

# PROFILE OF THE INDIAN SCIENCE CONGRESS ASSOCIATION

The Indian Science Congress Association (ISCA) is a premier scientific organization of the country established in 1914. ISCA has been promoting science and inculcating the spirit of science through its multifarious activities. ISCA meets in the first week of January in an Annual Congress of scientists, science managers, policy makers and the general public to give a stronger impulse and a more systematic direction to the scientific inquiry, to promote the interaction of societies and individuals interested in science in different parts of the country and to obtain a more general attention to the objects of pure and applied sciences. ISCA brings together scientists both from India and abroad for mutual interaction in the cause of national development. Ever since 1914, an annual Congress of the Association has been held every year with a very distinguished scientist as its General President (Annexure-I).

The Association was formed with the following objectives :

- (i) To advance and promote the cause of Science in India;
- (ii) To hold an Annual Congress at a suitable place in India;
- (iii) To publish proceedings, journals, transactions, etc.;
- (iv) To popularise Science.

The first meeting of the Congress was held during January 15-17, 1914 at the premises of the Asiatic Society, Kolkata, with the Honourable Justice Sir Asutosh Mookerjee, the then Vice-Chancellor of the Calcutta University, as General President. One hundred and five scientists from different parts of India and abroad attended and papers numbering 35 were divided into six sections; Botany, Chemistry, Ethnography, Geology, Physics and Zoology under six Sectional Presidents. From the modest beginning Indian Science Congress Association (ISCA) has grown into a strong fraternity with nearly eighteen thousand members—who participate in fourteen different sections of the Congress. The number of papers communicated for presentation has risen to about one thousand.

The year 1976 witnessed a significant departure in the trend of deliberations during the Congress. It was being felt for sometime that such a gathering of scientists, covering a wide spectrum ought to be seized of national issues that have scientific and technological implications. In 1976, Dr. M. S. Swaminathan, the then General President of ISCA, introduced the concept of Focal Theme of national relevance which is now discussed in every congress, during the annual session. This apart, several plenary sessions are organised around various facets of the Focal Theme in which scientists and technologists as well as policy makers and administrators interact with one another. ISCA has thus become a platform where members from different disciplines and from different walks of life contribute to discussions on the Focal Theme.

Another significant breakthrough was made in 1980, when the Department of Science and Technology, Government of India, has set up a permanent Task Force involving representatives of ISCA and chiefs of different agencies and voluntary organizations Chaired by Secretary, DST, as being responsible for follow-up action on various recommendations on the Focal Theme. Every year follow-up actions on recommendations made in the previous Science Congress are discussed at a General Session organized by DST during the Science Congress. Through this process, the Indian Science Congress Association has been contributing to the development of Science in general and National Science Policy, in particular.

ISCA introduced the programme for the benefit of young scientists from the 68<sup>th</sup> Session of the Indian Science Congress in 1981. The Programme enables young scientists to present their proposed research work with opportunities to exchange ideas in the relevant scientific problems with their

counterparts and specialists. For excellent presentations, such scientists are given ISCA Young Scientist Award. The Young Scientist Award has been enhanced from Rs. 5,000/- to Rs. 25,000/-, starting with 93<sup>rd</sup> Indian Science Congress, to encourage talented young scientists.

It was decided generally most of the contributed papers, which are accepted on the basis of a careful screening to be done by the concerned Sectional Presidents with the help of some experts, will be presented by way of posters from 1998 Session. Further, to encourage scientists it was decided that at most two Prizes of Rs. 1,000/- in cash alongwith a certificate be awarded to the best presentation in each section from 1999 Session. This is now enhanced to Rs. 2000/- from 93<sup>rd</sup> Indian Science Congress in 2006. Oral presentations of some selected contributed papers are also included in the programme of each section.

The Indian Science Congress Association (ISCA) has instituted many Awards to honour and encourage scientists in India—mainly through special endowments received from individuals and groups and also from its own funds. The concept of Awards was started from 1965 onwards and as of date, there are almost more than 25 Awards that are given by ISCA.

The India Science Award was instituted by the Government of India, Ministry of Science and Technology, Department of Science and Technology which will be given every year during the inaugural ceremony of the annual Science Congress. The Award is envisaged to be the highest and most prestigious national recognition for outstanding contribution to Science. It will be given for a ‘big’ achievement and the benchmark will be “global”. It will cover all areas of research in science including engineering, medicine and agriculture. The award amount is Rs. 25 lakhs. The Award will be given to a scientist, without any age limit, for major contribution(s) of a path-breaking nature and based on work primarily done in India. It will not be given to groups or institutions. The first Award was given by Hon’ble Prime Minister on January 3, 2006 at the Inaugural Session of the 93<sup>rd</sup> Congress.

The programme of the annual session of the Indian Science Congress is generally planned in the following manner :

**PROGRAMME OF THE ANNUAL SESSION  
OF INDIAN SCIENCE CONGRESS**

<p><b>Inauguration by Prime Minister &amp; General President’s Address Plenaries on Focal Theme &amp; Panels</b></p> <p><b>Public/Special Lectures Group Meetings/Round Table Discussions Sectional Presidential Addresses</b></p> <p><b>Platinum Jubilee Lectures Endowment Lectures (General &amp; Sectional)</b></p>	<p><b>Invited Lectures &amp; Symposia (in Sections) Posters/Oral Presentations (free communications)</b></p> <p><b>Young Scientists’ Award Programme</b></p> <p><b>Formulation of Recommendations to be submitted to DST, GOI on the Focal Theme</b></p> <p><b>Participation of Foreign Science Academies/Individuals</b></p> <p><b>Scientific Exhibition</b></p> <p><b>Valedictory Session</b></p>
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# THE NINETYTHIRD INDIAN SCIENCE CONGRESS

## INAUGURATION

The 93<sup>rd</sup> Session of the Indian Science Congress was held at Hyderabad under the auspices of the Acharya N. G. Ranga Agricultural University from January 3 to 7, 2006. Hon'ble Prime Minister of India Dr. Manmohan Singh, inaugurated the Congress in the morning of January 3, 2006 and Dr. I. V. Subba Rao, formerly Vice-Chancellor, Acharya N. G. Ranga Agricultural University, Hyderabad and General President, The Indian Science Congress Association presided over the function. About 4000 delegates from India and abroad attended the Congress.

The inaugural ceremony was started with invocation and presentation of Bouquets. **Dr. S. Raghu Vardhan Reddy, Vice-Chancellor, Acharya N. G. Ranga Agricultural University and Chairman, Organising Committee, 93<sup>rd</sup> Indian Science Congress** delivered the Welcome Address. Dr. Reddy extended his warm welcome to Hon'ble Prime Minister of India, Dr. Manmohan Singh, His Excellency Governor of Andhra Pradesh, Sri Sushil Kumar Shinde, Hon'ble Chief Minister of Andhra Pradesh, Dr. Y. S. Rajasekhara Reddy, Hon'ble Union Minister of State for Science & Technology, Sri Kapil Sibal, Hon'ble Minister for Agriculture, Horticulture and Civil Supplies, Sri N. Raghuveera Reddy, Hon'ble Minister for Mines & Geology, Smt. Sabitha Indra Reddy, Hon'ble Members of Parliament and State Legislative Assembly, Chief Secretary, Principal Secretaries and Secretaries, Members of Board of Management, Commissioners and Directors of State Development Departments, Officials from all the Line Departments, distinguished invitees and Nobel Laureates, Prof. Amartya Sen and Prof. Richard R. Ernst, ISCA Awardees, World Food Prize Winners, Scientists/ Teachers and Students of Academic Institutions and Universities of science across the country, to this historic function. Dr. Reddy also said "Acharya N. G. Ranga Agricultural University, which was established in the year 1964 as Andhra Pradesh Agricultural University, has a history of four decades in serving the interests of farmers of the state of A. P. The lone Agricultural University in this fourth largest, agriculturally most important state is vested with the major responsibility of supporting agricultural development of the state through education, research and extension support. The growth and development of the University over the years has been phenomenal. The multi-faculty and multi-campus University has 13 Colleges (6 in Agriculture, 1 in Agricultural Engineering, 3 in Veterinary Science, 1 in Fisheries, 1 in Home Science and 1 in Food Science & Technology), 17 Polytechnics (8 in Agriculture, 2 in Horticulture, 6 in Animal Husbandry and 1 in Poultry), 66 Research Stations including 7 Regional Agricultural Research Stations, 22 District Agro-Advisory and Transfer of Technology Centres (DAATTCs), 12 Krishi Vigyan Kendras, EEI, AI&CC, ATIC, Electronic Wing (1 each) and a host of other centres across the state with around 5800 scientific, supporting and administrative staff, apart from a good contingent of work force".

**Shri Sushil Kumar Shinde, His Excellency Governor of Andhra Pradesh** addressed the Congress.

**Dr. Y. S. Rajasekhara Reddy, Hon'ble Chief Minister of Andhra Pradesh** while delivering his speech said "The 93<sup>rd</sup> Indian Science Congress stands out for two reasons. Firstly, it is taking place at a time when the Union government is laying emphasis on rural development as part of 'Bharat Nirman' complemented by R&D activity in science & technology. Secondly, the 24<sup>th</sup> Indian Science Congress, which was the first one to be held in Hyderabad in 1937, had for its theme 'The village : Its past, present and future'. In a way, the wheel has turned full circle as the present congress being held in Hyderabad coincidentally has for its theme again 'Science and Technology as the tools of Integrated Rural Development'. Interestingly, 70 years after the Indian Science Congress discussed development of villages, we again have village development under our scanner." Dr. Reddy expresses his grievance "In spite of the strides made in rural development, largely through the Green Revolution, 26 per cent of the country's population is still below the

poverty line. The very fact that 72 per cent of the population lives in rural areas makes us introspect whether the “progress” made in science and technology has made significant difference to life in rural areas, compared with urban areas. No doubt, our food production has gone up. We in fact have surplus today. Yet, the quality of life in rural areas has not improved in relation to that of urban areas.” Dr. Reddy said “In the last one and a half years, our government took a number of measures such as free power to poor farmers, moratorium on repayment of loans, waiver of registration charges on new loans, supply of quality inputs and so on in order to create a sense of confidence among farmers.” Dr. Reddy also indicated “As most of our farmer are accustomed to cultivating paddy, and since conservation of water in reservoirs is inevitable, we have to encourage farmers to optimize their use of water through cultivation of appropriate paddy varieties that consume relatively less water such as ‘System of Rice Intensification,’ known in common parlance as ‘SRI’. Besides, we undertook ‘Jala Yagnam’ a mission, to bring 65 lakh additional acres of parched land in backward areas under irrigation by completing 31 irrigation projects, both new and ongoing. We believe, this will help completely transform the rural economy of Andhra Pradesh. As globalization will have little meaning without empowering rural folk, we have introduced ‘RAJIV’ i.e. Rajiv Internet Village with a wide network of kiosks in all districts. Now, farmer in our State can access the global market and update himself on the techniques of growing in line with global standards. As part of our efforts to improve rural economy and to meet the emerging needs of the transport sector, we have taken up plantation of 50 lakh bio-diesel plants that will start yielding in three years. We have just embarked upon a new programme called ‘Integrated Novel Development in Rural Areas and Model Municipal Areas’. Under this programme, all the undeveloped wards in rural as well as urban areas will be identified and developed in three annual phases. Effective functioning of the handloom sector is central to the health of our rural economy. Therefore, our government provides a package for supporting weavers. Another focus area of our government is protection of environment. You might have heard that the 900 Sq. Km. Kolleru fresh water lake in our State has shrunk to a narrow and serpentine channel because of encroachments by people involved in aqua culture. This is a major causative factor for floods in all surrounding agricultural fields in the last monsoon. Now, we have taken up a massive programme to restore the lake to its normal shape and size. In China, Poyang, a fresh water lake spread that had shrunk to 3900 Sq. Km., much like our Kolleru, was restored to its normal shape and size of 5,100 Sq. Km. in just five years. Here again, scientists and social activists have to play a key role in similarly creating awareness among rural public about the need for environmental protection in our country”.

**Shri N. Raghuvendra Reddy, Hon’ble Minister of Agriculture, Horticulture and Civil Supplies, Government of Andhra Pradesh** also addressed on this occasion.

**Shri Kapil Sibal, Hon’ble Union Minister of State for Science & Technology**, while delivering his address said :

“Dr. Manmohan Singh Ji, Hon’ble Prime Minister of India, His Excellency Shri Sushil Kumar Shinde, Governor of Andhra Pradesh, Dr. Y. S. Rajasekhara Reddy, Hon’ble Chief Minister of Andhra Pradesh, Dr. S. Raghu Vardhan Reddy, Vice-Chancellor, ANGRAU and Chairman, Organizing Committee, Prof. V. S. Ramamurthy, Secretary, DST, Prof. I. V. Subba Rao, General President, 93<sup>rd</sup> Indian Science Congress, Prof. C. N. R. Rao, recipient of the India Science Award, distinguished members of the scientific community, ladies and gentlemen,

1. I have had the signal honour of participating for the second time in the Science Congress this time held in the beautiful city of Hyderabad. Today is indeed a very special occasion. We not only celebrate the contributions of the scientific community in our nation’s onward march to modernity, it is also special in that the Hon’ble Prime Minister of India is conferring the first ever India Science Award to a truly great scientist son of India, Prof. C. N. R. Rao.

2. This Congress with its focal theme of Integrated Rural Development through Science & Technology also provides an opportunity for us to take stock of the challenges we face and provide a roadmap for the future. The Hon'ble Prime Minister articulated his vision of how Science and Technology must meet the challenges of the future when in his address as the President of C.S.I.R.Society on 26<sup>th</sup> July, 2005, stated "Our S&T system can play a decisive role only when it advances the well being of all sections of society, not just a privileged few. It must play the bigger role of creating wealth for all, not just a selected few. A theme that is close to my heart is on 'making technologies work for the poor and the underprivileged'. In other words, can we develop technologies, which will ameliorate poverty, create jobs, removed the disease burden of the poor, and improve the overall quality of life?"

It is not just a coincidence that at the Science Congress in January, 1947, at the dawn of independence, "Science in the Service of Nation" was the dominant theme. Our objective is clear. To be of service to the nation science and technology must ameliorate the life of the common man.

3. Thanks to Panditji and his enduring faith in science and technology and the subsequent political patronage that science and technology have enjoyed, from what was only 'small science' of very high quality at the time of Independence and near absence of modern technology, the nation has moved forward over the past six decades. We can today boast of a vast, diversified science and technology infrastructure covering a wide spectrum of disciplines.

4. In space science, India has the capability to design and launch its own satellites and the seven satellites for remote sensing, are the largest such constellation in the world. Our nuclear programme envisioned for peaceful purposes has developed in-house the entire range of technologies from prospecting for raw materials to the design, construction and operation of large reactors to generate electric power. And in defence research, we have the capability to design and build our own combat aircraft and state-of-art missiles. On the agricultural front, from a perennial importer of food grains, we have emerged as an exporter of food grains, with huge buffer stocks. In Ocean research, we have the distinct honour of being the first nation to be granted 'pioneer investor status' under the UN Convention of Law of Sea and have established two stations in the Antarctica. Our investments in biotechnology in the past three decades are beginning to bear fruit. We are today a major producer of vaccines in the world and in plant biotechnology, we have developed genetically modified cotton. The development of several GM food crops is on the anvil to catapult India towards an evergreen revolution. On the industrial front, the triumph of the Indian pharmaceutical industry is exemplary. The Indian pharmaceutical industry, because of its great strides in Science & Technology, produces 99% of the drugs India needs and exports 40% of its production in a highly competitive global scenario.

But there is another side to this successful story.

5. The models of development that we have propagated globally have given rise to a world of 'excluded' people and an environment of inequality. The income of 1% of the richest population of the world equals that of 75% of the poorest. The picture is no different in India. We live in an India where millions of children suffer from avoidable hunger, disease and pain. The extent of rural poverty is an outrage. And the outrage is not just that of avoidable deprivation; it is also that it coexists with those who are indifferent to the plight of the rural poor. The numbers are mind-boggling and we need to act with speed.

6. But who should act? It is often said that self-help is the best form of help. That the rural poor must help themselves. But often they cannot do so. The initiative in enabling and empowering them lies with us, the elite and the privileged who have much more power, knowledge and resources.

7. Democracy and freedom entail an egalitarian participation in production, access, absorption and social use of knowledge. Owing to different degrees of development in India, most rural areas

do not have enough capacity to participate in this process. And it is even more difficult when knowledge is used as an instrument of domination and not to “close the gap”. The owners of knowledge are in a minority and most of those ‘excluded’ and in majority live in the rural areas, excluded from the benefits of knowledge.

8. Rural development has traditionally been associated with agriculture. But over the years, there is a significant decrease in the contribution of agriculture to the national economy—from a high of around 55% of GDP at the time of Independence to around 20% at present. The relationship between rural communities and agriculture is in transition—from a situation where agriculture was the major driving force—to a new state where increasingly non-agricultural factors influence the nature of rural development. Integrated rural development thus reflects a new understanding of the development policy framework—that involves complex, multidimensional interaction of different actors, of which science and technology is one such element. What is needed is the formation of new and creative policies, strategies and models of participating through a national innovation system which strategically allows rural communities to be integrated into India’s onward march to prosperity.

9. In this scenario, the role of the Government is not merely to grant public funds and to formulate policies and implement them in a vertical manner, but more important to promote the participation of all actors for the coordinated construction of policies, planning, and their implementation. It is a much more active role that requires institutional strengths to promote, negotiate and monitor rural strategies and evaluate and manage results.

10. In the development and implementation of these strategies and for the execution of projects we find another obstacle to innovation : the inadequacy of our publicly funded R&D institutions and their low capacity to execute and implement policies and to respond to the requirements of rural concerns. Thus the need of the hour is for a paradigm shift in the models of public management of these institutions so as to respond to this demand in an effective and efficient manner.

11. Also, professional conditioning of our scientists and technologists tends to build biases of perception and skewed priorities. Such a mindset gives attention to whatever is urban, industrial, ‘high’ technology, capital-intensive, appropriate for temperate climates, and marketed and exported; to the neglect of what is rural, agricultural, ‘low’ technology, labour-intensive, appropriate for tropical climates, retained by the household and locally consumed. The national and international system of knowledge and prestige, with their rewards and incentives, draws professionals away from rural areas and up through the hierarchy of urban and international centers, is all pervasive.

12. A syndrome reflective of our bias is the allocation of resources to research and development. It is, in some sense, a measure of the importance the system accords to the field. Overwhelmingly, research and development expenditure is concentrated on industrial and strategic activities. Over 50 percent of the Central Government R&D budget directly and indirectly is earmarked for strategic sectors. A small incremental diversion of these national R&D resources to mitigate the misery of millions of rural people would be of great benefit to the nation.

13. Another feature that is affecting our rural brethren is globalization. It is an effort of big economic powers to eliminate national barriers to impose themselves and to expand freely with their interests. The new global paradigms respond to the hegemonic interests of the big transnationals in their quest to control world markets. As a result of WTO, Indian farmers are unable to get remunerative prices on exports of their agricultural produce and products on account of depressed global prices. The near self-sufficiency achieved by us in oilseeds production on account of the efforts of the Technology Mission was upset by dependence on cheap vegetable oil imports. Between 1996-97 and 2003-04 agriculture imports into India have increased by a whopping 375% in volume and 300% in value terms. It is important to note that the value of imports as proportion to agricultural

GDP has also increased from less than 3% to 4.34% during the same period. But we are doing our best to get a fair deal for our farmers, as reflected by the just concluded WTO Ministerial Conference at Hong Kong. India's leadership role at the Conference helped secure mechanisms to ensure 'food security' and protect our farmers from the vagaries of global agricultural markets.

14. Government is doing the best to safeguard the interests of the rural poor. It has many schemes and programmes to address and improve the conditions of our rural folk. We have already made inroads to empower our farmers. One such small step is the Farmers Call Center programme initiated in January 2004 by the Agriculture Ministry. It seeks to reach out to the farming population using a mix of basic telecom and information Technology. Young graduates from our agricultural universities have been drafted to man call centers located in 11 cities across the country, to provide information in 8 languages on crop-production, crop-protection, horticulture, animal-husbandry, agriculture and marketing to illiterate and semi-literate farmers calling up on a toll-free number from across the country. I must say our farmers have shown remarkable 'learning' to benefit by this programme.

15. Indian business also has been quick to 'reach out and empower' our people in the rural areas. We have HLL's I-Shakti Kiosks initially undertaken with Rajiv Gandhi Internet Village Programme of the AP Govt. These help create income generating capabilities and provide health information for underprivileged women in rural areas. The programme today extends to 20,000 villages in 11 states. We also have ITCs, e-chaupal, with the objective to empower our farmers, with agri and business information that today extends to 20,000 villages in six states with 4000 chaupals.

But much more needs to be done.

16. I would thus like to submit for your consideration and wider discussion the ways and means by which we can bring the benefits of science and technology to bear in greater measure for integrated rural development. I believe we could consider how to—

- encourage and enhance and demand for science and technology in and from the rural sector;
- strengthen the capacity of the productive and public sectors of rural society for absorption and use of knowledge, science and technology;
- organize networks of social and productive sectors of rural society with science and technology;
- motivate and excite scientists and technologists to address the problem of rural society;
- modify the priorities and programmes of publicly funded S&T institutions to address the problems of rural development; and
- enlarge the resource base for S&T that addresses the issues of rural society.

17. I cannot help, but hark'en back to the Indian Science Congress of January, 1947 when the best minds of the nation embraced politics for social good, I know why Dr. Manmohan Singh, a professional economist leads our nation today. Perhaps unwittingly he thinks the way Pandit Nehru thought and I quote "*Many of you are aware of what has been happening in India during the last quarter of a century and much more recently. A person like me who is not exactly a man of politics has to take an intimate part in political activity. I have often asked myself the question who this is so. Why should I go into politics? It is so because it is not possible to progress in any field, more particularly in the field of science, until you remove the vast number of letters which prevent people from functioning as they ought to*".

18. I would like to conclude by recalling the advice that Panditji gave to the scientists at the Science Congress of 1947,

"I hope that the Science Congress will devote itself to this task and not wait merely for the Government to take action. Governments may be good and may be bad, but governments normally are very slow and the only thing that moves them is some immediate public outcry which affects

their future indirectly. Therefore, I should discourage among the scientists a reliance always on what Government may or may not do”.

19. What we need is a partnership between Government, the scientific community, civil society and the entrepreneurs of India. A partnership that will serve India and in that process each Indian. India is young. More than half of our population, which exceeds the combined population of the USA and the European Union, is below the age of twenty-five. With the vast expansion of our educational system, over 10 million students are enrolled in universities. This has given rise to a burgeoning pool of highly qualified, skilled and talented young people. The challenge is to give to our young the freedom of choice, light their eyes with hope for the future and create for them an environment to realize their genius. I am sure that the deliberations during the course of this congress will go a long way in realizing their dreams.

20. For our part in our drive to serve the common man, we commit to do the following in the year 2006 :

i. To install a one million litre per day plant for conversion of sea water into drinking water off the coast of Tamil Nadu by mid 2006 and install another 10 million litre per day plant to help provide clean drinking water along the Indian coast by the end of this year. It is envisaged that the cost of drinking water obtained will be lower than that provided by any other technology in the world.

ii. To form an Earth Commission and Earth System Science Organization to integrate our efforts in our land, ocean and atmosphere programmes to help provide to our rural folk inputs of global quality on issues relating to climate environment, land use and ocean resources.

iii. To transform C.S.I.R. in a manner as to allow it greater autonomy for bolder initiatives for public-private partnerships and investing knowledge as equity. This transformation will be completed in 2006 and will make C.S.I.R. a nimble, accountable and performance oriented organization, serving the nation better.

iv. To put in place and give effect to a national biotechnology development strategy. This will allow us to create 50 centers of excellence, a national pool of 500 research positions in next five years, exclusively for life sciences and biotechnology and set-up institutions of animal biotechnology, sero-biotechnology and for transnational research for technology relating to public health.

v. To bring forth legislation, to make IPR Central in the functioning of our research establishments. It will assure inventors and organizations where research is carried out, a return for their innovative efforts.

vi. To setup an Autonomous Board of Science and Engineering Research with enhanced level of funding and create an initial pool of over 1000 scientific positions available for young researchers in India and abroad at different laboratories and universities for high quality scientific research.

vii. To establish regional clusters for developing linkages between Industry and Research. The first such international cluster will be set up in Chandigarh, with a focus on nano-biology within a national nano-technology institute.

**Dr. Manmohan Singh, Hon'ble Prime Minister of India, released the publications brought out on this occasion.**

The Government of India conferred the first India Science Award (2004) Rs. 25 lakhs to Prof. C. N. R. Rao, Linus Pauling Research Professor and Honorary President of the Jawaharlal Nehru Centre for Advanced Scientific Research and Honorary Professor of the Indian Institute of Science, Bangalore. The Citation was read by Prof. V. S. Ramamurthy, Secretary, DST and the award was presented by Dr. Manmohan Singh, Hon'ble Prime Minister of India to Prof. C. N. R. Rao.

## **Presidential Address by Dr. I. V. Subba Rao, General President**

Dr. I. V. Subba Rao, General President, ISCA in his Presidential Address, said

### **1. 'National Security' is linked to agriculture through 'food and nutrition security'.**

Besides the Green Revolution, the country has also witnessed White, Yellow and Blue Revolutions, but all these are not without the associated problems, which have emerged as potential threats to sustainable agriculture. These include, decline in soil fertility and factor productivity, plateauing of crop yields and reduced profit margins to the farmers, dwindling and degrading natural resources of soil, water, air and environment, water-logging and development of soil salinity in command areas, narrowing of genetic base and agriversity in crops, creation of inter and intra regional disparities, widening the gap between the rich and poor farmers and have and have nots and increasing migration of rural poor to urban areas. The other serious threats to sustainable agriculture are the unabated and burgeoning population growth, problems arising out of globalization and WTO regime, environmental degradation due to enhanced levels of CO<sub>2</sub> (green house effect) raising ambient temperatures and piercing the ozone layer.

### **2. Other Critical Issues for Inclusive Agriculture :**

The debt-ridden farmers' inability to access better healthcare, education, clothing and housing, not to speak of meeting the expenses on festivals, marriages, social customs, etc., had to be addressed with a sense of urgency and we have to seek out-of-the-box solutions.

Having said this, I would now like to focus attention on a few essential measures that would require an action agenda, which could be in the short term and long term:

- Establishment of Agriculture Technology and Rural Technology Parks after careful projectization in as many districts as the potential throws up.
- Establishment of Rural Universities in rural setup, one in each State for knowledge and skill empowerment of Rural People—I shall deal with this a little later.
- Strengthening of Agricultural Extension - both public and private to align with the above two interventions.
- Corporates, NRIs and other agencies to redirect their investments in infrastructure projects that would enhance enduring opportunities in agriculture and allied activities and those related to rural development.
- Allocation of market cess and Agriculture cess only for agricultural development.
- Institutional credit for agriculture to be stepped up substantially—in the near term to equal the share in GDP, extending the facility to tenant farmers also.
- Weather, crop and health insurance for farmers to be an integral package with appropriate linkages to credit to farm sector.
- Enhance public investments in Agriculture leading to higher capital formation in agriculture.
- Enhance the budgetary allocations for R&D, in agriculture, atleast to 2 per cent of agricultural GDP from the present level of less than 0.5 per cent as a 11<sup>th</sup> plan target.
- Harness information and communication technologies to the advantage of the farmers and agricultural market yards. Forthwith give the farmers identity cards/SMART cards that would address the issues of information asymmetry and adverse selection of the farmers and unremunerative and elongated payment mechanisms in the market yards.
- Priority for agro-processing, PHT and establishment of agro industries in rural areas and greater allocations for R&D in PHT, processing, value addition etc.
- Encouragement and promotion of agricultural exports duly adjusting the export-import duties in favour of Indian farmers.
- Providing subsidies to the farmers upto the WTO permissible limit of 10 per cent under the provisions of Aggregate Measure of Support (AMS).

- Since we cannot reverse the clock imposing quantitative restrictions in accordance with the agreed table under WTO, it is imperative that we have to fight for halting the manipulative green and blue boxes to prevail over the subsidy regime of the developed countries.
- Investment in irrigation, including micro-irrigation, to be stepped up substantially. Give priority to interlinking of river waters and desalinization of seawater which are the potential sources of water.
- Creation of “Risk Minimizing, Risk Mitigating, Compensatory Fund” to help the farmers in case of natural calamities and crop losses for reasons beyond their control.
- Public policies pertaining to agriculture to be farmer-friendly.

### **3. Rural Education: Knowledge and Skill Empowerment**

Swami Vivekananda said, “We want that education by which character is formed, strength of mind is increased, the intellect is expanded and by which one stands on his own feet”, and that is what I expect of our education today. Indeed, we want that education which is based on ethics, morals and values and that which can add real value to human resources by producing jobs and wealth creators and leaders in all fields and walks of life.

The country needs a large number of highly qualified meritorious bright sparks to work as teachers, conduct top class competitive research and man the scientific labs and Universities and develop new technologies through which the country can progress and develop. Yet, the dangerous trend in the past few decades is that, the number of inter or 10 + 2 class qualified students entering into the science stream of higher education showed a steep decline from about 35 to 19 per cent. This is still worse in the case of mathematics and basic sciences. We should, therefore, initiate steps to reverse this trend and attract more and more young, bright, highly talented, meritorious students to the science stream.

The village schools do not have buildings, equipment, laboratory facilities and much worse the qualified teachers. Those on rolls do not attend classes and teach students. Is it difficult to reverse these trends and improve school education? What is wanted is a political will to do so. The quality education is inaccessible and unaffordable to most Indians, what to speak of poor and those below the poverty line. Education has become expensive, 80 million children with no access to education, more than 60 per cent of students (from class 1 to 10) discontinue studies because of huge costs involved.

#### ***Knowledge and Skill Empowerment***

Science and Technology propel the growth and development of a country. If 20<sup>th</sup> Century was a Century of Science and Scientific Inventions, the 21<sup>st</sup> Century would be a Century of Technologies and Knowledge.

When we think of rural development as a propeller of growth and development of India, we should go for a different kind of education system. We require more of professionals, technocrats, technicians and grass root level workers, not the traditional graduates, post-graduates and Ph.Ds. Also, we want marketing and management specialists, experts in national and international trade, IPR etc. Women and Youth account for more than 50 per cent of the population. We should take up programmes to make them productive and stand on their own. They need knowledge and skill empowerment.

We need peripatetic teams of teachers, extension workers and scientists moving together to address this issue. The Rural University I envisage is not one of brick and mortar conferring diplomas and degrees. This University could be a virtual university where computerization ushered in new impulses of growth. It could also be a varsity powered with scientists and technologists with knowledge dissemination as their mission. I would commend to Government of India constituting

a “High Powered Rural Education Mission” with terms of reference leading to such thinking and approach. This would address the needs of country side, where a large number of artisans, craftsmen, mechanics, electricians, plumbers, local professionals, etc. would man the agrotech and rural technology parks. They need knowledge and skill empowerment and upgradation of old traditional skills. Rural crafts, services sectors, specific trades and enterprises, catering and hotel management, health and nutrition, sanitation, gardening, interior decoration, printing, dyeing, etc. are all the short term courses that would add value in the periphery on a sustainable basis. Farm women and rural youth need skill and enterprise oriented training and equipped with new gadgets and skills to reduce drudgery and improve work efficiency.

We have IT Parks, BT Parks, Pharma Parks and the latest Textile Parks. But we do not have Agricultural Technology Parks and Rural Technology Parks, where all the innovations that I mentioned a little while ago could reach rural India. Therefore, we should think of setting up of a large number of such parks, at least one in each State to start with and ultimately one in each district.

From the foregoing, it is clear that we should shift our focus from ‘Mass Education’ to more and more towards ‘Education for Masses’, which involves huge numbers. For this purpose, the advancements made in Information and Communication Technology (ICT) comes in handy to reach larger sections of people in a short time, and enable them to reap benefits of frontier sciences.

#### **4. A Healthy Rural India**

It may perhaps be an understatement when I say that Health is an important aspect determining the overall socio-economic development. Rural health and hygiene are vital to integrated rural development. However, health and sanitation, the basic amenities for humans are quite appalling in rural India, although health is one of the 29 subjects under Schedule 11 of the Panchayat Raj Act. Large areas and populations are still living in rural areas without even primary health care facilities. Preventive health care has taken a back seat, as the focus is largely in favour of curative aspects of health.

Rural health care system is in shambles. There are no good hospitals in the country side, even if there is one, there are no qualified doctors to look into the primary health care of the people. Needless to stress, for the Rural Health Care system to succeed; we need dedicated trained doctors, paramedical and nursing staff who are sensitive to the needs of the under privileged and vulnerable sections of the society.

Unhealthy and insanitary conditions prevailing in the villages are further compounding the health problems. The public health investment over the years is low at 0.9 per cent of GDP in 1999 compared to 1.3 per cent in 1990. As a result, India is placed in the bottom 20 per cent of the countries according to a World Bank Report.

Pure safe drinking water that acts as an insurance for good health, looks more like a mirage for rural India where the incidence of water-borne diseases is high. In many districts, particularly in drought prone areas, women have to walk a few kilometers to fetch a pot of drinking water.

In many districts, we come across severe flourosis, both in cattle and human beings, because of high flouride content in drinking water, mostly drawn from wells and bore wells. Arsenic in ground water has been reported from the states like Bihar, West Bengal, as also Bangladesh, reaching dangerous levels in drinking water. There should be a Mission Mode approach to ensure supply of pure safe drinking water by the time the country celebrates its Diamond Jubilee of Independence on August 15, 2007.

We should also encourage Ayurveda, Yoga, Unani, Siddha, and Homoeopathy systems (AYUSH) of medicine, for which the country is known, as complimentary to the Allopathic system.

Many of the health problems afflicting the poorer sections of the people can be tackled through proper and balanced nutrition. Fruits, vegetables, milk, meat, mutton, eggs, chicken, fish and cereal crops like *jowar*, *maize*, *bajra*, *ragi*, *korra*, *sama* and *variga* provide proteins, minerals and vitamins. It is time we make mid-day meal rich in minerals and vitamins supplementing with products made of cereals and less known and underutilized millets. Fruits of the season should invariably be supplied. This would also lead to prevention of the nearly 40 per cent wastage due to rotting of fruits produced in the country. These are less expensive but most effective measures that help us to contain and eliminate malnutrition and under-nutrition, quite prevalent among children, women and people below the poverty line and, hence, need serious attention of the governments. Supply of processed and packed milk and boiled eggs on alternate days to children as a part of the mid-day meals scheme also needs consideration of the governments. I venture to suggest that the millets be included in the Public Distribution System (PDS) and their cultivation encouraged as they also have export potential.

### **5. Employment for Livelihood**

Establishment of agro-industries in rural areas will create year long employment to rural work force. Bio-tech and processing and packaging industries are the upcoming potential areas for rural employment.

### **6. Agro-industries – Agro-processing and Value Addition**

Nucleus families, changing food habits and higher levels of consumption demand huge investments to create infrastructure, the state of the art PHT labs; certification centres, developing cutting edge technologies (or importing up-to date technologies) and to establish a network of agro-based industries to enable the country to fully exploit domestic and global markets. Value addition opportunities at the farm gate, therefore, demand greater attention so that the farmer would get better price in the bargain.

### **7. Marketing and Market Infrastructure for Wholesome Profits**

Modernization of market yards, rationalization and simplification of procedures, creation of modern infrastructure, better roads, transport, guest houses, godowns and storage facilities, refrigerated vans and access to reliable market information regarding demand-supply and market intelligence about prices across the national and international markets, quality parameters, sanitary and phytosanitary standards, interest free credit against farm produce stored in the market godowns would go a long way in reducing the marketing problems.

### **8. Rural Energy**

Rural energy issues impose severe strain on the economy. The biggest threat is the ever increasing import bill for fossil fuels. Energy is a vital infrastructure determining the growth of the economy.

India, as a tropical country is fortunate to have plenty of solar energy and wind power; but both the sources are under exploited. Therefore, efforts should be made to properly harness these alternate sources, besides streamlining the supply of electricity. We should also think of large scale bio energy plantations, as sources of energy for domestic, agricultural, industrial purposes and production of bio-fuels to substitute the costly fossil fuels like petrol and diesel, for which the country is facing severe shortage. There are number of plant species suitable for energy plantation, both seasonal and perennial, and certain crops like sugarcane, maize, castor, tapioca, etc. which are eminently suitable for this purpose, apart from the currently propagated *Jatropha*, *Pongamia*, *Mahua*, etc. *Simarouba* tree has great potential as a source of bio fuel. These plantations should be confined to waste lands, degraded lands, and ecologically disadvantaged areas and soils unfit for agricultural and horticultural crops.

## 9. Frontier Technologies and Rural Development

Several frontier technologies hold great promise to aid rural development to improve public health and sanitation, education and round-the-year employment, enhance agriculture productivity and food production, eradicate malaria and other infectious diseases and improve quality of life in the rural areas.

### *Nanotechnology*

Nanotechnology, is ubiquitous in its myriad and potential applications. It has been suggested that nanoparticles could benefit agriculture and rural development by using fertilizer made from buckyballs, using iron nanoparticles in soil cleanup and to aid germination using nanoscale chemical reactions in soil binders and using nanoscale vaccines for livestock improvement.

Rural livestock and fish will be affected by the nanotechnology revolution. Nanomedicine holds promise for disease detection and new pharmaceuticals for humans. Veterinary applications of nanotechnology will include accurate and rapid methods of disease detection, nanocapsule vaccines, sex selection in breeding farm animals, and provide increased employment created by the new practices for the rural populations.

Another nanotechnology application will be the production of a low cost, high-value, high strength fibre from a biodegradable and renewable waste product for air filtration, water filtration.

### *Biotechnology – The Future Hope*

Rural development will not be possible unless health and public sanitation in the rural environment are improved. Of great concern is the continuing prevalence of mortality due to malaria and other infectious diseases. Molecular technology has made it possible to develop DNA vaccines against major diseases like malaria. Extensive application of these technologies will help to transform the lives of the rural communities by substantially reducing mortality.

In the field of agriculture, biotechnology is being employed in the areas of :

- i. DNA marker aided selection breeding.
- ii. Genetically modified crops (transgenic crops) with desired trait through recombinant DNA technology.

Potential of frontier sciences and technologies can be harnessed to find solutions to some of the problems that defy solutions through conventional breeding approaches. Research towards development of edible vaccines, disease diagnostic kits, gene therapy and stem cell technology is likely to yield fruitful results in the near future.

Stringent evaluation of transgenics for bio-safety and human /animal health related risks through the 3-tier regulatory system now in place, should assure all those who have still reservation against GM crops.

Then, Dr. Manmohan Singh, Hon'ble Prime Minister of India presented the following ISCA Awards to the respective recipients :

<i>Asutosh Mookerjee Memorial Award</i>	: Dr. R. A. Mashelkar
<i>C. V. Raman Birth Centenary Award</i>	: Dr. S. Dattagupta
<i>Srinivasa Ramanujan Birth Centenary Award</i>	: Prof. V. Kannan
<i>Jawaharlal Nehru Birth Centenary Award</i>	: Dr. R. K. Pachauri
<i>M. N. Saha Birth Centenary Award</i>	: Prof. V. K. Gaur
<i>P. C. Mahalanobis Birth Centenary Award</i>	: Dr. Sankar K. Pal
<i>J. C. Bose Memorial Award</i>	: Prof. T. P. Singh

<i>P. C. Ray Memorial Award</i>	: Prof. D. K. Chattoraj
<i>H. J. Bhabha Memorial Award</i>	: Prof. P. K. Iyengar
<i>B. P. Pal Memorial Award</i>	: Dr. S. Nagarajan
<i>Jawaharlal Nehru Prize</i>	: Swadeshi Science Movement Represented by : Dr. Narendra Sharma
<i>Millennium Plaques of Honour</i>	: Prof. Anupam Varma Prof. R. Ramamurthi
<i>Excellence in Science and Technology Award</i>	: Dr. N. K. Ganguly
<i>Prof. R. C. Mehrotra Memorial Life Time Achievement Award</i>	: Prof. Asis Datta

Dr. Manmohan Singh, Hon'ble Prime Minister of India, also presented the following awards on this occasion :

<i>G. N. Ramchandran Award</i> (Instituted by CSIR)	: Prof. M. Vijayan (2004) Prof. P. Balaram (2005)*
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<i>93<sup>rd</sup> Indian Science Congress General President's Science Excellence Awards</i>	: Prof. Amartya Sen, N. L. Prof. Richard R. Ernst, N. L. Prof. M. S. Swaminathan Dr. R. S. Paroda Prof. S. S. Katiyar
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### **Summary of Inaugural Address by Hon'ble Prime Minister of India, Dr. Manmohan Singh**

After this, the Hon'ble Prime Minister of India, Dr. Manmohan Singh, delivered his Inaugural Address. He said :

“Shri Shindeji, Shri Rajashekhar Reddyji, Shri Kapil Sibal, Professor Subba Rao, Dr. Raghu Vardhan Reddy, Distinguished delegates, ladies and gentlemen,

I am delighted to be here in Hyderabad to inaugurate the 93<sup>rd</sup> Session of the Indian Science Congress. I would, at the very outset, like to pay homage to the memory of Professor M. C. Puri who was gunned down in the greatest temple of Indian science by the most reprehensible and cowardly enemies of our people. Dr. Puri was a soldier of knowledge. He lived a life of peace, dedicated to science and education. No civilized people can condone such an uncivilized act.

It is a symbol of the success of Indian science and technology, of our emergence as a knowledge power, that the symbols and temples of our knowledge society are today being targeted by terrorists. I am confident that all our knowledge workers will close ranks and join the struggle to make India a great nation, a humane and modern nation, a knowledge power. No force on the earth can weaken this resolve of the Indian people.

*Ladies and Gentlemen*

I am happy that you have chosen an agricultural university campus as the venue for this session since this year we mark the centenary of the setting up of modern agricultural colleges in the sub-continent. Our agricultural universities have played an important role in the agrarian transformation of India.

I am also happy that the focal theme for this session is the role of science and technology in the promotion of integrated rural development. I believe you are returning to this theme after almost three decades. It was in Andhra Pradesh, the rice bowl of India, that Indiraji addressed the Science

\*Unable to attend the inauguration.

Congress on this very subject, in 1976. It was a decade after our country had passed through the worst agricultural years since Independence. It was said in the mid-sixties that India was living a “ship-to-mouth” existence! By 1976, the Green Revolution had transformed many parts of the country.

Our scientists, our farmers, our community development staff and our extension workers, worked together to liberate the country from external dependence in food. The Indian Science Congress paid tribute to the work of scientists like Dr. Y. Nayudamma, a great son of Andhra, Dr. M. S. Swaminathan, who is here with us today, and many others who played a key role in taking the benefits of science to the farm. Dr. Nayudamma was among the first to urge scientists to step in and help in integrated rural development. He initiated the Karimnagar Project, here in Andhra Pradesh, that sought to bring together scientists, technologists, extension workers and community development staff. It will be interesting to see what lessons were learnt by that experiment, and how we can take forward that initiative.

Thirty years later, we can say that the Indian farmer has indeed benefited from the contribution of science and technology. However, in spite of the advances made, there still remains the challenge of bridging the development gap between urban and rural India; of increasing rural incomes; of increasing agricultural productivity; of increasing investment in agriculture and rural non-farm economy; of improving rural infrastructure and in the final analysis, forever ending the so-called divide between Bharat and India. The technologies and the strategies unleashed by the first Green Revolution have run their course. This requires, as I have said before, a Second Green Revolution, in non-food crops, in horticulture, in new plant varieties.

As I see our agricultural growth plateau, I realize that there is a need for a renewed thrust on research that can enhance farm productivity. We need greater emphasis on research that can increase the efficiency of utilization of inputs; that can improve farm management practices; that can reduce post harvest losses through better post-harvest management technologies in storage, transportation and processing; that can, in the final analysis, increase both yields and value addition at the farmer level leading to better incomes. This is extremely important if we have to ensure that our countrymen who depend on agriculture for sustenance are not left behind in this age of technology and knowledge.

India also needs increased application of science and modern technology to forest conservation and management, environmental protection water conservation and utilization of herbs and plants. We need a harmonious blend of advanced science and technology, appropriate technology and local knowledge to ensure an equitable distribution of the benefits of new knowledge.

In 1976, Indiraji had said to the Science Congress, and I quote :

*“The overwhelming majority of our people live in villages and will continue to do so for years to come. I would go further and say that we don’t even want to uproot them. All over the world, urbanization has brought comfort and stimulation; but who could claim that it has not given rise to complicated problems? Rural life should be so enriched as to prevent the migration of people and resources from villages to towns. Expedients worked out in countries where the agricultural population form but a small part of the work force cannot serve our country”.*

Indiraji’s wise words ring true even today. Our strategy for rural India has to be one of improving the quality of life in village India, based on easily accessible and appropriate technologies, so that people can continue to live where their forefathers have for generations and yet live comfortable and decent lives. Science must serve the needs of our farmers if scientists wish to contribute to the building of a more prosperous India.

Mahatma Gandhi once said: *“If the village perishes, India perishes too”*. He was echoing the thoughts of Oliver Goldsmith who once wrote: *“A bold peasantry, their country’s pride, / When once destroyed, can never be supplied”*.

*Ladies and Gentlemen*

My vision of rural India is of a modern agrarian, industrial and services economy co-existing side by side, where people can live in well-equipped villages and commute easily to work, be it on the farm or in the non-farm economy. There is much that modern science and technology can do to realize this vision. Rural incomes have to be increased. Rural infrastructure has to be improved. Rural health and education needs have to be met. Employment opportunities have to be created in rural areas.

Our Government has taken several initiatives in each area. We have launched Bharat Nirman, a time-bound programme to improve rural infrastructure, including rural roads, power, housing, telecom, and irrigation. We have launched a National Rural Health Mission, enhanced funding for rural education and for the mid-day meal programme for school children. We have enacted the National Rural Employment Guarantee Act and increased availability of credit to farmers. All these initiatives are aimed at offering a New Deal to Rural India.

The challenge before you is to pursue good quality science, world-class research and yet be able to address the needs of development and employment creation in rural India. Those of you who meet this challenge will be regarded as the real architects and builders of modern India.

*Ladies and Gentlemen*

Let me focus my attention on three challenges that science and technology must address to promote rural development. First, we have to increase agricultural productivity—the productivity of land, labour, seed and plant and other factors of production.

This is what I call the Second Green Revolution. Second, we have to develop affordable and appropriate technologies for energy and water. Third, we have to promote labour-using, yet efficient and relevant technologies in both farm and non-farm business.

### **Second Green Revolution**

The National Commission on Farmers has suggested a programme for “Agricultural Renewal” that can be the starting point of the Second Green Revolution. The five components suggested are: (a) soil health enhancement through concurrent attention to the physics, chemistry and microbiology of the soils; (b) water harvesting, water conservation and sustainable and equitable use of water; (c) access to affordable credit and to crop and life insurance reform; (d) development and dissemination of appropriate technologies and, (e) improved opportunities, infrastructure and regulations for marketing of produce.

I would add two more elements to this package, namely: (f) the application of science and biotechnology to the improvement of seeds and utilization of herbal and other plants; and, (g) the application of science to animal husbandry to improve the productivity of livestock and poultry. There is much that science and technology can do in each of these seven areas. There is much that agricultural universities can in fact do in each of these areas.

The technologies we develop must be economically affordable and relevant to small and marginal farmers, especially in drought prone regions. Two criticisms of the first Green Revolution have been : one, that it did not benefit dry land agriculture; and, two, that it was not scale neutral and had benefited large farms and big farmers. While evidence shows that this was not always the case, we must ensure that Second Green Revolution technologies have a special focus on dry land agriculture and do benefit small and marginal farmers.

The Second Green Revolution will not be possible without a rejuvenation of our agricultural universities and research institutions. We have to revitalize these institutions. We have to improve their academic standing and their relevance to agrarian society and the economy.

All advanced agricultural economies are knowledge-based economies. We must broaden the knowledge base of our farmers to enable them to make the best use of new technologies. Our farmers' needs for information are multi-faceted and these are not limited to technology alone. They need information about agriculture as a business, about farming practices, about policy initiatives, about best practices of other farmers and on market intelligence. Therefore, timely availability of information is a critical component in the development of our agriculture.

Our extension services need to gear up to meet these and emerging demands of farmers. Extension services have languished in the past two decades. We have to find innovative ways in which the skills of agricultural graduates can be harnessed for effective extension work. New communications tools can be used to overcome physical barriers between farmers and researchers. I am happy to learn that the Indian Council for Agricultural Research is seeking to provide electronic connectivity to about 200 Krishi Vigyan Kendras to make them hubs for accessing information by our farmers. I believe that Krishi Vigyan Kendras should function as "knowledge banks" in each district. They must bring scientists, extension workers and farmers together and bridge the gap between potential and actual farm yields.

### **Energy and Water**

Water and energy, like land, are scarce resources. Science and technology can help on the supply side by increasing factor productivity and by developing technologies that conserve utilization of these resources. The western world has not invested enough in research on water, bio-mass, solar and other relevant sources of energy because they are not under the kind of pressure we face. Solar energy and bio-mass are areas where Indian scientists must be at the forefront of research and development. I believe we can contribute to more economic use of resources, to improved productivity and to affordable infrastructure development through such research. Our Government will encourage world-class research in appropriate water and energy related technologies.

We are in urgent need of science-based solutions in energy and water provisioning, especially in rain-fed areas. Ground water use needs to be accompanied by mandatory rainwater harvesting and aquifer recharge. Our Government has taken several initiatives in watershed development and ground water replenishment. In some regions of the country, inter-linking of rivers may contribute to reduced dependence on ground water and to re-charge of ground water. I seek a more informed debate on utilization of river waters in a manner that would be ecologically sustainable and economically affordable.

I hope the session devoted to these issues at this Congress can come forward with suggestions as to how we can bring 10 million hectares of additional land under irrigation without associated environmental damage and with minimal human dislocation.

### **Employment Generation and Non-Farm Activity**

*Ladies and Gentlemen*

Public policy must respond to an important trend in the Indian economy. While the share of agriculture in national income is falling rapidly, the share of population dependent on agriculture is not declining as rapidly. This is creating rural distress and contributing to enforced migration to urban areas. The only sensible response to this trend is to create productive employment opportunities in rural areas, both in the farm and non-farm sectors. Scientists and technologists must develop labour-using technologies both in agriculture and in rural manufacturing so that jobs can be created closer home for those of our citizens who live in villages.

This requires a multi-pronged approach. To be sure, it requires investment in skill development. It requires financing of labour-using technologies on the farm, especially in processing, packaging and marketing farm produce. We must also help modernize our handlooms and handcraft industries

to enable rural artisans to reconnect with new markets. New functional townships must be developed, away from existing cities but equipped with basic infrastructure, to attract new investment in manufacturing and services sectors in rural areas.

All this opens up opportunities for new technology development. Agricultural Universities must be intellectually alive to such possibilities and develop courses and programmes to train people living in rural areas. We have no option but to encourage people living in rural areas to continue to live there even as the quality of their life is improved and more and more modern amenities are provided for them.

To enable this we must look at decentralized energy generation, decentralized social and economic infrastructure development, decentralization of governance and of the rules and regulations governing business activity. Excessive centralization has been the bane of development in India. While we create a single market, removing internal barriers to trade and movement of goods, services and people, we must enable the development of local markets so that local solutions can be generated to address local problems.

*Ladies and Gentlemen*

It is my sincere hope that within the foreseeable future we can rapidly modernize rural India and ensure that the gains of development reach every corner of our vast country. Our scientists must work with Government, with non-government organizations, with local bodies and stakeholder groups to make this happen. I hope your Congress will devote itself to such urgent concerns of our people, and entuse you to rededicate yourselves to the greater glory of our Nation.

I wish you all a Happy New Year. May your path be blessed. Jai Hind!

Prof. B. P. Chatterjee, General Secretary (Headquarters), ISCA proposed the vote of thanks on behalf of Indian Science Congress Association and the host Acharya N.G.Ranga Agricultural University.

The ceremony ended with National Anthem.

## BRIEF SUMMARY OF ADDRESS OF PROF. AMARTYA SEN

At the conclusion of the inaugural session on 3<sup>rd</sup> January 2006, an open public lecture by the economist of repute and Nobel Laureate Dr. Amartya Sen was organized. Dr. Sen choose to speak on the topic *Science and Practical Reason*. Citing the important declaration of Dr. M. S. Swaminathan, the Eminent Agriculture Scientist that the year 2006 should be treated as the year of “Agriculture Renewal” stressing the sense of urgency of the problems of the Indian farmers, Dr. Sen pointed out that (quote) “the urgency of dealing with the rural economy arised not only from the presence of adversities in this sector, but also—to take a different perspective—from the successes achieved in urban and industrial development in recent years, causing growing symmetries and inequalities within the country. Adding to the five components, which Dr. Swaminathan has identified viz., soil health, irrigation expansion, water use efficiency and equity, reforms to rural credit flow and insurance, improvement and dissemination of agricultural production methods, knowledge and inputs and marketing sensitive to the needs and expectations of small farmers, Dr. Sen stressed the importance of three more issues which have continued to adversely affect the rural economy. They are :

- i) Completion of Land Reforms
- ii) Rural Education and
- iii) Rural Health Care.

On land reforms, which began in earnest immediately after independence, has remained substantially incomplete even after 50 years Citing the example of China, he stated that through individual ownership of land (land lordism) was abolished, the ownership of land was not passed to the individual tillers but to collectives like cooperatives and communes with high hopes of increase in productivity through such collectivization, which did not happen. The incentive system of collectivist agriculture provided very little motivation for work of the kind needed to improve agricultural productivity. These problems reflected in disastrous famines of 1958 to 1961 causing mortality of 25 to 30 million people. In the words of Dr. Sen (quote) “the famine was sustained by the absence of a democratic system, so that the unfulfilled expectations were not brought in to public scrutiny and criticism. The absence of opposition parties and a free media allowed the scientific mistakes to survive in political and economic policy without correction for as long as three years, even as tens of millions died”.

In the second phase of land reforms the land was passed on directly to the tiller, often small cultivators, under the new “responsibility system” resulting in extra-ordinarily rapid expansion of agricultural production, with the Chinese rural economy faster through the 1980’s than any rural economy has ever grown anywhere in the world. Quoting the example of West Bengal where the process of land reforms has been successfully completed, the state has benefited a great deal particularly recording a high rate of agricultural economic growth. This example calls for completing the process of land reforms in all the other states which is long over due.

Commenting further on the social infrastructure for creating opportunities for increasing incomes and enhancing the well being of rural people, school education and basic health care can make vast differences. Access to good basic education to rural people can empower them for better employment and for the ability to produce commodities according to specification, with maintenance of quality and reliability. This applies to production with a rural base but also to the work and occupation of rural people who migrate to urban areas in search of income who can help rural economy to improve through remittances and through reduction of pressure on land in an agricultural economy. Access to good general education eventually leads to a cascading effect influencing several facets of the economy, including higher education. Coverage and quality of rural education being poor in India

from the studies carried out by the Pratichi Trust which Dr. Sen has set up with his Nobel Prize money, it is clearly established that in West Bengal teacher absenteeism in rural schools is a serious problem which needs to be redressed urgently. School inspections have become very rare and the inspectors also expressed their helplessness to frankly report absenteeism of teachers, given the power structure involved particularly in rural administration. As teachers jobs are fully secure, to ensure quality of education to rural children, inspection of schools is basic requirement. The parents of children also should have a major say in the running of the schools. According to Dr. Sen (quote) “This is certainly an area of great relevance to practical reason and policy making linked with the social sciences and probing empirical investigation”.

Another issue discussed by Dr. Sen in his lecture was basic health care in Indian rural society. Inadequacy of infrastructure and other facilities for primary health care are further compounded by absenteeism of health care personnel. As a result of these short comings in rural health care services, private practice flourishes largely operated by quacks who exploit the rural people offering nothing more than satisfaction. There are also “magic healers” who operate in rural areas and sizable rural populations seek their services. Dr. Sen argues for a need to reduce dependence of the Indian population, particularly in rural areas, on exploitative private health care. The private sector health works well as a supplement to public health care, as in Kerala, but it cannot be as a substitute for basic public health care system. There is a need to expand and strengthen basic public health care services across the country as privatization of health care in countries like China have not been able to deliver the expected benefits. To quote Dr. Sen “India has to bring the subject of basic health care as a public commitment more in to the making of policy and in to the nature of public discussion in the country”. Democracy gives us that opportunity, but we have seized it more fully.

## PLENARIES, PANELS AND SPECIAL PROGRAMMES

The Focal Theme ‘**Integrated Rural Development : Science and Technology**’ was introduced by the General President, Dr.I.V.Subba Rao at the inaugural function of the 93<sup>rd</sup> Indian Science Congress on January 3, 2006.

The Plenary Sessions on the Focal Theme were held as follows :

January 4, 2006  
1100–1300 hrs.

### PLENARY-I

#### *Science and Disaster Management*

- Chief Guest* : **Mr. Kapil Sibal**  
Hon’ble Minister of State for  
Science & Technology, Govt. of India, New Delhi
- Keynote* : **Dr. Harsh K. Gupta**  
Ex-Secretary, DOD, Govt. of India, Hyderabad  
**India’s Initiative in Mitigation of Tsunamis and Storm Surges**
- Convenor* : **Dr. V. P. Dimri**  
Director, NGRI, Hyderabad

#### **Speakers**

#### **Title of the Talks**

- |  |   |
|--|---|
| <b>Dr. D. K. Sinha</b><br>Formerly Sir Rashbehari Ghose<br>Professor of Applied Mathematics,<br>University of Calcutta, Kolkata              | Whither Evolution of Science in Disaster<br>Management?                       |
| <b>Dr. Mohan Kanda</b><br>Formerly Chief Secretary, Govt. of A.P.<br>Member, Secretary, National Disaster<br>Management Authority, New Delhi | Institutional, Legal and Policy Framework<br>for Disaster Management in India |
| <b>Dr. P. C. Kesavan</b><br>DAE-Homi Bhabha Chair &<br>Distinguished Fellow, MSSRF, Chennai  | Enhancing Resistance to Extreme Natural<br>Disasters in Coastal Regions       |

1100–1300 hrs.  
(Parallel Session)

### PLENARY-II

#### *Protecting and Prospecting of Biodiversity and Agridiversity*

- Chair & Kenynote* : **Dr. R. S. Paroda**  
Head, Program Facilitation Unit (PFU)  
Regional Coordinator, ICARDA  
CGIAR, Tashkent  
**Paradigm shift and Urgency for Managing our  
Genetic Resources**
- Convenor* : **Dr. E. A. Siddiq**  
Ex.DDG, ICAR  
Distinguished Professor  
CDFD, Hony. Professor  
ANGRAU, Hyderabad

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Dr. S. Ayyappan</b> DDG, ICAR, New Delhi	Fish Biodiversity in India and its Management
<b>Dr. Ved Pal Singh Malik</b> Biotechnologist USDA Riverdale, MD, USA	Microbial Diversity : Novel Products New Sources

1715–1915 hrs.

PLENARY–III

*New Biology/New Biosciences*

<i>Keynote :</i>	<b>Dr. Peter Glass</b> Chairman, Anesthesiology Stony Brook Medical Center Stony Brook, NY, USA <b>Progress through Clinical Research</b>
<i>Convener :</i>	<b>Dr. S. Pentyla</b> Stony Brook Medical Center Stony Brook, NY, USA

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Prof. Michael S. Wong</b> Department of Chemical and Biomolecular Engineering Rice University RM, USA	Nanotechnology Approaches in Biomedical and Environment Research
<b>Dr. Palli S. Reddy</b> Department of Entomology University of Kentucky Lexington, KY, USA	Emerging Bio-science Technologies that can Enhance the Quality of Life in Rural India
<b>Prof. Paolo Arese</b> Department of Genetics Biology and Biochemistry University of Turin, Turin, Italy	How Biology, Genetics and Natural Medicine Helped Human to Survive Malaria : A Lesson for the Future

January 6, 2006

0945–1145 hrs.

PLENARY–IV

*Rural Energy*

<i>Chair :</i>	<b>Prof. M. S. Swaminathan</b> Chairman, National Commission on Farmers Govt. of India, New Delhi
<i>Keynote :</i>	<b>Dr. Kirit S. Parikh</b> Member, Planning Commission, GOI New Delhi <b>Rural Energy Security : Not by Intentions Alone</b>
<i>Convener :</i> & <i>Lead Presentation</i>	<b>Dr. S. K. Chopra</b> Senior Advisor MNCEs, GOI, New Delhi <b>The Problem of Rural Energy : Causes, Consequences and Solutions</b>

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Prof. N. H. Ravindranath</b> Chairman, Centre for Sustainable Technologies Indian Institute of Science, Bangalore	Sustainable Rural Energy Strategy for India
<b>Dr. (Ms.) Gitanjali Chaturvedi</b> National Expert on Energy and Cleaner Production, UNIDO, New Delhi	Rural Renewal Energy : An Interface Between Science and Society
0945–1145 hrs. (Parallel Session)	

PLENARY–V

*Health, Sanitation and Communicable Diseases*

0945–1145 hrs.  
(Parallel Session)

PLENARY–VI

*Public-Private and Academia-Industry Partnership*

<i>Chair :</i>	<b>Shri B. Ramalinga Raju</b> Chairman Satyam Computer Services Ltd., Hyderabad
<i>Keynote :</i>	<b>Prof. Robert M. Moriarty</b> Department of Chemistry University of Illinois, Chicago, Illinois, USA <b>University Pharmaceutical Industry Synergy and Cooperation : Experience of an Academician/ Entrepreneur A Formula for Success</b>
<i>Convenor :</i>	<b>Dr. A. V. Rama Rao</b> Chairman, AVRA Laboratories, Hyderabad

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Dr. T. Rama Sami</b> Director Central Leather Research Institute Chennai	Public-Private Partnership with SMI Sector–A Case Study on Leather
<b>Dr. D. Yogeswara Rao</b> Head, TNBD Division CSIR, New Delhi	Public-Private Partnership–The Role of Government

January 7, 2006  
0945 – 1145 hrs.

PLENARY–VII

*Rural Education, Knowledge and Skill Empowerment*

<i>Chair :</i>	<b>Dr. M. V. Rao</b> Formerly Vice-Chancellor ANGRAU, Hyderabad
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*Keynote :*           **Justice M. N. Venkatachalaiah**  
Former Chief Justice of Supreme Court of India, Bangalore  
**The Future of Science and Science for the Future**

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Mrs.Mina Swaminathan</b> MSSRF, Chennai	Gender Issues in Agriculture and Livelihoods
<b>Dr.Viba Gupta</b> Centre of Science for Villages Magan Sangrahalaya Samiti Wardha, Maharashtra	Technologies for Rural Women

0945 – 1145 hrs.  
(Parallel Session)

#### PLENARY–VIII

##### *Harnessing Frontier Sciences/Technologies*

*Chair :*           **Dr. R. K. Dronamraju**  
&                   President  
*Keynote*        Foundation for Genetic Research Houston, Texas, USA  
*Convenor :*     **Dr. Ajay Parida**  
                      MSSFR, Chennai

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Prof. Shreefal Mehta</b> Program Director Radical Innovation Research Program Lally School of Management & Technology, NY, USA	Coupling Global Innovation in Biotechnology to Local Economic Growth or Entrepreneurship in Assessing Global Biotechnology Innovations for Local Economic and Social Needs in Developing Countries

0945–1145 hrs.  
(Parallel Session)

#### PLENARY–IX

##### *Management of Climate and Environment*

*Keynote :*       **Dr. Philippe Tulkens**  
Belgium  
**The Whitehouse and the Kyoto Protocol :**  
**Double standards on uncertainty and**  
**their Consequences**

<b>Speakers</b>	<b>Title of the Talks</b>
<b>Dr. Preety Bhandari</b> Director TERI, New Delhi	Climate Change and Development Challenges and Opportunities

January 4, 2006  
1100–1300 hrs.

PANEL–I

*Global Science and Rural Development in the SAARC Region*

*Keynote :*       **Dr. Mangala Rai**  
Secretary, DARE &  
Director-General, ICAR, New Delhi  
**Technology led Agriculture and Rural Development in the  
SAARC Countries**

*Convenor :*       **Dr. Y. P. Kumar**  
Advisor & Head (IC) DST  
Govt. of India, New Delhi

**Panelists**

**Title of the Talks**

<b>Dr. M. E. Tusneem</b> Chairman Pakistan Agricultural Research Council, Islamabad, Pakistan	Science Based Agriculture and Rural Development in Pakistan—Status Report
<b>Dr. P. Pushpaganan</b> Director, National Botanical Research Institute, Lucknow	Knowledge Empowerment and Bio-source Based Developmental Intervention for Transforming Rural India

1715 – 1915 hrs.

PANEL–II

*Global Initiatives to address Millennium Goals  
Hunger, Poverty Alleviation, Global Food and Nutrition*

*Chair :*           **Dr. William D. Dar**  
DG, ICRISAT, Hyderabad

*Keynote :*       **Dr. Daniel Gustafson**  
FAO Representative in India

**Panelists**

**Title of the Talks**

<b>Dr. William G Padolina</b> DDG, International Rice Research Institute Los Banos, Philippines	.....
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1715 – 1915 hrs.

PANEL–III

*Coastal Zone Management*

*Convenor :*       **Dr. V. Selvam**  
Programme Director  
Coastal Systems Research MSSRF, Chidambaram

**Panelists**

**Title of the Talks**

<b>Dr. B. R. Subramaniam</b> Director, Integrated Coastal and Marine Area Management, Chennai	Role of Coastal Zone Management in Coastal Disaster Management
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<b>Panelists</b>	<b>Title of the Talks</b>
<b>Prof. K. Kathiresan</b> Annamalai University Center of Advance Study in Marine Biology, Parangipettai	Coastal Mangrove Forests of India : Possibility of Mangrove Rehabilitation in Coastal Deserts for Coastal Protection and Poverty Alleviation
<b>Dr. Shailesh Nayak</b> Group Director Marine and Water Resources Group Space Applications Centre ISRO, Ahmedabad	Role of Remote Sensing and GIS in Coastal Zone Management
<b>Dr. U. S. De</b> Formerly ADGM (Research) IMD, Pune	Weather and Climate Hazard in the Coastal Zone Management
<b>Dr. Janki Andharia</b> Professor & Head Department of Urban & Rural Community Development, TISS, Mumbai	Coastal Zone Management : Social and Institutional Challenges

January 6, 2006  
1145–1315 hrs.

#### PANEL–IV

#### *Sustainable Water Security*

*Keynote :*

**Prof. Jan Lundqvist**  
Head, Institute of Water and Environmental Studies  
University of Linkoping, Sweden  
**Water Competition, Food Security under Rapid Urbanization**

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. Peter G. McCornick</b> Regional Director for Asia International Water Management Institute, New Delhi	Water Security through Knowledge Generation, Sharing and Application
<b>Dr. K. Radhakrishna</b> Director, National Remote Sensing Agency Hyderabad	.....

1400–1700 hrs.

#### PANEL–V

#### *Water : Biophysical and Socio-Economic Dimensions of Rural Food Security in the Developing Countries*

*Convener :*

**Prof. U. Aswathanarayana**  
Hon. Director  
Mahadevan International Centre for  
Water Resources Management, Hyderabad

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. P. M. Bhargava</b> Vice-Chairman National Knowledge Commission Govt. of India	Introductory Remarks

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. Jan Lundqvist</b> SIWI, Stockholm, Sweden	“Green” Water and Food Production
<b>Dr. K. Radhakrishnan</b> Director, NRSA, Hyderabad	Remote Sensing of Soil Moisture and Food Crop Planning
<b>Dr. Ajay Parida</b> MSSRF, Chennai	Drought and Salinity Resistant and Biofortified Food Crops
<b>Shri H. Hemnath Rao</b> ASCI, Hyderabad	Economic Instruments and Administrative Policies

#### **Invited Discussants**

<b>Dr. Kiran Sharma</b> ICRISAT, Hyderabad	Agrobiotechnology
<b>Dr. J. B. Prajapati</b> Anand, Gujarat	Fermented Foods
<b>Dr. S. S. Vepa</b> MSSRF, Chennai	Food Consumption Patterns
<b>Dr. S. P. Wani</b> ICRISAT, Hyderabad	Dryland Agriculture
<b>Dr. Hema Achyuthan</b> Anna University, Chennai	Soils, Soil Education and Food Security

January 7, 2006  
1145–1315 hrs.

#### PANEL–VI

#### *Centenary of Agricultural Education in the Sub-Continent*

<i>Chair :</i>	<b>Prof. V. L. Chopra</b> Member (Science) Planning Commission Government of India, New Delhi
<i>Chief Guest :</i>	<b>Prof. M. S. Swaminathan</b> Chairman National Commission on Farmers Govt. of India

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. Basheer Ahmed</b> Vice-Chancellor University of Agriculture, Faisalabad Pakistan	.....
<b>Dr. C. Ramasamy</b> Formerly Vice-Chancellor Tamil Nadu Agricultural University Coimbatore	A Decade of Economic Liberalisation and its Impact on Indian Agriculture Prioritizing Agricultural Research for Accelerated Growth
<b>Dr. J. C. Katyal</b> DDG(Edn.) ICAR, New Delhi	History and Development of Agriculture Education in India

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. M. V. Rao</b> Ex.Special DG & Formerly Vice-Chancellor ANGRAU, Hyderabad	.....
<b>Dr. S. L. Mehta</b> Vice-Chancellor Maharana Pratap University of Agriculture and Technology, Udaipur	How to Capitalize Quality Management in Education
1145–1315 hrs. (Parallel Panel)	

PANEL–VII

***Women Empowerment***

<i>Chair :</i>	<b>Dr. P. Geervani</b> Formerly Vice-Chancellor Padmavathi Mahila University Tirupati
<i>Keynote :</i>	<b>Prof. Baroness Susan Greenfield</b> Director The Royal Institution of Great Britain, London
<i>Convenor :</i>	<b>Dr. (Ms.) Mahtab Bamji</b> Ex.Director Grade Scientist NIN Emeritus Scientist Dangoria Charitable Trust Hyderabad

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. (Mrs.) Vineeta Bal</b> Staff Scientist National Institute of Immunology New Delhi	Women's Empowerment Health Matters
<b>Dr. (Mrs.) P. Geetha Kutty</b> Project Coordinator Centre for Studies on Gender Concerns in Agriculture Kerala Agricultural University Thrissur, Kerala	Towards Women Friendly Technologies in Rural Livelihoods
<b>Dr. (Mrs.) Sudha Nair</b> Director JRD Tata Eco-Centre MSSRF, Chennai	Technological and Economic Empowerment in SHG Movement an Effective Tool?

1145–1315 hrs.  
(Parallel Panel)

PANEL–VIII

***Sustainable Livelihood***  
***(off-farm and on-farm employment)***

**Keynote :** **Dr. (Ms.) Quratulain Bakhteari**  
Institute for Development Studies and Practices Quetta, Pakistan  
**Processes of Human Resource Development for Integrated  
Rural Development**

**Convenor :** **Dr. (Mrs.) Sudha Nair**  
Director, JRD Tata Eco-Centre  
MSSRF, Chennai

<b>Panelists</b>	<b>Title of the Talks</b>
<b>Dr. Narayan Hegde</b> NRM FAIF Laboratories Ltd. Pune	Generation of Gainful Self-Employment for Sustainable Livelihood : BAIF's Experience
<b>Dr. (Mrs.) Vijaya Khader</b> Dean of Home Science ANGRAU, Hyderabad	Socio-economic Empowerment of Fisher women in Coastal Eco-system of Andhra Pradesh, Kerala, Karnataka and Tamil Nadu

*January 3, 2006*  
1215 hrs.

**SPECIAL ADDRESS**

**Prof. Amartya Sen, Nobel Laureate**  
***Science and Practical Reason***

*January 3, 2006*  
1400–1500 hrs.

PUBLIC LECTURE–I

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Prof. C. N. R. Rao</b> Linus Pauling Research Professor and Honorary President Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore	What is happening in the Nanoworld?

1515–1615 hrs.

PUBLIC LECTURE–II

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. R. A. Mashelkar</b> Secretary, DSIR and Director General CSIR, New Delhi	Making High Technology Work for the Poor

January 4, 2006  
0845–1045 hrs.

PUBLIC LECTURE–III

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Prof. M. S. Swaminathan</b> Chairman, National Commission on Farmers, GOI, New Delhi	2006 : A Year of Agricultural Renewal

January 5, 2006  
1715–1815 hrs.

PUBLIC LECTURE–IV

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. R. Chidambaram</b> Principal Scientific Advisor Government of India	India's Technology Needs : Nuclear to Rural

January 6, 2006  
1715–1815 hrs.

PUBLIC LECTURE–V

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. N. Jaaya Prakash Narayan</b> Member, National Advisory Council, GOI National Coordinator Lok Satta, Hyderabad	Ensuring a Healthy Future

January 3, 2006  
0845–1045 hrs.

SPECIAL LECTURE–I

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Prof. Richard R. Ernst</b> Nobel Laureate Switzerland	Academic Responsibility and our Global Future

January 6, 2006  
0845–0930 hrs.

SPECIAL LECTURE–II

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. P. M. Bhargava</b> Vice-Chairman Knowledge Commission, GOI	How Do We Make India a Knowledge Based Society?

1815–1900 hrs.

SPECIAL LECTURE–III

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. Ulrich Kopke</b>	Elements of a Scientific Development in Organic Agriculture

January 7, 2006  
0845–0930 hrs.

#### SPECIAL LECTURE–IV

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. David Heckel</b> Director Max Planck Institute for Chemical Ecology, Berlin, Germany	The Role of Genomics in Devising more Effective Means of Controlling the Cotton Bollworm, <i>Helicoverpa armigera</i>

January 3, 2006  
1645–1800 hrs.

#### **Interface between Nobel Laureates, World Food Prize Laureates, Eminent Scientists and Young Scientists**

*Chair :* **Prof. V. S. Ramamurthy**  
Secretary, DST  
GOI, New Delhi

*Convenor :* **Dr. D. Balasubramanian**  
Director of Research  
L. V. Prasad Eye Institute  
Hyderabad

#### **Participants**

- *Young Scientists, Bhatnagar Awardees*
- *Nobel Laureates*
- *World Food Prize Laureates*
- *Eminent Scientists (Indian and Foreign)*

January 4, 2006  
1000–1300 hrs.

#### GROUP MEETING–I

#### **NGOs, Panchayat Raj Institutions Farmers and Public**

*Chief Guest :* **Sri Chinmay Basu, IAS**  
Director General I/C, NIRD  
Hyderabad

*Keynote :* **Shri Lalith Mathur, IAS (Retd.)**  
Former Director General, NIRD  
Hyderabad

*Convenor :* **Dr. S. Raja Kutty**  
Professor & Director  
CT&MP, NIRD, Hyderabad

*Speakers :*

- NGOs
- Voluntary Organizations
- Panchayat Raj Institutions
- Farmers Representatives
- Others involved in Rural Development

1000–1300 hrs.  
(Parallel Meeting)

GROUP MEETING–II  
**Media Perspectives of Rural Development**

*Participants :* Media Representatives

January 4, 2006  
1400–1700 hrs.

ROUND TABLE

**Science Collaboration between India and EU 7<sup>th</sup> Framework Programme for  
Research and Technological Development and Demonstrations (FP7)**

*Overview :* **Dr. Declan Kirane**  
EU, Brussels, Belgium  
Representative of EU  
Regional Office, New Delhi

*Participants :* **Dr. M. K. Bhan**, Secretary, DBT, GOI  
**Dr. R. Chidambaram**, Principal Scientific Advisor, GOI  
**Dr. S. E. Hasnain**, Director, CDFD  
**Shri Madhavan Nair**, Chairman, ISRO  
**Dr. Mangala Rai**, Secretary, DARE, GOI, DG, ICAR  
**Dr. R. A. Mashelkar**, DG, CSIR & Secretary, DSIR, GOI  
**Dr. R. S. Paroda**, Director, CGIAR, Tashkent  
**Dr. K. Radhakrishnan**, Director, NRSA  
**Prof. V. S. Ramamurthy**, Secretary, DST, GOI  
**Prof. C. N. R. Rao**, Chairman, SAC-Prime Minister  
**Dr. M. S. Swaminathan**, Chairman, NCF, GOI

January 5, 2006  
1400–1700 hrs.

SPECIAL SESSION–I

**Mission 2007 : Every Village—A Knowledge Centre**

*Chair :* **Prof. M. S. Swaminathan**  
*Coordinator :* **Dr. Subbiah Arunachalam**  
*Speakers :* **Prof. M. S. Swaminathan**, Chairman, MSSRF, Chennai  
**Dr. V. Balaji**, ICRISAT, Hyderabad

January 6, 2006  
1000 hrs. onwards

SPECIAL SESSION–II

**Open Access**

*Chair :* **Dr. P. M. Bhargava**  
*Speaker :* **Dr. V. Balaji**, ICRISAT, Hyderabad

January 6, 2006  
1400 hrs. onwards

FORUM MEETING  
**Forensic Science and Society**

- Chair :* **Dr. Ranbir Singh**  
Vice-Chancellor  
NALSAR University of Law, Hyderabad
- Chief Guest :* **Mr. Swaranjit Sen, IPS**  
Director General of Police  
Andhra Pradesh, Hyderabad
- Keynote :* **Dr. Syed E. Hasnain**  
Director, CDFD, Hyderabad
- Convenor :* **Dr. K. P. C. Gandhi**  
Director, A. P. Forensic Sciences Laboratory, Hyderabad

January 6, 2006  
1145–1315 hrs.

RAJ KRISTO DUTT MEMORIAL AWARD LECTURE

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Dr. S. C. Pakrashi</b> Former Director IICB, Kolkata	Medicinal Plants, Herbal Drugs and Rural Health Care in the Indian Context

FORTYTHIRD B.C.GUHA MEMORIAL LECTURE

<b>Speaker</b>	<b>Title of the Talks</b>
<b>Prof. U. C. Goswami</b>	Vitamin A in Fish and Human Nutrition

## ADDRESS AT THE 93RD INDIAN SCIENCE CONGRESS

on January 5, 2006

by

**Dr. A. P. J. Abdul Kalam**

**Hon'ble President of India**

### *Dynamics of Rural Development*

*“If you do not work, no problem will occur, But if you do a mission of task definitely problems of varying magnitudes will crop up. But problems should not become the master of individuals, individuals should become master of the problem, defeat and succeed”.*

Dear Friends, I am very happy that the Science Congress has focused on the theme **“Integrated Rural Development : Science and Technology”**. My greetings to all the scientists who have come here from various parts of the country and abroad. It will be a beautiful opportunity for sharing the thoughts between experienced scientists including Nobel Laureates and young scientists, which will enable us to evolve a roadmap for rural development.

### **Mission of Science Congress : 2006**

I consider every Indian Science Congress to be unique because a large number of aspiring young scientists from all parts of the country particularly from colleges located in the rural areas participate to meet the experienced scientists and deliberate on science and technology issues. This 93<sup>rd</sup> Indian Science Congress is very important since it is discussing the core issue of national development. Therefore, I visualize very important scientific, managerial event has to take place as a follow up of this congress. I am going to present to you what can be the mission linking academy, scientists, industry and our rural people of various regions.

### **Integrated Mission : Need of the hour**

Presently, the annual GDP growth rate of the nation is around 7% to 8%. There is a need to increase the growth rate of the GDP by additional 2% a year for transforming India into a developed nation and making the number of people below the poverty line to be near zero, we need to progressively implement the PURA programme in different parts of the country. As you are aware, the number of PURAs required to be brought out in the whole nation is around 7,000. Science and technology focus is required for making the integrated rural development programme sustainable and remunerative to the 700 million people of the country living in the rural areas.

In this context, connectivities are the central theme for both PURA as well as Bharat Nirman Programme and National Rural Employee Gurantee Scheme. The funds are assured, tasks are spread in various ministries with only one focus rural development. Institution like Indian Science Congress can become an integrating agency for the multiple schemes and give a scientific, technological and management leadership to the programme. Keeping this in mind I have selected the topic for discussion as “Dynamics of Rural Development”.

### **Providing Urban Amenities in Rural Areas (PURA) Experience**

Now I would like to discuss about some of the experiences of Providing Urban Amenities in Rural Areas (PURA) programme at various rural environment which I have visited with my team.

**Periyar PURA (Tamilnadu) :** I have inaugurated Periyar PURA complex pioneered by Periyar Maniammai College of Technology for Women, Vallam, Tanjore a year back. I thought of sharing with you the developmental concept of a cluster of over 65 villages near Vallam, Thanjavur district of Tamilnadu that involved a population of 3 lakhs. This PURA complex has all the three

Connectivities—physical, electronic and knowledge—leading to economic connectivity. The center of activity emanates from the women engineering college that provides the electronic and knowledge connectivity. Periyar PURA has health care centers, Primary to post graduate level education and vocational training centers. This has resulted in large-scale employment generation and creation of number of entrepreneurs with the active support of 850 self-help groups. Two hundred acres of waste land has been developed into a cultivable land with innovative water management schemes such as contour ponds and water sheds for storing and irrigating the fields. All the villagers are busy in cultivation, planting *Jatropha*, herbal and medicinal plants, power generation using bio-mass, food processing and above all running marketing centers. This model has emanated independent of any government initiative. The committed leadership has been provided by the Engineering institution. Recently, 5 of Periyar PURA villages are connected through Wi-MAX Wireless and having min 4 mbps connectivity with the Periyar PURA Nodel center. It provides a sustainable economic development in that region. This gives me the confidence that PURA is a realizable proposition and this movement can be multiplied by thousands of entrepreneurs, educational administrators, small-scale industrialists and bankers with the support of the government agencies.

**PURA : Loni Model (Maharashtra) :** Recently, I visited a place called Loni in Maharashtra where a participative model of integrated rural development has come up among 44 villages with the population of 80 thousand. The Loni PURA model has been pioneered by Pravara Medical trust. It is improving the productivity of the rural people through improved quality of the life with healthcare, education and employment. The concept is people centric development for social transformation. The trust area of development has been on comprehensive Medicine particularly for women and children, need based health education and e-connectivity to the farmers. The complex has created 27 educational and vocational institutions consisting of schools, colleges, polytechnic and ITI including medical and engineering colleges. They have created sugar factory, biogas plants, chemical plants and power projects. They have large number of self-help groups for providing low interest loan for the weaker sections in the society. Due to the co-operative effort of the people, literacy in these villages has gone up from 63% to 83%, birth rate has come down, infant mortality rate has decreased to 35 per 1000 from 70 per 1000 and the standard of living of the people has gone up by over 20% compared to other villages in the neighboring areas.

**Chitrakoot PURA (Madhya Pradesh) :** Recently I visited Chitrakoot in Madhya Pradesh, where I met Shri.Nana Deshmukhji (Age 90) and his team members belonging to Deendayal Research Institute (DRI). DRI is a unique institution developing and implementing a village development model, which is most suited for India.

DRI understands that people's power is more potent, stable and enduring than political power. By becoming one with the oppressed and depressed, one gains the acumen of administration and governance. Social advancement and prosperity are possible only by injecting the spirit of self-reliance and excellence in the younger generation. Using this principle, DRI has plans to develop one hundred clusters of villages having approximately five villages each around Chitrakoot. They have already developed 80 villages in 16 clusters consisting of about 50,000 people.

I witnessed one of the villages called Patni where the institute has promoted sustainable development based on indigenous and traditional technology, knowledge systems and local talents. The research work by the institute through field studies facilitates the development of replicable and tangible model for achieving self-reliance in villages. The programme aims at income generation through value addition, innovative agricultural practices, inculcating scientific temper among the villagers, improvement of health and hygiene, striving towards 100% literacy. As a part of integrated rural development, the villagers are doing water harvesting; effectively use it for cultivation of food grains, medicinal and aromatic and horticulture cultivation. Apart from all these development activities, the institute is facilitating a cohesive conflict free society. As a result of this, I understand

that the eighty villages around Chitrakoot are almost litigation free. The villagers have unanimously decided that no dispute will find its way to court. The differences will be sorted out amicably in the village itself. The reason given by Nana Deshmukhji is that if the people fight among each other they have no time for development. They can neither develop themselves nor the community. This message has been understood by the society and they have decided not to embark on any fighting. All these have been accomplished through DRIs “samaj-shil-pi dampati” (a graduate married couple) a new concept of counseling and intervention promoted by DRI. It was a great joy for me to take lunch with Patni village citizens. A new road connecting multiple villages in the Chitrakoot area is taking shape. In the same Chitrakoot environment there is another social organization called Shri Sadguru Seva Sangha trust is carrying out number of social activities including the running of quality eye care center. In a rural environment, I find a revolution is taking place due to the committed leadership to remove the human pain.

### **Technology Driven PURAs**

In all the three operational PURA's what I have observed is that technology and application of scientific methods of working play a very important role. For example, power through bio-gas and solar energy is used for house hold lighting and also for the farms; vermicomposting; check dams and water purification plants; Jatropha plantation to extraction and esterification; medicinal and aromatic plants cultivation, extraction and manufacturing healthcare products through self-help groups; low cost housing using alternative building blocks; dairy farming; healthcare and education services; connectivity using wireless and Wi-MAX technologies and enabling the sustainable development and business processing taking places among the village clusters. In all these three PURAs, employment generation was the focus using technology experiences from the colleges and educational institutions and through assessment of markets which can absorb the products and services. With the emergence of PURA Clusters in different parts of the country, what is now required is to establish the linkage of PURA clusters by setting up of Domain service providers through PURA Nodal Knowledge data centers.

### **PURA Nodal Knowledge Data Centre**

I have studied a system which is working and used by the farmers and fishermen in different parts of the country. This is called the Kisan Call Centre (KCC) established by the Ministry of Agriculture in partnership with TCIL (Telecommunication Consultant India Ltd) a Government Enterprise under Ministry of Communication and Information Technology.

Kisan Call Centre offers three levels of interaction and support in Agriculture, Fisheries and Animal Husbandry domains through the nationally nominated experts and corresponding directorates at the Central level. In the last one year of its operation the call center has provided consultancy, information, assistance and guidance to over 6 lakh callers from the villages of eight states. Anywhere in India, people can call 1551 as a toll free number to get the services. The top users of the scheme are Maharashtra and Tamil Nadu followed by UP and Rajasthan. As we have seen in the Agriculture and Fisheries oriented Kisan Call Centre setup, similar Domain Service Provider Call centers are required in the domains of Commerce and Industry, Entrepreneurial skill Development and Employment generation, Travel and Tourism, Banking and Insurance, Meteorological forecasting, Disaster Warning systems, Human Resource Development, Education and Health care and other necessary domains.

These call centers will act as a service provider to the PURA Nodal Knowledge Data Centres located in the PURA Complexes, which in turn will provide the area specific and customized knowledge to the Village Knowledge Centres in the villages in a holistic manner. In this connection, I would recall the meeting with 140 Fellows of National Virtual Academy, selected from various states by MSSRF. They will act as societal transformers in that villages.

## **Mission for Science Congress : Establishment of 100 PURA Clusters**

Now I would like to recall to you, the three PURAs : Periyar PURA, Loni PURA, Chitrakoot PURA all the three are driven by a technology/academy institutions. Since the Ministers and Secretaries both from State and Central Government are present here, decision can be taken to allot Rs.500 crore to develop 100 PURA Clusters and its components (comprising of 20 to 30 villages in the vicinity of the institution/college by the 100 selected educational institutions or colleges spread across the country. Rs.5 crore each will be utilized for developing infrastructure in rural complexes such electronic and knowledge connectivity to 100 clusters leading to setting up of village knowledge centers; agri-clinics; tele-education and tele-medicine centers; and other employment oriented schemes such as bio-gas plants; water treatment plants (brackish to potable water); mobile clinic with tele-medicine facility; initiation Jatropha farming to extraction plants; bio-fuel esterification plants; cold storage; consumer product development; vocational training centers and setting up of business centers by the entrepreneurs for national and international marketing of the products from these rural enterprises. But actions should not be taken by the colleges unilaterally, they should present their plans and alternatives to the local people who are beneficiaries and modify the plans to meet their needs based on their core competence.

These programmes initiated by 100 educational institutions colleges with public-private partnership will provide the experience to other institutions for taking up big programmes in future in an industrial scale. This venture will build the capacities of the villagers and encourage the Indian entrepreneurs to become an active partner in this development process. These activities should not be treated as mere experiments and scientific knowledge, it is the application of science and technology to societal transformation. The winners are the academic institutions and the rural people belonging to the PURA Clusters. At the end, there should be a clear assessment whether the users (villagers) have benefited by the villagers themselves. This can be assessed by a joint team of the village members and the scientists/technologists. This will lead to the birth of the Civic Scientists. This is the performance challenge which I would like to pose to the experienced scientific community and to the Government officials. Tonight, you can meet and take a decision. I have discussed this proposal with the Minister of Rural Development, Dr.Raghuvansh Prasad Singhji. If any assistance for obtaining approvals is needed, I can assist.

## **Emerging Rural India**

Friends, as you all are aware, I have visited all the states in our country and now I am focusing visits to particularly rural areas. Recently, I have visited rural areas in Punjab, Madhya Pradesh, Kerala, Rajasthan, Orissa and Bihar. Some experiences I would like to share with you based on what I have seen and discussed in these rural areas.

**Cotton productivity** : I visited a village called Gheri Buttar near Bhatinda in Punjab, where I met the farmers who have successfully increased the production of seed cotton from four hundred and sixty kilo gram per acre to eight hundred and sixty kilogram per acre in the year 2005. This has been achieved through a productive partnership between farmers, agricultural scientists, textile industry supervisors and the Government by following a scientific approach to farming, adopting pre-harvest and post-harvest techniques with an assured market for seed cotton. I have suggested the farmers in that village to mount a programme of second green revolution in cotton meaning that instead of selling the cotton produce directly in the market they should convert certain quantity of cotton into yarn, cloth and apparel in the village complex itself and market it in the national and international markets. This is the only way that the income of the farmers can substantially go up.

I am very happy to inform all of you that the farmers of Gheri Buttar took the following oath with me :

“We the people of village Gheri Buttar, are proud that we have increased the productivity of seed cotton. This has resulted from the team work of farmers like us, industry of this region and

the members of the university. We will spread the success of our village to many more villages and across the nation”.

This is the type of user satisfaction that is crucial for application of science. The message for higher cotton productivity achieved in Gheri Buttar village in Punjab should be spread in all the parts of country.

**Organic farming :** I visited Thodupuzha village, Kerala and seen the success of farmers in organic farming and pesticide free farming. Farmers showed me with lot of happiness the results of organic farming such as green plantain fruits, bigger variety of ginger roots, large sized root vegetables and various type of fruits particularly pineapple. What is needed in Thodupuzha is food processing, vegetable processing and fruit processing in a big way. This value addition will transform the village into an empowered village. The scientist should study the experiences of Thodupuzha and spread organic farming in the country.

**Healthcare :** In healthcare, I was impressed by the special school being run for special children at Thirupunithura and the new 350 bed Ayurvedic hospital. The important point we discussed was, Ayurveda hospital should aim at bringing out a document giving the diseases uniquely cured by Ayurveda. The college in partnership with the hospital should embark on the systematic development of molecule to drug as is being done in the allopathic system. The state of the art hospital at Parumala under the leadership of Dr.Cherian is carrying out valuable research in tissue culture for heart valves and is also performing heart operations. It is a hi-tech hospital in a rural setting. It is indeed noteworthy. At Vallikavu, I handed over 500 ready build houses to the tsunami affected people. I saw there compassion with divine blessings flowing all around with infrastructure development as the focus. In essence, the entire visit made me feel that a dynamic situation is flowing all around Kerala touching many walks of life. I was indeed very happy.

**Underground Sewerage System in Punjab village :** I would like to refer to another good model which, I came across during my visit to Kharodi village which is very near to Shaheed Bhagat Singh’s village in Punjab. A NRI, Shri H.G.S. Gill from Canada with the help of State Government, has laid the underground sewerage system with stabilization tank and activated sludge system. With the availability of this underground sewerage system the whole village has been able to construct household toilets and toilets in schools, hospitals and other public places.

**Electricity Generation from Municipal Waste :** A serious problem has arisen both in rural and urban areas due to the accumulation of municipal solid waste. Efficient and environmentally clean disposal of garbage has always been a major technological challenge. While being a threat to the environment, mounting garbage is also a rich source of energy. The potential for converting this waste into useable energy, which will eliminate a major source of pollution, was realized by one of our innovative organizations – Technology Information Forecasting and Assessment Council of DST which helped in developing a completely indigenous solution for the processing of waste into a source of fuel. This fuel could, in turn, be used for generation of electricity through mini plants. Two entrepreneurs in Andhra Pradesh adopted the technology with refinement and established two independent plants in Hyderabad and Vijayawada generating over 6 megawatts of electricity each, which is being supplied to the State Grid. India needs thousands of mini power plants both in rural and urban areas using municipal waste.

## **Conclusion**

While concluding, may I suggest the following societal missions to the scientific community, young and experienced, assembled here for promoting sustainable rural development missions through Science and Technology :

**a. Establishment of 100 PURA clusters and its components :** Time bound establishment of 100 PURA cluster and its components by Educational institutions or colleges by January 2007

with an investment of Rs.500 Crore and a strong focus on the local users for selection of projects, during the implementation and for assessment of final success. The results could be discussed in the 2007 Indian Science Congress in the form of successful papers.

**b. Operational PURA models to replicate :** Three operational PURA models namely Periyar PURA, Chittrakoot PURA, Loni PURA established and run by private initiative may be studied by the Ministry of Rural Development, Ministry of Communication and Information Technology and the Scientific community and spread the concept of these PURAs with industrial and academy participation in large scale.

**Research Missions :** I suggest the following seven research Missions for promoting sustainable rural development through Science and Technology. The scientists can mount an intensive time bound research programme in these areas :

**1. Second Green Revolution :** From now to 2020, we need to double the food production with the reduced availability of land for cultivation from 170 million hectares to 100 million. Also there will be shortage of water and human resource for farming. This increase will only be possible through the application of technology in agriculture farming, pre and post harvesting procedures and scientific storage.

**2. Seed Cotton productivity** has to be increased nationally to 900 kg per acre from 450 kg per acre using the existing successful model. In addition technology has to be provided to the farmers by the scientists to enable production of Extra Long Stable Cotton (ELSC) is currently being imported in India.

**3. Water treatment :** Many water borne diseases originate from the water consumed directly from the unprotected sources. Typical problems relate to existence of fluoride, arsenic, iron etc. in various parts of the country. Solution lies in establishment of cost effective large scale water treatment plants designed and built with reliability. In the case of arsenic after processing the water, the disposal of arsenic waste is becoming a health hazard. A safe scientific method has to be evolved.

**4. Hill Agriculture, Floriculture and Horticulture :** During my visit to earth quake affected areas in Uri, Thangdhar and Ursa of J & K. I found the need for hill agriculture, floriculture and horticulture. It is proposed to create Walnut, Apple, Almond, Olive nurseries in these areas and establish low cost green houses for production of vegetables during winter months and supply improved seeds of other crops grown by the farmers.

**5. Flowering of Bamboo :** As you are aware bamboo forests in India are spread over 10 million hectares. When I visited North East region of the country, I was told about a rare phenomenon—gregarious flowering of bamboo plants—is setting off alarm bells in the Northeast, leading to fear of a rodent menace. Flowering on such a scale, which takes place after every four decades has been noticed in Mizoram and Arunachal Pradesh. Unlike other plants, flowering in bamboo adversely affects the plant, producing large quantity of seeds. The seeds attract rodents, which in turn to other crops, leading to large-scale destruction. The last such flowering was followed by a famine in Mizoram. I would suggest that plant scientists to find a solution through plant genomics for preventing such flowering and the resultant problems to the other crops and farmers. Time is crucial factor now. It may be in a few years time. Therefore, within a year solutions are required.

**6. Productivity increase in rice and wheat :** I would like to narrate how the agricultural productivity has been enhanced in particular area of Bihar. An experiment has been carried out by TIFAC team in Bihar, in the RP Channel 5 and majholi distributory and later extended to Paliganj and other 5 distributaries on the request of the farmers. The productivity of paddy has increased in these villages from 2 tons per hectare to 5.8 tons per hectare and in respect of wheat, it has increased from 0.9 ton per hectare to 2.6 tons per hectare. This has been achieved using farming methods

involving soil characterization, matching the right seed to soil, seeding in time, fertilizer and pesticide selection, water management, pre and post harvesting methodology and marketing of the produce. Presently, paddy and wheat crops are spread in an area greater than 2500 hectares involving 3000 farmers. The experiment has been extended for promotion of medicinal and aromatic plants with processing for increasing the income of the farmers.

To remove the exploitation of farmers by middlemen, a local procurement center has been set up by the government. This model can definitely be replicated in many parts of the country. However to get the future requirement of food grains with the constraints of land availability and water would need enhancing the productivity further. This is where the scientists have to work now to discover new breeds of wheat which can yield 5 tones per hectare and rice which can yield up to 10 tones per hectare.

Bihar has a potential to become number one state in cereal production, since it is a Gangetic delta with quality soil, availability of abundant water and hardworking farmers. The planning commission, agriculture scientists and infrastructure development groups have to work together in making Bihar number one in cereal production since India needs one more State to produce large amount of cereal to meet the increasing demand. Since the terrains are similar such methods can be spread to Eastern Uttar Pradesh also.

**7. Solar Power Plants :** Commencement of establishing solar power plants is an essential requirement. At present, only kilo watt level solar power plants are available in the country. Rashtrapati Bhavan has planned to setup Asia's largest solar power plant of 5 Megawatt capacity by the end of the year 2006. Solar energy is available everywhere. The scientists have to take up the challenge of increasing the solar cell efficiency from 15% to 45%. Research is essential using CNT plus Silicon photo voltaic cells which will make the establishment of Solar power plants competitive.

I have discussed some of the components of PURA, which are essential for realizing the integrated rural development complexes. The educational institutions can also consider giving development components of PURA, as projects to the undergraduate and post graduate students. I would request the educational institutions and scientists to undertake the value added implementation of these components in their rural clusters in collaboration with private industries, NGOs State Government and the local people for whom it is proposed to be done.

My best wishes to all the participants of 93<sup>rd</sup> Indian Science Congress for success in the mission of providing science and technology solutions to the integrated and sustainable rural development of the country.

May God bless you.

## EXCERPTS OF THE ADDRESS

by

**Dr. A. P. J. Abdul Kalam**

**Hon'ble President of India  
at the Inauguration of the**

**National Virtual Congress of Farmers**

**Hyderabad**

**5 January 2006**

***“Empowering Farmers through Science and Technology”***

His excellency the President of India inaugurating the National Virtual Congress of Farmers said

I am delighted to participate in the Inauguration of the National Virtual Congress of Farmers. I greet the organizers, scientists and farmers in different locations. When I am in the midst of farmers I would like to share with you some of my experiences in the rural areas of different States. Let me first narrate the BAIF model in Gujarat.

### **Bharatiya Agro Industries Foundation (BAIF) Model for Tribal Rehabilitation & Dry Regions**

An integrated village cluster development programme has been taken up by Dr. Narayan G. Hegde, an IIM graduate who is an expert in farming and Dairying in two village clusters of south Gujarat-Chonda and Lachakadi, with a population of 5000.

I was told that the project was implemented through Self Help Groups (SHGs) by building mutual confidence. The groups took the responsibility to help the weaker members. This boosted progress. The results were phenomenal. In Ghatol cluster in Udaipur out of 3000 poor families, more than 90% were able to earn Rs. 20,000 per annum. Efficient watershed development not only helped to ensure the availability of safe drinking water throughout the year but also boosted their crop yields from 30% to 80%. Over 800 hectares of Anola orchards were established for the first time in the region, which started yielding from the third year. The farmers groups have started processing and marketing the fruits. The entire village cluster was self-sufficient in food supply. Dairy and animal husbandry further boosted their family income from 30 to 60%. These families had formed 71 Self Help Groups and 24 village level organizations. They have built their own corpus of Rs. 30 lakhs.

### **Cotton Production at Gheri Buttar**

I visited a village called Gheri Buttar near Bhatinda in Punjab, where I met the farmers who have successfully increased the production of seed cotton from four hundred and sixty kilo gram per acre to eight hundred and sixty kilogram per acre in the year 2005. This has been achieved through a productive partnership between farmers, agricultural scientists, textile industry supervisors and the Government by following a scientific approach to farming, adopting pre-harvest and post-harvest techniques with an assured market for seed cotton. I have suggested the farmers in that village to mount a programme of second green revolution in Cotton meaning that instead of selling the cotton produce directly in the market they should convert it into yarn, cloth and apparel in the village complex itself and market it in the national and international markets.

### **Periyar PURA (Tamilnadu)**

The center of activity emanates from the women engineering college that provides the electronic and knowledge connectivity. Periyar PURA has health care centers, primary to post graduate level education and vocational training centers. This has resulted in large-scale employment generation

and creation of number of entrepreneurs with the active support of 850 self-help groups. Two hundreds acres of waste land has been developed into a cultivable land with innovative water management schemes such as contour ponds and water sheds for storing and irrigating the fields. All the villagers are busy in cultivation, planting Jatropha, herbal and medicinal plants, power generation using bio-mass, food processing and above all running marketing centres. This model has emanated independent of any government initiative. The committed leadership has been provided by the Engineering institution. This gives me the confidence that PURA is a realizable proposition and this movement can be multiplied by thousands of entrepreneurs, educational administrators, small-scale industrialists and bankers with the support of the government agencies. The fourth model I have witnessed in Bihar which I would like to narrate now.

### **Productivity increase in rice and wheat**

An experiment has been carried out by TIFAC team in Bihar, in the RP Channel 5 and Majholi distributory and later extended to Paliganj and other 5 distributaries on the request of the farmers. The productivity of paddy has increased in these villages from 2 tons per hectare to 5.8 tons per hectare and in respect of wheat productivity, it has increased from 0.9 ton per hectare to 2.6 tons per hectare. Presently, paddy and wheat crops are spread in an area greater than 2500 hectares involving 3000 farmers.

The experiment has been extended for promotion of medicinal and aromatic plants with processing for increasing the income of the farmers. By June 2006, there will be a distillation plant is being set up locally. This project has been carried out by the Technology Information Forecasting and Assessment Council (TIFAC), in collaboration with a farmer's co-operative society, IARI and agricultural university in Pusa, Bihar. Using scientific method of farming involving soil characterization, matching the right seed to soil, seeding in time, fertilizer and pesticide selection, water management, pre and post harvesting methodology and marketing of the produce, using this model has more than doubled the production. This model can definitely be replicated in many parts of the country.

### **Project Siruthuli – revitalizing a water body**

This is an initiative started by Coimbatoreans for Coimbatoreans. This ecological project aims to bring back the glory of Coimbatore and its rich heritage. The project is represented by people from all walks of life and professionally organized. The primary focus is on large scale rain water harvesting, afforestation, sewage/waste water treatment and solid waste management. They have already standardized five of the nine primary tanks in Coimbatore for large scale rainwater harvesting. In conclusion, His Excellency said

I find, whenever the users, knowledge and skill possessors and implementers are linked and networked, success comes effectively and multiplies. As you all aware, a networked resource is a means for faster development. To increase the present GDP growth of 7% to 10%, we need such innovative steps. Friends, ignition of young population of any country, are one of the important resources. Nation possesses this in plenty. Nation has natural resources in all key sectors. If all the farmers in different States work with the scientific community, I am sure we will be able to realize our full potential. The National Virtual Congress of Farmers enables networking of all the stake holders for mutual support and overall prosperity.

## EXCERPTS OF THE ADDRESS

at the  
Children's Science Congress  
Hyderabad  
05 January 2006

by  
Dr.A.P.J.Abdul Kalam  
Hon'ble President of India  
Science is a Lifetime mission

*“Thinking provides knowledge Knowledge makes you great”*

I am indeed delighted to address the Children's Science Congress organized as part of 93rd Indian Science Congress. My greetings to the organizers, students, teachers and science planners participating in this Congress. I would like to share some important events in the life of two scientists which can enrich the work of aspiring students in their pursuit of science as a life time mission.

### **Father of Green revolution for multi-nations**

First I would like to tell you about Dr. Norman Ernest Borlaug, a Nobel Laureate and the father of the Green Revolution in many parts of the world. He also participated in the India's Green Revolution with our scientists and farmers. To finance his studies, Borlaug periodically had to put his education on hold and take a job. While working in one of the part time jobs in 1935, as a leader in the Civilian Conservation Corps, he has seen starvation and it left scars on him. A pragmatic, goal-oriented scientist, he accepts and discards methods or results in a constant search for more fruitful and effective ones, while at the same time avoiding the pursuit of what he calls “academic butterflies”. The life of Dr. Norman Borlaug is full of events and provides us with a message on importance of continuous Knowledge acquisition and indomitable spirit to face the challenges and succeed. Dear young friends, do you know that Dr. Norman Borlaug, got his Nobel Prize for peace, since as you all know poverty removal leads to peace. Let me share with you a trait of scientific magnanimity. You must adopt this trait when you grow and become great scientist. You must acquire these characteristics.

### **Scientific Magnanimity**

Friends, if you aspire to achieve great things in life, you need Scientific Magnanimity. It is my experience that great mind and great heart go together. This Scientific Magnanimity will motivate the scientific community and nurture team spirit.

### **A genius ahead of time**

Next I would like to talk about the great mathematician Ramanujan's life. Ramanujan was born in 1887 in Tamil Nadu and at the age of 10, he entered the Town High School in Kumbakonam, where he first encountered formal mathematics. At 11 he had mastered the mathematical knowledge of advanced trigonometry using loaned books. His genius was beginning at the age of 14. Not only did he achieve merit certificates and academic awards throughout his school years, he was assisting the school in the logistics of assigning its 1200 students (each with their own needs) to its 35-odd teachers, completing exams in half the allotted time. His peers at the time later commented “We, including teachers, rarely understood him,” and “stood in respectful awe” of him. However, Ramanujan could not concentrate on other subjects and failed his high school exams. His inexhaustible spirit and love for his subject made him contribute to the treasure houses of mathematical research—some of which are still under serious study and engaging all-available world mathematicians' efforts to establish formal proofs. Ramanujan was a unique Indian genius who could melt the heart of the most hardened and outstanding Cambridge mathematician Prof G. H.

Hardy. In fact, it is not an exaggeration to say that it was Prof. Hardy who discovered Ramanujan for the world. Professor Hardy rated various geniuses on a scale of 100. While most of the mathematicians got a rating of around 30 with rare exceptions reaching to 60, Ramanujan got a rating of 100. Friends, the genius in Ramanujan had to be discovered by Prof. Hardy.

In the area of analogue signal processing one uses a mathematical technique called Fourier Transform. When one enters the digital world a different tool called Discrete Fourier Transform is used. Whereas, if one has to analyse noise signals, engineers have recently come to the conclusion that an efficient mathematical tool would be the Ramanujan Fourier Transformation or in short RFT.

### **Planetary life - 3000 AD**

On 22 March 2005, I participated in the award ceremony of Shankar's International Children's Competition at New Delhi. There I found the visualization of a 13 year old girl named Aardhra Krishna on how the earth's civilization will look like around 3000 AD. In her imagination, the citizens are forced to migrate to Mars and have made Mars the home to a flourishing civilization. This advanced civilization, which was man made, comes suddenly under threat created by nature in the form of an asteroid of Jupiter. The asteroid from Jupiter orbit was coming towards Mars and Mars was in danger of extinction. The scientists on Mars come up with a very innovative plan of a barrage of nuclear cannons to attack the oncoming asteroid. The bombardment destroys the asteroid and the year 3000 sees a Martian civilization surviving from the fury of the nature by an innovative scientific application. What a wonderful thinking of a young girl! Dear students, I am sure your minds are equally powerful in visualising and thinking.

In conclusion, His Excellency suggested

For the aspiring young scientists that in the field of science, discoveries and inventions can be realized only after going through challenging problems. Courage is very vital. You have to prepare yourself, with knowledge, for this mission. I would recommend five books for you to read. You can buy if you can afford or your school/college library should acquire. Thirdly I would like you to design a mission statement for your life. That will put you in the higher plane of mind. His Excellency explained :

#### **1. Courage**

Dear friends, will you take a oath with me on Courage.

#### **COURAGE**

Courage to think different,

Courage to invent,

Courage to discover the impossible,

Courage to combat the problems and succeed are the unique qualities of the youth.

As a youth of my nation, I will work and work with courage to achieve success in scientific discoveries.

#### **2. Books as your friends**

I would request all of you to read the following five books during the year 2006 in addition to your course material.

- a. **Empires of the Mind** : Lessons To Lead And Succeed In A Knowledge-Based by Denis Waitley
- b. **Journey into Light**: Life and Science of C.V. Raman by G. Venkataraman
- c. **A Brief History of Time** : From the Big Bang to Black Holes by Stephen W. Hawking, Ron Miller, Carl Sagan, Stephen Hawking
- d. **Parallel Worlds**: A Journey Through Creation, Higher Dimensions, and the Future of the Cosmos by Michio Kaku"
- e. **The Best of Indian Physics**: (Contemporary Fundamental Physics) Edited by B. G. Sidharth.

**ADDRESSING AT THE 93<sup>rd</sup> INDIAN SCIENCE CONGRESS  
ON SUSTAINABLE FOOD SECURITY AND RURAL PROSPERITY  
HYDERABAD ON 5 JANUARY 2006**

**Dr. Jacques Diouf  
Director-General**

**Food and Agriculture Organization of the United Nations**

Said that :

Mutual support among developing countries has a long and honourable tradition. A notable example is the contribution made by civil rights movements in South Africa to the struggle of the Indian National Congress party.

It is precisely to South Africa that Mohandas Karamchand Gandhi decided to go to practice law upon completion of his studies in Britain in 1891. While in South Africa, Gandhi developed the *satyagraha*—a new non-violent way to redress wrongs—which he then transferred to India upon his return in 1941 and thus led the country to freedom and independence from colonial rule.

FAO has been promoting South–South Cooperation Programme since 1996, which focuses specifically on achieving sustainable food security. FAO has been supporting and encouraging South-South Cooperation is its Special Programme for Food Security (SPFS), launched in 1994 to reduce hunger and malnutrition sustainably.

Dr. Jacques Diouf announced, to assist in the implementation of the SPFS and successor national programmes for food security (NPFS) that are currently emerging, developing countries with relevant expertise have been offered the opportunity to provide their own experts and technicians to work in host countries through tripartite South-South Cooperation agreements arranged by FAO. As at October 2005, 625 South-South Cooperation experts and technicians were working with farmers and fisher folk in various countries.

Some of the more salient characteristics of South-South Cooperation agreements which make them so attractive are that :

- They facilitate partnership among willing countries having special relationship of historical, cultural and geopolitical nature or other factors;
- They involve fielding of the critical mass of specialized technicians and experts, in principle at least 100 per country, to induce rapid change within a finite period, usually two to three years;
- Technicians live and work directly with local communities and farmers where they promote innovations by demonstration and training;
- Direct costs are low – US\$7,200 for technicians and US\$ 12,000 for experts per year plus international travel and a small installation allowance of US\$ 300 for each person fielded. The other costs are shared between the three parties, namely, the cooperating country, the recipient country (or a donor), and FAO (or a donor).

Dr. Diouf informed that to date, thirty-six South-South Cooperation agreements have been signed and thirteen cooperating countries have provided experts. These agreements envisage the fielding of up to 2500 South-South technicians and experts, but the number actually fielded lags far behind. The main reason for this is resource constraints in the recipients countries which have prevented them from meeting their obligations under the signed agreements.

Thus new partnership would require a due recognition of the need for a special and differential treatment for Least Developed Countries (LDCs), Land Locked Developing Countries (LLDCs), Low Income Food-Deficit Countries (LIFDCs) and Small Island Developing States (SIDS), in contrast with emerging, middle income and oil exporting countries.

Dr. Diouf also said, today large numbers of small-scale farmers in developing countries cannot secure their livelihoods nor, at times, their very survival, without technological innovation and agricultural intensification on the very small plots that they cultivate. Indian Science and agriculture have much to teach, as your farmers have practiced intensive agriculture on very small plots of land for centuries.

Because the scale of current efforts is not yet sufficient to make a measurable difference, millions of Africans remain impoverished and hungry, and food insecurity is more widespread in Sub-Saharan Africa than anywhere else in the world.

He further stated that it is striking to note that the largest proportion of undernourished is in Sub-Saharan Africa where it represents 33 percent of the total population. In Asia, this same proportion is of 16 percent, whereas the actual number of undernourished in Asia is more than double (519 million) that of Sub-Saharan Africa (203 million). Overall, per capita food production in Asia has nearly doubled between 1970 and 2004, while declining nearly 20 percent in Sub-Saharan Africa, during the same period.

He observed that in the short term, focus will have to be placed on finding solutions which are largely within the reach of Africa's small-scale farmers, including water harvesting and small-scale irrigation, production intensification and diversification, including the development of fisheries and aquaculture.

At the World Food Summit: five years later, in 2002, 180 Heads of State and Government or their representatives reaffirmed their commitment to halve the number of undernourished people in the world by 2015. This commitment is echoed in the first of the Millennium Development Goals.

FAO has been strengthening the Special Programme on Food Security in the 105 countries through an expansion to cover all agro-ecological zones. It has now embarked upon a programme of assisting requesting member countries and regional economic integration organizations to formulate national and regional programmes for food security (NPFS and RPFS) covering the full range of policies investments, expertise and actions needed to achieve the WFS and MDG target.

Dr. Diouf stated that today, the NPFS offers a broad overall policy framework for achieving the first Millennium Goal, including components for productivity improvement, market performance, sustainable rural livelihoods, nutrition and food quality, rural financing, rural infrastructure, construction and maintenance, and capacity-building for small farmers, rural communities, extension workers and local government officers.

He said at the regional level, programmes include trade negotiations, sanitary and phytosanitary measure, quarantines and control of transboundary pests and diseases, harmonization of legislation and regulations in the area of food quality and safety standards, market information and early warning, research coordination and integration.

The technical areas for which there is the most current demand for South-South experts include, *inter alia* : water control; crop intensification; diversification of production systems into short cycle animals, aquaculture and fish but also rural infrastructure.

Based on past experience, it is assumed that around 8000 technicians and 800 experts will be required during the period 2006-2010, -4500 for Africa, 1500 for Asia and the Pacific, 1200 for Latin America and the Caribbean and 800 for the Near East.

In the year 2002, FAO estimated incremental public investment requirements for agriculture and rural development to meet Millennium and World Food summit goals to be approximately 19 billion US dollars per year for the world as a whole. But in recent decades, agriculture and rural development have lost ground on the development agenda.

Over the past 20 years, resources for this sector have declined by more than 50 percent. External assistance to agriculture in Sub-Saharan Africa plummeted from a peak of US\$ 43 per agricultural worker in 1982 to US\$ 9 per worker in 1994. In Latin America and the Caribbean this assistance also plummeted from US\$ 98 per agricultural worker in 1983 to US\$ 29 per worker in 2002; and at present, external assistance to agriculture in the Asia and the Pacific region and in the Near East and North Africa region are today US\$ 4 and US\$ 9 per worker, respectively. But this trend is now beginning to change.

Dr. Diouf said, today I call on you, a body of eminent Indian Scientists with a particular concern for sustainable food security and rural prosperity, to devote some of your skills and energies to making this new South-South partnership a meaningful reality. By applying your knowledge and skill, scientific wisdom and curiosity to the challenge of modernizing small-scale agriculture you can make a difference that counts for present and future generations in the Third World. It is my great honour to offer you today this challenge and this opportunity for a better and more equitable world.

## ACTIVITIES IN SECTIONS

Deliberations in the 14 sections commenced with the addresses of Sectional Presidents (Annexure-II) followed by Platinum Jubilee Lectures (Annexure-III) in each section. Symposia on Special Topics (Annexure-IV) and a large number of Invited/Special Lectures (Annexure-V) were organised by the Sectional Presidents which formed an integral part of the technical programme of the Science Congress.

### ISCA Young Scientists' Programme

Presentation of papers under ISCA Young Scientists' Programme in the sections were arranged on January 4, 2006. This year thirteen young scientists received awards under this programme in recognition of their contributions in respective areas of research. ISCA Young Scientist Awards (Certificate and Cash Award of Rs. 25,000/-) were presented by H.E. The President of India on January 5, 2006. Names of those young scientists and titles of their papers are given in Annexure-VI.

### Presentation of Contributed Papers (Poster/Oral)

Most of the contributed papers accepted on the basis of screening done by the Sectional Presidents, Local Sectional Secretaries and Experts were presented by way of Posters during January 5-6, 2006. The names of judged for best poster presenter during the 93<sup>rd</sup> Indian Science Congress—2006 in different sections are given in Annexure - VII. Oral presentations of some selected contributed papers were also made in the sections concerned.

## ISCA ENDOWMENT LECTURES

The following ISCA Endowment Lectures were delivered during the 93<sup>rd</sup> Indian Science Congress in different Sections :

<b>Name of the award</b>	<b>Speaker</b>	<b>Title</b>
<i>Prof. Hiralal Chakravarty Award</i>	<b>Dr. Shamsul Hayat</b> Aligarh	Brassinosteroids: A Plant Hormone
<i>Pran Vohra Award</i>	<b>Dr. Deepanjan Majumdar</b> Anand	Nitrous Oxide Emission and Attenuation from Soil and Agricultural Fields
<i>Professor Umakant Sinha Memorial Award</i>	<b>Dr. Debasis Chattopadhyay</b> New Delhi	Transcription Factors, Good Targets for Gene Manipulation
<i>Prof. K. P. Rode Memorial Lecture</i>	<b>Prof. V. K. Verma</b> New Delhi	Geo-identity Assault on Environmental Syndrome Fulcrum
<i>Dr. B. C. Deb Memorial Award for Soil/Physical Chemistry</i>	<b>Dr. Ch. Srinivasa Rao</b> Hyderabad	Need for Inclusion of Nonexchangeable Potassium in Soil Testing and K Fertilizer Recommendations
<i>Dr.(Mrs.) Gouri Ganguly Memorial Award for Young Scientist in Animal Sciences</i>	<b>Dr. B. Sreedevi</b> Tirupati	Bovine Ulcerative Theilitis-an emerging Disease of Buffaloes in Andhra Pradesh
<i>Prof. Sushil Kumar Mukherjee Commemoration Lecture</i>	<b>Dr. Suman Preet Singh Khanuja</b> Lucknow	Enabling Pharming of Phytomolecules from Plants through Genetic Interventions: the New Opportunities in Farming of Drugs

## CHILDREN'S SCIENCE CONGRESS

A focused programme on **Children's Science Congress** was organized for three days from 4<sup>th</sup> to 6<sup>th</sup> January, 2006 during the 93<sup>rd</sup> Indian Science Congress with a view to provide a forum for children below 17 years, both from formal and non-formal school systems, to exhibit their creativity and innovativeness. The themes were (i) Harness Water for Better Future (ii) Lead Youth to Lead India to Lead the World by 2020 and (iii) Interactive Environment Education.

The Children's Science Congress was inaugurated by Shri Kapil Sibal, Hon'ble Minister of State for Science & Technology, Govt. of India on January 4, 2006 at 10.00 hrs. An interaction session with His Excellency The President of India, Dr.A.P.J.Abdul Kalam was arranged at 1500 hrs on January 5, 2006.

## BHARAT NIRMAN–SCIENCE EXHIBITION

Shri Kapil Sibal, Hon'ble Minister of State for Science & Technology, Government of India, inaugurated the **Bharat Nirman – Science Exhibition** on January 3, 2006 one of the major events of the 93<sup>rd</sup> Indian Science Congress. The exhibition had a special feature called "Hall of Pride" which was dedicated to Prof.M.S.Swaminathan, a world famous agriculture and environmental scientist and Shri Deveshwar Dayal, Chairman, ITC. The exhibition was focused to India's development and addressed to common people and students Pride of India Expo, International Pavilion. Also there was separate halls "Lab to Land" and Land to Lab" show casing the cutting edge technologies and indigenous knowledge and practices respectively. The participants were from various R & D laboratories, major corporates, state and central government institutions and departments, amongst others took part in the exhibition.

## PARTICIPATION OF FOREIGN SCIENTISTS

Scientist representatives from 18 countries of foreign scientific societies/academies and a few individual scientists from abroad participated in various deliberations in the 93<sup>rd</sup> Indian Science Congress. The list includes two Nobel Laureates Prof. Amartya Sen and Prof. Richard R. Ernst as given below :

- |  |  |   |
|--|--|---|
| 1. Prof. Amartya Sen,<br>Nobel Laureate<br>USA/UK  | 5. Dr R. S. Paroda<br>Head, Program<br>Facilitation Unit (PFU)<br>Regional Coordinator<br>ICARDA, CGIAR,<br>Tashkent | 9. Dr. Pentyla S.<br>Stony Brook Medical<br>Center<br>Stony Brook, NY, USA  |
| 2. Prof. Richard R. Ernst<br>Nobel Laureate<br>Switzerland   | 6. Dr. Ved Pal Singh Malik<br>Biotechnologist USDA<br>Riverdale, MD, USA   | 10. Prof. Michael S. Wong<br>Department of Chemical<br>and Biomolecular<br>Engineering<br>Rice University RM USA    |
| 3. Dr. R. P. Sah<br>Executive Director<br>Nepal Agricultural<br>Research Council<br>(NARC) Kathmandu,<br>Nepal | 7. Dr. William G. Padolina<br>DDG, International Rice<br>Research Institute,<br>Los Banos, Philippines               | 11. Dr. Palli S. Reddy<br>Department of<br>Entomology<br>University of Kentucky<br>Lexington, KY, USA               |
| 4. Dr. M. E. Tusneem<br>Chairman<br>Pakistan Agricultural<br>Research Council<br>Islamabad, Pakistan           | 8. Dr. Peter Glass<br>Chairman,<br>Anesthesiology Stony<br>Brook Medical Center<br>Stony Brook, NY, USA              | 12. Prof. Paolo Arese<br>Department of Genetics<br>Biology and Biochemistry<br>University of Turin,<br>Turin, Italy |

13. Prof. Robert M. Moriarty  
Department of Chemistry  
University of Illinois  
Chicago, Illinois, USA
  14. Prof. Jan Lundqvist  
Head Institute of Water  
and Environmental  
Studies University of  
Linkoping, Sweden
  15. Dr. David Heckel  
Director  
Max Planck Institute for  
Chemical Ecology  
Berlin, Germany
  16. Dr. Dronamraju  
R.Krishna  
President  
Foundation for Genetic  
Research  
Houston, Texas, USA
  17. Prof. Shreefal Mehta  
Program Director  
Radical Innovation  
Research Program  
Lally School of  
Management &  
Technology, NY, USA
  18. Dr. Phillippe Tulkens  
Belgium (India TERI)
  19. Dr. Basheer Ahmed  
Vice-Chancellor  
University of Agriculture,  
Faisalabad, Pakistan
  20. Prof. Boroness Susan  
Greenfield  
Director  
The Royal Institution of  
Great Britain, London
  21. Dr. (Ms.) Qurantulain  
Bakhteari  
Institute for Development  
Studies and Practices  
Quetta, Pakistan
  22. Prof. Seyed Hasan Saditi  
Islamic Azad University,  
Iran
  23. Dr. Madan Gupta  
Intelligent Systems  
Research Laboratory  
College of Engineering  
University of  
Saskatchewan  
Saskatoon, SK.S7N 5A9,  
Canada, USA
  24. Prof. J. N. Dahiya  
Department of Physics  
South East Missouri  
State University, Cape  
Girardeau,  
MO 63701, USA
  25. Prof. C. Channa Reddy  
USA
  26. Prof. Ram Kumar Prasad  
Gaya  
Flora of Japan
  27. Prof. Dr. Khalid  
Mahmood Khan, S-I  
Secretary-General,  
Pakistan Academy of  
Sciences &  
Vice-Chancellor,  
University of Arid  
Agriculture, Murree  
Road, Rawalpindi-46300
  28. Prof. Dr M. Shamsheer Ali  
President  
Bangladesh Academy of  
Sciences, Agargaon,  
Dhaka
  29. Dr. John Lovett  
Chairman  
Cooperative Research  
Cube for National Plant  
Bio-Security Act,  
Australia, Deakin.
  30. Prof. C.R. Rao  
Department of Statistics,  
Pennsylvania State  
University  
University Park, PA-  
17602, USA
  31. Dr. Ulrich Kopke  
Institute of Organic  
Agriculture University of  
Bonn, Germany.
  32. Dr. Jacques Diouf  
DG, FAO, USA
- LIST TO FOREIGN  
SCIENTISTS INVITED FOR  
SECTIONAL MEETINGS
33. Dr. M. V. K. Siva Kumar  
Chief, Agricultural  
Meteorology Division  
World Meteorological  
Organization (WMO)  
Ibis, Avenue de la paix  
PO Box No.2300, 1211  
Geneva 2, Switzerland
  34. Prof. Suresh I. S. Rattan  
Department of Molecular  
Biology,  
University of Aarhus  
Gustav Wieds  
Vej 10C, DK-8000  
Aarhas-C, Denmark
  35. Prof. Delane C. Kritsky  
Department of Health and  
Nutrition Science  
College of Health  
Professions, Box 8090,  
Idaho State University,  
Pocatello, Idaho, 83209,  
U.S.A.
  36. Dr. Christian Strumpell  
Free University of Berlin  
Institute of Ethnology  
Drosselweg 1-3  
Berlin 14195 , Germany
  37. Prof. Robert E. Rhoades  
Department of  
Anthropology  
University of Georgia  
Athens, Georgia 30602

38. Dr. Ramesh C. Pandey  
Chairman & CEO  
Xechem International Inc.  
New Brunswick  
Technology Centre  
100 Jersey Avenue Bldg  
B-310, New Brunswick,  
NJ 08901, USA
39. Prof. Bruce Mitchell  
Associate Provost  
Academic and  
Student Affairs  
Needles Hall, University  
of Waterloo  
Waterloo, Ontario,  
Canada N2L 3G1
40. Dr. Doghlas K. Bingham  
Elegant Computing  
Productions  
965286 Avenue,  
Edmonton, Alberta,  
T6C 1J9 Canada
41. Dr. Claudio Modena  
Professor,  
Department of Civil  
Engg.,  
University of Padova,  
Padova, Italy.
42. Prof. Masayuki Hyodo  
Department of Civil  
Engg.,  
Yamaguchi University,  
2-16-1 Tokiwadai,  
Vbe 755-8611 Japan
43. Prof. Jerome O. Nriagu,  
Department of  
Environmental and  
Industrial Health,  
School of Public Health,  
The University of  
Michigan,  
Ann Arbor, Michigan
44. Prof. David Suzuki,  
The David Suzuki  
Foundation,  
#219, 2211 West 4th Ave.,  
Vancouver, BC V6K 4S2,
45. Dr.L. Zadesh  
Computer Science  
Division, Dept. of  
Electrical Engineering  
and Computer Science  
University &  
California Berkeley,  
CA 94728-1776
46. Dr. Chen-Khong Tham  
Supervisor of Computer  
Networks and  
Distributed Systems  
(CNDS) Laboratory  
Department of ECE, NUS
47. Prof. Tetsuya Osaka  
Department of Applied  
Chemistry  
Waseda University  
3-4-1 Ohkubo, Shinjuku-  
Ku Tokyo,  
Japan 169-8555
48. Prof. Hiroshi Iwasaki  
Department of Quantum  
Molecular Devices  
The Institute of Scientific  
and Industrial Research  
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Osaka University  
Osaka 5670047, Japan
49. Dr. Abul Hasan Siddiqi  
Professor, Department of  
Mathematical Sciences  
KFUPM
50. Prof. Andrea Milani  
Comparetti  
Dipartimento do  
Matematica  
Piazzale B. Pontecorvo 5  
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51. Dr. Stephen Luby,  
Head of the Programme of  
Infectious Diseases  
ICDDR,B: Centre for  
Health and  
Population Research  
68 Shaheed Tajuddin  
Ahmed Sharani,  
Mohakhali, Dhaka 1212,  
Bangladesh.
52. Dr. Animesh Dhar, Ph.D.,  
Clinical Associate  
Professor, Hematology  
and Oncology Division,  
Kansas University  
Medical Center and  
Research  
Kansas City VA Medical  
Center, Building 15,  
Room 302, 4801 Linwood  
Boulevard, Kansas City  
MO 64128, USA.
53. Prof. Marsha R Rosner  
Director  
Ben Mary Institute for  
Cancer Research  
University of Chicago  
5841 S Maryland Ave.  
MC6027  
Chicago, IL 60637, USA
54. Prof. Sankar Ghosh  
Department of  
Immunobiology,  
Molecular Biophysics and  
Biochemistry School of  
Medicine, Yale University  
330 Ceda Street, New  
Hevan, CT 06520, USA
55. Dr. Nisha Singh  
School of Biological and  
Conservation Sciences,  
Westville Campus,  
University of KwaZulu –  
Natal (SOUTH AFRICA)
56. Professor KY Paek  
Director  
Research Center for the  
Development of  
Advanced Horticultural  
Technology Chungbuk  
National University  
48, Gaeshin-dong,  
Heungduk-gu Cheongju,  
CHUNGBUK-361-763,  
KOREA

## UNIQUE AND SPECIAL EVENTS

The 93<sup>rd</sup> Indian Science Congress (2006) has witnessed certain unique and special events, some for the first time in the history of Science Congress as under :

i. The First India Science Award of Rs. 25.00 lakhs was presented to Prof. C. N. R. Rao by Dr. Man Mohan Singh, Prime Minister of India on 3.1.2006.

ii. National Virtual Congress of Farmers was inaugurated by H.E. The President of India, Dr. A. P. J. Abdul Kalam on 5.1.2006 who interacted with the Farmers of the five States of Andhra Pradesh, Tamil Nadu, Maharashtra, Orissa and Rajasthan via satellite through a two way video sitting in the University Auditorium of Acharya N. G. Ranga Agricultural University.

iii. The Young Scientist Award amount was enhanced from Rs. 5,000/- to Rs. 25,000/- and presented to 13 Scientists on 5.1.2006 by H. E. The President of India instead of by the General President in the Valedictory function on the last day of the Congress Session.

iv. The Annual Science Congress was hosted and organized by an Agricultural University for the first time.

v. The CSIR Prof. G. N. Ramachandran Award (2004) was presented to Prof. M. Vijayan by Hon'ble Prime Minister in the inaugural session on 3.1.2006.

vi. Implementation of 15 PURA Cluster Projects in 15 States by identified institutions under the aegis of The Indian Science Congress Association.

vii. ISCA Platinum Jubilee Lecture Award Amount was enhanced from Rs. 2000 to Rs. 5000.

viii. Many administrative and financial reforms made during the year.

ix. The status of Local Sectional Secretaries was enhanced giving scientific status and joint execution of the programmes along with the Sectional President.

x. The number of Official delegates on payment of TA and DA to the Sectional Meetings was increased from two to five.

xi. Coromandel Award was presented by HE The President of India to Dr. R. S. Paroda, Past General President, ISCA on 5-1-2006.

xii. Director General, Food and Agriculture Organisation of the United Nations (Dr. Jacques Diouf) for the first time participated in the Indian Science Congress (and also delivered the Coromandel Lecture on 5-1-2006).

## VALEDICTORY FUNCTION

The Valedictory Function of the 93<sup>rd</sup> Indian Science Congress was held on January 7, 2006 at 6.30 p.m. at the Main Pandal, Acharya N. G. Ranga Agricultural University, Rajendranagar, Hyderabad which was started with invocation and presentation of bouquets, Dr. I. V. Subba Rao, General President, presided.

Dr. P. Raghava Reddy, Local Secretary, 93<sup>rd</sup> Indian Science Congress welcomed the dignitaries, scientists and members of ISCA.

The Chief Guest Sri N. Raghuvveera Reddy, Hon'ble Minister for Agriculture and Civil Supplies, Government of Andhra Pradesh presented twentyseven Best Poster Awards (Rs. 2,000/- in Cash along with a Certificate) to the participants judged as best poster presenters in the sections respectively during the 93<sup>rd</sup> Indian Science Congress and released publications of ANGRAU. After this, Sri Reddy delivered his valedictory address.

Prof. Harsh Gupta, General President-Elect, gave a brief introduction of the Focal Theme "Planet Earth" of the 94<sup>th</sup> Indian Science Congress.

Dr. I. V. Subba Rao, General President, 93<sup>rd</sup> Indian Science Congress made his Presidential Remarks on this occasion.

Then, the General President, Dr. I. V. Subba Rao presented awards and mementoes to the distinguished guests on this occasion.

Prof. S. P. Singh, General Secretary (Outstation) offered a hearty vote of thanks on behalf of the Indian Science Congress Association.

Prof. M. Sudarshan Reddy, Local Secretary, also offered a hearty vote of thanks to the participants of the 93<sup>rd</sup> Indian Science Congress on behalf of host University.

## **RECOMMENDATIONS OF THE FOCAL THEME “INTEGRATED RURAL DEVELOPMENT : SCIENCE AND TECHNOLOGY” OF THE 93<sup>rd</sup> INDIAN SCIENCE CONGRESS**

### **AGRICULTURE AND FORESTRY SCIENCE**

1. Conservation and efficient management of natural resources are vital for sustaining and improving crop productivity. Development of natural resources inventory needs to be given priority. Soil information system and soil management technologies should be developed and propagated in a large scale.

2. Climate should be treated as a resource. Information on climatic variability and weather forecasting should be integrated into resource use and development decisions. This will reduce long term vulnerability to climatic disasters.

3. Emphasis should be given on water harvesting and improving water use efficiency by using advanced technologies. Irrigation facilities improvement will impart resilience and drought proof Indian agriculture.

4. To realize the dream of making every village a knowledge centre, development of self-help groups (SHGs), Crop Resource Group (CRG), Call Centres and District Agricultural Advisory and Transfer of Technology Centres (DAATTC's) should be given priority.

5. Rainfed farming should be given its due importance to combat malnutrition in the country. Various technologies developed for rainfed agriculture should be propagated using participatory natural resource management techniques.

6. Apart from food security, nutritional security is of prime importance. To achieve nutritional security the approach of balanced and integrated nutrient management should be followed. Innovative nutrient and water management techniques, therefore, need to be developed and reached to the farmers.

7. For integrated rural development, rural women should be empowered with knowledge and economic security as they hold the key to livelihood security in the family which in turn helps the community, society and the country in their developmental endeavours.

8. As the stock of fossil fuel is getting depleted, emphasis should be given to renewable sources of fuel such as bio-fuel crops and tree borne oilseeds.

9. Conservation of genetic biodiversity and exploitation of the rich biodiversity of the country through molecular bio-technology needs emphasis in the context of WTO and intellectual property regime.

10. Environmental pollution is threatening our natural resource bases. Monitoring and mitigation of environmental pollutants should be done on regular basis and proper environmental laws should be developed and implemented to stop the menace.

11. Precision agriculture involving molecular marker technology for assisting in selection of crop varieties and detection of virulence should be given priority.

12. Research should be focused on development of simulation models for prediction and monitoring of greenhouse gases viz. methane, nitrous oxide etc. from crops and soils.

### **ANIMAL, VETERINARY AND FISHERY SCIENCES**

13. Application of GIS in study of districts of animals and plants to further the cause of conservation of bio-diversity

14. For conservation/bio diversity involving local communities should be a major thrust creating bio diversity maps which should include invasive alien species for developing conservation strategies,

Knowledge Commission, environment and forest ministry of central/state governments take the initiative with the cooperation of schools, colleges and NGO's.

15. Generation of disease free live stock.

16. Xenobiotics including pesticides, weedicides and their improper use or application create various hazards in both terrestrial and aquatic environment. A proper monitoring system could be generated through the development of useful code and conduct. It is desirable to promote "Invitro" Toxicity Testing Systems Using cell lines, enzymes and fast generated microbes to some animals populations in experimentation.

17. Production of aqua cultural species along with other such sericultural species and production of quality meat etc are of significant issue related to integrated management.

18. A Suitable Model for identification of parasites and parasitic diseases should be developed as a barcode

19. Mapping and Monitoring of bio diversity is essential for sustainable development.

## **ANTHROPOLOGICAL AND BEHAVIOURAL SCIENCES**

**(including Archaeology and Psychology & Educational Sciences)**

20. The nutritional status of individuals and populations is of wide socio-economic and public health concern. Many development projects intended to improve nutrition are constrained by a limited knowledge base, and hence the need to maximize the nutrition impact of rural (as well as tribal and backward communities) development projects. All findings show that mere availability of food does not provide adequate nutrition. Nutritional assessment methodologies (such as Anthropometric techniques) can reinforce linkage between nutrition and agriculture development for beneficiary targeting and project formulation, monitoring and evaluation. It is recommended that nutritional surveys of rural and tribal populations, and other vulnerable sections of the society need to be urgently undertaken. It is further recommended that Ministry of Rural Development and Ministry of Tribal Affairs integrate in its various programmes and projects the problems concerning nutritional status and assessment, incorporating the expertise available with anthropologists and behavioural scientists.

21. The PURA concept of His Excellency, the President of India, has to be incorporated with the help of committed field-Anthropologists and experts in public health.

22. There is urgently need to create an Indigenous Knowledge Bank by documenting details, which with spreading power of globalization may be lost to the world.

23. Distributing forest land to tribals needs to be reconsidered because it will let loose a chain of problems which will be difficult to contain.

## **CHEMICAL SCIENCES**

24. Research on natural and synthetic bioactive molecules be initiated and facilities be created. Infrastructure in selected Universities/Centres be strengthened through the financial support from DST, Biotechnology Department, CSIR, UGC & DOEn.

25. In view of the importance of aromatic and medicinal plants and herbal drugs in India, this can be an important area for rural development generating employment for rural masses. This shall create job opportunities for rural folk and backward population in the country. The research work on different aspects of M & APs be argued.

## **EARTH SYSTEM SCIENCES**

26. The Committee reiterates that the Earth Sciences be introduced at the school level in the context of significance of the earth's environment and earth resources.

27. DST Funding is required for land resource management water resource, mineral, fossil fuels.

28. Training programme should be organized for geotechnical investigations.

29. Action plan for land and water resources in rural development as an integral part of PURA Scheme.

### **ENGINEERING SCIENCES**

30. Small and efficient production units should be developed in various sectors of rural amenities and infrastructure for increased production to help create massive employment.

31. For improving the economic conditions of the rural people dissemination and application of appropriate technologies must be ensured for processing of wastes generated in villages.

32. Primary and preferably secondary level education, to all, should be ensured to help the farmers in understanding the technology for the overall growth and development of rural areas.

33. Energy infrastructure in rural areas has to be developed on priority basis with special emphasis on biomass energy, solar energy, wind energy etc.

34. Innovative and economical technologies should be adopted for construction of rural housing, farm godowns, storage structures, ware houses, animal shelters, green houses and farm ponds for agriculture.

35. Introduction of measures against natural disasters, specially, earthquakes as per code should be made mandatory to minimize loss of life and property. There is an urgent need to organize and train people engaged in construction industry on the subject.

36. Young engineers who want to take massive housing as career have to be thoroughly exposed to the State of the Art technology with the possibilities of saving the use of scarce materials and institutional resources in all aspects of design, construction and implementation.

37. To face stiff competition because of World Trade Organization (WTO), updated and advanced technology for increasing the agricultural yields must be deployed with specific target and mandate to engineers in all areas.

38. Integrated approach with S & T back up is necessary for provision of amenities and infrastructure in rural areas to achieve desired results in line with national objectives including Five Year Plans.

### **ENVIRONMENTAL SCIENCES**

39. Promotion of cleanliness of the environment as a safe-guard of public health.

40. Affordable low-cost technology for the environment sanitation; and finally.

41. Applications of biotechnology for the management of synthetic, bio-degradable products, solid-wastes, waste control etc.

### **INFORMATION AND COMMUNICATION SCIENCES & TECHNOLOGY (including Computer Sciences)**

42. There is an urgent need to strengthen the R & D in ICT Sector.

43. Efforts be made at the national level to minimize the digital divide, at two levels : between Indian and advanced nations and within India.

44. With the advent of ICT and its extensive use in all walks of life, new social order is emerging as a part of knowledge/information society. There is an urgent need of freshly designing the socio-economic policies of the state in order to avoid new social tensions in near future.

45. There is an urgent need of making special efforts to provide quality connectivity in rural India. There is a need to have clear cut state policy on the KIOSK set up in rural India.

46. Role of ICT in the domain of higher education is needed to be enhanced.

47. One special session, may be evening session, be dedicate for developing dialog between delegates of ICT Section and the experts from local/nearby ICT R& D units or ICT industries.

## **MATHEMATICAL SCIENCES (including Statistics)**

48. December 22, the Birthday of Srinivasa Ramanujam be declared as National Mathematics Day.

49. Fundamental Research Centre be established at University level in Celestial Mechanics at the earliest.

## **MEDICAL SCIENCES (including Physiology)**

50. Surveillance and control of common infectious diseases through development, testing, transfer of technology for local manufacture and introduction to the people of vaccines.

51. Emphasis should be given to Maternal & Child health on nutrition, antenatal care, etc. delivery and immunization.

## **NEW BIOLOGY (including Biochemistry, Biophysics & Molecular Biology and Biotechnology)**

52. Genetic engineering with genetic markers have become a valuable tool to speed up the process of crop variety improvement. Markers which reduce breeding time are available for rice, soybean, cotton, wheat, fruits and vegetables. Food crops are being genetically enhanced to withstand drought, resist potent weed killers, and even produce natural pesticides genetically coded for by the food crop itself. They must be harnessed for the welfare of mankind.

53. Chloroplast technology, is potentially a cheap, efficient and environmentally friendly way to produce proteins, because genes are inserted into chloroplast DNA rather than the nucleus. Chloroplasts are not involved in plant reproduction so there's little danger that inserted genes would be released into the environment. This technology was used to develop an anthrax vaccine that is being tested by NIH, USA. One plant can produce 400 million doses of anthrax vaccine, which is also free of any contaminants and human pathogens. Chloroplast technology also yields up to 1,000 times more protein than traditional methods. Each inserted gene gets copied 10,000 times in each plant cell, producing abundant amounts of protein. These technologies should be exploited in full.

54. The research emphasis would now shift from sequencing the genome to annotating the genome, with the goal of discovering a wealth of information about the way in which genes and families of genes function and sometimes malfunction. The role of variation in individual genes-known as single nucleotide polymorphisms (SNPs)-would now become a new frontier of investigation. With the locations of 2.1 million SNPs in the human genome and report of association of SNPs with various diseases, "Personalized medicine" treatment of individual patients based on their individual genetic traits becomes a reality now. It is predicted that SNPs could provide a major advancement for clinical genomics. This area should be given priority. Nanotechnology is being used to look directly at such molecular-size variations between two copies of the same gene which are essential for correlating genetic variations with disease. The goal is to fine-tune the Nano Sensor (carbon) to distinguish between the four chemical units (A,T,G,C) that make up DNA and read the sequence directly from the molecule. Such fine resolution would eliminate the need for molecular tags because the letters making up the code could be read directly. Research should be strengthened further in this regard.

55. A high throughput version of this technology could have broad applications in medical diagnostics and personalized medicines. It is time to take up extensive research in this area.

56. The genetic signatures of tumors may offer physicians a powerful new tool to help identify cancers that elude diagnosis using traditional techniques.

These included 14 common classes of tumors, ranging from breast cancer to melanoma. There is need for further research to exploit fully the potential of this frontier area.

57. Genome sequencing should help us solve the problems of HIV, malaria and tuberculosis, three killer diseases in these parts of the world. So efforts should be intensified in these areas to Tackle TB, AIDS and malaria to save lives.

58. Boundaries seem to be blurring, chemistry, physics, maths, bio are all overlapping. Systems biology has emerged as a result of the genetics “catalog” provided by the Human Genome Project, and a growing understanding of how genes and their resulting proteins give rise to biological form and function. The dynamics of living cells need to be understood and cataloged in a form that lends itself to computation, so as to develop a predictive system, to the extent that such a system would allow us in future to generate “designer” cell types. Such computational approaches are being taken in several ways, such as in understanding protein-protein interaction networks. Therefore, emphasis should be given for research in system biology.

59. Ample rewards may be envisaged from genomics, proteomics and bioinformatics research. But the payoff from these researches should benefit all nations, not just the rich, with regard to areas such as food, health and infectious diseases. With the scientists lie the responsibilities of standing up for all humanity.

### **PHYSICAL SCIENCES**

60. Education of the rural area should be oriented in such a way that it can be utilized for repair work of electrical equipments, motor, radio, TV sets and other equipments so that the rural people need not move to city for repairs. This syllabus should be included in the middle level education compulsorily. Elementary basics of electricity, magnetism may be included in the syllabus and special illustrative books should be made available in local languages.

61. Solar energy quantum should be enhanced in the rural areas. As solar energy is available for about 300 days a year, this freely available energy must be harnessed most effectively and efficiently. Solar battery chargers, Solar water pumps, solar lamps and batteries, solar cookers etc should be made available on subsidized prices and loans.

62. Cow dung is an important material in the rural areas. The enhancement of Goshala's and the production of Gobar gas should be encouraged on cooperative basis. This gas may be a source of energy saving. Further the waste can be used as manure in the agriculture enhancing crop production.

63. Some plants oils produce energy like “Ratanjot”. The cultivation of such plants must be enhanced in the open areas. This will be useful in producing oil, which will be used as energy supplement.

64. Radio programs should be exclusively based on the needs of the farmers in different seasons and time of the day. The programs should be so arranged that the farmers get latest information so that agriculture productivity increases. Further meteorological information should also be given every three hours in rainy days.

65. Weather Information and warning signals system should be strong at the remote and interior villages for good productivity of the agricultural sector.

### **PLANT SCIENCES**

66. Life Sciences and Biotechnology have to serve as engines for balanced and equitable economic growth of rural India.

67. Efforts should be made to make the biotech products socially relevant and affordable.

68. Technologies having the largest impact on employment generation or for added household income should be identified and promoted.

69. More stress should be laid in the researches in the area of Plant Biodiversity. Studies should be encouraged in Taxonomy in general and Molecular Taxonomy in particular. These shall help proper identification, and evaluation of national plant resources.

# 93<sup>RD</sup> INDIAN SCIENCE CONGRESS

## TOPIC-WISE RECOMMENDATIONS

### 1. DISASTER MANAGEMENT

- It is prudent and cost effective to develop an integrated mitigation system for Tsunami and storm surges because of several commonalities in terms of observational network, database on bathymetry and coastal topography, data communication, dissemination of warnings, training and education and operational practices.
- The design of the integrated system, being implemented by the Department of Ocean Development, involves (i) upgrading of existing seismic stations, (ii) observational network of 8-10 bottom pressure recorders, (iii) 45-50 tide gauges at strategic locations for real time sea level monitoring, (iv) 10 radar based monitoring stations, (v) a network of 8-10 deep sea current meter moorings, (vi) numerical modeling of Tsunami and storm surges, and (vii) development of a Tsunami Warning Centre at INCOIS, Hyderabad.
- It is essential to ensure holistic and proactive planning for prevention, mitigation and preparedness. Each Ministry/Department of the Central/State Governments should ensure that disaster reduction elements are integrated and mainstreamed into development planning.
- India should develop science-based disaster preparedness and mitigation systems and integrate these with sustainable management. This can be achieved through rural knowledge centres, community-centered grain and water banks together with cyclone/tsunami shelters in vulnerable regions.
- Preparation of seismic risk map of India and microzonation of major cities and implementation of building codes for safe constructions.
- Public understanding of Natural Disaster Science has to be cultivated. The necessary scientific temper ought to be built up among all the segments of the society without which disaster awareness can hardly take roots and more so at the grass-root level.
- Training and capacity building for the technological empowerment of the resource poor rural communities should be based on social and gender equity.
- Modelling critical aspects of disaster management, reckoning complexity of disaster phenomena should be resorted to for conceptualisation and subsequent use in disaster realities.
- Development of short term forecasting models for fog, especially for the Himalayan foothills and Ganga basin regions, to help transport and tourism industries.
- Prediction of extreme spatial variability of monsoon is still a challenging task. Dynamic models describing the physical laws governing monsoon variability must be used instead of empirical techniques. Coupled Ocean-Atmosphere model is a must to predict space time structure of monsoon intra-seasonal oscillations. Considerable work is still required in this field.
- Recent developments in Science and Technology offers potential to put in place early warning systems to predict the incidence of natural disaster with a certain degree of confidence. The National Disaster Management Authority constituted by the Government of India in 2005 can coordinate these efforts to effectively prevent loss of life, property and human suffering.
- Preparedness is the key to prevent damage due to natural disaster.
- The deliberations at the Congress clearly point out the need to protect the coastal ecosystem. Mangrooves and casuarina plantations are very effective in preventing the damage due to the onslaught of Tsunami. The Swaminathan Committee Report (2004) also emphasises the need to develop “BioShields” all along the coastal areas by intensive planting and protection of

mangrooves and casuarina etc. Some thorny plant species native to coastal areas on the other hand caused damage to human and animal life due to injuries caused by the plants thorny characteristics.

## 2. BIODIVERSITY AND BIOPROSPECTING

Underscoring the fact that ‘diversity’ is the bedrock for progressive improvement of all flora and fauna including microbes of importance to man, the session made the following observations and recommendations on the need and urgency of conservation, evaluation and sustainable management of the shrinking of agrobiodiversity resources.

### Conservation of Biodiversity

Despite all efforts underway, loss of agrobiodiversity comprising crop and animal genetic resources is still at rapid pace warranting accelerated technical and legal measures to slow down the trend of erosion.

- a. In plant component, protection of diversity in insecure habitats/environments by the strategies of farmer participatory on-farm conservation of landraces/wild relatives of all major crop plants including underutilized crops and Bioprospecting of forest species of medicinal and industrial value should receive priority.
- b. In animal component, conservation effort is left much to be desired, though the country is endowed with rich diversity in livestock and fisheries.
  - The breeds/species at the verge of extinction or in the endangered category be inventorised, characterized and mass multiplied for conservation and sustainable utilization.
  - National livestock policies should be with a dual purpose of improvement and conservation of diversity, which is largely through breed level variation. Accordingly within breed, selection be practiced in indigenous breeds while cross breeding be restricted to crosses of non-descript populations with exotic improver breeds.
  - Government sponsored programmes for conservation of indigenous breeds through establishment of ‘livestock farms’ are not effective enough. Formation of ‘Breeders’ Associations’ driven by farmers based on their perceived needs be encouraged for *in situ* conservation of indigenous breeds.
  - Among the major reasons for severe and rapid erosion of livestock resources, deceleration of sanctuaries and national parks and restriction of seasonal animal grazing practice of ages due to joint forest management programme are important. It is, therefore, necessary that the entire spectrum of laws relating to these trends/developments be re-examined and redesigned so as to be benign and sensitive to conservation of livestock diversity.
  - The states with adequate funding support from the central government should take the responsibility of conserving livestock breeds in the form of semen, embryos, blastomeres, cells, genes and DNA sequences in the National Gene Bank.
- c. In the case of fisheries, greater efforts are warranted for documentation of both marine and freshwater (inland) biodiversity for planned conservation.
  - *In situ* conservation in protected water bodies and *ex situ-in vivo* conservation endangered and commercial species by sperm conservation be given priority.
  - Protection of marine sanctuaries (14 under category 1, three notified biosphere reserves–Sundarban, Gulf of Mannar, Great Nicobar Biosphere reserves) and fresh water aquatic sanctuaries 29 fish sanctuaries in the Himalayan region and some

river stretches protected due to religious sentiments (Rishikesh, Hardwar, Almora, Ajmir Shringeri, Tunga River etc.) should receive augmented research and development efforts to conserve and sustainably manage the unique diversity.

- d. Given that over 95 percent of diversity in microbes still remain uncovered largely for lack of appropriate cultural techniques, concerted research effort to bring out and study vast majority of microbes would be to our advantage in the wake of product patenting applicable to microbes as well now in place.
  - Special efforts be made to survey and collect microbial diversity in Northeast Indian Hill states in general, Arunachal Pradesh in particular, and desert regions of Rajasthan and Gujarat specifically for agriculturally important fungi.

### **Evaluation of Agrobiodiversity**

One of the serious weaknesses in genetic resources activities is little attention given to systematic evaluation of diversity for traits of economic importance. Irrespective of the strategy-conventional or molecular—it is the complete passport information that forms the pre-requisite and basis for targeted improvement of crops and animals.

- a. In crop improvement, only a small fraction of the inherently available genetic variability has been used so far as breeders have no knowledge as yet of the potential of the germplasm. Taking advantage of Coordinated Testing System in place, evaluation and documentation of the diversity be accelerated.
- b. Both livestock and fish germplasm be evaluated for traits of economic value covering feed conversion efficiency, tolerance/adaptation to biophysical stresses especially diseases and temperature extremes, prolificacy, fecundity, productivity etc. Germplasm unique to the country/region should receive special attention for such evaluation and legal protection.
- c. Microbial biodiversity be characterized and evaluated keeping in view the emerging needs. They include screening for identification of efficient strains for biocontrol and biofertilizer, fermentation of cellulose, cost effective production of bioethanol, conversion of wastes into valuables etc. and production of steroids by engineering yeast with relevant genes drawn from various organisms.
  - Screening and documentation of microbial diversity will remain incomplete as long as their biotechnological application remains unexplored. Thus, special attention be paid to discover novel candidate genes/promoters etc. for use in application genomics in crop improvement.

### **Bioprospecting of Genetic Diversity**

Very little has been done in search for and identification of strains and bio-molecules of pharmaceutical, nutritional, pesticidal value in both flora and fauna, the country is endowed with. Intensive screening of biodiversity with such objectives and benign public policies enabling locals to earn livelihood while nurturing and protecting centers of diversity should serve the dual purpose of 'prospecting from and conserving of biodiversity.

- a. In the case of plant species provisions in the Biodiversity Bill, Environment Protection Act etc. favouring tribal communities to earn their livelihood from and protection thereby of biodiversity would help to achieve conservation by optimal utilization.
- b. Bioprospecting of aquatic and marine biodiversity for high value compounds of industrial and pharmaceutical value be prioritized and targeted.
- c. In respect of livestock, scope to identify rare traits of economic value in indigenous breeds and wild be explored. Many local strains well adapted to tropical/temperate conditions,

resistance to diseases, and those known for high prolificacy, meat and milk quality be identified and used in livestock improvement.

- d. In the case of microorganisms, extensive search for new species and more efficient strains for doing the known jobs and study of their usefulness to do synthetic chemistry be given priority attention. Also, enormous scope available to discover and use marine bioactive molecules/metabolites, pharmaceuticals, enzymes, cryoprotectants, cosmaceuticals, agri-chemicals, microbes, corals, sponges and sea weeds be explored intensively in over 3,00,000 described plant and animal species the oceans harbour. Marine biotech products offer unlimited market world over.

#### **Other Issues Warranting Attention:**

- a. National Policy of Science and Society be developed for effective management of genetic resources for sustainable agriculture.
- b. Mechanisms and policy directions be evolved expeditiously for unrestrained lateral/multilateral exchange of germplasm, as declining trend has started impacting adversely crop improvement research. Also, steps be initiated to repatriate the germplasm of ours now in various international genebanks.
- c. Awareness among people living in the neighborhood of centers of diversity about the importance and urgency of conservation and sustainable management of genetic resources for the present and future generations be created.
- d. A Coordinated National Programme for systematic evaluation and documentation (National Data Base) of plant, animal and microbial genetic resources be launched.
- e. Declining production trend in riverine fisheries traceable to pollution, sedimentation etc., and erosion of reefs and corals in marine ecosystem due to launch of not-well-researched developmental activities be studied for corrective measures.
- f. A strong mechanism of quarantine and fish health certification be evolved to prevent entry of undesirable exotic fish species.
- g. In case of livestock, government should develop a legal framework under which the breeds bred, nurtured and sustained be registered and breeding programmes be regulated for improvement-cum-conservation goal. The community concerned and the government should share the cost on *in situ* conservation.
- h. If indigenous breeds are to be improved and conserved, the issue of ban on cow slaughter be reexamined in the light of feed availability to so large a population of cattle.
- i. To grant ownership of local breeds, communities be determined based on their breeding tract. For instance, in the case of cattle and sheep breeds such as Nagor, Rathi, Tharparkar, communities that regulate breeding of these strains in Rajasthan shall be the owners. As strains like Sahiwal, Sindhi and Haryana of North India are being owned by several neighbouring countries they will enjoy multi-country ownership. The country, therefore, should initiate registry on documentation of the breeding tracts for various indigenous breeds and communities responsible for their development.
- j. As for the access to livestock germplasm by user institutions especially foreign agencies enjoy the right to deny the germplasm and associated indigenous knowledge, if it feels that it would adversely affect the local interest.
- k. The country with long coast on three sides and porous northern border coupled with increased flow/exchange of germplasm is vulnerable to invasive exotic plant/animal species with potential to adversely affect the economy, environment and human health with diseases etc.

There is, thus, a need to establish a National Centre for Plant Biosecurity with the objective of monitoring/intercepting and counteracting the impact of invasive species through application of innovative technologies and integrating approaches across agencies and jurisdictions.

### **3. STRATEGIC RESEARCH**

#### ***Translational Research***

- 1. Educate both basic scientists and clinicians about the concept of translational research .**
- 2. Departmental funding for translational research .**
- 3. Provide technical support and other resources for translational research .**

#### ***Basic Research***

- 1. Increased funding for basic research .**
- 2. Funding Support for basic research .**
- 3. Increase laboratory space .**
- 4. Recruit additional research faculty .**
- 5. Increase interactions among research faculty .**
- 6. Visiting Basic Scientist Program .**
- 7. Increase the ‘presence’ of the institute as a major force in meetings.**

#### ***Clinical Research***

- 1. Increase Medical Colleges effort in clinical research.**
- 2. The Clinical Research classes should become part of the curriculum in medical colleges.**
- 3. Interaction between Old and New faculty and private and public institutions.**
- 5. Student Research Rotation from MBBS students as part of curriculum.**

### **4. HEALTHCARE**

Among the major promoters of growth and equity in developing countries like India, ‘Healthcare’ is foremost. Unfortunately, it is receiving low priority in public spending (0.9% of GDP as against 8.1% by OECD countries). Like education it is one area wherein maximum public good is possible with minimal investment. Our knowledge, expertise in this field can match the best in the world. Yet, our health indicators are very poor. Given the fact that 7-8% of the annual household income of poor families account for healthcare and hospitalization accounts for 60% of an average Indian’s total annual expenditure on medical care, sickness is the major contributor to impoverishment and indebtedness. Independent India has made impressive achievements in the health sector, given the doubling of life expectancy, halving of infant mortality and control of many deadly infectitious diseases. Nevertheless, the real challenge is one of creating and sustaining a viable, effective and responsive health delivery system. We have many strengths in the health sector. Yet, we are not still free from many a deficiency. The following are some of the observations and recommendations towards building a “Healthy India” through effective healthcare system, awareness creation among people of communicable diseases and inexpensive ways of controlling them through safe drinking water and sanitation and educating on the importance of balanced diet.

#### **A. Healthcare Delivery System**

The malaise afflicting our healthcare system is broadly three fold viz Accessibility, Affordability and Accountability.

- Most people, especially in the rural areas, do not have proper access to healthcare of acceptable standard. Except in a couple of states, public health facilities are largely inadequate all over.

Low level of public expenditure (skewed excessively towards salary component) inadequate infrastructure and skewed priorities have limited access to healthcare delivery for the bulk of our population. Corrective measures be taken to address these constraints to the delivery system.

- Unaffordability of bulk of our population is the second major problem afflicting our health delivery. Bulk of India's health expenditure (83%) is in the private sector (90% of it has to be out-of-pocket) coupled with declining public spending on health imposes disproportionate burden on poor. As preventive and primary care are relegated to the background and as curative services are becoming evermore sophisticated and expensive, the cost of healthcare is increasingly unaffordable to most, warranting development and adoption on a massive scale low cost high impact solutions as detailed elsewhere.
- The third major problem afflicting the health sector is lack of accountability. Poor quality of services, medical malpractices, overbilling, callous treatment of patients, excessive investigation, needless hospitalization etc. all traceable to corruption/poor accountability.

All these warrant effective steps to find remedy to them. Clearly public expenditure on healthcare should be stepped up substantially. Most importantly most public expenditure should be directed towards preventive and primary healthcare. We need to evolve mechanisms for risk-pooling so that most healthcare interventions are affordable to the poor. Mechanisms must be evolved for enforcing accountability within the sector. There is as well need to focus on better delivery and to direct resources sensibly to ensure maximization of public good.

### **Low Cost High Impact Solutions**

In order to ensure maximum results with prudent expenditure, the following have to be implemented expeditiously.

#### **a. Raising an Army of Community Health Volunteers**

Wide gap between the formal health institutions and public could be bridged through efficient functioning of Community Health Volunteers. They include female VHWs for serving villages and Urban Health Workers (UHW) to serve urban areas inhabited by low income and poor populations. A million village health workers (VHW) would be required to place one VHW for every 1000 population. The VHWs exclusively females among the educated from any given area will be selected by the community. The VHWs and UHWs will be given a 3 month training spread over 3 years. Several non-profit/charitable organizations/Foundations like Voluntary Health Association of India, Jana Swastha Abhiyan, Foundation for Research in Public Health etc. be involved in their training and capacity building programmes. VHWs will be purely voluntary workers and they will be recruited and paid reasonable honorarium by the Village Panchayats. Their work primarily should focus on preventive care, health education, immunization, maternal and childcare, family planning services, home delivery of babies, early diagnosis and control of preventable diseases, counselling and prevention of female foeticide and gender violence.

#### **b. Strengthening Primary Healthcare Delivery System**

Despite impressive health infrastructure, there are serious deficiencies requiring remedial measures. They include high percentage shortage of medical staff in PHCs (physicians, female and male MPWS, male health assistants, lab technicians and Pharmacists), of drugs and consumables in many states. Massive effort is needed to fill these gaps and make our primary healthcare delivery institutions at PHC and sub-centre levels effective. With many states starving of funds, central assistance is required to address these deficiencies. Subject to financial health, services of 80,000 MPWs be drafted in poor states with highest disease burden with central funding. Provisioning of

35 drugs listed in the Essential Drugs list to all PHCs, intensification of the ongoing communicable disease control programme, addressing the burden of non-communicable diseases associated with the rise of prosperity levels in urban areas etc. also should receive priority attention.

### **c. National Mission for Sanitation**

Safe drinking water and sanitation are two vital requirements for good health. While level of accessibility to drinking water achieved is impressive, the condition of sanitation is appalling (only 31% people have access to safe hygienic toilet facilities). The problem is largely on account of ignorance, habit and poverty. Through massive public education campaign on the need and how at low cost such facility can be created for households or communities, the level of sanitation can be improved appreciably.

### **d. Taluk/Block level Referral Hospitals for Curative Care**

It is essential to strengthen the existing institutions and create institutions to serve as credible and effective referral centres to offer curative services. Such centres contributed by local Government and District Health Board should have 30-50 bed facility for every 1,00,000 population with adequate number of physicians of accessory staff.

## **B. Communicable Diseases and Their Management**

Incidence and spread of communicable diseases are traceable largely to unsafe water and conditions of poor sanitation and hygiene all over in general and rural and semi-urban areas in particular. Though what has been achieved during the last two decades in providing safe drinking water (95%) and toilet facilities (33%) in such environments, slippage from 'fully covered' (15%) and non-functional water points (15%) and unsafe water (15%) in the case of drinking water and still prevalent open defecation and wide disparity in the use of household/community toilets between states continue to be formidable sources of communicable diseases. The mean level of reduction in morbidity and mortality possible through improved water and sanitation/hygiene has been estimated to range between 26 and 55% for diarrheal diseases. By protecting the existing drinking water sources for adequate and safe water through continuous monitoring and offering a range of sanitation technologies available for different socio-economic and regional needs could greatly minimize the incidence of all major communicable diseases. The following are some of the recommendations :

- i. Ensuring the sustainability of existing as well as new water supplies is critical and this must shape policy and its implementation. The demand responsive, community based principles that underpin GOI's Swajaldhara programme now need to be reflected in a Sector Wide Approach.
- ii. With many states facing unprecedented water scarcity, consistent inter-sectoral strategies are needed to improve the equitable allocation and management of fresh water resources. These need to reinforce and scale-up local approaches to wise water management. Policies must balance supply augmentation with demand management.
- iii. Whilst water quality is now being prioritized by Government, the scope of interventions must be broadened to manage faecal contamination of public and private water sources-this will require IEC and local action, as well as affordable technology.
- iv. In many states, TSC is proving to be an effective programme, resulting in accelerated toilet construction. The use of TSC subsidies for BPL families may need to be reviewed to provide incentives that promote use as well as construction, both individually and across communities.
- v. Toilet use should also be promoted through a second generation of IEC. This should also address other critical hygiene practices, in particular, hand washing with soap.
- vi. Monitoring systems which currently focus on financial disbursements and physical coverage should be adapted to include an assessment of toilet use and hand-washing with soap.

- vii. Water supply and sanitation facilities are still needed in countless schools and anganwadis, together with hygiene education as part of the curriculum. To achieve this, full convergence and resource pooling of TSC and SSA is needed at all levels.

### **C. Knowledge About the Importance of Balanced Diet**

Nutrition and environment are the most important determinants of health. Developing countries like India suffer from double burden of pre-transition diseases like malnutrition and infectious diseases as well as post-transition life-style related diseases like obesity and hypertension and cardio vascular diseases. Areas of particular concern in India are : a. high degree of malnutrition (over 50% children suffer from grade 2 to 3 malnutrition), b. high incidence of low birth weight (30%), c. high infant and maternal mortality, d. low sex ratio, e. low literacy, early marriage and f. poor access to sanitation (31%). In some of these indicators, India fares poorly even in comparison to neighbouring countries. Aside alleviation of poverty empowering of women with knowledge about the importance of balanced diet, sanitation, planned family, child care etc. would greatly help vast majority of us, especially in the rural areas to lead a healthy life.

- Factors like maternal malnutrition, low maternal age, premature delivery, lack of antenatal care, infections and hard physical work till the end of gestation contribute to low birth weight which leads to high morbidity and mortality, stunting, impaired physical and mental development, adverse outcome of pregnancy for daughters in later life, and increased susceptibility to cardiovascular diseases in later life. Indian diets are qualitatively deficient in micronutrients (vitamins and minerals). Additionally, diet of children and adolescents is more deprived than of adults suggesting that it is not just lack of food due to poverty, but lack of understanding of the nutritional needs of vulnerable segments.
- Awareness leads to demand for and access to better food, environment and health care. Access to a variety of foods at household level can be increased through development of homestead gardens, dairy, poultry, fishponds etc. Crop diversification giving due emphasis to less water requiring horticultural crops, legumes, millets etc. can help improve nutrition security as well as environmental sustainability. Women can become effective partners in such livelihood and production activities, if knowledgeable, educated and trained.
- Women be trained as health and nutrition workers/entrepreneurs and encouraged to participate in meeting the health needs of their family and community. They must as well be shaped into stakeholders in promoting technologies of liquid and solid waste disposal, maintaining drinking water sources etc. through appropriate training. Improved sanitation in and around their residences will reduce the burden of many an infectious disease. A variety of models for nutrition, health and environment developed by public and private institutions now available be accessed and used to educate women folk both in rural and neglected urban areas through structured training programmes.

### **5. RURAL ENERGY**

- Ensuring wider choice and availability of Distributed Generation (10-100 Kw) technology packages involving conventional, renewable and hybrid packages.
- Harness emerging fuel (Energy) options such as biodiesel, wind, tidal.
- Design, develop and popularise appliances and equipments specifically for rural application.
- *Prima facie*, biodiesel seems to have a significant potential to contribute to India's energy security. The need of the hour is to undertake R & D on sustainable plantation management, oil extraction and use, environmental and social impact assessment and build institutional models.

- Establish fuel wood plantations in the periphery (1 km) of villages to create livelihood opportunities, improve income and access to fuel wood.
  - Power plants based on wood gasification can be an option in areas where biomass production from fuel wood trees is optimal.
  - Community sized biogas plants utilizing animal dung has a great promise but the efforts in this direction are not very successful. They should be managed as commercial enterprises after carefully studying the causes for failure and initiating corrective steps.
  - Women Self Help Groups (SHG's) can form Fuel Wood Production (Tree growing) Cooperatives.
  - To develop fuel wood and biodiesel plantations to reduce drudgery in collecting fuel wood for meeting household energy equipment.
- Quote "Fuel to cook the food has become the greater constraint than the food itself" Dr. M. S. Swaminathan, Report of the Fuel Wood Committee, 1982.
- Ecofriendly energy sources have not been harnessed to the optimum. The next decade should concentrate on this aspect. The options are many but the priorities are lopsided and continue to be in favour of exploiting non-renewable energy sources.
  - All out efforts are needed to reduce emissions of Green House Gases to reduce environmental pollution.
  - Energy transmission, distribution and maintenance costs and losses are high. They should be controlled and minimized.
  - A strategy and technology package based on bioenergy is appropriate to meet the energy needs of rural India, where the villages are dispersed and vary in population densities with high varying energy demand.
  - The ultimate goal should be to provide equitable access to quality energy, to improve the quality of life of rural population and enhance the productivity of basic resources of land, water and the human capital.

## **6. EDUCATION, KNOWLEDGE AND SKILL EMPOWERMENT**

- Recognising the need for education as an engine for growth and development and advancement for scientific education and research, there is need to step up investment in education atleast to 6 per of GDP, which even the smaller countries than India are spending.
- Education should be based on ethics, morals and values and that which can add real value to human resources.
- Strategies should be developed to induct, nurture and retain young talent in the science stream, Science education to 10 + 2 and undergraduate level needs special attention.
- The goal of universal education and functional literacy should be achieved by the end of 10<sup>th</sup> FYP. Quality education should be accessible and afford able to all Indians. Village schools should be provided with buildings laboratory facilities modern equipment and qualified teachers.
- The Country needs more and more of professionals, technocrats, technicians and grass root level workers, marketing and management specialists. Women and youth need knowledge and skill empowerment. The 21st century graduates should be job providers and entrepreneurs. All this needs a new system of courses and a different type of education.
- Education focus should shift from 'mass education' towards 'education for masses'. Advancements made in Information and Communication Technology should be harnessed

to reach large section of people in a short time and enable the masses to reap the benefits of frontier sciences.

- Research is indispensable for solving the great future problems like sustainable development, resources, energy and water, health and narrowing the gap between rich and poor by providing employment for all. Research being part of education, teaching and research shall never be separated.
- There is great need of novel, comprehensive and lasting approaches that build public trust and attend to social obligations. Teachers and Scientists should serve as positive Role Models by stimulating within the Universities a transdisciplinary discourse on societal problems. The key stimuli is change.
- Research and Scientists community should work in close coordination with people around so that social entrepreneurship will herald a power house of new ideas for sustainable development.

## 7. MANAGEMENT OF CLIMATE AND ENVIRONMENT

☞ Generally, climatic variability and change will endanger sustained agricultural productivity in tropical Asia in the decades to follow. The cropping seasons may have to be rescheduled. The duration of the growth period of crops may also be affected. Studies conducted in Asia have indicated adverse effects on sorghum in rainfed areas in India, corn in Phillipines and tea production in Srilanka. These results indicated the necessity to study the impact of climate change on crop yields.

☞ Application of Science and Technology, including prediction and early warning system with sufficiently good lead time about the impending weather and climate hazards help in minimizing the adverse impact on agriculture. Information and technology transfer have a critical role to play with regard to preparedness, effective response and reducing vulnerabilities.

☞ The impact of natural disasters and extreme weather events on agriculture highlight the need for a critical Risk-Based Management approach to natural disaster planning in agriculture, forestry, livestock husbandry and fisheries.

☞ Normal agricultural activities also have profound influence on climate. The cultivated area across the globe increased from 265 Mha in 1700 to the present area of 1473 Mha and of pasture from 524 to 3215 Mha, at the expense of natural forests and gross lands, had decreased the forest area by 20 per cent during the last 140 years contributing to enormous release of green house gases mainly CO<sub>2</sub>. Through agricultural activities anthropogenic interferences have altered land cover characteristics affecting climate. Introduction of fertilizer responsive high-yielding varieties, expansion of irrigation, fertilizer use have further impacted climate through increased release of GHGs. Animal production also releases GHG's mainly methane.

☞ Amongst all the major components of natural resources climate, though extremely critical, has received less attention in efforts to promote sustainable farming practices world wide. Climate *per se* should be regarded as a 'Resource' not as a hazard. Resources for sustainable agriculture should be assessed in quantitative terms and manage properly. It is argued by meteorologists and atmosphere scientists that climate be treated as natural capital endowment of a region and as a factor that may trigger crises impacting economy and the environment. Therefore, climate prediction activity should be introduced in the planning process for which climatologists, meteorologists, agronomists, social scientists can play very crucial and significant role. Improved understanding and climate modelling can provide very useful inputs for sustainable farming.

- ☞ Climate forecasts must address needs, both real and perceived.
- ☞ There is need for prediction of components of climate variability in relevant period, at appropriate scale, with sufficient accuracy and lead time.
- ☞ Climate forecasts should target appropriate stakeholders in a form to assist decision makers and address problems encountered. More active involvement of stake holders can enhance the value of climate forecasts.
- ☞ Priority to communication and extension activity can enhance the value of climate forecasts and application. Reasons for non adoption of climate related information converted through forecast will provide valuable feed back for correction and reengineering of forecasts.
- ☞ Despite a good deal of optimism on social benefits of understanding and prediction of climate variations, the actual use of long lead climate forecasts have been limited. Economic benefits can be derived through climate prediction applications to the general economy and trade and stocking of farm produce. This aspect needs evaluation particularly countries integrated into global markets than isolated ones.
- ☞ Adoption of appropriate crop and livestock husbandry practices can reduce the negative impact of farming to climate change.
- ☞ Enduring links and networking between researchers in climate and farming can improve the value of climate predictions and its applications.
- ☞ One of the major challenges to promotion of climate forecast applications in most of the sectors of economy of a country is the lack of clear national climate agenda. Absence of clear cut policy leads to problems such as clear guidance as to which institutions/organisations have the responsibilities to synthesise and offer climate products, inadequate research capacity and lack of critical mass to deal with key climate related issues and problems. It is important that such issues be dealt on priority basis to create better institutional and policy environment to provide valuable information to policy and decision makers on the value of climate forecasts.
- ☞ Appropriate management strategies to cope with climate change and variability can be drawn from traditional and modern technologies.
- ☞ The agenda for future research on climate change and agriculture are ways and means to enhance carbon sequestration, climate and crop production, sustainable agriculture, forestry, livestock husbandry, fisheries and aquaculture practices, innovation methods for climate forecasting and information technologies for effective transfer of technology.

## **8. ACADEMIA–INDUSTRY PARTNERSHIP**

- Academia-Industry and Private–Public partnership must be encouraged and all public funded institutions must come forward to forge such partnerships, because, complementing each other can overcome individual weaknesses and add to wealth creation more than what individual partners can achieve operating separately.
- The distrust existing between academic institutions which consider industry and trade as profit oriented entities and the industry holding the view that nothing or very little can be gained from purely academic research carried out by academic and research institutions should be eliminated.
- Emerging knowledge and skill based global economies demand that countries must leverage all their internal strengths through synergies and covert comparative advantages to competitive strengths. This can be achieved only through Academic–Research–Industry partnerships.

- Academic Institutions and Research Organizations, except a few involved in carrying out purely basic research, should evolve very focused R & D programme to benefit the public and establish enduring links with industry to utilize the outcome of research work for commercialization which creates wealth to the Nation. Research without application and unfocussed to do public good is a folly which developing nations can ill afford.
- Academic and public funded research organizations need a lot of reorientation to reengineer their academic and research programmes to make them application oriented. The faculty and scientists should be well aware of the nuances and intricacies of IPR and patent regime.
- Venture capitalists and financing institutions look for viable and profitable technologies which can be commercialized. These emerging opportunities should be harnessed by academic and research institutions by resetting their priorities.
- As the era of absolute dependence on public funding of academic and research institutions is gradually coming to an end, the institutions should gear themselves to face this challenge of funds crunch and look for avenues to generate funds by reorienting their academic and research programmes and establish enduring links with industry, trade and commerce. Conflict of interests among the partners viz., Academia, Research Organizations, Industry, Trade and Commerce can be resolved for immense mutual benefit and wealth creation as has happened in USA and other countries of the Western World, Japan and countries of Asia and the Pacific.
- CSIR is spear heading to establish Academia–Research–Industry partnership and the other public funded Institutions can benefit from such novel initiatives which have proved very successful. To cite a few successful initiatives launched by CSIR “Bio-Suite” a versatile portable software suite for bio-informatics was developed through close collaboration with TCS (Tata Consultancy Services) which had product expertise but no domain expertise and 19 academic and research institutes which had domain expertise but no product expertise. The software has successfully been launched during July 2004. In the field of pharmaceuticals and rural health care, also such partnerships have yielded good results.
- Some new initiatives for forging PPP (private–public–partnerships) undertaken by CSIR are :
  - ❖ Establishment of incubation centres for technology transfer.
  - ❖ Promoting knowledge based entrepreneurship.
  - ❖ Sharing of facilities with industry.
  - ❖ Sponsor and support mobility of scientists from academic institutions to industry and vice-versa.

These initiatives should be utilized by academic and research institutions to forge viable and enduring partnership with industry, trade and commerce.
- Recent developments in frontier areas of Science and Technology which owe its progress to both academic and research institutes functioning in the public domain and industry as well as privately sponsored research and development must be harnessed for the benefit of countries across the globe through PPP initiatives. Some frontier areas of Science and Technology, to mention a few, which have exhibited unimaginable progress in the last two decades are :
  - Biotechnology and Molecular Biology.
  - Nanotechnology and Material Science.
  - Computer Science and Information Technology.
  - Medical and Pharmaceutical Sciences.
  - Energy Science and Engineering.
  - Gene and Cell Therapy (Regenerative medicine).

The US biotech and other industry start ups are evolving business models worth critical study world over for adaptation.

## 9. GLOBAL INITIATIVES TO ADDRESS MILLENNIUM DEVELOPMENT GOALS

- Improve food and nutrition security of the chronically hungry, increase agricultural productivity of the food insecure, restore and conserve natural resources essential for food security and increase incomes and make markets work for the poor.

Some of the initiatives to achieve the objectives are :

- Strengthening governance of agriculture and food production systems at the global, country, regional and local levels to effectively translate new initiatives into action at the ground level.
- Scaling up public investment for agriculture and rural development.
- Targeted steps to improve food and nutrition security and primary health care of the poor.
- Creating an effective global mechanism to prevent and mitigate disasters.
- Ensure on-farm profitable employment, farmers should have access to natural resources, potential for improving farm productivity, low investments with low risk, ensure good demand for the produce, well established market outlets and assured food security. Additionally, the use of traditional knowledge and skills must be promoted.
- Sustainable livelihoods can be achieved by promotion of livestock husbandry, agro-forestry, sericulture, agro-service centres, processing of agro and forest produce, biofertilizer, biopesticide, vermicompost, nursery and seed, cattle and poultry feed production.
- Among the off-farm activities cottage industries such as pottery, smithy, ethnic textiles and dress making, embroidery, services for farm machinery and equipment, repairs and maintenance, construction material supply, etc. are profitable.
- To ensure livelihood in arid rainfed regions livestock husbandry integrated with crop production is very encouraging.
- Community pasture management, planting and maintenance of wood lots to serve as a source of domestic fuel, soil and water conservation, community water shed development, soil reclamation, horticulture, agro-processing, mushroom cultivation, hand made paper, rope making, handicrafts, etc. provide a source of livelihood and promote sustainable rural development.
- Women empowerment through literacy and gainful employment, promotion of small family norm, community health care, support to self-help groups through training and access to credit facilities, linkage with financial institutions, markets, NGO's and development agencies ensure livelihood, peace and prosperity of rural communities. All the above need involvement of scientists, technologists, official machinery, NGO's, Social Scientists and the Stake holders the rural community.
- Effectively combat communicable diseases like malaria, AIDs, venereal diseases, enteric diseases and food scarcity and malnutrition through integrated Rural Development Programmes involving the local community, Panchayatraj institutions, agriculture, veterinary, health care government official machinery and the NGO's.

Based on the Indian experience, three multi-dimensional approaches are proposed to achieve the UN Millennium Development Goal of halving by 2015 the number of undernourished people in the world.

## 10. SUSTAINABLE WATER SECURITY

### *More crop per drop*

1. Use of remote sensing, GIS, GPS, and VRT (Variable Rate Technology), for making surface water inventories, groundwater mapping, airborne salinity mapping, management of irrigated agriculture, vegetation indices, soil moisture, crop production forecasting, wasteland reclamation, regulation of water rights and aquifer depletion through the use of evapotranspiration and lysimeters, etc. Fragmented farm holdings in the country constitute a serious impediment in the farmer-specific application of remotely sensed soil moisture and other kinds of data applications.
2. Development of drought-resistant and salinity-tolerant crop varieties. Use of recombinant DNA technology and methods for transferring (say) salt-tolerant genes (say, from mangroves) into important food crops, such as rice. Gene isolation and development of transgenics in locally adapted cultivars.
3. Preparation of hydro climatic calendar on the basis of the analysis of satellite-based, climate-related information (including ENSO impacts), for use in crop planning.
4. Maintenance of soil health. Use of soil microorganisms and micronutrients such as zinc to improve soil fertility and productivity.
5. “Blue” water irrigation - To make irrigation water available on demand, and to price it in proportion to the quantity used per unit area of land. Reduction in conveyance losses. Efficient use of irrigation water through practices such as drip irrigation.
6. Use of wastewater and inferior quality water to grow appropriate crops.
7. Use of SRI (System of Rice Intensification) method of rice cultivation, which uses less seed (~2 kg), less water (~400 m<sup>3</sup> as against the usual 600 m<sup>3</sup>), and better harvest (~6.9 t), per acre.
8. Rainfed agriculture: The greatest potential for meeting the burgeoning demand for food, lies in rainfed agriculture, based on “green” water (soil moisture), and conversion of non-beneficial evaporation to beneficial transpiration through crops, through (say) on-farm rain water harvesting, and moisture conservation methodologies. Integrated Watershed Management can increase crop productivity two to three fold through productivity-enhancing agricultural technologies (e.g. supplemental irrigation, micronutrient management), and thus break the unholy nexus between drought, land degradation and poverty (“Access to affordable water is the first step out of poverty”).

### *Food fortification*

Fermentation of cereals, pulses, root crops, vegetables, fruits, milk, meat and fish could create new kinds of foods, which are more nutritious, more digestible, and with therapeutic benefits, while improving the taste, flavour and texture, etc. Fermented foods thus offer a solution to malnutrition and ill-health and also value addition to rawfoods.

Consumer preferences drive the production pattern of foods. Both the poor and the affluent are eating less amounts of cereals - the former on grounds of affordability, and the latter on grounds of preferring to eat more meat and fruits. Ways have to be found to address the macronutrient and micronutrient deficiency in the diets of the low-income people, through appropriate food processing mechanisms.

### *Access to food*

Food availability is necessary but not sufficient condition for food security. The policy framework for food security involves three elements of availability, acceptability and accessibility. Economic and physical access to food need to be enhanced.

Development of micro-enterprises would enhance the purchasing power of the people living below the Poverty Line, to buy food.

Government incentives to promote drip irrigation, to grow low water-need crops, such as, *bajra* (in the form of guaranteed prices) and rearing meat animals with low water consumption. Weaning away the farmers from rice cultivation in drought-prone areas, etc.

Designing *customised “mix”* of inputs for improved food security at the level of watershed/*mandal*/district/state/country, depending upon locally available technologies, agroclimatic conditions, economic policies, public awareness, Information Technology, etc.

1. The *Management System* to implement the proposed strategy should take into account the multi-dimensional nature of the enterprise.
2. Policy level (“Top-down” approach)–to serve as a “think-tank” to integrate and optimize various biophysical and socioeconomic factors. This is essentially at Government level supplemented by NGOs.
3. Technology Transfer Level (“Bottom-up” approach)–to design institutional arrangements for adapting the technologies to the specific local biophysical and socioeconomic situations; to develop mechanisms and modalities of training of all the concerned entities (such as managers, NGOs, stakeholders, financial institutions, Panchayat Raj institutions, etc.)
4. Implementation level to design institutional arrangements for the management of implementation, monitoring and servicing of the micro-enterprises. “Hand-holding” with stakeholders where necessary. NGOs will be the principal players.

## **11. EMPOWERING WOMEN IN AGRICULTURAL AND RURAL DEVELOPMENT**

- The multiple roles of the rural Indian women as a home maker, care give and agricultural activities have gone unnoticed. Their role should become visible and be recognized.
- Support for the multiple roles of women can be provided by Group Services like Social Security, Community Health care supported by the State, the community or Private Institutions.
- Rural women should have access to skills and knowledge and above all basic education.
- When women are provided access to new technologies their curiosity to learn and attention to details increases. This calls for radical changes in extension strategies, which by and large have continued to by pass women.
- A comprehensive strategy is required to improve the situation with regard to women empowerment. Policy interventions are needed to arrest the recent trend of exploitation of markets by Multinationals for some products developed by women entrepreneurs in the small scale sector in respect of some farm products.
- To meet the challenges of livelihood opportunities in rural areas, the Government and non-government organizations have encouraged and promoted the formation of self-help groups (SHG’s) of women, which are active in the area of internal lending, thrift and income generating activities with the help of credit from microfinance institutions. To become economically, ecologically and socially sustainable the SHG’s should have the advantage of linkages with institutions involved in generating rural technologies, microfinance institutions and marketing organizations. However, the JRD Ecotechnology Centre at M.S. Swaminathan Research Foundation has reported that the SHG’s have been nurtured by them, their capacities built to improve their skills to adopt technologies, get self organized in terms of accounting and transparency in financial dealings and establish enduring links with markets. Many technologies have been demystified and taken to rural poor women who have adopted them to generate incomes with the help of credit linkages and a supportive role from technology providers.

- The various programmes of DST / DBT and other governmental organizations can help in transforming SHG's into sustainable entities and help a great deal in empowering women in rural areas.
- There are over a million women elected representatives in Panchayats in the country which is stupendous in the process to take the country out of the clutches of poverty and hunger which could not be resolved by adopting a top-down approach since past five decades. The interaction with many of the women representatives, the India Hunger Project has revealed that their priority is food security, violence against women, caste discrimination, health, education, water and sanitation, which is the spirit of their leadership.
- The elected women representatives have started to participate in Gram Sabhas and actively taking up basic survival issues. They have moved forward against odds in various facets of micro level planning, in establishing schools, rural health care facilities, watersheds and other basic amenities. These recent developments should be provided with all the support and encouragement needed to usher in a silent revolution in rural India.
- In Andhra Pradesh, the SHG's are reported to have performed very well which can be role model for the other states to adopt.
- In matters related to health, economic empowerment does not always lead to other positive changes in the life, health of women included. Women do not seem to become healthier by economic empowerment alone. Education, awareness and access to health care are vital to ensure health and happiness of women.
- There is a wide spectrum of health related issues of women and men in rural areas and among the urban poor. While some of these are common for both the sexes, they affect women's health more severely for socio-economic reasons. Child bearing and the health problems associated are exclusive to women, under and malnutrition compounding the problem. Women are more undernourished than men and children as traditionally they eat last and least. There is also an obvious neglect of health care of women during illness. There are also taboos in respect of food women are made to eat during pregnancy and illness.
- Women are major users of contraceptives and they undergo sterilization more than men undergo vasectomy. Sex selective abortions, use of hormonal contraceptives are playing havoc with women lives. These problems show that Indian women face serious health related problems which should be tackled by social scientists, and the medical fraternity. They are of the opinion that economic disempowerment is not the reason but social disempowerment. As long as women are not treated as equal partners in all walks of life, as long as Patriarchy continues to dominate women health problems are unlikely to improve and their empowerment will continue to remain as a dream.
- If technologies have to be accessed by women in their empowerment process it should be recognized that there is a need to engender technologies. For this the technology developers and personnel involved in transfer of technologies need to be sensitized to make the technologies women friendly which will halt the serious problem of deprivation of technologies. The experiences of institutions and NGOs working on gender issues and the vast repository of Indigenous Technical Knowledge can help the technology developers and extension agencies to reengineer their efforts to make their technologies women friendly or atleast gender neutral.
- Undernourishment and malnutrition, low birth weight, high IMR and MMR, low sex ratio, early marriage, low literacy status and poor access to sanitation and safe drinking water continue to effect the life of rural and urban poor. Indian diets are deficient in protein-calorie, micronutrients and growth factor exacerbated further by poverty and lack of understanding of

nutritional needs of vulnerable sections of population Women need to be empowered with correct knowledge of nutritional needs, balanced diets to minimize malnutrition of themselves and their children.

- Educated girls in the rural areas can be trained as health and nutrition workers who can also be trained to provide information on primary health care and sanitation. Village Panchayats can pay for their services. Specially designed technology development and extension strategies need to be evolved to empower women as active partners in farm related activities including livestock husbandry, poultry keeping, vegetable gardening, conservation of germplasm, storage of farm produce, marketing, value addition to farm products and rural handicrafts.

## **12. MEDIA PERSPECTIVES ON RURAL DEVELOPMENT**

- The media ardently supports the call of the Hon'ble Prime Minister Dr. Manmohan Singh's for a Second Green Revolution and Dr. M.S. Swaminathan's proposal to observe the year 2006-2007 as the year of Agricultural Renewal. The PURA (Providing Urban Amenities to Rural Areas) concept of Hon'ble President Dr. APJ Abdul Kalam finds full support of the media group.
- There is a need to open a website exclusively dedicated for knowledge connectivity on various rural development programmes, schemes and projects implemented by various government departments, NGOs and private organisations.
- A common platform for interaction with farmers, extension personnel, researchers and technologists with media personnel must be created.
- To bring about an attitudinal change and create positive response to rural development programmes, sensitization programmes have to be conducted at frequent intervals.
- Telecast of rural development programmes in all channels at appropriate time to benefit the rural population is essential.
- Periodic utilization of synchronized communication system to procure and disseminate information related to rural development needs is essential.
- Conduct training programmes to sensitize media personnel on latest technologies and developments related to rural development.
- Enable rural population to access localized meteorological information through the media.
- Dissemination of centralized market information through internet and other information channels is needed.
- Use of super computer to meet the current challenges like rural health care, disease surveillance etc. The media needs to play a critical role in data collection at the grass root level for processing and critical analysis by a centralized agency.
- Creating awareness regarding loan, insurance facilities subsidies etc.
- The media can play a crucial role to enable access to information about rural development, employment schemes, non-farm self employment opportunities and agro-based industries to prevent migration of rural population to urban areas.

## RECOMMENDATIONS OF GLOBAL SCIENCE AND RURAL DEVELOPMENT IN THE SAARC REGION

1. To forge new partnership to reduce hunger and poverty due recognition of the need for special and differential treatment for Least Developed Countries (LDC's), Land Locked Developing Countries, Low income Food Deficit Countries and small Island Developing States in contrast with emerging, oil exporting, middle Income countries. In the short term to move towards reducing hunger and poverty, the focus should be on finding solutions which are within the reach of small scale farmers such as water harvesting, irrigation, production intensification and diversification encompassing fisheries and aquaculture. The target for meeting the challenges of food insecurity can be met by concentrating efforts and focus them in locations where they can make a concrete and significant difference in relatively short period of time as only 10 years remain before the 2015 deadline to reduce the number of undernourished by half.

2. It is essential to formulate both national and regional programme for food security covering the full range of policies, investments, expertise and actions needed to achieve the World Food Security and Millennium Development Goals Targets.

3. The demand for experts to be deployed under the South–South cooperation programme include water management, agricultural intensification, diversification of farm production systems through integration of livestock husbandry, fisheries and aquaculture.

4. The Director General proposed a strategic alliance between India, China and FAO supported by other committed countries to eradicate hunger in the world within the next one decade. He called on the Indian Scientific community to share their concern for achieving sustainable food security and rural prosperity by devoting their skills and energies to make the South–South partnership a reality.

5. A package of recommendations appropriate for the SAARC region he observed are :

- There is a need for increasing Research partnership.
- Capacity building through strengthening of existing R & D systems.
- Enhanced human resource development for farmers and researchers.
- Agricultural growth and diversification.
- Improving competitiveness in Agriculture.
- Poverty alleviation and
- Sustainability of Agricultural Systems.

6. It is suggested that agricultural mechanisation, diversification, supply of seeds and planting material, protected cultivation, integrated pest and disease management, fisheries and aquaculture, disease management of livestock, post harvest management, restructuring of agricultural trade policy post WTO to bring relief to farmers, are vital to move towards sustainable agricultural and rural development.

7. The SAARC region countries should:

- ❖ Compete, cooperate, coordinate, complement, cycle and recycle.
- ❖ Centering people, productivity, profitability and permanently.
- ❖ Invest, innovate, intensify import and indiginise.
- ❖ Concentrate on efficiency to be effective and relevant.

8. The Congress recommends bioresource based developmental intervention for transformation of rural people in SAARC countries and called for Bioresource based development of SAARC countries as they are rich in bioresources, cultural diversity and traditional knowledge.

For Bioresource based rural transformation the programme package should include

- ❖ Inventory of plant genetic resources and traditional knowledge systems.
- ❖ Identification of location specific collection, cultivation and value addition based on bioresources.
- ❖ Knowledge and Skill empowerment of farmers and ushering in an enabling environment for sustainable use of bioresources.
- ❖ Rural upliftment through employment generation utilizing the bioresource base through production and processing of herbal drugs, nutraceuticals, cosmeceuticals, functional foods and non-timber forest products.

9. The Recommendations for the development of agriculture in Nepal include:

- ❖ To overcome poverty which is deep rooted in rural areas, sustainable agricultural growth is the only option.
- ❖ Commercialization of agriculture through public – private partnership involving various sectors and stakeholders and employing multidisciplinary approach.
- ❖ Strengthening agriculture research system to generate need based technologies.
- ❖ Sustained investments for infrastructure development, agricultural research and marketing.
- ❖ Development of agrobased industries, value addition, trade promotion, to achieve integrated rural development.

## **RECOMMENDATIONS OF STRATEGIC RESEARCH**

1. Some pertinent recommendations which emerged out of the discussion in the scientific sessions are :

In every field of science outcome of strategic research is already proving extremely beneficial to the society while generating enormous wealth in the developed Countries. The developing countries, including India, should learn from their experience and emulate the examples set by them in addressing the problems important and relevant to us. The areas where developing countries in general, India in particular can benefit by focused strategic research are :

- Food and nutrition security.
- Information and Communication Technology.
- Biotechnology and genetic engineering
- Medical and Pharmaceutical Research.
- Energy studies to develop alternative to fossil fuels.
- Environmental Science and Climate Change.
- Material Science & Nano Technology.

Developments pertinent to “Strategic Research” are Genomics and Proteomics, Synthetic Biology, Minimal Genomes and Synthetic cells, Designer Bugs, Customized Chromosomes, Gene Chips and Microarrays, Stem cell culture, Gene therapy and Cloning, Nanocrystals, Nanotubes, Nanomotors, Bio-resource conservation Bioprospecting, Environmental Pollution and Abatement, Tissue Engineering and Cloning, Imaging, Combination Chemistry, Bioinformatics and Computational Biology, Gene switch Technology.

### **Translational Research**

1. Educate both basic scientists and clinicians about the concept of translational research.
2. Translational research in terms of scientific/financial gains should be a long term plan.

3. The department should determine as to which of the research ideas have the highest probability of becoming successful translational research projects. The investigator should be encouraged to give the probable timeline with budgetary requirements to properly implement the ideas and take the project to completion. Based on the progress made on the project, it should be decided whether the ideas and results would give better spin off, if external funding is solicited. Many of the translational research projects attract private biotech and pharmaceutical companies and proper guidelines and budgetary items should be put in place to attract external funding.

4. The departmental guidance and funding is important at this phase. It would be ideal if the investigator and the department take a proactive approach in convincing companies to support these sorts of ideas and projects initially.

5. Ideas not but experiments give results. To do experiments, additional hands, as well as space, time and enthusiastic support are required. Normally, investigator's time is tied up with all sorts of clinical/academic activities, and, hence, providing needed hands and other facilities be given serious consideration. Based on the decision jointly by the Scientist and Clinicians whether a project has to be supported or not, appropriate resources can be provided to the investigators to do translational research.

6. It will be a good idea to involve appropriate experts in the project so as to develop fruitful partnerships. The mechanism to have a floating support staff would be ideal but the timeliness and goals have to be well defined. Appropriate resources in terms of space, time and support personal can be given to the P.I. based on the consensus on the scope and the outcome of the project.

7. It would be ideal to support a project that can stand on its own till attracting external funding and heading towards a viable invention/discovery so as to plan and act on patenting and licensing opportunities. A specific timeline cannot be put in place for many of the translational projects but it should be the responsibility of the P.I. or the inventor to set goals in a limited amount of time.

8. Considering the relevance of translational research in the present context, there is need for well worked out road map for planning executive and resource management for the proposed project.

9. Effective execution of such projects would depend on (a) finding a proactive/curious/inventive person having time/space to lead the project. (b) finding appropriate partners for sharing defined responsibilities. (c) identifying and aligning groups based on the expertise/need. (d) having technical support. (e) developing a mechanism to have a floating skilled technician/post doc and decisiveness in identifying and prioritizing projects based on quick turnaround in terms of results and procuring additional funds and time limits, if any.

10. As for the resources to do translational research the project be sure about (a) mechanism of support and funding sources (b) nature and level of interaction with industry/pharma/biotech (c) role of clinicians/basic scientists in actively soliciting resources the need to link time/space with funds and the outcome and rewards (monetary as well as scientific) from the project. It should also involve Technology Licensing Office (Invention disclosure form and further solicitation by the technology Office to match with funding sources) (No need for patenting initially).

### **Basic Research**

- Each basic science research faculty member in a university or institute should have at least one project to work with adequate funding associated with it. Departmental support, collaboration among the faculty, grant-brain storming sessions in search of new ideas and formulation of projects be ensured for effective implementation of the envisaged project.

- Through monthly department/institute meetings progress of research and status grant application be assessed.

- Each investigator's lab should have 70% external support and 30% departmental support. Actual percentages of departmental support should range from 10% (investigator with 2 external grants,

maintenance and equipment upgradation expenses), to 30% (investigator with 1 external grant, preparing a second submission) to close to 100% (new investigator and bridging support for investigators between grants). The support should have provision for an annual emergency maintenance budget. Each faculty member should prepare expenditure statement spelling out future plans and budget detailing expected external and required departmental support. Research committee of the institute should examine the budget proposal and make recommendations to the chair/director.

- Each major grant holder should have adequate laboratory space (800-1000 ft<sup>2</sup>). While identifying locations for establishing additional labs care should be taken that the dedicated space is for the newly recruited faculty and specific research programme.
- Declining research productivity of majority of our national institutions and Universities in terms of volume and quality is primarily due to inadequate research/technical staff vis-à-vis the research mandate. Many of the sanctioned positions remain unfilled for long. