



# NIAS

# NEWS

A NEWS LETTER OF THE NATIONAL INSTITUTE OF ADVANCED STUDIES,  
BANGALORE

Vol-3

Friday, 1st July 1994

No. 1

This Fourth Issue of the NIAS Newsletter covers the activities of the Institute for the period from January 1, 1994 to June 30, 1994. The first half of Ninety Four has really been very busy as can be observed from the number and variety of activities that packed the months. The regular schedule has included the Eighth NIAS Course on "An Integrated Approach to Knowledge and Information" held between January 10 and February 5, 1994, the normal research and academic activities, and also preparation for the Second NIAS Course jointly sponsored by the University Grants Commission, NIAS and Jawaharlal Nehru Centre for Advanced Scientific Research, for University/College Teachers, to be held between July 4 and July 30, 1994. In addition, NIAS had the opportunity to host a high level non-official INDO-US Joint Meeting on "TECHNOLOGY TRANSFER AND NON-PROLIFERATION" during January 17 to 19, 1994. A separate report on this INDO-US MEETING appears in this issue.

Yet another highlight was that our Director, Dr. Raja Ramanna attended a unique Conference of unprecedented composition on Arms Control proposals in South Asia in SHANGHAI during February 23-26, 1994. This Conference was sponsored by the Federation of American Scientists (FAS) and was attended by non-official representatives from INDIA, CHINA, PAKISTAN and THE UNITED STATES. A brief on the SHANGHAI CONFERENCE also appears separately.

Ever increasing response and consistent encouragement from the Associates and well wishers of NIAS have made us double the circulation of the NIAS NEWS.



Left to Right : Mr. Rober McNamara, Dr. Raja Ramanna, Prof. CNR Rao, Dr. Balachandran and Dr. S. Varadarajan during INDO-US Joint Meeting at NIAS

## THE FACULTY

### UNIT OF HEALTH AND HUMAN BEHAVIOUR

Professor R.L. Kapur heads the unit which is also constituted by Dr. Biswajit Sen, Ms. Susmita Subramanyam and Dr. Fatihma Nusrat Jehan.

#### Activities of the Unit

**1. Creativity amongst Indian Scientists:** This project has now entered its final phase and is expected to be completed within another year. The next step is to interview scientists who have been identified to be 'creative' by their peers. Ms. Susmita Subramanyam assists Prof. Kapur in this project.

**2. A Psycho-social Study of Alienation amongst Indian Youth:** Prof. Kapur (Principal Investigator) and Dr. Biswajit Sen (Co-investigator) have almost completed gathering their data for this Defence Research and Development Organisation (DRDO) project. In addition to 570 youth in different parts of the country responding to a questionnaire survey, over 70 detailed interviews have been conducted in Bangalore, Calcutta, Delhi, Patiala, Bhagalpur and Guwahati with ex-Naxalites, ex-ULFA activists, ex- and current Punjab terrorists, and also with people who have dedicated their lives to socially constructive activities.

**3. Two-day Workshop on "Stress and its Management":** This was organised for senior scientists and administrators of the DRDO. Lecture-discussion sessions by Prof. Kapur and Dr. Sen, group discussions on stress-related issues and a live demonstration of "Yoga Nidra" by Prof. Kapur were held.

**4. Three-day Gender Workshop:** Prof. R.L. Kapur directed a workshop designed to understand and explore male perspectives of gender issues in the areas of development and rearing, work place, marriage, relationships in the broad context of sexuality, parenthood and social networks. The workshop was organised by SAKTI, Bangalore.

**5. Programme for Social Harmony in Schools:** Dr. Sen is part of a volunteer team - of scholars, artistes and media persons - which has launched a 2-year programme in both English and Kannada on themes related to Social Harmony. The overall objective is developing a positive spirit of enquiry among the children.

## EIGHTH NIAS COURSE

The Eighth NIAS Course on "An Integrated Approach to Knowledge and Information" was held from January 10 to February 5, 1994 for senior executives of government and industry. Participants represented various central government, public and private sector organisations (IAS, DRDO, Tata group of companies, Mysore Cement, Armed Forces, Bhabha Atomic Research Centre, Atomic Energy Commission, Department of Science and Technology, etc) and came from all over the country. They represented a wide variety of disciplines.

A series of lecture-discussions were held on the following topics:

Sl. No.	Name of Lecturer	Lecture Theme
1.	Dr. R. Chidambaram	Inaugural Lecture Topic: Many Dimensions of Nuclear Energy
2.	Prof. Andre Beteille	Sociology
3.	Dr. J. Mohan Rao	Indian Economic Scene
4.	Dr. N. Rajam	Appreciation of Music
5.	Dr. Biswajit Sen	Psychology and Mental Health
6.	Prof. K.N. Panikkar	Historical Roots of Indian Culture
7.	Prof. R.L. Kapur	Psychology and Mental Health
8.	Dr. S.R. Rao	Discovering India's Past
9.	Prof. N.R. Madhava Menon	Constitution and the Law
10.	Mr. I.K. Gujral	National and Inter-national Politics
11.	Vice Admiral M.K. Roy	Indian Ocean
12.	Dr. Vina Mazumdar	Role of Women in the Indian Political System
13.	Dr. P. Rama Rao	Science and Technology
14.	Prof. P.K. Mukhopadhyay	Indian Philosophy
15.	Prof. C.V. Sundaram	Materials and Society
16.	Prof. B.N. Goswamy	Appreciation of the art of Painting
17.	Prof. K. Satchidananda Murty	Valedictory Address Topic: Rousing of Reason

As customary, a symposium was held during the course on January 29, 1994 on "India in the 21st Century". The speakers were:

1. Prof. Ashish Bose
2. Dr. Ramachandra Guha
3. Prof. R.L. Kapur
4. Prof. M.N. Srinivas
5. Mr. K. Subrahmanyam
6. Dr. Joseph Thomas



Special programmes were also arranged every week. In the first week, Prof. (Smt.) N. Rajam, Professor in Violin, Banaras Hindu University, Varanasi, gave a violin recital. Next Prof. Sarat Chandra, Chairman, Microbiology and Cell biology, Indian Institute of Science, Bangalore, spoke on "The Human Genome", Dr. Raja Ramanna spoke on "Philosophy of Science" and finally Prof. Nathan Glazer, Professor of Education and Sociology, Harvard University, U.S.A. addressed the participants on "Multiculturalism".

## SECOND NIAS COURSE FOR UNIVERSITY/COLLEGE TEACHERS

The Second NIAS Course on "An Integrated Approach to Knowledge and Information" for University and College Teachers will be held from 4th July to 30th July, 1994. For such courses certain themes are given particular importance, in addition to overviews in many other areas. This year the concentration will be more on programmes which help in directly influencing the social responsibilities of the individual. To that end, some of the areas we have chosen are: two half-day workshops on "Women in India", lectures on "Rights and responsibilities of the Indian citizen", a one and a half day workshop on "Cinema as vehicle for social change", and also special lectures by Mrinal Sen and Kiran Bedi on the influences which shaped their lives. The inaugural address will be delivered by Dr. Manmohan Singh, the Hon'ble Minister for Finance and the Valedictory address at the end of the course will be delivered by Mr. T.P. Issar, Former Chief Secretary, Government of Karnataka.

### VISITS

- |                                                           |               |
|-----------------------------------------------------------|---------------|
| 1. National Institute of Mental Health and Neuro Sciences | July 14, 1994 |
| 2. Shravanabelagula, Belur & Halebid                      | July 16, 1994 |
| 3. Urban NGO                                              | July 21, 1994 |
| 4. Rural NGO                                              | July 22, 1994 |

## VISITING CHAIRS

### HOMI BHABHA CHAIR - PROF. C.V. SUNDARAM

The acceptable temperature limit for the condenser effluent from coastal power stations in the tropical zone has been the subject of discussion in recent times. For an environmental impact study on 'thermal pollution', a project proposal titled 'Marine Microbial Ecology in the Vicinity of a Coastal Power Station' has been prepared by Prof.

C.V. Sundaram and Dr. P.K. Shetty, and submitted to the Atomic Energy Regulatory Board, Bombay, seeking funds for this programme. Dr. Shetty will be the principal investigator in this project, and will work in collaboration with the scientists at the Kalpakkam Centre (Tamil Nadu) of the Department of Atomic Energy.

