular modeling of polymers, Dr U Natarajan, National Chemical Laboratory, Pune, October 11, 2005.

Jack of all trades: The many evasive faces of the HIV Nef protein?, Dr Satyajit Rath, National Institute of Immunology, New Delhi, October 14, 2005.

Superconductivity and the rattling of alkali metal atoms in the beta-pyrochlore oxide AO_2O_6 , Dr Hiroi Zenji, University of Tokyo, Japan, October 24, 2005.

Optical properties of gold organosol: Exploitation of its localized surface plasmon resonance (LSPR), Dr Sujit Kumar Ghosh, Raidighi College, West Bengal, October 24, 2005.

Materials on a knife's edge: $NaxCoO_2$ and $NaxCoO_{2-xy}H_2O$, Prof David Singh, ORNL, USA, October 24, 2005.

Fuel cells: Many materials challenges and opportunities, Prof Francis J DiSalvo, Cornell University, New York, November 1, 2005.

Griffiths phase in unconventional quantum hall effect, Dr Rajesh Narayanan, Institute for Nanotechnology, Karlsruhe, Germany, November 2, 2005.

Math1 and Atonal in proprioception and hearing, Prof Hugo Bellen, Howard Hughes Medical Institute, Baylor College of Medicine, Texas, November 8, 2005.

One-step synthesis of Pt and Au nanoparticles using lamellar phases, Dr Rema Krishnaswamy, Laboratoire de Physique des Solides, November 9, 2005.

Advanced materials for organic electronics, Dr Satish Patil, University of California Los Angeles, November 23, 2005.

Hydraulic jumps, Dr Arnab Rai, Harischandra Research Institute, Allahabad, November 28, 2005.

Differential cross-talk between spectrin and variant hemoglobins: Implications in hemoglobinopathy, Dr Abijit Chakrabarti, SNIP, Kolkata, December 1, 2005.

Transport properties of $La_{0.6}Pb_{0.4}MnO_3$ grain boundaries and peak effect in type-II superconductors, Dr Prasanta Chowdhury, Bhabha Atomic Research Centre, Mumbai, December 7, 2005.

A nanometer-scale spectroscopic study with photoemission microscopy, Dr Stefan Heun, Laboratorio Nazionale TASC INFN-CNR, Basovizza, Italy, December 8, 2005.

Molecular understanding of cytokinesis, Dr Lakshmikanth Gandikota, Stanford University School of Medicine, USA, December 9, 2005.

Synthetic MWNT based Gecko Foot-hairs from multiwalled carbon nanotubes, Prof Ali Dhinojwala, University of Akron, USA, December 13, 2005.

Polyatomic anions and networks in alkali-metal salts of the triel family (Ga, Tl) in solid state systems, Prof J D Corbett's, December 14, 2005.

Influence of HLA polymorphisms upon intracellular assembly and trafficking of MHC class I molecules, Dr Malini Raghavan, University of Michigan Medical School, USA, December 16, 2005 (MBGU Guest lecture).

Synthesis, surface chemistry and Bio-analytical application of nanomaterials, Dr Nikhil Ranjan Jana, Institute of Bioengineering and Nano Technology, Singapore, December 19, 2005.

Materials design from multiscale simulations: From fundamental electrochemistry to tailor-made electrocatalysts, Dr Chandra Saravanan, Nanometrics, USA, December 20, 2005.

Mathematical models for pest management, Dr Samit Bhattacharyya, University of Calcutta, December 22, 2005.

Decoding the cell-cell communication at the maternal-fetal interface, Dr Rupasri Ain, Kansas School of Medicine, Kansas City, December 22, 2005.

Dynamic projection on Feshbach molecules: a probe of pairing and phase fluctuations, Prof Ashvin Vishwanath, University of California at Berkeley, USA, December 23, 2005.

Dynamical properties of proteins: a new approach, Dr Arun Setty, December 23, 2005.

Physics in life science – Cross-disciplinary convergence in action, Dr Bala S Manian, ReaMetrix, Bangalore, December 26, 2005.

Phonons, phase transitions, and negative thermal expansion in network structures, Dr A K Arora, IGKAR, Kalpakkam, December 28, 2005.

Semiconducting ReSi_2 thin films grown on $\text{Si}(001)$: Their epitaxy and their infrared photoresponse, Prof John E Mahan, Colorado State University, Fort Collins, USA, January 3, 2006.

Structural basis for the proteins involved in histone code recognition and protein degradation, Dr B Padmanabhan, Riken Institute, Yokohama, Japan, January 4, 2006.

Role of tissue-tissue interactions and morphogens in skeletal differentiation, Dr Amitabha Bandyopadhyay, Harvard Medical School, USA, January 9, 2006.

Intrinsic and extrinsic control of stem cells in the nervous system, Dr Robin Lovell-Badge, MRC National Institute for Medical Research, January 9, 2006.

Dynamics of gel-forming systems, Dr Walter Kob, Laboratoire des Colloïdes, Université Montpellier II, January 10, 2006.

Patterning of the embryonic chick retina: A tale of two signaling molecules, Dr Jonaki Sen, Harvard Medical School, USA, January 11, 2006.

Micro X-ray powder diffraction Ab-initio structure solution from microgram samples, Dr N S B Bhuvanesh, Texas A&M University, College Station, Texas, January 11, 2006.

Inevitable life, Prof Eric Smith, Santa Fe Institute, New Mexico, USA, January 16, 2006.

Strong-fragile dynamic crossover in systems with a liquid-liquid phase transition, Dr Pradeep Kumar, Boston University, Boston, January 17, 2006.

Maldi TOF TOF technology for expression proteomic analysis, Dr Uwe Rapp, Bruker Daltonics, Germany, January 25, 2006.

Raman studies of proteins, Prof V J Davisson, Purdue University, January 26, 2006.

Dynamic porous framework: Functionalities based on their regularity and flexibility, Dr Tapas Kumar Maji, Kyoto University (Katsura Campus), Japan, February 1, 2006.

The structure of a flavin dependent thymidylate synthase from Mycobacterium tuberculosis and battles with Peroxin battles, Dr Parthasarathy Sampathkumar, Howard Hughes Medical Institute and Department of Biochemistry, University of Washington, Seattle, USA, February 6, 2006.

RSC Publishing, why, where and how?, Dr Robert Eagling, Dr Neville Reed and Dr Graham Mc Cann, RSC Publishing, February 6, 2006.

Spiral evolution in confined geometry, Dr Madhav Ranganathan, University of Maryland, February 10, 2006.

Genetic and immunologic predictors for preterm birth, Prof Surendra Sharma, Deputy Director, Centre for Biomedical Research, Brown University, USA, February 17, 2006.

The role of retinoid signaling in regulating mammalian male germ cell differentiation, Prof Debra J Wolgemuth, Professor of Genetics and Development, Columbia University Medical Centre, New York, February 27, 2006.

Dynamics of Foams, Dr. Kapilanjani Krishan, School of Physics, Georgia Institute of Technology, Atlanta, GA - 30332, USA, February 27, 2006.

An investigation of the vortex dominated flow field around an oscillating airfoil, Dr Sunetra Sarkar, Technical University of Delft, The Netherlands, February 27, 2006.

Polymerisation of fullerene C60 under high-pressure and high-temperature, Dr N S Kini, Hiroshima University, Japan, March 2, 2006.

New generation MalDI ToF MS for Proteomics, Dr Emmanuel Rapkits, Product Manager, Kratos Analytical, U K, March 7, 2006.

On the evolution of insect wings, Dr L S Shashidhara, Centre for Cellular and Molecular Biology, Hyderabad, March 10, 2006

Structure and function of nucleolin, a major nucleolar protein, Prof Philippe Bouvet, Ecole Normale Supérieure, Directeur du Laboratoire Joliot Curie, Membre de l'Institut Universitaire de France, France, March 13, 2006.

Electronic and chemical changes of the Cu(001) surface induced by local lattice strain, Prof Fumio Komori, University of Tokyo, Japan, March 20, 2006.

Impacts of Nanotechnology in the 21st Century, Prof Mildred S Dresselhaus, Massachusetts Institute of Technology, Cambridge, March 21, 2006.

Neutral free radical based organic materials: New approach towards magnetic conductors and superconductors, Dr Swadhin K Mandal, University of California, Riverside, USA, March 22, 2006.

Large eddy simulation of reacting turbulent shear layers using explicit filtering, Dr Inga Mahle, TU Munchen, Germany, March 23, 2006.

8. Conferences

International Meeting on "Recent developments in metal oxides and related materials", IISc and JNCASR, January 10, 2006.

Indo-European Thematic Workshop on computational materials science, February 20-23, 2006, Conveners: Dr Umesh V Waghmare (JNCASR) and Prof D D Sarma (IISc).

