



JAWAHARLAL NEHRU CENTRE FOR
ADVANCED SCIENTIFIC RESEARCH

*ANNUAL
REPORT*

1992-93

Indian Institute of Science Campus
Bangalore 560 012

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The Centre having taken root during the three previous years can be said to have now started its growth phase with the help of leading scientists of the country who are honorary members of the faculty, and others.

The first formal academic unit of the Centre - a Condensed Matter Theory Unit - was set up during the year.

Over 25 seminars and discussion meetings on important scientific topics in frontier and emerging areas were organised. Research work was carried out with the participation of the honorary faculty, the visiting scientists and the faculty of the Indian Institute of Science, who are contributing to the activities of the Centre. Under the Visitors' Programme, around 34 scientists spent a few weeks to a few months each at the Centre interacting with our faculty members and others on various topics of scientific research. During the summer of 1992, 39 young students participated in the Summer Research Fellowship Programme. Several books were published.

The Centre has now a Visitors' House (Jawahar) on the campus of the Institute for accommodating visitors, particularly those participating in the seminars, etc. of the Centre. The first phase of construction of buildings at Jakkur campus has been brought to its final stages.

In all its activities, the Centre is privileged to work closely with the Indian Institute of Science and to have the full support of the Department of Science and Technology, Government of India.

C.N.R.Rao
President

This Centre came into being during the Birth Centenary Year (1989) of Pandit Jawaharlal Nehru in memory of his sustained and inspiring support for science and technology in India. It is devoted to research in frontier and emerging areas of science and engineering. The Centre is fully supported by the Department of Science and Technology, Government of India.

Registered as a Society under the Karnataka Societies Registration Act, the Centre functions as an independent, autonomous national centre devoted to research. It is governed by a Council of Management consisting of distinguished scientists and administrators.

The Centre has its office on the campus of the Indian Institute of Science and has established strong academic links with the Institute. It carries out various academic activities with the help of the faculty of the Institute and also honorary faculty of the Centre. Certain essential infrastructural facilities for the Centre have been created at the Indian Institute of Science campus. The Centre is developing its main campus at Jakkur (a place about 10 km away from the Indian Institute of Science) on lands gifted by the Government of Karnataka.

OBJECTIVES

The main objectives of the Centre are:

- (a) To carry out and promote front-line research in selected areas of science;
- (b) To promote collaborative research with scientists at the Indian Institute of Science and other institutions in the country;
- (c) 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;
- (d) To organize periodic winter and summer schools in certain areas, where young talented scholars would be associated;
- (e) To provide opportunities to carry out research projects for talented young students;
- (f) To provide facilities to visiting scholars and faculty from all over India, and abroad, to spend extended periods at the Centre;
- (g) To publish monographs and reports on frontier and futuristic areas of science as well as monographs of educational value.

The Centre generally promotes emerging as well as interdisciplinary areas of science and engineering. This is being done by making use of the facilities at the Indian Institute of Science and other advanced research institutions nearby and by developing such facilities of its own for theoretical studies and laboratory work as are essential.

SOCIETY

The Society of the Jawaharlal Nehru Centre for Advanced Scientific Research consists of 10 members. The Annual General Meeting of the Society was held on 20th November 1992.

The administration and management of the Centre are conducted by a Council of Management consisting of:

Dr. Raja Ramanna
Chairman of the Council of the
Indian Institute of Science
(*ex-officio*) (Chairman)

Mr. S.B. Krishnan
Joint Secretary & Financial Adviser
Department of Science & Technology, New Delhi

Prof. N. Mukunda
Dean of the Science Faculty
Indian Institute of Science

Prof. C.N.R. Rao,
Director, Indian Institute of Science
& President of the Centre

Prof. P. Rama Rao
Secretary, Department of Science & Technology
New Delhi

Prof. H. Sharat Chandra
Professor, Department of Microbiology &
Cell Biology
Indian Institute of Science

Prof. M.M. Sharma
Director & Head
University Department of Chemical Technology
Bombay

Prof. O. Siddiqi
Professor of Molecular Biology
Tata Institute of Fundamental Research, Bombay

Mr. L. Raghavendra Rao
Administrative Officer
(*ex-officio*) (Secretary)

The Council held its meetings on 28th April and 20th November 1992.

ACADEMIC ADVISORY COMMITTEE

The Council of Management is advised on all academic matters by the Academic Advisory Committee, which consists of:

Prof. C.N.R. Rao
President of the Centre (Chairman)

Prof. A. Chakravorty
Indian Association for the Cultivation
of Science, Calcutta

Prof. S.K.Joshi
Director-General, Council of Scientific
and Industrial Research, New Delhi

Prof. N. Kumar
Chairman, Division of Physical &
Mathematical Sciences
Indian Institute of Science

Prof. R. Kumar
Department of Chemical Engineering
Indian Institute of Science

Prof. R.A. Mashelkar
Director
National Chemical Laboratory, Pune

Prof. R. Narasimha
Director
National Aeronautical Laboratory, Bangalore

Prof. G. Padmanaban
Chairman, Division of Biological Sciences
Indian Institute of Science

Prof. V. Rajaraman
Chairman, Supercomputer Education &
Research Centre
Indian Institute of Science

Prof. T.V. Ramakrishnan
Chairman, Department of Physics &
Centre for Theoretical Studies
Indian Institute of Science

Prof. N. Mukunda
Dean of the Science Faculty
Indian Institute of Science (Coopted member)

Mr. L. Raghavendra Rao
Administrative Officer (Secretary)

The Committee held its meeting on 8th September 1992 and 25th February 1993.