With reference to the request that had been received from the Hutti Gold Mining Company (near Raichur, Karnataka), for undertaking an Environmental Impact Assessment Study of the mining and gold extraction operations, Prof. Sundaram had again visited the Hutti Site, along with the Scientists of the Environmental Assessment Division of the Bhabha Atomic Research Centre, Bombay, for observations and discussions. Following this, a budget estimate has been prepared by BARC and submitted for conducting the EIA study over a one-year period, with monitoring of air, water and soil samples in and around the mine site. The Company is yet to take a decision on this proposal.

### J.R.D. TATA CHAIR - PROF. M.N. SRINIVAS

Apart from continuing his work on his autobiography, he is about to finish the editing of the Symposium, 'Caste: its Twentieth Century Avatar' to be published by Penguin India in 1994.

### DR. S. RADHAKRISHNAN CHAIR - PROF. B.V. SREEKANTAN

During the period May 2 to October 30 1993 Prof. B.V. Sreekantan was at the Centre for Space Research, Massachusetts Institute of Technology, Cambridge and worked on the X-ray Timing Explorer (XTE) project. The XTE is a very sophisticated X-ray  $\gamma$ -ray Astronomy Satellite that is scheduled to be launched by US in 1995 as a sequel to the highly rewarding series of satellites ROSAT, GINGA, SIGMA, GRO etc., which have provided considerable new information on a variety of celestial X-ray and  $\gamma$ -ray sources. The XTE - with its large area proportional counters, precision pointing accuracy, scintillation spectrometers and an All Sky X-ray Monitor (ASM) and for the first time very sophisticated on-board processing facilities providing time and energy histograms, pulsar analysis, burst catching modes etc., - is specially designed to extend and supplement the existing observations in a variety of ways. Particular emphasis will be on time variation studies right down to the submillisecond range on both galactic and extragalactic sources; search for transient and bursting sources, pulsar studies, aperiodic variations, cyclotron line

features, spectral studies of Active Galactic Nuclei, Seyferts, quasars, search for pulsations from SN 1987a which may show up by 1995 as an X-ray pulsar, and so on. The data from the Satellite right from the time of its becoming operational will be available for the international community of X-ray astronomers who can propose specific observations to be carried out with the various instruments on the Satellite. An exciting prospect is the opportunity for simultaneous observations in the various bands of the EM Spectrum - Optical, Radio, IR, Hard X-rays etc., which can be carried out from India also.

Prof. Sreekantan attended the 23rd International Conference on Cosmic Rays held at Calgary in Canada during July 19-30 1993. Some of the papers presented by Prof. Sreekantan and his collaborators from the Tata Institute of Fundamental Research, Bombay at this Conference are listed under publications.

During the month of November 1993, he was at the Physics and Astronomy Department of the University of California, Irvine and during December at Centre for Astronomy and Space Sciences, University of California, San Diego. At these centres he lectured on the following topics:-

- (i) Sources of High Energy Cosmic Rays.
- (ii) Primary Spectrums and Composition of Cosmic Rays at High Energy  $10^9$ - $10^{21}$  ev.
- (iii) Nuclear Interaction characteristics at Ultra High Energies.

Since his return in January 1994, Prof. Sreekantan has been working with Dr. Raja Ramanna on some aspects of elementary particle physics, which is now under publication.

#### ASSOCIATES PROGRAMME

The topics of the Associates programmes during the first half of the year were:-

1. 14th January 1994 - Violin Recital by Dr. (Smt.) N. Rajam, Professor of Violin, Banaras Hindu University, Varanasi.
2. 31st January 1994 - Lecture on "Multiculturalism" by Prof. Nathan Glazer, Professor of Education & Society, Graduate School of Education, Harvard University, Massachusetts, USA.

3. 25th March 1994 - Lecture on "Gene Therapy" by Prof. G. Padmanabhan, Deputy Director, Indian Institute of Science, Bangalore.
4. 25th April 1994 - Lecture on "The Market meets its match: restructuring the economy of Eastern Europe" by Prof. Lance Jerome Taylor, Formerly of the MIT.
5. 25th May 1994 - Lecture on "Indian National Security in the North-East: a human rights perspective" by Ms. Nandita Haksar, Human Rights Activist & Visiting Professor, National Law School of India University, Bangalore.
6. 24th June 1994 - Lecture on "Prediction of Earthquakes" by Prof. Vinod Gaur, Former Director NGRI, Hyderabad.

#### MEETING OF THE COUNCIL OF MANAGEMENT AND ANNUAL GENERAL MEETING (1994)

The eleventh meeting of the Council of Management of the Institute and the fourth Annual General Meeting of the Society were held on 17th March 1994 at NIAS.

Mr. J.J. Bhabha, Managing Trustee, Sir Dorabji Tata trust was unanimously elected as Chairman of the Council of management in place of late Mr. J.R.D. Tata. Besides passing resolutions on auditors statement of accounts together with auditors report, approval of the budget proposals for the year 1994-1995 and annual report on the activities of the Institute, various aspects with regard to future activities of the Institute were discussed.

It was decided to nominate Prof. C.N.R. Rao, presently an ex-officio member, as a nominated member of the Council of Management for a period of five years on completion of his term of office as Director, Indian Institute of Science in July, 1994. The other new members nominated to the Council of Management are Mr. Ratan N Tata and Dr. V.S. Arunachalam. The Government of Karnataka has nominated the Commissioner and Secretary of the Education Department and the Commissioner and Secretary of the Finance Department as Ex-officio members of the Council of Management.

#### JRD TATA MEMORIAL CENTRE

An important decision taken in this meeting was that the auditorium and library complex of NIAS, now under construction would be named as the JRD TATA MEMORIAL CENTRE as a befitting tribute to Late Mr. JRD Tata, the founder Chairman

of the Institute to whose vision and guidance the Institute owes a great deal. It will also house a project on Women's Policy research and advocacy.

Mr. Bhabha announced that the Sir Dorabji Tata Trust has made a donation of Rs. 50 lakhs towards development of the JRD Tata Memorial Centre at NIAS.

### CHRONOLOGY OF IMPORTANT ACTIVITIES AT NIAS

(January 1, 1994 to June 30, 1994)

1. Eight NIAS Course on "An Integrated Approach to Knowledge and Information" held between 10th January and 5th February 1994.
2. INDO-US Joint Meeting on "Technology Transfer and Non-Proliferation" held between 17th and 18th January 1994.
3. Seminar on "Management issues in Health and Family Welfare" from 28th February to 2nd March 1994, organised by Foundation for Revitalisation of Local Health Traditions, Bangalore.
4. "Consultative Meeting for Indian National Medicinal Plants Distributed Database Network (INMEDPLAN)" from 4th to 5th March 1994, organised by Foundation for Revitalisation of Local Health Traditions, Bangalore. "INMEDPLAN" is a Multi-Institutional initiative to create a national information resource on Medicinal Plants. This meeting was of experts on Agro-Technology of medicinal plants. The objective was to:-
  - a) Prepare a draft database structure for agro-technology that can be used across the country for computing information on medicinal plants.
  - b) Initiate work for preparation of a directory of institutions and nature of work being done in the field of Agro-Technology.
5. DRDO Workshop on "Stress and its Management" held between 11th and 12th March 1994, organised by NIAS.
6. Training cum Orientation Program for Technical Staff on "MPCP Field Genebank Training Program" from 26th to 31st March 1994, organised by Foundation for

Revitalisation of Local Health Traditions, Bangalore.

7. Consultative Meeting for "Ecology database structure of INMEDPLAN" on 26th March 1994, organised by Foundation for Revitalisation of Local Health Traditions, Bangalore.
8. Seminar on DST Project entitled "Formulation of Criteria for Effective R & D Funding" held between 12th and 13th March 1994, organised by NIAS. A report on the progress of this project appears separately.
9. Indo-British Workshop on "Management of Environmental Law Regime" from 7th to 9th April 1994, organised by National Law School of India University, Bangalore. A brief on this workshop also appears in this issue.
10. "Consultative Communication Workshop of FRLHT" on 19th April 1994, organised by Foundation for Revitalisation of Local Health Traditions, Bangalore.
11. A Discussion Meeting on "Science, Technology and Performing Arts" held on 30th May 1994, organised by NIAS and the Gandhi Centre of Science and Human Values (Bharatiya Vidya Bhavan, Bangalore).

### INDIA AND THE UNITED STATES: A TWO DAY SEMINAR AT NIAS

V.S. ARUNACHALAM

One of the puzzles about the relationships among nations is the difference between perception and practice. Take for instance, the relationship between the United States and India. Normally one would expect this to be warm and cordial and even taken-for-granted. After all, both are democratic societies with a lively and free press and endowed with similar institutions. In commerce, US is the largest trading partner of India and its investments are more than any other country's investments in India. In science and technology, both the countries have been co-operating over decades. In addition, there is a significant immigrant community of Indians in the United States, consisting largely of professionals and contributing to the growth of the society. In spite of all these, often the relationship between India and the United States is less than warm, and at times borders on coldness. Why is this so? Are the problems between the two countries really



insurmountable or are they resolvable through discussions?

To analyze this issue in some detail, National Institute of Advanced Studies, Bangalore and Carnegie Mellon University in Pittsburgh, U.S.A. in collaboration with, and support from, the Rockefeller Foundation organized a two-day meeting at Bangalore on January 17-19, 1994. The participants were a group of specially invited members from the United States and India. Unlike the past meetings of this kind - when only professionals and experts working in problems of political relationships participated - this meeting brought together a group that was refreshingly different and diverse. Experts in diplomacy sat along with scientists and technologists, industrialists, politicians and non governmental foundation heads. Mr. Ratan N Tata, Head of the House of Tatas was there along with Mr. Peter Goldmark, President of the Rockefeller Foundation and Dr. S. Varadarajan, President of Indian National Academy of Engineering. Prof. C.N.R. Rao, Director of the Indian Institute of Science was a member along with Prof. Granger Morgan, Prof. Robert White and Prof. Susan Henry from Carnegie Mellon University. There was a parliamentarian in Mr. Jaswant Singh and the Prime Minister's advisor Mr. Naresh Chandra was also a participant. Non-proliferation experts included Dr. Thomas Graham. Mr. K. Subrahmanyam, Dr. P.K. Iyengar and Ambassador Leonard, underlining the significance attached to nuclear non-proliferation issues. The American industrial establishment was represented by Mr. Ken Richeson (IBM), Mr. George Brody (Northern Telecom), and Mr. Azim Hasham Premji from the WIPRO Corporation. A complete list of the delegates is given at the end.

The meeting started with a welcome from Dr. Raja Ramanna, Director, NIAS who spoke of the need for an improved understanding and better relationships between the two countries and this was echoed by Mr. Robert McNamara who urged the group to analyze the two issues that are generally barded as obstacles to a better relationship: nuclear non-proliferation concerns and technology transfer. He wanted some recommendations from the participants for resolving these issues amicably.

There were only two presentations in the meeting. Dr. Thomas Graham spoke on 'The

Future of Nuclear Weapons: International Debate' and Prof. V.S. Arunachalam on 'India and the United States: Issues in Science & Technology'. These two presentations which were distributed well before the meeting were followed by lively, detailed and often frank discussions. Many issues were discussed: technology control regimes and embargoes; discriminatory nature of NPT; US concerns about nuclear proliferation and about unsafeguarded reactors; export control of computer chips; intellectual property rights; India's energy crisis and the relevance of nuclear power; burgeoning opportunities in bio and information technologies and opportunities for increased trade between the two countries.

After discussions, Dr. Ramanna and Mr. McNamara asked the two delegations to meet separately and develop recommendations for consideration by the group as a whole. The lists as prepared independently by the two groups included recommendations that were very similar that suggested that the problems between the two countries were solvable given some understanding and recognition of the different perceptions. The recommendations included easing of technology export controls to India; need for increased transparency in all Indian power reactors to assure the commitment of India for using the power reactors for producing power and materials for civilian applications and pursuit of studies to ensure that technology transfer mechanisms are efficiently used for the economic growth of India. The group also recommended the use of non governmental financial institutions to fund India's programs for producing power including nuclear electricity.

The meeting was followed by a press conference where both Dr. Ramanna and Mr. McNamara explained the recommendations of the group. Much earlier, at the time the meeting was being planned, Dr. Ramanna had met Mr. J.R.D. Tata to brief him on the meeting. At that time, Mr. J.R.D. Tata was enthusiastic and promised full support to the meeting. In spite of his frail health, he had insisted on his personal participation. He felt that both the countries must bury the suspicions and concerns of the Cold War era and build a relationship based on mutual understanding. "We must move forward", he said; and that was the way, the Bangalore meeting went.

## List of participants

### INDIA

1. Dr. Raja Ramanna - Leader
2. Dr. V.S. Arunachalam
3. Prof. D. Balasubramian
4. Mr. Naresh Chandra
5. Dr. P.K. Iyengar
6. Prof. G. Padmanabhan
7. Mr. Azim Hasham Premji
8. Prof. C.N.R. Rao
9. Mr. Jaswant Singh
10. Dr. R.P. Shenoy
11. Mr. K. Subrahmanyam
12. Mr. Ratan N Tata
13. Dr. S. Varadarajan

### UNITED STATES

- 1 Mr. Robert S. McNamara - Leader
2. Mr. Peter Goldmark
3. Ambassador James Leonard
4. Dr. Marshall Bouton
4. Ambassador Harry Barnes
6. Prof. Granger Morgan
7. Dr. Richard Getzinger
8. Prof. Susan Henry
9. Mr. George Brody
10. Prof. Robert White
11. Dr. Thomas W. Graham
12. Mr. Ken Richeson

*(Dr. V.S. Arunachalam is currently a Senior Visiting Professor at Carnegie Mellon University, U.S.A. Earlier he has held the positions of Scientific Advisor to the Defence Ministry, Director General, DRDO and Secretary, Department of Defence Research and Development, Ministry of Defence. He is also a member of the Council of Management of our Institute.)*

### THE SHANGHAI CONFERENCE

The above unprecedented conference to assess the chances of various Arms Control proposals in South Asia was sponsored by the Federation of American Scientists (FAS) and took place in Shanghai between 23rd and 26th February 1994. This was a non-official meeting mostly of representatives who were scientists, bureaucrats, soldiers, and ex-policy makers of their countries. It was really unprecedented in so far as the composition of participation (namely INDIA, CHINA, PAKISTAN and THE UNITED STATES) was concerned and its locale - SHANGHAI. As regards the process, South Asia watchers across the globe were astounded at how well the four-party conference went.

The origin of this Conference can be traced to mid 1993, when the initiative for the Conference came from the Americans, in this case from Frank von Hippel, then Chairman of the FAS Fund, policy research and education arm of the Federation. With his subsequent decision to join the Clinton Administration, the planning of the conference was left to the FAS President Stone.

Earlier in Philadelphia, the FAS invited five Indians to a preliminary conference and as a consequence the scope of the Shanghai Conference was widened to include politico-technical aspects of the problem.

The Indian team consisted of Raja Ramanna, presently the Director of the National Institute of Advanced Studies, Ex- Chairman of the Atomic

Energy Commission and India's Minister of State for Defence; General Krishnaswami Sundarji, former Chief of Staff of the Indian Army; A.P. Venkateswaran, former Indian Foreign Secretary, and former Ambassador to China, who had headed the Indian delegation to the senior official level talks between China and India over the border dispute; Brahma Chellaney, a research Professor at New Delhi's Centre for Policy Research, and former journalist for United Press International. The fifth Indian, Rakesh Sood, currently Director of the Disarmament & International Security Affairs Division was invited, but could not attend.

The Pakistani delegation comprised Mubashir Hassan, former Minister of Finance, Planning, Development and Economic Affairs and later Secretary-General of the then governing Pakistani People's Party; Abdul Sattar, a career diplomat, who was also Foreign Minister of the interim administration and had previously served as Ambassador to India and to the Soviet Union; General Khalid Mahmud Arif, an Ex-Chief of Staff of the Pakistani Army; Munir Ahmed Khan, Ex-Chairman of the Pakistan Atomic Energy Commission and Riaz Hussain Khokhar, Pakistan High Commissioner to India.

The Chinese team consisted of Qian Jiadong, former ambassador to the United Nations conference on disarmament in Geneva; Fang Jinying, specialist on Indian Policy from the China Institute of Contemporary International Relations - subordinated to the State Council; Zheng Ruixiang, Deputy Director, the China Institute of

International Studies - subordinated to the Chinese Foreign Ministry; Mu Changlin, expert on non-proliferation from the China Institute for International Strategic Studies; Chen Xueyin, a physicist interested in the future role of nuclear weapons from the China Institute of Applied Physics and Computational Mathematics, & Director of Program on Arms Control and Disarmament at Defence Science and Technology Information Center; Ni. Shixiong, Vice-Chairman, a prolific author from the International Politics Department of Fudan University; Wu Zhan, Senior Fellow of Institutè of American Studies; Wang Hongyu, Deputy Director, Shanghai Institute for International Studies; Dingli Shen, Associate Professor, Fudan University.

The American team consisted of Richard Garwin, the FAS Vice-Chairman and Chairman of the FAS Fund; Frank von Hippel, winner of a MacArthur genius award; Jeremy J. Stone; Dr. Jerome Holton, a Physicist representative from FAS; Stephen P. Cohen from the Univeristy of Illinois and ex-member of the State Department Policy Planning Staff.

It is reported that for the first time three South Asian countries with diverse cultures agreed to discuss nuclear arms control in South Asia, even at a non-official level, and the American team conducted the business with great care and cordiality, and respect for each other. Each member of the delegation brought out various proposals explaining their national interests and possibilities of compromise. At such a meeting, it was understandable that consensus was hard to reach, but friendship and goodwill, the corner stones on which peace and security could be built, was maintained throughout.

The Indians were happy to note that the Chinese delegation fully understood the Indian point of view.

The conference has decidely opened up new avenues for the participating countries to have future dialogue bilaterally or otherwise.

## **JEHANGIR RATANJI DADABHOY TATA - AS I REMEMBER HIM**

**C V SUNDARAM**

"Beyond the Last Blue Mountain" - a biography of J.R.D. Tata, by his colleague and admirer R.M. Lala, had been first published in 1992 about the time the nation's highest award of Bharata Ratna was conferred on JRD. In the

present Penguin edition, published after JRD's passing away on November 29, 1993, a new Preface and an Epilogue have been added. On going through this important source book of JRD's life, personality and contributions, I have felt inclined to write this short memoir.

I was a student and research worker in Metallurgy, at the Indian Institute of Science, Bangalore during the 1950's - when JRD Tata was already the President of the Institute's Court. One of my first recollections of him and his versatile mind is when he had been invited as the Chief Guest for the Annual Day Function of the Institute's Students' Gymkhana. As the Chief Guest, he spoke briefly for ten minutes, and then for nearly one hour he responded to a variety of questions 'fired' at him from the audience - on a wide range of topics of current and futuristic importance. It was an absolutely charming performance, and for me it was one of those rare visions of a brilliant and agile mind - and a fascinating display of all-round knowledge of the modern world.

Later, when I was working in the Department of Atomic Energy, JRD was a Member of the Atomic Energy Commission, the policy making body of our Programme. His vast industrial and administrative experience should have been a great resource for the AEC Chairmen right from the time of Homi Bhabha. Of the many occasions that are etched in my memory, I particularly recall the sad morning in December 1971, when we in Trombay received the shocking news of the sudden demise of Vikram Sarabhai in Trivandrum. Sarabhai who had been on a visit to the Space Centre had died in his sleep. In the course of the morning, we came to know that Sarabhai's body was being brought to Bombay by air, on its way to Ahmedabad, Sarabhai's home town, where the funeral was to take place. And buses were arranged for all of us to go to the airport to pay our homage to the departed leader. When I reached the airport, I was struck by the orderliness in the arrangements there. JRD, both as a senior member of the AEC, and as Chief of Air-India was in command, in his spotless white uniform. A large area in the Departure lounge of the Bombay airport had been cordoned off, to receive Sarabahai's body and for visitors to walk past in single file. When the aircraft arrived, JRD was one of the 'bearers' to bring the casket into the lounge and place it in position. It was a moment charged with emotion for all of us. JRD's face looked a bit grim, and of course he was sad; he was at the same time paying



attention to all the details, with his quiet efficiency. It was his way of saying farewell to a comrade.

My direct interactions with JRD were only few, and they were during the period I was serving at Kalpakkam. At one of the meetings of the Atomic Energy Commission in Delhi, I had been asked to present the case for advanced technology development for the 500 M(e) Prototype Fast Breeder Reactor. (The PFBR is a major project of large and complex dimensions, and if undertaken in the near future will cost around Rs. 2,000 crores). JRD listened with deep interest, and then raised the question whether such a complex project could and should be undertaken entirely on our own technical resources. Though I was a bit surprised by the comment - coming from one who was fully aware of the dim chances of getting any assistance from outside for this project - I saw the point of the comment, and it made me think further about it. And subsequently in the time available to me, I did take the steps to restore some linkages with France and the then U.S.S.R. - for getting our designs scrutinised and for exploring avenues for technical exchange.

The last occasion I had the opportunity of listening to JRD was at the foundation stone laying ceremony at NIAS in March 1992. It was an evening function arranged in the open, on the grounds of NIAS. JRD was in a particularly expansive and reminiscent mood that day. Just a few days earlier, he had attended a special celebration in his honour in the City of Jamshedpur, where the citizens had gathered in number to felicitate him on the award of Bharata Ratna to him. He spoke with great feeling and rich emotion, and once again vividly recalled the amazing vision and enterprise of Jamsetji Nusserwanji Tata, the founder of the Tata empire, who was responsible for the establishment of the Steel City of Jamshedpur. He also spoke in great detail about the various stages through which his own idea had to go through, of setting up an institution in India, on the lines of the Grand Ecoles in France - as a Centre to train people for leadership, and how NIAS ultimately came to be established in its present form. It was an address with a vast sweep, and one could get glimpses of the many models, ideas and emotions that had inspired him in the course of his life and work. He was eighty eight, and he was on his feet for one full hour delivering that remarkable address.

There has been some discussion on the propriety of the Padma and Bharata Ratna Awards instituted by the Government of India. The title of Bharata Ratna was first conferred on C.V. Raman, Sarvepalli Radhakrishnan and C. Rajagopalachari for their distinguished and sustained contributions in the fields of Science, Philosophy, Politics and

Administration. Over the years it was unfortunate that purely political considerations came to influence the selection for these awards. So, it was a refreshing return to sound judgement when JRD was chosen for the title in 1992. JRD himself, however, was taken by surprise when the announcement was made. He sincerely felt that the Award should be reserved for great scientists, literateurs, philosophers and thinkers, and wondered how he has been chosen. One cannot think of many instances where one has seen such a combination of brilliant intellect, a spirit of adventure, sterling character, profound sense of responsibility and initiative, and compassionate concern for fellowmen, with such enlightened humility in self-assessment. As Dr. Raja Ramanna succinctly put it: 'The gracious way in which our Chairman reacted to the Bharata Ratna award is an example of how a great man honours his country'.

This is not the place to attempt any extensive review of Lala's biography. We are deeply indebted to Lala for his labour of love in bringing out an excellent chronicle on JRD. It is not an account that can or should be read in one stretch, but taken and savoured in segments as it is so well structured. I should admit I was a trifle overwhelmed by the wealth of detail - of names, events, and interconnections - but then one is also overwhelmed by 'the stories within stories' in a great epic - and the life of JRD was definitely one of epic dimensions.

## TEYYAM

### A RITUAL PERFORMING ART OF NORTHERN KERALA

BY BALAN NAMBIAR

Teyyam, Tira, Mutiyettu, Kaliyuttu and Patayani are some of the spectacular ritual performing art forms still being practised in Kerala. Hundreds of Teyyam shrines exist in Northern Kerala. Over 450 different forms of Teyyams are performed at one shrine or the other every year.

After the harvest season when the work in the field is less, the sky is clear and until the onset of the monsoon, the people in the villages have a lot of leisure time. During this period, villagers gather together at shrines and other improvised worshipping places to celebrate Teyyam festivals. The sound of drums, pipes and cymbals fills the air. Priests and oracles dress themselves in colourful costumes and put on enormous crowns, invoke the blessing of the divinity, get possessed by the spirit and take the role of Gods and Goddesses. In this state of identification with the

divinity they go into a trance and dance to the tune of vigorous drumming and other music. During the performances they walk on fire, strike themselves with sharp swords, utter prophecies, to ward off famine and pestilence and give their several blessings to the rural communities.

Mother Goddess is the most widely worshipped deity in these regions. Every village has its own gramadevata, the village deity. The narration of the story of the gramadevata, sung at the beginning of the performances, though glorifying these manifestations, is in fact a local legend which has no sanction in the puranas. At the end of the story, the heroine dies and her spirit is identified with the Adi Sakti. This spirit is deified and worshipped. Where the Mother Goddess is not specifically identified with a vaishnavite goddess, she is attributed to the aspect of the Adi Sakti, Kali or Bhadrakali. There are very few vaishnavite mother goddesses among Teyyam.

Teyyams are performed by certain communities considered to be in the lower strata of the society. When the so called lower-caste man assumes the role of Teyyam, he gains the status of a 'Super Caste': he becomes a medium between the village folk and the village god or goddess. On such occasions even the upper caste people seek his guidance and blessings.

Teyyam is a unique theatrical performance where the performer, apart from being the priest with occult and mystical powers, is also a dancer, musician, actor, incorporating in himself the artistic skills of crafts, decoration, painting etc. Some of the colourfully decorated costumes of these performers are over three meters in diameter and in some cases the height of the head decoration or crown is over 20 meters.

There are various media or artistic creations that are utilised during the rituals. They include craft objects, pictorial representations, diagram or designs, singing of hymns, chanting of mantras and dances, all of which symbolize dependence on the Higher Power. The craft objects for this purpose are made by skilled craftsmen who make most intricate designs and decorations with palm-leaves.

People in their own way explore the possibilities of using colour in their most vivid and brilliant forms. The predominant colours used in their ritualistic art are black, white, red, yellow and green. These colours are made of locally available organic materials.

In spite of the fact that Aryans have exerted their overall influence all over India, in the southern part there still exists a culture where pre-aryan civilization and unbroken heritage of indigenous nature are preserved in their folk-ritual art forms. It is not a dead culture, but living in and around homes and villages, participated by people of every age group and every caste and class.

The future of these fantastic ritual performances is in danger. Most of the dedicated performers are in their sixties and seventies. Not many youngsters come forward to take the role of Teyyam, particularly the role of Veliccapatus, the oracles, because of the rigid taboos associated with the roles. And, because of changing socio-economical and political climate, probably the same fate of what has happened to the Balinese and the Papua New Guinean Art might befall the performing ritual art of Kerala in the foreseeable future. Unless these unique ritual art forms are documented they will be lost for ever.

*(Shri Balan Nambiar is a renowned painter, sculptor and a research scholar. He is a Nehru Fellow doing research on ritual arts of the West coast. He is also an Associate of NIAS).*

## POSSIBLE HEALTH EFFECTS OF LOW LEVEL EXPOSURES TO IONISING RADIATION

BY D V GOPINATH

### Introduction :

It is well known that whenever high energy radiations such as  $\alpha$ ,  $\beta$  or  $\gamma$ -rays pass through matter, they induce "Ionisation", a process in which a neutral atom or molecule is separated into a positive ion and an electron. Hence they are termed as "Ionising radiations". Separating a neutral atom into a positive ion and an electron requires energy. Hence in the process of ionisation, the radiation loses a part of its energy which is deposited in the material in which it is traversing. This deposited energy is called the radiation dose and is measured in the unit Gray (Gy). A 'Gray' corresponds to the deposition of one Joule of energy in one Kilogram of material. In a living system, the deposited energy can bring about changes deleterious to the system. Furthermore, it has been observed that for the same amount of energy deposited by different types of radiations, the biological effects could be different. Hence while dealing with radiation dose to living matter another unit called Sievert (Sv) is employed which accounts for the deposited energy as well as its



biological effectiveness. Milli Sievert (mSv) refers to one-thousandth of a Sievert.

The global average dose due to natural background radiation is about 2 mSv per year. This corresponds to an average lifetime dose of about 140 mSv. However the natural background radiation and consequent lifetime dose vary widely from place to place ranging upto two orders of magnitude. The internationally accepted limit for occupational exposure is 20 mSv per year averaged over a period of 5 years. But the globally averaged occupational exposure for radiation workers in different fields is in the range of 2-8 mSv per year. Also, there is a declining trend in this due to improved technology and practices. When we say low level exposure it generally refers to low dose rate (fraction of a mSv per minute) or low dose cases (in the range of 200 to 400 mSv).

### **Biological Effects of ionising radiation:**

Biological effects of ionising radiation are of two types; deterministic and probabilistic. The deterministic effects arise due to massive cell damage or cell killing through the passage of ionising radiation. Examples of deterministic effects are the depression of red blood cells, skin reddening and blistering, induction of sterility etc. These effects are characterised by their appearance within a few hours to few weeks after exposure to radiation. A very important feature of deterministic effects is that they occur only above a particular level of radiation dose called Threshold. The threshold levels are different for high dose rate (acute) and low dose rate exposures. In the case of human species, about 200 mSv of acute exposure is needed for any identifiable deterministic effect. Such exposures occur only in serious radiation accidents or from unwanted but inevitable irradiation of healthy tissues in radiation therapy. For more commonly encountered low dose rate exposure, the threshold value is significantly higher, of the order of a few Sieverts.

Probabilistic effects, which are also called Stochastic effects result from the 'Mutagenic' action of ionising radiation. In a living cell, the Deoxyribonucleic acid (DNA) present in the chromosomes residing inside the nucleus, is the repository of all the information required for governing the cell functioning and its replication. The DNA is a double stranded, helical macro-molecule. The backbone of each strand is a string of sugar and phosphate residues and the two strands are linked by a pair of 'Nucleotide' bases. The sequence of such base pairs in the DNA molecule is the 'Text' of the information required for all cell activities. If the DNA molecule is affected either by affecting the individual base pair

or its sequence, the information content gets altered and such a change is called Mutation. If the cell happens to be a Somatic (non-germinal) cell in the body, the mutagenic disturbance can lead to loss of control of cell division which may eventually result in cancer induction. Or if it is a germ cell, the mutated information may get passed on to the progeny leading to genetic effects. Ionising radiations are known to damage the DNA molecule either by directly affecting it or by producing active chemical species in its vicinity which in turn damage the DNA. Both the direct and indirect modes of damage are probabilistic in nature, with the probabilities increasing with radiation dose. Some common types of damage to DNA are; (a) base damage (b) single strand break (c) double strand break (d) cross linkage of the molecule. The damage to DNA is subject to very efficient repair mechanisms mediated by enzyme actions. If the damage is confined to single strand, the repair mechanism uses the strand. Repair is then highly efficient but not totally error free. Misrepairs are more frequent in the case of double stranded breaks. Such instances result in the loss of biological information which may lead to carcinogenic or genetic effects.

### **Risk Evaluation**

It is the mutagenic effect of radiation which has given rise to maximum concern amongst the public. Unlike deterministic effects, these effects are assumed to have no threshold levels of exposure. Though there are some arguments against this non-threshold hypothesis, it is generally accepted in the absence of firm data to disprove it. According to this hypothesis, however small the radiation dose is and whether it is incurred in one shot or extended over a period, the effect, or more precisely the probability of its occurrence, is proportional to the cumulative dose. Further more, irrespective of the number of persons exposed in the population and their levels of exposure, the probability of the manifestation of these effects in the population is proportional to the sum total of all the individual exposures called Collective dose and expressed in person-sieverts.

It must be mentioned here that the mutations are nothing new nor specific to ionising radiations; they are also introduced by other agents such as some chemicals and viruses, excessive heat, living habits etc. The mutagenic phenomenon has always existed in nature and it is a part of our evolutionary system. As a matter of fact, the frequency of natural mutations is about a million



times more compared to the number introduced by the radiations at the levels we are interested in.

The biological information system has been built with sufficient amount of redundancy which provides a degree of resilience to the system. Besides, cancer is a multifactorial disease which needs more than one initiator. Hence, it is not that every mutation ends up as a malignancy or genetic abnormality; infact it rarely happens. It is in this context that these effects are called stochastic and dealt with in terms of probabilities. For quantitative assessment, the biological detriment of these effects is expressed in Risk-Co-efficients. Simply put, the risk co-efficient is the frequency of undesirable events introduced in the population due to unit collective dose (There are several variants of this definition, each one with its own advantage, but we may not go into those details).

Understandably, there has been an enormous scientific effort, in terms of laboratory experiments on animals, in-vitro studies on mammalian cells and epidemiological studies, towards determining the risk co-efficients. While the laboratory studies have significantly contributed towards our understanding of the radiobiological basis for risk determination, the risk co-efficients themselves have been obtained from epidemiological studies. The data base currently available from such studies falls under two categories: High Dose Rate exposures (HDR) and the Low Dose or Low Dose Rate Exposures (LD/LDR). The HDR data base consist of about three hundred thousand person-years (PY) of Life Span Studies (LSS) of the Atomic Bomb Survivors in Hiroshima and Nagasaki, and more than million PY each from the radiation treatment and diagnostic examinations. Of them, the Life Span Studies is the most thoroughly planned one. Essentially based on the data from this study, the risk co-efficient for cancer fatality is estimated to be about  $5 \times 10^{-2}$  per Sievert. To put this in proper perspective, if one million persons are exposed to 10 mSv each and followed for their entire life, the number of excess cancer deaths attributable to radiation exposure should be about 500. Since the spontaneous cancer mortality observed in different societies of the world varies from 5 to 20%, in the same million population the cancer deaths, which have nothing to do with radiation, will be in the range of 50000 to 200000.

For the genetic effects, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has arrived at the risk co-efficient of about  $1 \times 10^{-2}$  per Sievert. Again to

use the above example, the genetic abnormalities in the reference population attributable to radiation exposure would be about 100. Since the natural incidence of genetic abnormalities is about 10%, the above 100 has to be observed against a background of about 100000 natural incidence.

It must be mentioned here that none of the epidemiological studies conducted so far, including the life span studies of Atomic bomb survivors, have shown any evidence of genetic effects.

#### Low Level Exposure

It has been well established that for the types of ionising radiation with which we are interested (i.e. gamma - rays) the biological risk has a strong dose and dose rate dependence. Firstly, the dose response curve has been observed to be non-linear. This means that the effects at low doses estimated by the backward interpolation of high exposure data tend to be over estimates. Second and more important, for the same total dose, the low dose rate exposure results in a significantly lower determine. Based on extensive experimental and epidemiological studies, the Dose and Dose Rate Effectiveness Factor (DDREF) has been observed to be in the range of 2-13. It may be mentioned here that the basis for the risk co-efficients mentioned in the earlier section is the life span studies of Atomic bomb Survivors which is essentially a high dose rate category. Of course, to extend the application of this data to low level exposures a DDREF of 2 has been adopted in the risk co-efficients. However the actual DDREF applicable to low dose rates could be significantly different resulting in much lower risk co-efficients as observed in the low dose and low dose rate (LDR) epidemiological data.

The presently available LDR data consists of about 2 million PY of environmental exposure in High Background Radiation Areas (HBRA). This data base does not provide a clear support for the presently adopted risk co-efficients. It is even consistent with a 'Non-Risk' model. Amongst the LDR database, epidemiological investigation in China happens to be the largest which has about a million PY of observation for people living in HBRA with a mean radiation dose of 5.4 mSv/year and a similar number for people living in control areas with a mean dose 2 mSv/year. The study shows no increase in cancer mortality in the HBRA population. As a matter of fact, the frequency of observed cancers in the HBRA population was marginally less compared to that of control population (However, this by itself is not significant enough to support firmly any negative correlation of cancer with

radiation exposure). Large size LDR epidemiological studies have also been conducted in USA, Japan, France and Sweden. None of them have shown any significant association of cancer with low level exposures.

#### Conclusion :

Based on extensive laboratory studies and epidemiological surveys the risk co-efficients have been arrived at on a conservative basis. They have been derived from high exposure data. Quite small as they are, there are strong reasons to believe that for low level exposures they are over estimates and can be considered only as upper limits. How small they are or whether they exist at all at low level exposures are the issues of interest at present.

*(Dr. D.V. Gopinath, is former Director, Health, Safety and Environment Group, BARC, Trombay)*

### WORKSHOP ON THE ENVIRONMENTAL LAW REGIME AND ITS MANAGEMENT - A BRIEF

Under the joint sponsorship of the National Law School of India University, Bangalore and the British Council Division of the British High Commission, an Indo-British Workshop was organized on the theme 'Management of the Environmental Law Regime' during April 7-9, 1994 at NIAS. Shri Rangarajan Kumaramangalam, MP, inaugurated the session and Dr. Raja Ramanna presided over the inaugural session.

With the participation of selected specialists from the legal profession, academic institutions, central and state government bodies and the public, the objective of this workshop was to analyze the strengths and weaknesses in the existing environmental laws, national and international legal instruments and to compare the experiences in different countries. The workshop was also expected to provide the guidelines to formulate appropriate curricula for courses in environmental law, and for the training of legal personnel.

Prof. MacRory (Imperial College of Science Technology and Medicine, London) and Dr. Duncan (Chief Inspectorate of Pollution, London) provided valuable information on the British experience in the implementation of Environmental laws and the regulatory practices. Prof. MacRory observed that the S & T community is generally naive, and requires to be trained in the ways of the world, and in particular about legal and political systems.

In the course of the workshop, the important role to be played by the NGOs in the environmental conservation programs was emphasized.

Prof. Madhava Menon (Director, National Law School of India University, Bangalore) stated that environmental law education has to be an ongoing program, responding to the problems faced by the community, and providing the strategies for redressal through the instrument of law. It is necessary to provide para-legal training, possibly through distance education, to social activists and also the inspectors.

Above all, there is a need to involve the people in the development mechanism. Specialists in varied fields such as scientists, technologists, lawyers, judges and activists should imbibe the right societal concerns in discharging their professional responsibilities.

### DST PROJECT ON THE FORMULATION OF CRITERIA FOR EFFECTIVE R&D FUNDING - A REPORT

The first seminar for the DST project on 'Formulation of Criteria for effective R & D Funding' was held at NIAS on 12-13 April '94. The participants were Dr. Raja Ramanna, Dr. P.K. Iyengar, Shri K. Balaramamoorthy, Dr. R. Kumar, Prof. C.V. Sundaram and Prof. B.V. Sreekantan and invited scientists from different Science and Technology institutions in the country.

The main focus of this project is to clearly define criteria for identifying good programs and competent scientist teams to ensure effective funding of such programs. The participants, drawing from their training and experience in basic and applied sciences, engineering, R & D and experience in industry, provided parameters (or criteria) for DST funding.

Dr. Aiyagari (DST) suggested that the scope of the present project should extend beyond the DST to other agencies like DBT, ICAR and ICMR. He pointed out that DST supports, apart from basic and applied research, societal programs, scientific surveys, meteorological services, autonomous institutions etc. While presenting the objectives of the DST, Dr. Aiyagari said that in the coming years, DST will

- i. vigorously support priority areas in scientific research,
- ii. intensify development programs of urgent societal relevance, and
- iii. develop technology, utilizing the resources from the cess on imported technology.

Prof. Mukunda (IISc) emphasized that basic research should be encouraged and funded. He expressed his firm conviction that it is basic research that provides the essential background knowledge for developing applied research, and it is again the opportunity for doing research that attracts and inspires talented young students to take to a career in science.

Prof. Mukunda felt that DST should play an active role in the promotion, co-ordination and intensification of research in high priority areas and in spotting and encouragement of young scientists of promise. He also suggested flexible time frames for project completion.

Mr. M.K. Sridhar (Formerly of BHEL) suggested a set of objective criteria for project selection. In his opinion, for R&D to succeed, there should be a clear mission right upto end user acceptance, and the approach should be user/market oriented right from the inception of the program. The collective effort should be distributed among various organizations (with the required experience) to achieve results in the specified time frame. There will be a need to demonstrate a prototype prior to market acceptance. Finally the marketing of R & D should be aggressive.

It is planned to organize more seminars and discussions of this kind involving other funding agencies.

## GUEST SPEAKERS

1. DR. RAJ REDDY, Dean, School of Computer Science, Carnegie Mellon University, Pittsburgh, USA and Herbert A Simon University Professor of Computer Science gave a very interesting and stimulating talk on "FUTURE OF INFORMATION TECHNOLOGY - SKY IS THE LIMIT" at NIAS on 28 April 1994. Dr. Reddy is a brilliant academic whose varied Research interests comprise study of artificial intelligence, multi-media presentation technology, speech recognition and understanding systems, the world language bank project and the automated machine shops project. He is recipient of the Legion of Honour from President Mitterand of France.

According to Dr. Reddy, the current trend is that Information Technology is expanding at an exponential rate, doubling in performance every fifteen months. The result is that even those who are right in the middle of this revolution are simply not in a position to keep pace with it. Future

computers, say twelve years hence, will be more powerful than the supercomputer, with 200 million operations per second and with more memory and more disc capacity than that of systems now existing.

The current guess is that the next major revolution will be not so much from computer or information technology as from knowledge industry. Basically, if one has access to knowledge or any information that one can figure out how to use and one has an agent to help you to think thousand times faster than one can now think, then it would be possible to create inventions and discoveries at a rate we cannot now comprehend. The people who are able to master this technology and use it in their own individual field will be far ahead of the rest of the people of the world. The physical manifestation of this new activity is what is known in the US as Information Super-Highway and in this inter-state highway system that is built, you can proceed at high speed without any traffic obstructions. This has transformed the way of commerce and of products in US and Europe. According to Dr. Reddy, though we do not have such an infrastructure in India as yet, the Information Super-Highway is an area where we need not be second to anybody.

In brief, other important points highlighted by Dr. Reddy as spin offs of this technological development are:-

(a) VIDEO-CONFERENCING: The concept of video-conferencing already exists in a limited way in the USA. In fact it has already been tried out between two departments of the Carnegie Mellon University. In this Conference, a group of people in a country say in the USA can have conference with another group of people at NIAS in India as if the two groups are functioning side by side. Yet a third party could join from any other country if these two groups welcome their intrusion without loss of security. Dr. Reddy felt that the technology is there and is being updated to achieve inter-continental interface. What is required is the building up of infrastructure at our end and it is possible for India to do so without going through the evolutionary process but by leap-frogging. He felt Pittsburgh and NIAS could take the lead in this regard.

(b) One major source of new knowledge and information likely to be available is the digital Library of Congress. The Library of Congress is currently available if one can travel to Washington and visit the library. In ten years, it seems in USA



ninety percent of the library capability will be available to every high school and college student on their desks. It has been estimated that to digitise all the old manuscripts would cost about 10 billion dollars (Rs. 30,000 Crores). It is likely to become more of an international project. But once it is available in USA, it will be available to everybody. Similar exercise of digitising important manuscripts in India can also be undertaken initially on a selective basis. Once this knowledge is used inter-continently, it will be economically viable.

(c) The next biggest problem that we face is how do we obtain what we need to know. Probably there is going to be creation of intelligent librarians, not physical human beings, but systems assisted by human beings, where the librarian does ten percent of the job, and the other ninety percent gets done electronically. The idea could be that one would state his problem in a non-formal way and it will be the job of the intelligent librarian to locate and transmit the information in a couple of seconds from any corner of the world where the infrastructure has been built, for a reasonable price, viz say rental cost of a video cassette.

Dr. Reddy is confident of the realisation of the scenario drawn by him and he feels that it will be possible to achieve results, as initially the entertainment industry will drive the technology, and later, others will benefit.

2. A talk on "LOW LEVEL IONISING RADIATION AND ITS EFFECTS ON HEALTH" was given by DR. D.V. GOPINATH, former Director of Health, Safety and Environment Group - BARC, Trombay on May 12, 1994. The article on the theme of his talk appears in this issue.

3. DR. S. GANESAN, Reactor Physicist, Nuclear Data Services Group of the International Atomic Energy Agency, Vienna, Austria gave a talk on "NUCLEAR ENERGY - THE PRESENT WORLD PERSPECTIVE" on June 16, 1994.

He gave an assessment of the likely contribution of Nuclear fission power to world electricity generation in the next decades. He also referred to the on going collaboration between the US, Russia, Europe and Japan on the design of a large (1000 MWe) Thermo-nuclear fusion reactor, at a shared cost of one billion dollars over five years. A decision to build such a reactor will be taken possibly in 1997, and the estimated cost for the reactor is thirteen billion dollars.

## LECTURES/PUBLICATIONS/ADDRESSES/ PRESENTATIONS/SYMPOSIUMS BY FACULTY MEMBERS

(JANUARY 01 1994 TO JUNE 30 1994)

DR. RAJA RAMANNA, DIRECTOR

### ADDRESSES/LECTURES:

1. Addressed the Fellows of the Indian National Science Academy at the Inaugural Function of the Diamond Jubilee Celebrations of INSA, New Delhi, January 7, 1994.
2. Attended Indo-US Joint Meeting on "Technology Transfer and Non-Proliferation" at National Institute of Advanced Studies, Bangalore, January 17-19, 1994 as leader of the Indian team.
3. Lecture on "Philosophy and Science" to the participants of the 8th NIAS Course on "An Integrated Approach to Knowledge and Information", Bangalore, January 28, 1994.
4. Address "On the elimination of Nuclear Weapons" to the Saturday Group of the India International Centre, New Delhi, February 19, 1994.
5. Participated in the Workshop on "Possible Interlinked South Asian and Worldwide Nuclear Arms Control and Disarmament Initiatives" at Fudan University, Shanghai, China, February 24-26, 1994.
6. Participated in the Seminar on "Gandhi and the Present Global Crisis" organised by the Indian Institute of Advanced Study, Shimla at New Delhi, March 22, 1994.
7. Inaugurated the National Seminar on "Inference Mechanisms in Sastras and Computer Science" organised by the Academy of Sanskrit Research, Melkote at Mysore, April 9, 1994 and gave a lecture on elementary particles.
8. Delivered the Corporation Bank Endowment Lecture on "Elements of Technology Culture" at the Karnataka Regional Engineering College, Surathkal, April 16, 1994.
9. Lecture on "The Structure of Music in Raga and Western Systems" at Shimoga, April 17, 1994.
10. Delivered talk in the Special Colloquium on "Masses and Lifetimes of Elementary

Particles" at Bhabha Atomic Research Centre to mark the 20th year of Pokhran Explosion, Bombay, April 18, 1994.

11. Presided over as the Chief Guest at the function to felicitate winners of the National Olympiad convened by the National Board for Higher Mathematics, Bombay, at the Indian Institute of Science, Bangalore, June 3, 1994.
12. Visited and delivered a talk at M.V.J. College on "Elementary Particles", Whitefield, Bangalore, June 8, 1994.
13. Gave a talk in the session "Influence of the West on Music of the East" at "The 3rd East West Music and Dance Encounter" organised by the Bangalore School of Music, Bangalore, January 31, 1994.

#### UNDER-PUBLICATION:

1. Paper "On the Masses and Lifetime Elementary Particles".

#### PROF. R.L. KAPUR, DEPUTY DIRECTOR

##### LECTURES/WORKSHOPS/SEMINARS/ SYMPOSIA

1. Delivered D.L.N. Murthy Rao Oration at the 46th Annual National Conference of the Indian Psychiatric Society, Madras, on January 6, 1994. A paper on "Violence in India: A Psychological Perspective" was presented at the meeting.
2. Visited McMaster University to attend a workshop to study the effect of violence in children's health in War Zones. There is an international research programme to study Post Traumatic Stress Disorder (P.T.S.D.) amongst children. Dr. Kapur went as an expert to help in designing a suitable research protocol in Bosnia-Herzegovina, occupied Palestine Territory and Sri Lanka. During this visit he also went to other academic centres to present the National Institute of Advanced Studies work on "Violence amongst Indian Youth".
3. Made a grand round presentation on "Violence in India" at Toronto General Hospital on 18th February, 1994. Also conducted a seminar on "Cross-Cultural Psychiatry" at the Toronto General Hospital on the same day.
4. Participated in a Workshop entitled "Narrativity and Medicine" on February 25,

1994 and delivered a lecture on "Violence in India" at Harvard University, U.S.A.

5. Delivered a lecture on "Psychological Perspective of Violence" on March 1, 1994 at Carnegie Mellon University, U.S.A.
6. Participated in the National Symposium of Training in Psychotherapy from 6th to 8th April, 1994 organised by National Institute of Mental Health and Neuro Sciences and gave a talk on "Explorations into the Personal Frontiers of the Therapist".
7. Participated in a one-day symposium on "Long Term Care of Chronic Schizophrenia" organised by Indian Psychiatric Society, Sub-Speciality Section - Rehabilitation Psychiatry, Bangalore on 29th May, 1994 and gave a talk on "Long-term care of patients with chronic schizophrenia".

#### PUBLICATION

1. Paper on "Violence in India: A Psychological Perspective" accepted for publication in the Indian Journal of Psychiatry.

#### PROF. C.V. SUNDARAM, HOMI BHABHA VISITING PROFESSOR

##### LECTURES:

1. Two lectures on 'Materials and Society', at the Eighth NIAS Course on "An Integrated Approach to Knowledge and Information" February 2-3, 1994.
2. Commemoration Address at the Golden Jubilee Reunion, P.S. High School, Mylapore, Madras, March 6, 1994.
3. Participation as Discussant in the Indo-British Workshop on 'Management of the Environmental Law Regime', NIAS. April 7-9, 1994.
4. Participation in the NIAS Seminar on 'Formulation of Criteria for Effective R & D Funding', April 12-13, 1994.

#### PUBLICATIONS

1. 'Wisdom in Sanskrit Literature', in the publication of the Samskrita Sanga, Indian Institute of Science, Bangalore.
2. Book Review on 'Advances in Materials and their Applications', Current Science, Vol 66, No. 11, June 10, 1994.

3. Rare Metal Metallurgy - Reminiscences and Reflections on Indian Experience", Invited article submitted for publication in Current Science.

**PROF. M.N. SRINIVAS, J.R.D. TATA**  
VISITING PROFESSOR

**LECTURES/SEMINARS ETC:**

1. Presented a paper at a Seminar on "The implications of the entry of foreign media into India", organised by Madhyam at Ashirvad, Bangalore, 27th January, 1994.
2. Addressed the valedictory session of a Training Course in quantitative economics for college teachers in South India, organised by the Quantitative Economics Unit, Institute for Social and Economic Change, Bangalore, 31st January, 1994.
3. a) Participated in a two-day "National Workshop in Sericulture", organised by the Beneficiary Assessment Project (on Sericulture development in India), ISEC, Bangalore, February 14-15, 1994.  
b) Chaired the Steering Committee of the Beneficiary Assessment Project, at ISEC on 16th February, 1994.
4. Delivered two lectures on "Ethnic, Linguistic, Religious and Cultural Diversity in India" to students of the University of Puget Sound, Washington, USA, on 21st February 1994, at CFTRI, Mysore.
5. Presented a paper on "Notes for an Indo-German Dialogue" at the three-day seminar organised by Max Mueller Bhavan, Delhi, on "Towards an Agenda of Cultural Exchange", at Lonavla, 21st - 24th March, 1994.
6. Delivered the Inaugural address (in Kannada) at a three-day seminar on "Bhakti Path and Social Work" at the Sarpabhusana Matha in Bangalore, 9th April, 1994.

**PUBLICATIONS:**

**BOOK:** Revised and enlarged edition of *The Dominant Caste in Rampura and other Essays*, Oxford University Press, New Delhi, April 1994.

**ARTICLE:** "Tamil Nadu Past and Present", "The Times of India", 19th March, 1994.

**PROF. B.V. SREEKANTAN,**  
**DR. S. RADHAKRISHNAN**  
VISITING PROFESSOR

**PUBLICATIONS:**

1. Search for Neutrino Oscillations using KGF data (with H.R. Adarkar et al)  
Contributed papers 23rd ICRC (1993) Vol. 4, p. 487.
2. Search for UHE Gamma Rays From Celestial Sources (with B.S. Acharya et al).  
Contributed papers 23rd ICRC (1993) Vol 1, p.397.
3. Search for UHE Gamma Rays from crab, with the KGF EAS Array (with B.S. Acharya et al)  
Contributed papers 23rd ICRC (1993) Vol. 1, p.283.
4. Search for UHE Gamma Rays from PSR 1957+20 with KGF EAS Array (with B.S. Acharya et al).  
Contributed papers 23rd ICRC (1993) Vol. 1. p.400.
5. Episodic Emission of the UHE radiation from Geminga (with S.K. Gupta et al).  
Contributed papers, 23rd ICRC (1993) Vol.1 p. 316..
6. Episodic Emission from Binary Sources at  $\sim 10^{14}$  ev (with S.K. Gupta et al)  
Contributed papers, 23rd ICRC (1993) Vol 4 p.487
7. Composition of Primary Cosmic Rays at Energy of  $10^{14}$  ev (with S.C. Tonwar et al).  
Contributed papers 23rd ICRC (1993) Vol.2 p.64

**DR. BISWAJIT SEN**

**LECTURES**

1. Continuing Medical Education (CME) programme of the 46th Annual Conference of the Indian Psychiatric Society in Madras on "Management of psychiatric disorders in the community" in January, 1994.
2. A series of three lectures to teachers of engineering colleges in CEDT, a Department of the Indian Institute of Science, on "Psychology of Indian Youth" in March, 1994.
3. National Law School of India University on "Biological basis of a sense of Justice" in April, 1994.



4. A series of five lectures at Bharat Electronics Ltd. (BEL) on "Psychobiological basis of Power, Justice and Personal Growth" in May, 1994.
5. A workshop organised by CEDT of Indian Institute of Science on "Psychology of Children and Youth" in June, 1994.

#### PUBLICATION:

1. Management of psychiatric disorders in the community" - accepted for publication in the Bulletin of Sciences.

#### MS. SUSMITA SUBRAMANYAM

1. Registered at the National Law School of India University to work on the Ph.D. topic "An Exploration Into Higher Psychological Potential" with Prof. R.L. Kapur as guide.
2. Conducted two workshops at the Bharat Electronics Ltd. (BEL) on Psychology and Growth.

#### NIAS LIBRARY

Besides developing a well-balanced collection of books, a particular theme of interest is chosen every year and relevant books in the area are added to the library collection. The focus in the current year has been on Art and Literature. General books on appreciation of Art and English translations of world classics now adorn our shelves. The library also aims at having an exclusive section for Mahatma Gandhi and his works. The library has included Economist and Computers Today to its list of journals.

#### INFRA-STRUCTURAL BUILD-UP

The construction of the Auditorium which is now a part of the JRD TATA MEMORIAL CENTRE is progressing as per schedule.

#### THE FOUNDER'S DAY

In a meeting of the Faculty Committee of NIAS, a decision has been taken to observe July 29, 1994 as the Founder's Day, which happens to be the birth day of late Mr. J.R.D. Tata, the first Chairman and the founder of our Institute.

#### WELCOMING THE NEW MEMBERS

We heartily welcome the following new members who have joined our fold:-

a) Dr. (Mrs.) Srikanta, a Doctorate in Physics joined us as Computer Consultant on May 1, 1994.

b) Dr. V. Suchitra Mouly, a Doctorate in Management of R&D Productivity, from the Indian Institute of Science, joined us as a Research Fellow on June 1, 1994.

We wish them a very satisfying and fruitful tenure in NIAS.

#### AN EMBLEM FOR NIAS



In the last meeting of the Council of Management, in keeping with the objective of the Institute, an Emblem of NIAS was approved. The Emblem is derived from one of the Vedic Altars.

#### ALTAR OF AGNICAYANA

One of the most elaborate of ceremonies in the Vedic rituals was called Agnicayana, the 'piling of Agni' or simply Agni, the origin of which is traced to 1000 BC. Agnicayana plays an important part in the Vedic literature after Rgveda, and especially in the Yajurveda.

Sulaba Sutra (600 BC) dealt extensively with the measurement and construction of Altars.

The measurements of the bricks of the altar of Agnicayana are calculated with reference to the height of Yajamana, the main ritual performer. Ten types of bricks, each of them consecrated, are stacked in five layers to form a particular design representing a bird. The first four layers consist of 200 bricks each and the top layer has 205 bricks (including 10 bricks of half thickness).

Satapatha Brahmana says, with regards to the Agnicayana, 'This fire altar is knowledge (vidya) and this fire altar is action (karma)'. The largest square within the altar is its atman, 'body' or 'self'.

The Agnicayana is a great work of art combining mathematics, aesthetics, philosophy and literature.