EXTENSION ACTIVITIES

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

The Centre offers summer fellowships for two summer months to bright undergraduate and M Sc students (renewable for a second year for selected students). Every year 120 - 150 fellowships are offered. Out of this, fifty fellowships are supported by the Department of Science Technology, Government of India, fifteen by the Rajiv Gandhi Institute of Contemporary Studies, New Delhi and the rest by the Centre. For the year 2006, 130 students were selected.

The following is the list of institutions where students have been placed so far.

Advanced Centre for Treatment, Research and Education in Cancer, Mumbai
Banaras Hindu University, Varanasi
Bose Institute, Kolkata
Central Drug Research Institute, Lucknow
Central Electrochemical Research Institute, Karaikudi
Centre for Cellular and Molecular Biology, Hyderabad
Centre for DNA Fingerprinting & Diagnostics, Hyderabad
Guru Gobind Singh Indraprastha University, Delhi
Gurunanak Dev University of Amritsar, Amritsar
Harishchandra Research Institute, Allahabad
Indian Association for the Cultivation of Science, Kolkata
Indian Institute of Chemical Biology, Kolkata
Indian Institute of Chemical Technology, Hyderabad
Indian Institute of Science, Bangalore
Indian Institute of Technology, Chennai
Indian Institute of Technology, Delhi
Indian Institute of Technology, Kanpur
Indian Institute of Technology, Mumbai
Indian Statistical Institute, Bangalore
Institute of Genomics & Integrative Biology, Delhi
Institute of Microbial Technology, Chandigarh
Jawaharlal Nehru University, New Delhi
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
National Aerospace Laboratory, Bangalore
National Agriculture Research Institute, Pune
National Centre for Cell Science, Pune
National Centre for Biological Sciences, Bangalore
National Centre for Genome Research, Delhi
National Chemical Laboratory, Pune
National Institute of Immunology, New Delhi
National Institute of Oceanography, Goa
Nicholas Pharmaceutical Research Institute, Mumbai
Pt. Ravishankar Shukla University, Raipur
Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram
Raman Research Institute, Bangalore
Regional Research Laboratory, Thiruvananthapuram
Saha Institute of Nuclear Physics, Kolkata
S N Bose National Centre for Basic Sciences, Kolkata
Tata Institute of Fundamental Research, Mumbai
Tuberculosis Research Centre, Chennai
University of Hyderabad, Hyderabad
University of Pune, Pune.

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 Scholars

Ms Anne Poduska
Cornell University, USA

Mr Leejun Kim
SKK University, South Korea

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 and honorary faculty of the Centre.

The following were offered Visiting Fellowships during 2005 - 2006 to work at the institutions as indicated below:

Name and address of the visiting scientists	Collaborating with
Dr P Nagendra Senior Scale Lecturer Bharathi College Maddur Taluk, Mandya.	Prof C N R Rao CPMU, JNCASR
Dr Milan Kanti Naskar Technical Officer Central Glass & Ceramic Research Institute Kolkata.	Prof C N R Rao CPMU, JNCASR
Dr Mallikarjun N Shakarad Faculty Fellow Poornaprajna Institute of Scientific Research Devanahalli, Bangalore.	Prof Tapas Kumar Kundu MBGU, JNCASR
Dr S Ravichandran Lecturer Annamalai University, Tamilnadu.	Prof Hemalatha Balaram MBGU, JNCASR
Dr M K Unnikrishnan Addl. Professor College of Pharmaceutical Sciences Manipal.	Prof Raghavendra Gadagkar Centre for Ecological Sciences Indian Institute of Science Bangalore
Dr Rajeswari Sheshadri Assistant Professor Sir M Visveswaraiah Institute of Technology, Bangalore.	Prof R Narasimha Prof Rama Govindarajan EMU, JNCASR

4. Project Oriented Chemical Education (POCE)

The Project Oriented Chemical Education, (POCE) programme was initiated in 2004 to give an opportunity to talented undergraduate students to explore their potential and to stimulate genuine interest in science, while motivating them to pursue scientific career, and has now entered its third year. The positive impact of the programme on these students (created during this short span of time) is quite visible. One of the POCE-2004 students has published a scientific paper in an internationally reputed journal and one student of POCE has got an award in the poster presentation during the annual in-house symposium.

Our efforts to reach more number of students and to adjust our academic calendar (to suit a majority of the students) have yielded results. The ten students selected for POCE –2005 summer programme are from six different universities. During their short mid semester break almost all the students of POCE-2005 (first year) worked on small projects under the guidance of faculty members.

The advertisement for summer programme of POCE-2006 appeared in print media and the Center's web and the response is good. 10 students from different colleges of six universities across the country have been selected for this programme for the year 2006.

5. Project Oriented Biological Education (POBE)

In 2006, the Centre has initiated the Project Oriented Biological Education (POBE) programme for undergraduate students. The programme will be conducted during summer for a period of 6 to 8 weeks and is conceived of as an adjunct to, and not a replacement for, the body of factual information students typically imbibe during their undergraduate curriculum in biology. In POBE, the focuss is on equipping students with the conceptual, experimental and inferential tools that will help them in subsequent research work. The students are introduced to an integrated view of living systems, highlighting common underlying concepts and mechanisms, and emphasizing that interesting questions in biology can be approached simultaneously at various levels of structural organization, using a whole range of tools and techniques. Practical work is integrative and emphasizes the use of modern tools, data analyses, and experimental design to solve problems. The students will undertake a research project in their second and third years, under the direct supervision and mentoring of faculty members of the Centre. The response of the 10 students selected for POBE in 2006 has been excellent.

6. Science Education Programme

National Science Day

In the celebration of National Science Day on February 28th, 2006, about 110 students and 11 teachers from 10 local schools participated. The programme consisted of lectures on and experimental demonstrations of the scientific principles underlying topics ranging from modern aerospace, superconductivity and intriguing phenomena relating to the dynamics of fluids to DNA, HIV/AIDS, development of vascular systems and malarial parasites. These illuminating events designed and executed carefully by some of the Centre's faculty, students and research staff, must have excited the curiosity of school children. Later, the students and teachers visited a few Biology laboratories at the Centre and had an opportunity to take a glance at current research activities. Active participation of the faculty, students and research staff made this programme a great success.

RESEARCH PROGRAMMES

I. 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:

- ✓ Chemistry of Materials
- ✓ Molecular Modelling of Materials
- ✓ Raman Spectroscopy, Brillouin Scattering and High-Pressure Research
- ✓ Nanomaterials and Catalysis
- ✓ Experimental Nonoscillation, Electronic Charge Density from Molecular Crystals
- ✓ Organic Electronics and Optoelectronic Device, Physics and Photophysics, Solution processing and Patterning, Soft Matter and Hard Properties, Biophotonics
- ✓ Synthesis and Study of Novel Functional Oxides : Superconductivity, Magnetism and Ferroelectricity
- ✓ Aerospace and Atmospheric Fluid Mechanics
- ✓ Computational Fluid Dynamics
- ✓ Complex Fluids : From 'Microscopic' to 'Hierarchical' Modelling
- ✓ Flow Instabilities and Transition to Turbulence
- ✓ Fluid Mechanics and Heat Transfer
- ✓ Dynamics, Rheology and Stability of Complex Fluids
- ✓ Chronobiology and Animal Behaviour
- ✓ Evolutionary Genetics
- ✓ Small population and Metapopulation dynamics
- ✓ Neotectonics and Environmental Geology
- ✓ Chromatin Biology and Genomics
- ✓ Understanding the Molecular Genetic and Cellular Mechanisms of Human Diseases
- ✓ Protein Engineering and Molecular Parasitology
- ✓ Molecular, Genetic and Developmental Analysis of the Cardiovascular System
- ✓ Transcription Regulation in Humans with Special Emphasis on Diseases
- ✓ HIV-1 Pathogenesis, Molecular Biology and Immunology
- ✓ Mechanism of Chromosome Segregation: A Molecular Approach
- ✓ *Plasmodium falciparum* : Functional Genomics of Metabolic Pathways, Antimalarial Drug Development and Molecular Epidemiology
- ✓ Equilibrium and Nonequilibrium Statistical Mechanics of Condensed-Matter and Other Complex Systems
- ✓ Condensed Matter Theory : *Ab initio* Investigations of Low-Dimensional Systems
- ✓ Advanced Quantum Theory: From Molecules to Extended Materials
- ✓ Dynamics and Phase Transformations in Disordered Systems: Liquids, Glasses and Biomolecules
- ✓ Computational Materials Theory: From Electronic Motion to Macroscopic Properties of Materials
- ✓ Isolation and Structure Determination of Unusual Peptides from Fungal Sources
- ✓ Effect of Signal Peptide on the Stability and Folding Kinetics of Maltose Binding Protein
- ✓ Design of Temperature Sensitive Mutants
- ✓ Total Synthesis of Complex Bioactive Natural Products
- ✓ Cationic Surfactants, Novel Lipids and Nucleic Acid Analogs
- ✓ Bile Acid Chemistry
- ✓ Electronic Structure, Especially Strongly Correlated Electron Systems

2. Research Facilities

The Centre has procured the following research equipment/facilities during the year 2005-2006.

Sorvall Evolution RC Refrigerated Centrifuge
Dam5 Drosophila Activity Monitor (2)
Nikon Stereozoom Microscope
Basic FEG Scanning Electron Microscope
UV VIS Spectrophotometer
Leica Digital Live Image Camera
Quantachrome Adsorption Unit
Zeta Sizer Nano ZS Particle Size Analyzer
Labram HR Visible Raman System
Olympus Fluorescence Illuminator
Olympus Trinocular Microscope & Inverted Microscope
ABI Prism 3730 DNA Analyser
Heraeus Co2 Incubator HeraCell 150
Refrigerated Incubator Shaker
Julabo Refrigerated & Heating Circulator
NVT65 Rotor Assy, Type SW41, Tube Topper, Quick Seal Tube
Precision Workstation Ferroelectric Test System
Model Fluoro Max-3 Compact Spectrafluorometer
Cell Harvester, Pressur Vac, Filter Mats
Protein Purification and Characterization Setup.
Hitachi Model U2810 Double Beam Wave Length
Objectives for Existing Nikon Trinocular Microscope
Single Longitudinal Model Green Laser
17MW Red Polarised He-Ne Laser with Power Supply
EGI 120 Paraffin Dispenser with Integrated Hot Plate
Eppendorf Centrifuge 5415R 230v/50-60hz, W/O Rotor
Scroll Pump for PPMS System
Milliq Biocell Water Purification System (2)
Leica Stereo Microscope
Cold Light Source with Goose Neck
Ultraspec 2100 PRO UV Visible Spectrophotometer
Benchtop Refrigerated Incubator Shaker (3)
Single Crystal X Ray Diffractometer
Zeta Probe GT
Green Laser 315m-150 OEM System
Wheaton Cell Optimizer System with Accessories
Mini Lamp Annealer Model Mila with Accessories
Model FI 1039, 450w, Ozone Free Xenon Lamp
Gene Amp PCR System 9700
Heraeus Table Top Centrifuge with Accessories
Laser 628 3128, Adapter, Gasket, Plate
Affymetrix Genechip System
Olympus Inverted Trinocular Microscope
Sorval Super T21 Refrigerated Table Top Centrifuge
Geldoc XR Upgrade
Linkam UK Make Stage Model TAMS
Thermal Transfer System
Ultraflux II Maldi Time of Flight System
Ultraspec 2100 PRO, Standard
Ice Flaking Machine FM 251
Hybridization System Model HYB4
Focussed Microwave Synthesis System
300W Full Spectrum Solar Simulator
Transblot SD Scan & Accessories
Cobolt Blues TIM Laser 25mw
High performance computer systems
Computer Cluster with 32 Nodes

3. Sponsored Research

Sl.No.	Investigator	Title	Funding Agency	Duration
1.	C.N.R. Rao	Materials based on transition metal oxides	DAE (BRNS)	4 years
2.	C N R Rao	Collaborative projects between JNCASR & DRDO	DRDO	4 years
3.	Namita Surolia	Fatty acid biosynthesis in Malaria Parasite <i>Plasmodium falciparum</i> as target for developing novel anti-Malarials.	DBT	3 years
4.	Maneesha S Inamdar	Functional analysis of identified gene trap clones in blood vessel formation studies on embryonic stem cells and chimeric mice.	DST	3 years
5.	Hemalatha Balaram	<i>Plasmodium falciparum</i> hypoxanthine guanine phosphoribosyltransferase and adenylosuccinate Synthetic: Targets for antimalarial drug development.	DBT	3 years
6.	Tapas Kumar Kundu	Screening of cancers manifesting altered histone Acetyl-transferases (HATs) & (HEACs) function & research for inhibitors of these enzymes in natural products as therapeutic agents	DABUR,DST	3 years
7.	Tapas Kumar Kundu	Role of positive cofactor 4 (PC4) in Transcriptional Regulation diseases	DST	3 years
8.	G U Kulkarni	Investigation of properties and phenomena exhibited by Nano-materials, nano-fabrication, lithography & related aspects	DST	3 years
9.	Swapan K Pati	Prediction of new organic chromophore and biochromophore optical limiters	CSIR	3 years
10.	Rama Govindarajan	Secondary instabilities of viscosity-stratified flows	DRDO	2 years
11.	K R Sreenivas	Research infrastructure for high precision measurements in fluid mechanics	DRDO	2 years
12.	Anuranjan Anand	Deafness in India : A network mission towards understanding the genes and mutations and their clinical outcomes	DBT	3 years
13.	Namita Surolia	Purification of anti-malarial compound from Indian Herbs & Elicidation of their mode of action in <i>Plasmodium falciparum</i>	ICMR	3 years
14.	C N R Rao	Geography, Learning Science & books	DSERT	
15.	Anuranjan Anand	Molecular genetic basis of hot water epilepsy	ICMR	3 years
16.	K S Narayan	Development of semi-conducting polymer based DAE devices for spatially resolved photocurrent	DAE	3 years

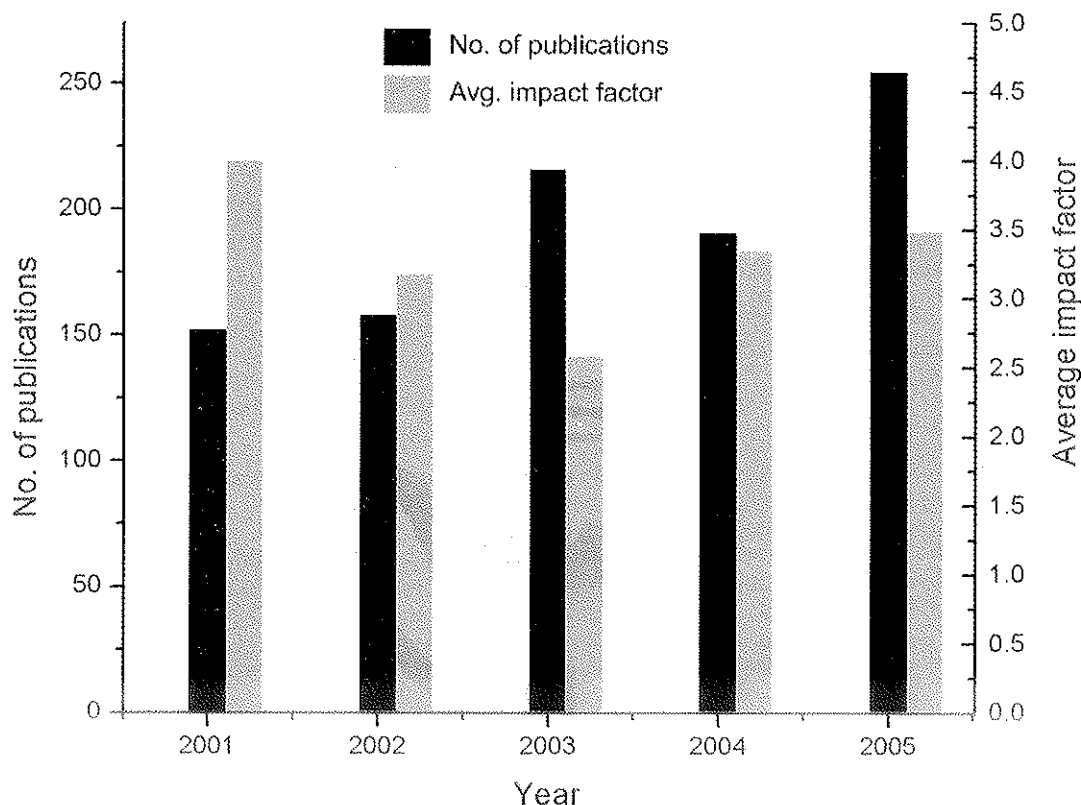
17.	S Balasubramanian	Computer simulations of aqueous protein solutions: A study on the role of biological water	DBT	3 years
18.	Swapan K Pati	Electronic transport in molecular nano-systems	DST	3 years
19.	Srikanth Sastry	Swarnajayanthi Fellowship	DST	5 years
20.	Srikanth Sastry	Understanding the landscape of glass forming systems	IFCPAR	3 years
21.	K S Narayan	Polymer based photo detectors and Development of pixilated line sensors	MIT	2 years
22.	Ranga Uday Kumar	Efficacy and safety evaluation of siddha Medicines HIVS-2003 for HIV/AIDS	DST and Vedic Drugs Ltd.	2 years
23.	R Narasimha	Research Programme on Flow Instabilities	DRDO	3 years
24.	K S Narayan	Interfacial processes in conducting polymer-bacteriorhodopsin structures	DRDO	2 years
25.	Umesh V Waghmare	Electroactive Polymers (EAP) and Composites – The DuPont Young Faculty Programme	DuPont	One year
26.	Co-ordinated by	Postdoctoral Fellowship in Nano Science JNCASR and Technology	DST	2 years
27.	Maneesha S Inamdar	Genome-wide transcriptional profiling and Pathway analysis in embryonic stem cells and the vasculature	DBT	3 years
28.	C N R Rao	The Science Outreach Programme	DAE/BRNS	
29.	Hemalatha Balaram	NMITLI Project on "Improved Genome Annotation through a combination of Machine learning and experimental methods: <i>Plasmodium falciparum</i> as a case study	CSIR	3 years
30.	Ranga Uday Kumar	Functional Analysis of the NF- κ B Polymorphism in the terminal repeat of HIV-I subtype-C viruses	DBT	3 years
31.	Hemalatha Balaram	Molecular dissection of the purine salvage Pathway in <i>plasmodium falciparum</i> : Essentially of HGPRT, IMPDH and ADSS in purine nucleotide synthesis	CSIR	3 years
32.	Ranga Uday Kumar	Immunological and molecular characterization of HIV-I Tat and long terminal repeat (LTR) cloned from Indian patient with and without dementia and/or opportunistic infection	ICMR	3 years
33.	Ranga Uday Kumar	Developing an indigenous and cost effective CD4 and CD8 count assay for HIV/AIDS	DST/MIPL	2 years
34.	Amitabh Joshi	Towards a realistic model of insect population growth in the single and metapopulation level: <i>Drosophila</i> as a model system	DST	3 years
35.	M R S Rao	Nuclear Import Machinery of Male Haploid Germ Cells: A study with Transition proteins TP1 and TP2	DBT	3 years

36.	Rama Govindarajan	An analysis of the vortical density stratified flows	NPOL	2 years
37.	K R Sreenivas	Study of turbulent shear flows in Stratified medium	NPOL	2 years
38.	Co-ordinated by JNCASR	Unit on Nano Science & Technology UNANST-DST	DST	5 years
39.	S Balasubramanian	Computer simulation studies of room temperature ionic liquids	DST	3 years
40.	S Balasubramanian	Simulation studies of structure, Dynamics and solute-solvent interactions in super-critical carbon dioxide	CSIR	3 years
41.	Roddam Narasimha	Novel Transition	DRDO	
42.	Maneesha S Inamdar	Expression and Functional analysis of the Drosophila HOMOLOG of rudhira, A Novel WD40 Protein involved in Hematopoiesis	CSIR	3 years
43.	Tapas Kumar Kundu	Role of multifunctional human transcriptional coactivator PC4 in Chromatin Organization, cell cycle and apoptosis in vivo "National Bioscience Award 2004-05"	DBT	3 years
44.	Anuranjan Anand	Functional Characterization of deafness-causing mutations at the Connexin-26 gene, the most common cause of hereditary deafness in Indian populations	NIHH	1 year
45.	Tapas Kumar Kundu	Chromatin modifications (Methylation, Acetylation, Deacetylation) – a new target for Cancer therapy and diagnostics	DBT	3 years
46.	Shobhana Narasimha	Effect of Local Environment on Catalytic Activity – Indo-Italian Research project Under the AEGIS of Indo-Italian POC in S&T 2005-07	DST	3 years
47.	Tapas Kumar Kundu	Functional genomics of Human Transcriptional cofactors and histone deacetylases- A special reference to cancer	ICMR	3 years
48.	Ranga Udaykumar	Pathogenic relevance of Extracellular tat in the body fluids of HIV-1 seropositive subjects to disease progression	DBT	3 years
49.	Tapas Kumar Kundu	The Role of Anti-Cancer DNA Binding Drugs on Chromatin Organization and Function	DAE	3 years
50.	Maneesha S Inamdar	Training and research facility for human embryonic stem and human embryonic carcinoma cells	DBT	3 years
51.	Namita Surolia	X-ray Crystallographic Analysis of the Proteins involved in the Fatty Acid Biosynthesis of <i>Plasmodium falciparum</i>	DBT	3 years
52.	A Sundaresan	Atomic Engineering of High to Superconductors by layer by-layer deposition of AuO_2 (A=Ba, Sr, Ca) infinite layers	CSIR	3 years

53.	M R S Rao	NMITLI Project on "A prospective study to correlate gene signatures with clinical outcome of astrocytomas and identification of potential therapeutic target(s) under the New Millennium Indian Technology Leadership Initiative Scheme	CSIR	3 years
54.	Anuranjan Anand	Whole Genome-based Studies to Identify Novel Molecular Genetic Pathways Causing Human Epilepsy Syndrome - DAE-SRC Outstanding Research Investigator Award	DAE	5 years
55.	S Balasubramanian	Centre for Computational Materials Science	DST	5 years
56.	Namita Surolia	Genetic manipulations and apcoplast targeting studies with Plasmodium Type II FAS Proteins	DBT	3 years
57.	Namita Surolia	National facility for screening drugs and their biological effects for Cancer, AIDS and Malaria	DBT	3 years

PUBLICATIONS

The Center has registered a very good progress in its publications. A chart showing the year-wise publication and the impact factor thereof is appended below:



I. Research Publications of Units

(i) Chemistry and Physics of Materials Unit

1. Rao CNR, Dan M, Behera G. Chemical design of materials: A case-study of inorganic open-framework materials. *Pure & Appl. Chem.* (IUPAC Plenary Lecture), **77**, 1655, 2005.
2. Rao CNR, Kulkarni GU, Agarwal VV, Gautam UK, Ghosh M. Use of the liquid-liquid interface for generating ultra-thin nanocrystalline films of metals, chalcogenides and oxides, *J. Colloid Interface Sci.* (Feature article); 289, 305, 2005.
3. Rao CNR. Chemical routes to nanocrystals, nanowires and nanotubes. *Int. J. Nanoscience* (ICONSAT Keynote), 4, 811, 2005.
4. Rao CNR, Deepak FL. Absence of ferromagnetism in Mn and Co doped ZnO. *J. Mater. Chem.*, 15, 573, 2005.
5. Kundu AK, Rao CNR. Effects of large cation size-disorder on the magnetic properties of the rare earth cobaltates, $\text{La}_{0.5}\text{Ba}_{0.5}\text{CoO}_3$. *Solid State Commun.*, 134, 307, 2005.
6. Kundu AK, Seikh MM, Ramesha K, Rao CNR. Novel effects of size disorder on the electronic and magnetic properties of rare earth manganates of the type, $\text{La}_{0.7-x}\text{Ln}_x\text{Ba}_{0.3}\text{MnO}_3$ with large $\langle r_A \rangle$, *J. Phys. Condens. Matter*, 17, 4171, 2005.
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(ii) Engineering Mechanics Unit

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60. Wadehra A, Deb BM. Use of an Intense Microwave Laser to Dissociate a Diatomic Molecule (communicated)
61. Gupta N, Deb BM. Does the Classically Chaotic Henon-Heiles Oscillator Exhibit Quantum Chaos Under Intense Laser Fields ? (communicated)
62. Deb BM. Chemical Education at the M.Sc. Level (communicated).

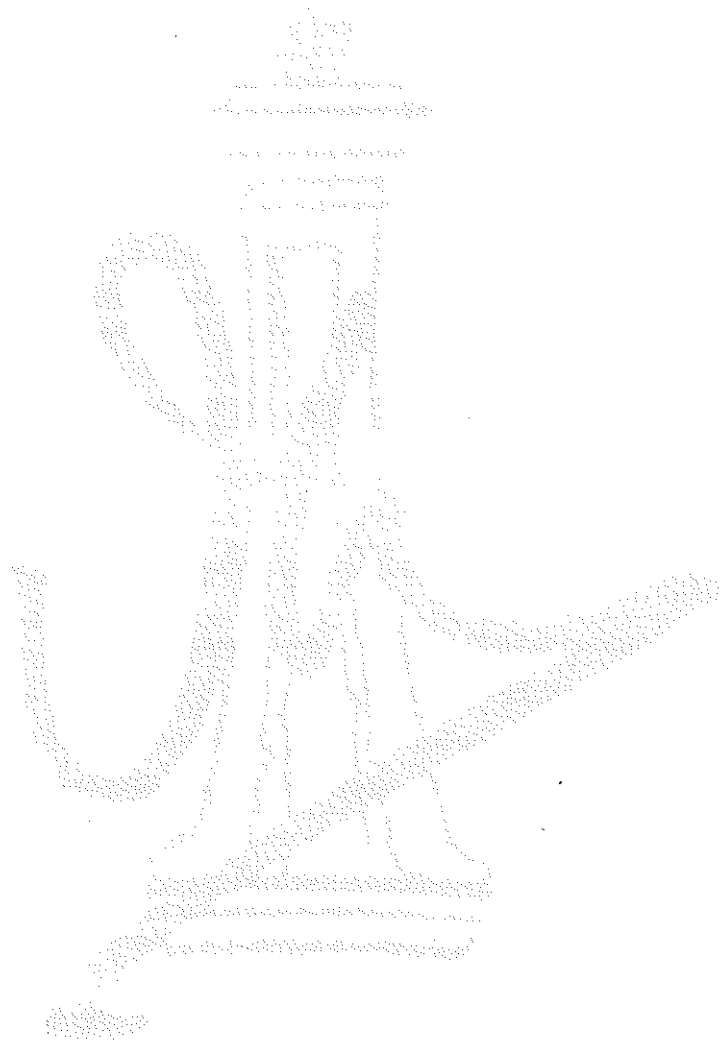
3. Books/Proceedings Authored/Edited by Faculty

1. Rao Indumati, Rao CNR. *Learning Science* (in four parts), Science for Children, 2005.
2. Rao CNR, Govindaraj A. *Nanotubes and Nanowires*. The Royal Society of Chemistry, (London), 2005.
3. Kulkarni GU, Thomas PJ, Rao CNR. *Na₂ no crystals: Size-dependent properties and emerging applications*. In "Dekker Encyclopedia of Nanoscience and Nanotechnology", 2005.
4. Govindarajan R. (Ed) *Sixth IUTAM Symposium on Laminar-Turbulent Transition* Kluwer, 2006.

4. Books/Proceedings Authored/Edited by Hon. Faculty Members

1. Gadagkar R, Chandrashekara K. Behavioral Diversity and its Apportionment in a Primitively Eusocial Wasp. In: *Insect Phenotypic Plasticity – Diversity of Responses* (Eds.) T.N.Ananthakrishnan and Douglas Whitman, Science Publishers, Inc., Enfield, USA and Plymouth, UK, pp.107-124, 2005.
2. Gadagkar R. Nothing in Biology Makes Sense Except in the Light of Evolution – A Review of *The Theory of Evolution* by John Maynard Smith, Canto Edition, Cambridge University Press, (1993). *Resonance – journal of science education*, 10 (11), 95-97. 2005.
3. Gadagkar R. (Ed). Proceedings of the DST Workshop on "Methods in Behavioural Ecology" organised at Jawaharlal Nehru Centre, Indian Institute of Science Campus, Bangalore from 16th-28th January 2006, Technical Report No. 108. 2006.

4. Pahari D, Chattopadhyay S, Das S, Mahapatra US, Mukherjee D. Size-consistent State-specific Multi-reference Methods: A Survey of Some Recent Developments in *Theory and Applications of Computational Chemistry: The First 40 Years*, (Eds) Dykstra CE., Kim KS, Frenking G, Scuseria GE. Elsevier, 2005..
5. Sant DA, Rangarajan G. Study of Indian climate variability using predictability indices, in *Modern Applied Mathematics* (Ed) Misra JC , Narosa, New Delhi, 145. 2005
6. Bhattacharya S, Maitra U, Mukhopadhyay S, Srivastave A. Advances in Molecular Hydrogels. In *Molecular Gels*, (Eds) Weiss RG, Terech P, Springer, 2006.
7. Varma R, Mayor S. Homo-FRET microscopy to investigate molecular-scale organization in living cells in *Cell Imaging*. (Ed) Stephens D. Methods Express Series, Scion Publishing Ltd, UK. 301. 2006.
8. Rangarajan G. Long term stability studies of particle storage rings using polynomial maps, in *Proceedings of the International Conference on Industrial Mathematics* , (Eds) Joshi MC, Pani AK, Sabnis SV, 357, 2006.



AWARDS / DISTINCTIONS

The following faculty and honorary faculty members of the Centre have received various distinctions and awards both at the national and international level in recognition of their significant contributions to the progress of science and technology.

Awards & Honours

Prof C N R Rao

- Pinnamaneni award for science, 2005.
- Sri Chandrasekarendra Saraswati National Eminence award for Science, 2005.
- L. Singhanian-IIM Lucknow award for leadership in Science & Technology, 2005.
- National Research Professorship by Government of India.
- "Desikottama" (D. Lit. Honaris Causa), Visva-Bharati, Santiniketan.
- D Sc (Honoris Causa) Kuvempu University
- D Sc (Honoris Causa) Lucknow University

Prof M R S Rao

- FICCI Award, 2004-05
- J C Bose National Fellowship Award

Prof Anuranjan Anand

DAE Science Research Council Outstanding Research Investigator

Prof S Balasubramanian

- Materials Research Society of India Medal, 2005
- B.M. Birla Science Prize in Chemistry, 2005

Prof Tapas Kumar Kundu

- National Bioscience Award, DBT, Govt. of India, 2005
- S S Bhatnagar Prize, CSIR, Govt. of India, 2005.

Prof R Narasimha

Aryabhatta Award, Astronautical Society of India, 2004

Prof S M Deshpande

Distinguished Professor of Aerodynamics Research & Education, DRDL

Prof Swapan K Pati

Materials Research Society of India Award, 2006

Dr Amitabhha Chattopadhyay

Dozor Visiting Fellow, Ben Gurion University, Israel

Prof S Dattagupta

- Meghnad Saha Award and Lecture of the National Academy of Sciences, 2005
- C V Raman Birth Centenary Medal of the Science Congress Association for lifetime achievement in science.

Prof Raghavendra Gadagkar

Prof. U.S.Srivastava Memorial Lecture Award, National Academy of Sciences, India.

Dr R S Gokhale

Swarnajayanthi Award

Prof E D Jemmis

Professor Priyaranjan Ray Memorial Award, Indian Chemical Society.

Prof N Kumar
Padmashri

Prof H R Krishnamurthy
Alumni Award for Excellence in Research for Science for 2006, Indian Institute of Science, Bangalore , 2006

Prof P T Manoharan
Lifetime Achievement Award in EPR Spectroscopy, 2005

Prof R A Mashelkar

- Suryadatta National Award, Suryadatta Group of Institutes, Pune, 2006
- Asutosh Mookherjee Memorial Award, Indian Science Congress Association, 2005
- The TWAS medal by TWAS, the Academy of Sciences for the Developing World, 2005
- Suryadatta National Award, Suryadatta Education Foundation, 2005
- Baroda Sun Award, Bank of Baroda, Mumbai, 2005
- Maharashtra Bhushan Award, Government of Maharashtra, Mumbai for contributions to science and technology; 2005
- Honorary Doctorate, D.Lit. (*Desikottama*), Visva Bharati, Santiniketan, 2006
- Honorary Doctorate, Lucknow University, Lucknow University, 2006
- Honorary Doctorate, Mohanlal Sukhadia University, Udaipur, 2006
- Honorary Professor, Banaras Hindu University, 2005.

Prof D Mukherjee

Sadhan Basu Memorial Lecture Award, Indian National Science Academy, 2005.
Plenary Talk: WATOC, Cape Town, South Africa, 2005.
Plenary Lecture: 40th IUPAC Congress, Beijing, China, August, 2005
Invited talk: 2nd Asia Pacific Conference on Theoretical and Computational Chemistry, Thailand, Bangkok, 2005.
R. P. Mitra Memorial Lecture, Delhi University, 2005.

Prof Raghavan Varadarajan

Darshan Ranganthan Memorial Lecture, CRSI, 2005.
Rev.Fr.LM Yeddnappally Memorial Medal, Indian Chemical Society, 2005

Prof M M Sarma

International Fellow, Royal Academy of Engineering
Foreign Associate, US National Academy of Engineering
Honorary Doctorate, University of Calcutta
Honorary Doctorate, University of Lucknow

Prof Seyed E Hasnain
Padmashri

Prof M Vijayan
The First CSIR/Science Congress G.N. Ramachandran Award for Excellence in Biological Sciences and Technology, 2004

FELLOWSHIPS

Prof C N R Rao
Honorary Fellowship, Indian Association for the Cultivation of Science, 2005.

Prof Tapas Kumar Kundu
Elected Fellow, National Academy of Science, Allahabad, 2005.

Prof S Chandrasekaran
J.C.Bose National Fellowship, Department of Science & Technology, 2006-2010

Dr Amitabhha Chattopadhyay
Elected Fellow, Indian National Science Academy

Prof G Mehta

Elected Fellow, Royal Society (FRS)

Prof E V Sampath Kumaran

Elected Fellow, Alexander von Humboldt Foundation

EDITORIAL BOARDS

Prof Amitabh Joshi

Member, Editorial Board of Resonance: Journal of Science Education

Editor, Journal of Genetics

Prof Anuranjan Anand

Editor, Journal of Genetics

Prof M K Chandrashekar

Member, Editorial Board, Resonance

Prof Vijay Kumar Sharma

Member, Editorial Board, Journal of Circadian Rhythms.

Dr Amitabhha Chattopadhyay

Member, Advisory Editorial Board, *European Biophysics Journal*

Prof B M Deb

Member, Editorial Advisory Board, Pure and Applied Chemistry (Journal of IUPAC).

Prof J Gopalakrishnan

Associate Editor, Journal Materials Research Bulletin.

Member, Indian Journal of Chemistry, Section A.

Prof V Nanjundaiah

Chief Editor, Journal of Biosciences

Prof E V Sampathkumaran

Member, Solid State Communications

Dr Satyajit Mayor

Member, Editorial Board, Traffic, 2005

Prof K VijayRaghavan

Chief Editor, Journal of Genetics

MEMBERSHIPS/APPOINTMENTS

Prof C N R Rao

Foreign Member, Argentina Academy of Sciences

Foreign Member, Mongolian Academy of Sciences

Prof Amitabh Joshi

Member, Board of Studies in Genetics (Postgraduate), University of Mysore, 2005-2008.

Member, Sectional Committee for Animal/Plant Sciences, Indian Academy of Sciences, Bangalore,

2004- present. External Member, Faculty of Science, Delhi University, 2004-2007.

Prof G U Kulkarni

National Coordinator for JEST-2006.

Member, Materials Research Society of India

Member, Chemical Research Society of India

Member, Indian Crystallography Association

Dr Meheboob Alam

Selected to head the "Max-Planck-India Partner Group" with the Max-Planck Institute for Marine Microbiology, Bremen (Administered by the Max Planck Society, Germany and the Department of Science and Technology, India).

Prof Vijay Kumar Sharma

Visiting Professor, New York University (2004-2006).

Prof S Chandrasekaran

Elected Member of the Bureau of the International Union of Pure and Applied Chemistry (IUPAC) 2005-2008.

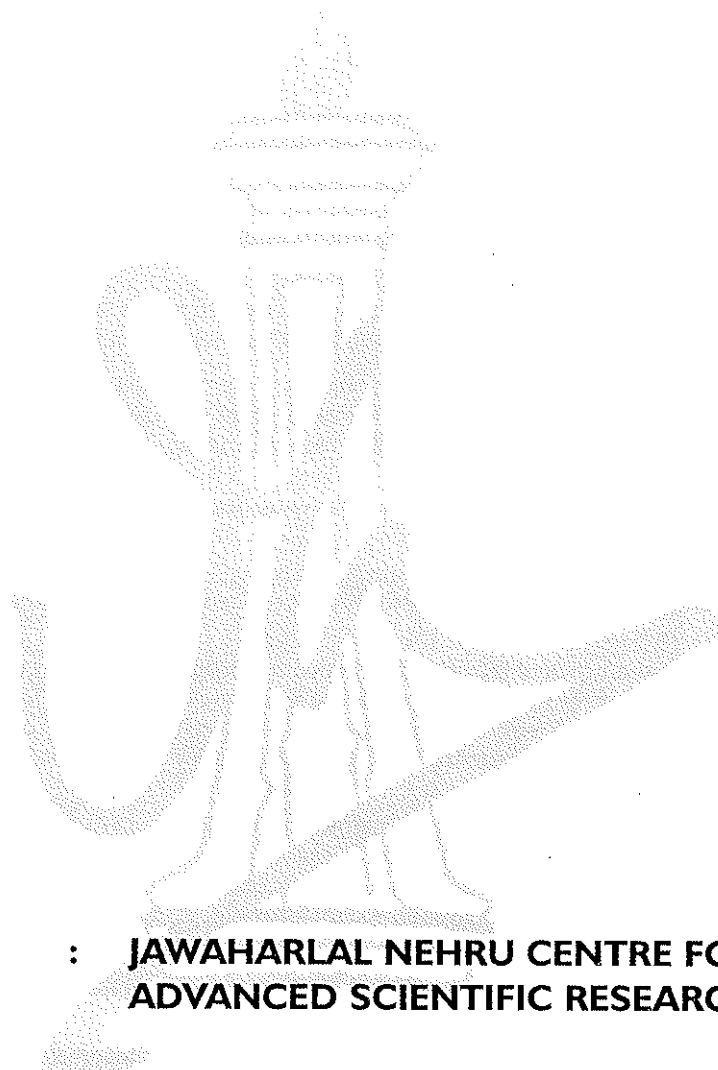
Prof Raghavendra Gadagkar

- Member, Indian Delegation to participate in the meetings of the Inter-academy Panel held in Shanghai and the International Council for Science held in Suzhou, China, October 2005.
- Member, Local Committee for implementation of the Charter of "National Institute for Scientific Education & Research (NISER)" at Kolkata. 2005
- Member, Programme Advisory Committee (PAC) of the "Centres of Excellence in areas of Biotechnology", Department of Biotechnology, Government of India, 2005 – present.
- Member, National Bioscience Awards for Career Development, Department of Biotechnology, Government of India, 2005-present.
- Member, National Organization Committee of THIRD "International Conference on Plants & Environmental Pollution" (ICPEP-3).
- Member, Panel on Women in Science, Indian Academy of Sciences, Bangalore, 2005-present
- Member, Council of the National Academy of Sciences, India for the year 2006.
- Member, Expert Committee on Capacity Building and Awareness Generation on Biosresource Development and Utilization, Department of Biotechnology, Government of India, 2006 – present.
- Nominee of the University Grants Commission on Search Committee for the selection of Professor in the Rajiv Gandhi Chair.
- Member, Monitoring Committee of Experts for the ICAR 10th Five Year Plan EFC Network Project on Insect Biosystematics Functioning at Indian Agricultural Research Institute, New Delhi, 2006.

Prof D Mukherjee

Member, International Organizing Committee of the on-going series of Asian-Pacific Conference on Theoretical and Computational Chemistry.

FINANCIAL STATEMENTS



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

Address : **JAKKUR POST, BANGALORE – 560 064**

Year Ended : **31ST MARCH 2006**

Assessment Year : **2006-07**

Auditor's Report to the Members of the Governing Body of Jawaharlal Nehru Centre for Advanced Scientific Research

We have audited the attached Balance Sheet of Jawaharlal Nehru Centre For Advanced Scientific Research as at March 31, 2006 and also the Income & Expenditure Account for the year ended on that date annexed thereto. These financial statements are the responsibility of the management of Jawaharlal Nehru Centre for Advanced Scientific Research. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing, standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material 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 statements presentation. We believe that our audit provides reasonable basis for our opinion.

We report that:

1. 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.
- * 2. In our opinion proper books of accounts as required by law have been kept by Jawaharlal Nehru Centre For Advanced Scientific Research so far as it appears from our examination of those books.
3. The Balance Sheet and Income and Expenditure Account dealt with by this report are in agreement with the books of account.
4. The Balance Sheet and Income and Expenditure Account dealt with by this report are prepared in accordance with the Accounting Standards issued by the Institute of Chartered Accountants of India subject to :
 - (i) It is the policy of the entity to prepare its financial statements on accrual basis except in respect of interest income from investments made, recoveries from CSIR fellowship and SRFP and income from Royalties which are recognized as and when received rather than when earned. Non recognition of interest income, Royalty income, recoveries from CSIR fellowship and SRFP on accrual basis is not in conformity with the Accounting Standards 9 (Revenue Recognition) issued by the Institute of Chartered Accountants of India [Refer Note No.4,8 and 9 of Schedule No.24]
 - (ii) Non-Provisions of accrued liability in respect of leave encashment which is not in conformity with the Accounting, Standard 15 [Accounting for retirement benefits in the financial statements of Employers] issued by the Institute of Chartered Accountants of India. [Refer Note No.3 of Schedule No.24]
 - (iii) It is the policy and practice of the entity to deduct the amount spent on acquisition of fixed assets from the total grants/ subsidies received in the Income & Expenditure account. This is not in conformity with the Accounting Standard- 5 issued by the Institute Of Chartered Accountants of India. It has been explained that this Format has been consistently used to present the the accounts before the authority who grant the funds.
 - iv) Note No 11 of Schedule-24 regarding the method of accounting of Work-in-progress in respect of Fixed assets which is not in conformity with the generally accepted accounting practice.
5. In our opinion and to the best of our information and according to the explanations given to us and subject to notes on accounts and our qualifications in para 4 above, the said accounts give a true and fair view in conformity with the accounting principles generally accepted in India:
 - (a) in the case of Balance Sheet, of the state of affairs of the Jawaharlal Nehru Centre for Advanced Scientific Research as at March 31, 2006; and
 - (b) in the case of Income and Expenditure Account, of the excess of Income over Expenditure for the year ended on that date.

For **P. V. PRABHU & CO.,**
Chartered Accountants

Sd/-
(NAGARAJA)
Partner

Membership No. 205345

Place : Bangalore
Date : 29.09.2006

Annual Report 2005-2006

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
BALANCE SHEET AS AT 31ST MARCH 2006

Description	Schedule	Current year		Previous year	
		2005-06		2004-05	
		Rs.	Ps.	Rs.	Ps.
LIABILITIES					
Capital Fund	1	678204167.44		554787912.56	
Earmarked and Endowment Funds	3	61985629.26		54417634.16	
Current Liabilities and Provisions	7	64756495.35		29296323.35	
Other funds-Cluster Studies		39541.00		39541.00	
Scheme Balances		56043085.62		41575000.92	
Surplus as per Income & Expenditure A/c		9333602.74		NA	
Total		870362521.41		680116411.99	
ASSETS					
Fixed Assets (at gross)	8	678204167.44		554787912.56	
Investments-Endowment Funds	9	59900000.00		52150000.00	
Investment - Others	10	106215690.00		54970000.00	
Current Assets, Loans, Advances etc.	11	26042663.97		13850544.05	
Deficit as per Income & Expenditure A/c		NA		4357955.38	
Total		870362521.41		680116411.99	
Significant accounting policies(Enclosed)	24				

Schedule 1 to 24 form integral part of Accounts

For Jawaharlal Nehru Centre for Advanced Scientific Research

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

for P. V. Prabhu & Co.,
Chartered Accountants
Sd/-
(Nagaraja)
Partner
Membership no.205345

Sd/-
Prof.M.R.S.Rao
President

Sd/-
R.S.Gururaj
Accounts Officer

Place : Bangalore
Date : 29.09.2006

**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2006**

Description	Schedule	Current year		Previous year	
		2005-06		2004-05	
		Rs.	Ps.	Rs.	Ps.
INCOME					
Grants/Subsidies received	13	239505372.00		161433529.00	
Less: Extent of fixed assests procured		63841023.88		83745356.90	
Capital Work in Progress		59575231.00			
		116089117.12		77688172.10	
Royalty Income		449835.00		0.00	
Income from Fees/Subscriptions etc	16	603003.00		3089168.50	
Income earned - Interest	17	4980784.00		518860.00	
Other income	18	9692864.00		197535.00	
Total		131815603.12		81493735.60	
Expenditure					
Establishment expenses	20	44340409.00		34069202.00	
Other adiministrative expenses	21	71827130.00		47437077.35	
Total		116167539.00		81506279.35	
Less: Overhead recoveries from schemes		4000000.00		NA	
Net Expenditure		112167539.00		81506279.35	
Excess of Income/(Expenditure) over expenditure/(Income)		19648064.12		(12543.75)	
Less: Transferred to Corpus Fund Account		5956506.00		NA	
Excess of income over expenditure carried forward		13691558.12		(12543.75)	
Significant accounting policies (Enclosed)	24				

Schedule 1 to 24 form integral part of Accounts

For Jawaharlal Nehru Centre for Advanced
Scientific Research

This is the Income and Expenditure account
referred to in our report of even date.

for P. V. Prabhu & Co.,
Chartered Accountants
Sd/-
(Nagaraja)
Partner
Membership no.205345

Sd/-
Prof.M.R.S.Rao
President

Sd/-
R.S.Gururaj
Accounts Officer

Place : Bangalore
Date : 29.09.2006

Schedule No. 24

Accounting Policies and Notes on the Accounts for the Year 2005-06

1. The fixed assets are stated at cost. The Centre has identified depreciation on Fixed Assets, and since they are created out of Grant in Aid funds, they have been classified the same in the statement of affairs under Capital Fund and also under Fixed Assets schedule respectively.
2. Grants received and utilised for procurement of Fixed Assets has been reduced from the total grants received in the Income and Expenditure Account and the same has been included under the Capital Fund Account.
3. The leave encashment to the staff members is accounted as and when it is paid.
4. Investments of the Centre are stated at cost. The interest on investment is accounted as and when they are received.
5. The foreign currency transactions are translated at the rates prevailing on the date of transaction.
6. Previous years figures have been regrouped and reclassified to read in conformity with the current year's figures.
7. 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.
8. Royalty income has been accounted as and when received.
9. Income in respect of CSIR Fellowships and SRFP amounting to Rs.67,83,190 represents the dues received from the CSIR and Department of Science and Technology of Government of India is accounted on receipt basis. These dues pertain to earlier years where it was not provided.
10. Recoveries made on account of Over Head Charges spent for various Schemes/Projects were hitherto directly transferred to the Infrastructure Corpus Fund accounts. From the current year these recoveries will be routed through Income & Expenditure account for proper presentation.
11. Capital Work in Progress in respect of Buildings and Equipments represents the firm order placed with vendors and building contractors up to 31.03.2006.
12. The Expenditure listed under Schedule 20 as Establishment Expenses include the salaries paid to Faculty, Scientific and Research Personnel. The Expenditure listed under the Schedule 21 as Administrative Expenses include the expenses towards Laboratory Consumables and Seminar/Workshops/ Discussion meetings exclusively incurred for Research purposes.
13. Application for exemption from payment of Income Tax has been made and it is in the process of finalisation. Hence provision for income tax not made in the accounts.

For **P. V. Prabhu & Co.,**
Chartered Accountants

Sd/-
R.S.Gururaj.
Accounts Officer.

Sd/-
(Nagaraja)
Partner
Membership no.205345

Sd/-
Prof.M.R.S.Rao
President

Place : Bangalore
Date : 29.09.2006

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	31.03.2006	31.03.2005
	Rs. Ps.	Rs. Ps.
Schedule 1: Capital Fund		
Balance as at the beginning of the year	508039873.56	424294516.66
Carbon Nano Materials	34182430.00	34182430.00
Physics and Chemistry of Materials	9878095.00	9878095.00
Cluster Studies	2687514.00	2687514.00
	554787912.56	471042555.66
Less : Depreciation up to the end of previous year	137033758.00	116526261.59
	417754154.56	354516294.07
Add : Addition to Fixed Assets during 2005-06	123416254.88	83745356.90
	541170409.44	438261650.97
Less : Depreciation for the current year	24576767.00	20507496.41
	516593642.44	417754154.56
Add : Depreciation Reserve per contra	161610525.00	137033758.00
TOTAL	678204167.44	554787912.56
Schedule 3 Earmarked / Endowment Funds		
A: Infrastructure Corpus Fund		
Opening Balance	19716139.65	13078199.01
Add : Amount transferred on account of Overhead recoveries from Schemes Account	4000000.00	4384371.84
Amount transferred from Income & Expenditure A/c	449835.00	0.00
Interest earned on investment during 2005-06	1506671.00	2253568.75
	25672645.65	19716139.60
B: Other funds		
Opening Balance of the Funds	34701494.51	33892503.40
Add : Additions :		
Funds/Donations/Grants/Royalties	658311.00	600000.16
Funds-Income from Investments made	3502797.10	2939747.00
Funds - other funds		
Interest receipts transferred to the Centre's A/c	0.00	429185.00
	38862602.61	37861435.56
Less : Funds-utilisation/Expenditure incurred	2265105.00	3159941.00
Fund transferred reversed	429185.00	
	36168312.61	34701494.56
TDS on interest - Current Year	144671.00	
TOTAL	61985629.26	54417634.16
Schedule 7 Current liabilities and provisions		
Sundry Creditors EMD	311203.00	292203.00
Sundry Creditors CMD	103185.00	107185.00
Sundry Creditors for equipments / others	63011273.45	27566102.26
Due to Scheme Account	1330833.90	1330833.09
TOTAL	64756495.35	29296323.35

Sd/-
R.S.Gururaj
Accounts Officer

Annual Report 2005-2006

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Sl No.	Description	31.03.2006	31.03.2005
		Rs. Ps.	Rs. Ps.
	Schedule 8: Fixed Assets		
1.	Land - Free Hold	17715351.00	17715351.00
2.	Buildings	79658165.26	79658165.26
3.	Plant/Machinery/Equipment	209026492.35	183853372.47
4.	Vehicles	1351027.00	1083551.00
5.	Furniture and fixtures	22238332.87	16943424.87
6.	Office equipment	5380314.63	5222690.63
7.	Computer/peripherals	19738867.00	13856320.00
8.	Electrical installations	3667276.00	3118336.00
9.	Library Books	8281955.21	7608858.21
10.	Library Journals	47898674.80	40613344.80
11.	Tubewells and water supply	248912.00	200034.00
12.	Infrastructure facility	34891894.32	32328997.32
13.	Hostel Building	15570835.00	15570835.00
14.	New Lab Building - AMRL	25377072.00	25377072.00
15.	Animal House	5425605.00	5425605.00
16.	Staff Housing	4118031.00	4118031.00
17.	ETU Building	2048814.00	2048814.00
18.	The College, Biology block, Extn.AMRL etc.	41949861.00	26003654.00
19.	Equipments Carbon & Nano Materials	34182430.00	34182430.00
20.	Equipments Physics and Chemistry of Materials	9878095.00	9878095.00
21.	Equipments Cluster Studies	2687514.00	2687514.00
22.	Equipments Advance Technology Lab	20202562.00	20202562.00
23.	Equipment Magnet	7090855.00	7090855.00
24.	Capital Work in Progress		
	Buildings	15000000.00	0.00
	Equipments	44575231.00	0.00
	TOTAL	678204167.44	554787912.56
	Less - Depreciation up to the end of previous year	137033758.00	116526261.59
	Depreciation for the current year(excluding item no.24)	24576767.00	20507496.41
	Written down value of the assets as on 31.03.2006	516593642.44	417754154.56
	Add - depreciation reserve per contra	161610525.00	137033758.00
	TOTAL	678204167.44	554787912.56

Note : Capital work in progress in respect of Buildings and equipment represent the firm order placed with vendors and building contractors up to 31.03.2006

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	31.03.2006	31.03.2005
	Rs. Ps.	Rs. Ps.
Schedule 9: Investments - Earmarked/Endowment Funds		
Long Term Deposits		
Fixed Deposit with ICICI Bank	800000.00	800000.00
Fixed Deposits and Bonds with IDBI Bank	3100000.00	3100000.00
Fixed Deposits with HDFC Trust	8100000.00	12050000.00
GOVERNMENT OF INDIA 8% SAVINGS BONDS 2003 (SHCIL & SBI)	47900000.00	36200000.00
TOTAL	59900000.00	52150000.00
Schedule 10 Investments - Others		
Short Term Deposits		
Fixed deposits with banks - Canara Bank	63500000.00	22000000.00
Fixed deposits with banks - Canara Bank (Schemes)	42715690.00	32970000.00
TOTAL	106215690.00	54970000.00
Schedule 11 Current Assets, Loans, Advances etc.,		
Cash & Bank Balances		
Cash in hand at Centre	52644.00	67519.00
Cash in hand with Schemes	70922.00	49819.00
Imprest balance	16972.00	0.00
Cash at bank :		
Centre - Canara Bank	10071491.35	3637864.13
Schemes - Canara Bank	12159475.79	2531467.79
Schemes - State Bank of India	1096997.83	6023714.13
Advances to staff	133461.00	112885.00
Contingent Advances	295885.00	132000.00
Other advances	1334692.00	1259603.00
TDS receivable	312978.00	0.00
Amount recoverable from Income Tax Department	461473.00	0.00
Linus and CPF accounts	35672.00	35672.00
TOTAL	26042663.97	13850544.05

Sd/-
R.S.Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	31.03.2006	31.03.2005
	Rs. Ps.	Rs. Ps.
Schedule 13: Grants/subsidies		
Grants - DST	230000000.00	155000000.00
Grants - Discussion meetings/Seminars	9334803.00	5862642.00
Grants - Travel grants	170569.00	570887.00
TOTAL	239505372.00	161433529.00
Schedule 16 Income from other sources		
Income from fee, subscriptions, medical contribution etc.,	603003.00	3089168.50
TOTAL	603003.00	3089168.50
Schedule 17 Interest earned		
From Term deposits	3383408.00	153064.00
From SB accounts with nationalised banks	90705.00	365796.00
From Investmnt on Infrastructure fund	1506671.00	
TOTAL	4980784.00	518860.00
Schedule 18 Other income		
Visitors house, Guest rooms, Licence fee etc.,	1570746.00	197535.00
CSIR Fellowships, SRFP reimbursement etc.,	8122118.00	
TOTAL	9692864.00	197535.00

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	31.03.2006	31.03.2005
	Rs. Ps.	Rs. Ps.
Schedule 20 Establishment Expenses		
Salaries & Scholarship to students	32085060.00	26174422.00
Wages	5307061.00	5485106.00
Allowances (Medical reimbursements etc.,)	1212997.00	809519.00
Bonus	150487.00	155421.00
Contribution to CPF	2031352.00	1178673.00
Other expenditure like honorarium etc.	174046.00	205879.00
Contribution to Group Insurance Scheme	3251816.00	
LTC	127590.00	60182.00
TOTAL	44340409.00	34069202.00
Schedule 21 Other Administrative Expenses		
Electricity & Power	11103309.00	10474948.00
Water charges	2133468.00	1598218.00
Insurance	44012.00	253592.00
Repairs & maintenance	5129800.00	2917344.00
Rents, rates & taxes	471001.00	267266.00
Vehicles running & maintenance	2736231.00	2081191.00
Postage, telephone & communication	4545880.00	3741763.50
Printing & stationery	2091526.00	1857574.00
Travelling and conveyance	2756244.00	1950003.00
Expenses on Seminars/workshops/discussion meetings	15057596.00	6445052.75
Subscriptions	37625.00	42891.00
Fees towards training etc.,	536181.00	106700.00
Professional charges	1773360.00	1213899.00
Canteen subsidy	626.00	7452.00
Laboratory Consumables	20148643.00	10389133.00
Advertisement & Publicity	1013288.00	2122303.00
Other miscellaneous expenses	802024.00	836873.10
Audit Fees	22448.00	22040.00
Student Research Fellowship Programme	1423868.00	1108834.00
TOTAL	71827130.00	47437077.35

There are no transactions pertaining to Schedule Nos.2,4,5,6,12,14,15,19,22 and 23

Sd/-
R.S.Gururaj
Accounts Officer

**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
CPF AND GRATUITY FUND STATEMENT AS ON 31.03.2006**

Particulars	Rs.	Rs.	Particulars	Rs.
SUBSCRIPTIONS				
Opening Balance	10644419.00		Investments in:	12500000.00
Less : Entries omitted in 2004-05 to be accounted.	30170.00	10613385.00	Government of India 8 % Bonds (SHCIL)	2640416.67
Interest to be adjusted	864.00	2713213.00	State Government Securities (25 lakhs)	4500000.00
Add : Subscriptions during the year			Fixed Deposits at Canara Bank	19640416.67
Add : Interest on subscriptions		885359.00	Cash at Bank:	
		14211957.00	SB A/C No.17513	1299559.10
Less withdrawals		1661915.00	Canara Bank, IISc branch	
Less Bank Charges		643.55	Subscription, refunds and contribution of March 2005 credited on 24.04.06	339501.00
Closing Balance		12549398.45	TDS receivable up to the previous year	41234.00
CONTRIBUTIONS			TDS receivable for the year 2005-06	8008.00
Opening balance	7121893.00		Less:	
Add : Accrued interest for 2004-05	103969.00	8986111.00	Deficit in CPF Account	39229.68
Add : Contribution during the year	1222351.00			
Add : Interest on total contributions	537898.00			
Less :				
Payments		358208.00		
Balance in excess of payment obligation		8627903.00		
Closing Balance		209353.00		
Refundable to Endowments		8418550.00		
Gratuity fund Opening Balance	1414077	400000.00		
Less : Gratuity fund paid to Group Gratuity Scheme of LIC	1414077	0.00		
Total		21367948.45	Total	21367948.45

For Jawaharlal Nehru Centre for Advanced Scientific Research

for **P.V.Prabhu & Co.,**
Chartered Accountants

Sd/-

(Nagaraja)
Partner

Membership no.205345

Place: Bangalore
Date : 29.09.2006

Sd/-

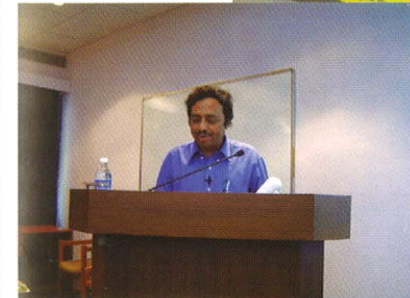
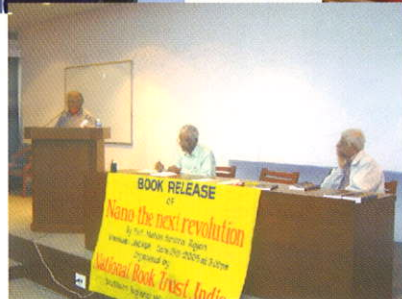
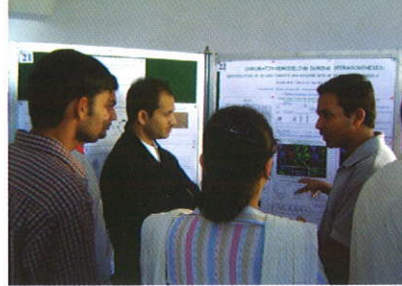
R.S.Gururaj

Accounts officer

Sd/-

Prof.M.R.S.Rao

President, JNCASR





 **JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH**

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