HONORARY PROFESSORS

The following are Honorary Professors of the Centre
(This list includes two additions made during the year):

Biological Sciences

Prof. B.K. Bachhawat, F.A.Sc., F.N.A.
University of Delhi, New Delhi

Prof. D. Balasubramaniam, F.A.Sc., F.N.A.
Centre for Cellular & Molecular Biology, Hyderabad

Prof. Madhav Gadgil, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. G. Padmanaban, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. J. Ramachandran, F.A.Sc.,
Astra Research Centre India, Bangalore

Prof. V. Sasisekharan, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. H. Sharat Chandra, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. O. Siddiqi, F.A.Sc., F.N.A., F.R.S.
Tata Institute of Fundamental Research, Bombay

Prof. M.S. Valiathan, F.A.Sc., F.N.A.
Sree Chitra Tirunal Institute for Medical
Sciences & Technology, Thiruvananthapuram

Prof. M.A. Viswamitra, F.A.Sc., F.N.A.
Indian Institute of Science

Chemical Sciences

Prof. A. Chakravorty, F.A.Sc., F.N.A.
Indian Association for the Cultivation
of Science, Calcutta

Prof. B.M. Deb, F.A.Sc., F.N.A.
Punjab University, Chandigarh

Prof. M.V. George, F.A.Sc., F.N.A.
Regional Research Laboratory, Thiruvananthapuram

Prof. V. Krishnan, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. G. Mehta, F.A.Sc., F.N.A.
University of Hyderabad, Hyderabad

Prof. C.N.R. Rao, F.A.Sc., F.N.A., F.R.S.
Indian Institute of Science

Engineering Sciences

Prof. R. Kumar, F.A.Sc., F.N.A.
Indian Institute of Science

Dr. R.A. Mashelkar, F.A.Sc., F.N.A.
National Chemical Laboratory, Pune

Prof. R. Narasimha, F.A.Sc., F.N.A., F.R.S.
National Aeronautical Laboratory, Bangalore

Prof. V. Rajaraman, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. P. Rama Rao, F.A.Sc., F.N.A.
Department of Science & Technology, New Delhi

Prof. M.M. Sharma, F.A.Sc., F.N.A., F.R.S.
University Department of Chemical Technology,
Bombay

Physical and Mathematical Sciences

Prof. S. Chandrasekhar, F.A.Sc., F.N.A., F.R.S.
Centre for Liquid Crystal Research, Bangalore

Prof. R. Chidambaram, F.A.Sc., F.N.A.
Bhabha Atomic Research Centre, Bombay

Prof. S.K. Joshi, F.A.Sc., F.N.A.
Council of Scientific & Industrial Research
New Delhi

Prof. N. Kumar, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. N. Mukunda, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. M.S. Narasimhan, F.A.Sc., F.N.A.
Tata Institute of Fundamental Research, Bombay

Prof. Jayant Narlikar, F.A.Sc., F.N.A.
Inter-University Centre for
Astronomy and Astrophysics, Pune

Prof. T.V. Ramakrishnan, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. Virendra Singh, F.A.Sc., F.N.A.
Tata Institute of Fundamental Research, Bombay

HONORARY SENIOR FELLOWS

The following are Honorary Senior Fellows of the
Centre; among these are four added during the year:

Prof. Biman Bagchi, F.A.Sc.
Indian Institute of Science

Prof. C. Dasgupta, F.A.Sc.
Indian Institute of Science

Prof. Deepak Dhar, F.A.Sc.
Tata Institute of Fundamental Research
Bombay

Dr. K.N. Ganesh, F.A.Sc.
National Chemical Laboratory, Pune

Prof. H.R. Krishnamurthy, F.A.Sc.
Indian Institute of Science

Prof. V. Nanjundiah, F.A.Sc.
Indian Institute of Science

Dr. Gangan Prathap, F.A.Sc.
National Aeronautical Laboratory, Bangalore

Prof. S. Ramasesha, F.A.Sc.
Indian Institute of Science

Prof. M.R.S. Rao, F.A.Sc., F.N.A.
Indian Institute of Science

Prof. A.K. Sood, F.A.Sc.
Indian Institute of Science

Prof. J. Srinivasan, F.A.Sc.
Indian Institute of Science

The following scientists worked at the Centre as Visiting Professors, etc. and were engaged in the activities indicated against their names:

VISITING PROFESSORS

Prof. Thomas Kailath (Stanford University, U.S.A.)
- July-Aug. 1992: Interaction with the active research community at IISc in Electrical, Electronics, Computer Engineering and Mathematics.

Prof. Alan L. Mackay (Birkbeck College, London) -
- Oct.-Nov. 1992: Interaction with the faculty of the Department of Physics and Metallurgy at IISc in Crystallography.

Prof. K.R. Sreenivasan (Yale University, U.S.A.) -
Nov.-Dec. 1992. Interaction with Prof. R. Narasimha in Fluid Dynamics.

Prof. J.T. Bonner (Princeton University, U.S.A.) -
Jan.-Mar. 1993: Collaboration with Prof. V. Nanjundiah in Developmental and Evolutionary Biology.

Prof. C.M. Varma (AT & T Bell Labs., U.S.A.) -
Jan. 1993: Collaboration with Prof. N. Kumar in Theoretical Solid State Physics.

SENIOR ASSOCIATES

Prof. G.V. Anantha Iyer (Retired Professor of IISc)
- Oct. 1990-Sep. 1992: Writing of a monograph on Precambrian Crustal Evolution for use by geologists, chemists and other researchers in the field.

Dr. P. Radhakrishna (Laboratoire Leon Brillouin, France) - from Dec. 1990: Experiments on magnetism.

Dr. B.V. Subbarayappa (Retired Executive Secretary, INSA and an historian of Science) - February 1991-April 1992; Writing of a book 'In Pursuit of Excellence - a history of the Indian Institute of Science'.

- Prof. P.S. Narayanan** (Retired Professor of IISc) - June 1991-June 1992: Research in non-linear optics.
- Prof. V.S.R. Rao** (Retired Professor of IISc) - Aug. 1991-Dec. 1992: Research in Molecular Modelling, design and development of carbohydrate databank.
- Prof. P.J. Vithayathil** (Retired Professor of IISc) - from May 1992: Research on Plant Cell wall in association with Prof. M.A. Viswamitra.
- Prof. S.N. Balasubrahmanyam** (Retired Professor of IISc) from Aug. 1992: Research in Organic Structures and Organic Synthesis.
- Dr. R.P. Shenoy** (Retired Director, LRDE) - since Jan.1993: Research in Microwave Imaging.

FELLOWS

- Dr. Amit J. Basu** - Feb.1991-Jul. 1992: Research in Fluid Dynamics in association with Prof. R. Narasimha.
- Dr. D. Sengupta** - Oct. 1991-Dec. 1992: Research in Fluid Mechanics in association with Prof.R. Narasimha.
- Dr. Suman B. Iyer** - from March 1992: Research on Diamond Films in association with Prof. R.M. Mallya in the Materials Research Centre at IISc.
- Dr. R. Bhakthavatsalam** - from April 1992: Research in Electromagnetic Theory and its Applications in association with Prof. R.P. Shenoy in the Department of Electrical Communication Engineering at IISc.
- Dr. (Mrs.) Kusuma G. Rao** - from May 1992: Research in Atmospheric Sciences in association with Prof. R. Narasimha.
- Dr. (Mrs.) Monika Datta** - from July 1992: Research in FTIR spectroscopy in association with Prof. M.M. Sharma, UDCT, Bombay.

VISITING SENIOR FELLOW

Prof. V.N. Rajasekharan Pillai (Mahatma Gandhi University, Kottayam) - January-May 1992: Interaction with Prof. V. Krishnan *et al* in Organic Polymer Chemistry.

VISITING FELLOWS

Dr. M. Verelst (Toulouse Paul Sabatier University, France) - Sep.1991-July 1992: Research in the Synthesis of oxides and other solids, in association with C.N.R.Rao.

Dr. B.K. Das (Gauhati University) - June-July 1992: Research on Inorganic Solids in association with Prof. C.N.R. Rao in the area of Inorganic Solids.

RESEARCH ASSOCIATES

Dr. Shyam Sundar Parhi (Indian Institute of Science) - April-May 1992: Worked with Dr. M.K. Surappa to find out Mathematical solutions to some metallurgical problems.

Dr. C.V. Yelamaggad (Karnataka University) - since January 1992: Working with Prof. S. Chandrasekhar in Liquid crystal materials.

Dr. Supurna Sinha (Syracuse University, U.S.A.) - from July 1992: Working with Prof. Chandan Dasgupta on slow kinetics of supercooled liquids and suspensions.

Dr. D.M. Gaitonde (Institute of Physics, Bhubaneswar) - from Sep. 1992: Working with Prof. T.V. Ramakrishnan and others on Condensed Matter Theory. Earlier (Jan.-Aug.1992) worked with Prof. T.V. Ramakrishnan and others as Research Fellow.

Dr. (Mrs.) S.M. Gokhale (Pune University) - since Sep. 1992: Working in Surface science with Prof. D.D. Sharma and Prof. C.N.R. Rao.

Dr. S. Baranidharan (Indian Institute of Science) - from Nov. 1992: Working with Prof. M.R.N. Murthy in Molecular Biophysics Unit at IISc.

VISITING SCIENTISTS

Dr. Avinash Singh (IIT, Kanpur) - June-July 1992: Interaction with Prof. T.V. Ramakrishnan and Prof. H.R. Krishnamurthy on High T_c Superconductors.

Prof. M.V. Srinivasan (Australian National University, Canberra) - Aug.-Sep. 1992: Interaction with Prof. Y.V. Venkatesh and others on Visual sciences.

Dr. Tapash Chakravorty (National Research Council of Canada) - from Nov. 1992: Working with Prof. T.V. Ramakrishnan and Prof. N. Kumar in the area of Condensed Matter Theory.

Prof. K.P. Sinha (NEHU, Shillong) - Dec. 1992-Feb. 1993: Interaction with Prof. N. Kumar and other faculty members in the area of Condensed Matter, Complete systems, Gravitation and Cosmology.

JUNIOR RESEARCH FELLOWS

Ms. Nagalakshmi Seshadri (University of Poona, Pune) - Sep.1991-Aug. 1992: Research in DNA methylation in *D. melanogaster*.

Mr. Pramod Gupta (International Centre for Theoretical Physics, Trieste, Italy) - From Sep. 1992: Working with Prof. N. Kumar the area of Strongly Correlated Electronic systems.

CHAIRS BY INDUSTRY

ASTRA Research Centre instituted a Chair in the Centre. In the earlier years Chairs had been endowed by Messrs Gharda Chemicals Ltd., Messrs CMC Limited and Messrs Hindustan Lever Ltd.

The Centre has developed academic links with the Rajiv Gandhi Institute for Contemporary Studies, Rajiv Gandhi Foundation, New Delhi, which has shown much interest in the activities of the Centre.

The Rajiv Gandhi Institute has a programme of awarding Science Talent Research Fellowships to promote scientific creativity in young undergraduate students in science and engineering. These Fellowships are jointly announced along with the Summer Research Fellowship of the Centre. The first ten among those selected for the summer programme are named Rajiv Gandhi Science Talent Research Fellows and receive a fellowship amount of Rs.2,000 p.m. each. They also spend 2-3 months during summer in research training with Professors at various places in the country.

The Rajiv Gandhi Institute also awards research grants for innovative ideas in Science and Technology. These grants, which are of a value of Rs.2-3 lakhs each, are awarded to a select number of young Ph.D's working independently in Universities, National Laboratories and other Centres to try out innovative ideas in science and technology. The Centre has taken upon itself the responsibility for inviting applications, having them scrutinized and recommending eligible scientists for these awards.

A national debate on Science and Technology in the post-liberalisation era: Role of the Government and the Industry which was held on 3rd February 1993 was co-sponsored by the Rajiv Gandhi Institute.

The Centre is also organising the Annual Rajiv Gandhi Science and Technology Lectures.

ANNUAL GET-TOGETHER OF THE FACULTY

On 20th November 1992, an annual get-together of the honorary faculty was held. Apart from discussing academic matters of interest to the Centre, a programme of lectures by five of the faculty members on the status of, and the latest developments in, their respective fields had been arranged for an open audience. As in the previous years, the texts of these talks are being published as a Special Issue of the Journal of the Indian Institute of Science.

ADMINISTRATIVE AND SUPPORT SERVICES

An office has been established with the minimum staff. Services of some members of the staff of the Indian Institute of Science are being utilised in several ways. The construction of buildings for the Centre is being supervised by Project Engineer of the Centre and the Engineering staff of the Institute.

The Centre also has the benefit of the advice of some of the scientists who are associated with it as Honorary Professors.

LAND AND BUILDINGS

At the campus at the Indian Institute of Science, a Visitor's House named `Jawahar` having 43 rooms (double) was commissioned in September 1992. A laboratory-cum-office for the President was also completed.

The following buildings are in the final stages of construction:

	<u>Estimated Cost</u>
1. Guest House, office and stores	Rs.40 lakhs
2. President's house	Rs.20 lakhs
3. Staff housing	Rs.60 lakhs

The Government of Karnataka had granted 15.55 acres of land in Jakkur (11 km from IISc) free of cost in the name of the Indian Institute of Science for establishing the Centre . It has now passed orders transferring the land in the name of the Jawaharlal Nehru Centre for Advanced Scientific Research.

The main campus of the Centre is being developed on this piece of land in Jakkur. Construction of the following buildings, designed by the noted architect, Charles Correa has been progressing in this campus:

	<u>Estimated Cost</u>
1. Academic and Administrative Block	Rs.130 lakhs
2. Visitors' Hostel	Rs. 90 lakhs

RESEARCH SUPPORT

The following support was extended by the Centre to the faculty and other scientists during the year:

- Prof. V. Nanjundiah - Rs.7 lakhs for equipment, consumables and contingencies over a three year period for research in Pattern formation in the cellular slime molds.
- Prof. M.A. Viswamitra - Rs.1 lakh for consumables and contingencies for research in Structural studies of biologically important molecules, oligonucleotides, DNA-drug complexes, cyto-protecting peptides, steroids, model compounds and proteins.
- Prof. M.A. Viswamitra/Prof. P.J. Vithayathil - Rs.50,000 for chemicals, glassware, consumables and contingencies for research in Research on plant cell wall.
- Dr. S.A. Shivashankar/Prof.C.N.R. Rao - Rs.1,12,500 for special camera, UPS and other minor equipment and consumables for research in Scanning Tunneling Microscopy.
- Prof. A. Chakraborty - Rs.2.5 lakhs for equipment, chemicals, etc. for research in Isomer preference and other studies in some variable valence platinum metal systems.
- Condensed Matter Theory Unit - Rs.3,50,000 for Intel 80486 based computer systems for research in Condensed Matter Theory.
- Prof. G. Padmanaban - Rs.2.5 lakhs for consumables and minor equipment for a Pilot study in Gene Targeting Therapy and Therapeutics.
- Prof. G. Mehta - Additional Rs.50,000 for 1992-93 for purchase of consumables, etc. for State-of-the-Art project on Electronic Control of π facial selectivity etc.

Besides the above, Project staff was provided to several of the faculty members and other scientists for their research.

A Condensed Matter Theory Unit - the first formal academic unit of the Centre - has been set up.

Following are some of the areas in which research work is being carried out by the faculty members and others assisted by the Centre:

- Isomer preference and other studies in some variable valence platinum metal systems (A. Chakravorty).
- New liquid crystalline materials (S. Chandrasekhar with C.V. Yelamaggad).
- Condensed Matter Theory (H.R. Krishnamurthy, Biman Bagchi, Chandan Dasgupta, T.V. Ramakrishnan, N. Kumar and others).
- Mechanisms for Cuprate Superconductivity; metal insulator transitions in correlated electron systems; correlated Bose systems on a lattice; liquid-solid transition in modulated liquids; and dynamics of sheared colloidal crystals (H.R. Krishnamurthy, N. Kumar, T.V. Ramakrishnan C. Dasgupta).
- Theoretical research in Physics and Chemistry pertaining to properties of Correlated Electron States in Molecular and Extended Systems and other Areas using a mini-supercomputer (H.R. Krishnamurthy, S. Ramasesha, D.D. Sarma, S. Yashonath and A. Patel).
- Time-resolved Resonance Raman Spectroscopy of Charge-Transfer Processes (V. Krishnan and S. Umapathy).
- Paramagnetic Meissner Effect (PME); Theoretical study of the possible PME associated with the mesoscopic defect structures/weak links in the highly anisotropic layered cuprate superconductors (N. Kumar).

- Luttinger Liquid: The role of the continuum limit of the Luttinger model in 1D correlated electrons; study of tunneling through a Luttinger Liquid in relation to transport through long conjugated molecules suspected of spin-charge decoupling (N. Kumar with Pramod Gupta).
- Marginal-Fermi Liquid; The role of marginal fermi-liquid in providing an incoherent cut-off in strongly correlated disordered metallic oxides was considered in relation to the linear tunneling characteristics observed with these materials (N. Kumar with C.M. Varma)
- State-of-the-Art in Organic Syntheses (G. Mehta).
- Development of pattern in the cellular slime mold *Dictyostelium discoideum* (V. Nanjundiah).
- Gene Targeting, Therapy & Therapeutics - A Pilot Study (G. Padmanaban).
- Development of techniques for solving Finite but Large Correlated Model Hamiltonians (S. Ramasesha).
- Molecular mechanism of Meiotic Recombination Process (M.R.S. Rao).
- Sex determination and dosage compensation (H. Sharat Chandra).
- *In-situ* FTIR studies of different systems (M.M. Sharma and Monika Datta).
- Biologically important Molecules like Oligonucleotides, DNA Drug Complexes, Cytoprotecting Peptides, Liver Peptides, Model Steroids and Proteins (M.A. Viswamitra).
- Plant Cell Wall (M.A. Viswamitra and P.J.Vithayathil).

- Scanning Tunneling Microscopy using a home-made ST Microscope operating at room-temperature (in air) and also a Low Temperature Tunneling Spectrometer operating in a magnetic field for investigation of metallic oxides, including high T_c oxides (A.K. Raychaudhuri and others).
- Magnetic Studies (P. Radhakrishna and others)
- Features of protein structures of interest in terms of protein folding (M.R.N. Murthy with S. Baranidharan)
- Atmospheric Boundary Layer and Monsoon Circulation (Kusuma G. Rao)

DISCUSSION MEETINGS, ETC.

Seminars, workshops and discussion meetings on important and exciting topics in science and engineering are periodically organised. These are aimed at promoting interaction and collaboration among scientists of the Centre in general and those in the country at large, and at stimulating young talented scholars. During the year, 26 discussion meetings were organised. Some of the areas covered were Algorithms and Complexity, Energy Systems, Chaos, Ultra-fast Processes in Chemistry, Biodiversity of Western Ghats, Molecular Recognition, Antenna Design, Aerospace Sciences & Engineering, Allergy and Autoimmunity, Fullerenes, Superconductivity. Experts from overseas also actively participated in a few of these programmes, adding to their value.

An important programme arranged was a national debate on Science and Technology in the Post-Liberalisation Era: Role of the Government and the Industry; this was cosponsored by the Rajiv Gandhi Institute for Contemporary Studies.

SUMMER RESEARCH FELLOWSHIP PROGRAMME

Under this Programme 39 students (including 7 from the previous batch who were offered the fellowship for a second year) were trained in the methods of research during the summer of 1992.

Monographs and Popular Science Books

The Centre has a publication programme at three levels:

- Advanced Monographs series, devoted to specialised topics in current research, intended for the international research community;
- Educational Monographs with short accounts of interesting areas in science and engineering, meant for students at graduate and postgraduate levels.
- Popular Science and General books, meant for the general public.

The following have been published under the Educational Monograph series through Wiley Eastern:

Superconductivity Today
- T.V. Ramakrishnan and C.N.R. Rao

The World of Bohr and Dirac: Images of
Twentieth Century Physics - N. Mukunda

Supercomputers - V. Rajaraman

A Kannada version of the popular science book 'Computer - A Child's Play' by Dharma Rajaraman was published through the Karnataka Rajya Vijnana Parishat.

Proceedings of Conferences, Symposia, etc.

The Centre supports the publication of the Proceedings of important conferences, symposia, etc. sponsored by it. The following proceedings were published during the year:

Recent Advances in Aerospace Sciences and Engineering - Proceedings of the International Symposium held during 12-15 December 1992. Eds. H.S. Mukunda and A.V. Krishna Murthy (Interline Publishing).

Proceedings of the Discussion meeting on Recent Advances in Signal Processing and Communication held in Bangalore during January 18-20, 1993. Eds. T.V. Sreenivas and K.V.S. Hari (Tata McGraw Hill).

Special Publication

A special issue of the Journal of the Indian Institute of Science, embodying the five lectures delivered by the honorary faculty at the Annual Faculty Meeting held in November 1992, was brought out.

FACULTY PUBLICATIONS

The faculty published around 100 scientific papers and authored four books.

LIBRARY

At the end of the year the Library had around 800 books. It subscribed to 16 current journals on Science and Engineering to meet the essential needs of the faculty and others.

RECOGNITIONS

The Centre has been recognised as a scientific/industrial research organisation by the Ministry of Scientific & Industrial Research (Department of Scientific & Industrial Research). It has also been approved for the purpose of Section 35(1)(ii) of the Income Tax Act, 1961.

FINANCES

The Department of Science & Technology, Government of India released a grant of Rs.265 lakhs during the year 1992-93; this included Rs.40 lakhs which had been sanctioned during 1991-92. An expenditure of Rs.327.67 lakhs was incurred on both recurring and non-recurring items.

AUDIT

The audit of the accounts of the Centre for the year was carried out by Messrs. Santhappa & Co., Chartered Accountants.

President

Prof. C.N.R. Rao, D.Sc. (Mysore), Ph.D (Purdue),
D.Sc.(h.c.), F.A.Sc., F.N.A., F.R.S.

Head, Academic Programmes

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

Administrative Officer

Mr. L. Raghavendra Rao, B.A. (Karnataka)

Co-ordinator

Dr. R.B. Iyengar, D.Sc.(Calcutta)

Accounts Officer

Mr. T. Ranganatha Rao, B.Com.(Mysore),
LL.B.(Bangalore)

Facilitation & Liaison Officer

Mr. N. Nagaraja Rao, M.A. (Mysore), M.B.A. (IGNOU)

Honorary Advisor (Projects)

Mr. K.C. Reddy, B.E.(Mysore), M.S. (Purdue)

Project Engineer

Mr. N. Munivenkataswamy, B.E. (Mysore)

Honorary Finance-cum-Audit Officer

Mr. C.A. Seshagiri Rao, B.Com. (Mysore)

Honorary Medical Officer

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

Honorary Librarian

Mr. N.M. Malwad, M.Lib.Sc. (Bombay), A.D.R. (INSDOC)

Superintendent

Mr. B.N. Balaji, B.Sc., LL.B. (Mysore)



M/s Santhappa & Co.
Chartered Accountants
201, II Floor
House of Lords
St. Mark's Road
BANGALORE 560 001.

Date: 5th May 1993

FORM NO. 10 B
AUDIT REPORT UNDER SECTION. 12 A(b) OF THE
INCOME TAX ACT, 1961.

We have examined the Balance Sheet of JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH, Indian Institute of Science Campus, Bangalore 560 012, as at 31st March, 1993, and the Income and Expenditure Account for the year ended on that date which are in agreement with the Books of Account maintained by the said Centre.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit. In our opinion, proper books of accounts have been kept by the Centre, so far as it appears from our examination of the books of accounts subject to the comments given hereunder:

In our opinion and to the best of our knowledge and according to information given to us, the said accounts give a true and fair view:-

- (i) In case of the Balance Sheet of the State of Affairs of JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH as at 31st March, 1993.

AND

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

for SANTHAPPA & CO.
Chartered Accountants

Sd. A.C. Raju
PARTNER

**Income & Expenditure Account
for the year ended 31st March 1993**

Actuals 1991-92		Expenditure		Rs	P	Rs	P	Actuals 1991-92		Income		Rs	P	Rs	P
		RECURRING EXPENDITURE:													
	10,85,042	00	To Salaries & Honorarium	19,49,770	00					By Grant in Aid from DST					
	4,869	91	" Medical reimbursement	5,765	85			-		Govt. of India					
	998	00	" Bonus	1,497	00			4,13,00,000	00	Opening Balance		2,01,09,276	99		
	950	00	" Staff Training	2,250	00			-		Receipts during the year		2,65,00,000	00	4,66,09,276	99
	-		" Superannuation Fund-Pension	11,000	00					" Interest					
	-		" " -Gratuity	7,000	00					On Term Deposit		37,65,890	00		
	-		" Retirement Benefits	7,157	00			8,18,451	00	" SB A/c		1,50,216	00		
	-		" G.P.F. Interest	61	00	19,84,500	85	1,83,475	59	" Mobilization Advance		1,68,870	28	40,84,976	28
		Office Expenses						-		" Guest House receipt				60,540	00
	1,52,128	02	" Printing and Stationery	1,34,851	47			12,750	24	" Misc. receipts				4,695	00
	30,756	20	" Postage	37,896	00										
	36,102	00	" Telephone, Telex and Fax	1,95,010	60										
	20,635	55	" Conveyance	50,363	95										
	18,384	00	" Bank Charges	2,067	00										
	2,160	00	" Electricity & Water	1,742	20										
	-		" Petrol, Oil & Lubricant	5,215	00										
	-		" Book Binding	6,556	00										
	-		" Newspaper & Magazine	2,227	00										
	40,300	23	" Miscellaneous Expenses	26,648	60	4,62,577	82								
	-		" Maintenance - Building	1,08,900	25										
	67,082	00	" " - Garden	62,765	00										
	65,465	85	" " - Equipment	1,01,495	60										
	-		" " - Guest House	21,032	50										
	-		" " - Vehicle	750	00	2,94,943	35								
	27,160	00	" Advertisement			43,205	00								
	12,24,225	70	" Discussion Meetings			17,06,356	14								
	19,558	35	" Research Support			2,25,407	83								
	62,755	55	" Publication of Books			98,060	90								
	91,023	45	" Council and other meetings			84,165	00								
	3,82,270	73	" Consumables			7,21,233	93								
92	83,360	00	" Research Programme: SRFP 92	1,24,403	00										
91	53,425	50	" " : SRFP 93	1,09,744	00										
91	10,616	00	" " : CTSSSP 92	13,046	00	2,47,193	00								
	34,286	15	" Security services			66,986	69								
	-		" T.A. to candidates			2,109	00								
	-		" Travelling Expenses			37,189	00								
	-		" Uniforms			4,896	40								
	-		" Guest House Consumables			22,345	60								
	2,100	00	" Legal Fee	4,500	00										
	7,500	00	" Audit Fee	7,500	00	12,000	00								
	3,90,04,395	64	" Surplus C/F			4,47,46,317	76								
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	4,25,07,550	83	Total Rs.	5,07,59,488	27	4,25,07,550	83			Total Rs.				5,07,59,488	27

contd.

Actuals 1991-92		Expenditure		Rs	P	Rs	P	Actuals 1991-92	Income		Rs	P	Rs	P
		NON-RECURRING EXPENDITURE												
1,15,139	98	To Opening Balance												
1,17,24,457	15	" Building Construction		2,21,13,897	16	3,90,04,395	64	By Surplus b/f					4,47,46,317	76
2,97,913	86	" Off. Equipment & Appliances		4,47,111	77									
59,34,380	71	" Scientific Equipment		27,92,229	75									
1,60,115	50	" Furniture		1,93,291	30									
-		" Vehicle		1,71,369	86									
6,63,111	45	" Books & Journals		10,35,547	51									
2,01,09,276	99	" Excess of Income over Expenditure		1,79,92,870	41									
3,90,04,395	64	Total Rs.		4,47,46,317	76	3,90,04,385	64	Total Rs.					4,47,46,317	76

As per our report of even date
for SANTHAPPA & CO.
Chartered Accountants

Place: Bangalore
Date: 5th May 1993

Sd. T. Ranganatha Rao
Accounts Officer

Sd. C.N.R. Rao
President

Sd. A.C. Raju
Partner

Jawaharlal Nehru Centre for Advanced Scientific Research

BALANCE SHEET AS AT 31st MARCH 1993

Actuals 1991-92	Liability	Rs	P	Rs	P	Actuals 1991-92	Assets	Rs	P	Rs	P
	<u>CAPITAL FUND</u>						<u>FIXED ASSETS</u>				
2,92,17,551	Fixed Assets: As per Contra	5,59,70,998	87			2,92,17,551	As per Schedule 2 as per Contra			5,59,70,998	87
2,01,09,276	Surplus: As per Income and Expenditure Account	1,79,92,870	41	7,39,63,869	28	32,79,394	<u>Advances & Deposits</u>			25,62,369	13
	<u>SUNDRY CREDITORS</u>					21,95,177	As per Schedule 3			30,16,508	45
15,11,104	As per Schedule 1			27,54,893	97	1,71,98,821	Endowment Fund FDR as per Contra			1,25,00,000	00
20,00,000	Endowment Fund Carpus			26,00,000	00	10,998	Fixed Deposits, Canara Bank			27,628	00
1,95,177	" Interest as per Contra			4,16,508	45	11,31,166	Stock of Seminar Bags			56,57,767	25
							Cash at Canara Bank SB A/c No.13474				
5,30,33,110	Total Rs.			7,97,35,271	70	5,30,33,110	Total Rs.			7,97,35,271	70

As per our report of even date
for SANTHAPPA & CO.
Chartered Accountants

Place: Bangalore
Date: 5th May 1993

Sd. T. Ranganatha Rao
Accounts Officer

Sd. C.N.R. Rao
President

Sd. A.C. Raju
Partner

Jawaharlal Nehru Centre for Advanced Scientific Research

SCHEDULE - No.1 Sundry Creditors

Sl. No.	Particulars	Rs	P	Rs	P
A	Security Deposit & EMD				
1	R. Muniswamy	265	00		
2	Royal Furnishing Co.	5,063	00		
3	B.V. Sreenivas	33,327	00		
4	Interior India	9,073	00		
5	H.N. Vijayaraghava Reddy	5,28,200	00		
6	Doddamane Bros.	4,99,930	00		
7	Nagappa	3,55,077	00		
8	M.P. Pradeep Kumar	19,488	00		
9	K. Narasimhalu	2,70,307	50		
10	N. Diwakar	5,77,445	00		
11	New India Interiors	2,398	00		
12	G. Raveendra	21,904	00		
13	Decorin	48,470	00		
14	Decor	5,000	00		
15	Entee Enterprises	800	00		
16	Shapoorji & Pallonji & Co.	65,000	00		
17	SPS Borewell	3,469	00		
18	Suresh P.R.	605	00		
19	Inside Design & Furniture	800	00		
20	Toms & Co.	5,100	00		
21	Batliboi Engs.	22,175	00		
22	Emgee Associates	5,375	00		
23	Navarang Electricals	35,621	00		
				25,14,892	50

Sl. No.	Particulars	Rs	P	Rs	P
B	IISc. - Water Charges			37,888	47
C	Audit fees payable			7,500	00
D	Wages Payable			7,125	00
E	Retiring Fund:				
	GPF Subscription & Interest	10,218	00		
	Pension Fund	11,000	00		
	Gratuity Fund	7,000	00		
		-----	---	28,218	00
F	Suspense Account				
	K.S.T. & Others			99,270	00
G	Rajeev Gandhi Foundation			60,000	00
	Total A+B+C+D+E+F+G Rs.			27,54,893	97

As per our report of even date
for SANTHAPPA & CO.
Chartered Accountants

Place:Bangalore Sd.T. Ranganatha Rao Sd. C.N.R. Rao Sd. A.C. Raju
Date:5th May 1993 Accounts Officer President Partner

Jawaharlal Nehru Centre for
Advanced Scientific Research

SCHEDULE No.2 - FIXED ASSETS

Sl. No.	Name of the Asset	As on 31.3.92		Additions during the year		As on 31.3.93	
		Rs	P	Rs	P	Rs	P
1	Land at Jakkur (granted by Government of Karnataka free of cost, vide order No.RD.174-LGB-87(P)/21.9.89)	-		-		-	
2	Buildings completed	5,52,866	97	-		5,52,866	97
3	Buildings under construction	2,04,13,218	90	2,21,13,897	16	4,25,27,116	06
4	Off. Equipment & Appliances	2,97,913	86	4,47,111	77	7,45,025	63
5	Scientific Equipment	63,85,672	72	27,92,229	75	91,77,902	47
6	Furniture	5,98,510	57	1,93,291	30	7,91,801	87
7	Vehicle	-		1,71,369	86	1,71,369	86
8	Books and Journals	9,69,368	50	10,35,547	51	20,04,916	01
	Total	2,92,17,551	52	2,67,53,447	35	5,59,70,998	87

As per our report of even date
for SANTHAPPA & CO.
Chartered Accountants

Place:Bangalore Sd.T. Ranganatha Rao Sd. Prof. C.N.R. Rao Sd. A.C. Raju)
Date:5th May 1993 Accounts Officer President Partner

Jawaharlal Nehru Centre
for Advanced Scientific Research

SCHEDULE No.3 - ADVANCES & DEPOSITS

Sl. No.	Particulars	Rs		P	
		Rs	P	Rs	P
A	Mobilisation Advance:				
	N. Diwakar	3,11,111	00		
				3,11,111	00
B	Material Advance:				
	H.N. Vijayaraghava Reddy	1,02,748	00		
	Doddamane Bros.	1,94,240	00		
	K. Narasimhulu	43,193	35		
	N. Diwakar	6,92,424	46		
	Navarang Electricals	3,54,000	00		
				13,86,605	81
C	Research Grant:				
	Prof. G. Mehta	1,04,547	45		
	Prof. A. Chakravorty	1,50,000	00		
				2,54,547	45
D	Cement Deposit:				
	IISc.			5,91,046	87
E	Contingent Advance				
	Prof. H. Sharat Chandra	2,500	00		
	IISc	201	00		
				2,701	00
F	Retiring Benefit Fund				
	GPF Recovery Deposit			10,157	00
G	Permanent Advance				
	Imprest Guest House			200	00
H	Festival Advance				
	Staff Members			6,000	00
	Total A+B+C+D+E+F+G & H			25,62,369	13

As per our report of even date
for SANTHAPPA & CO.
Chartered Accountants

Place:Bangalore Sd. T. Ranganatha Rao Sd. C.N.R. Rao Sd. A.C. Raju
Date:5th May 1993 Accounts Officer President Partner

Jawaharlal Nehru Centre
for Advanced Scientific Research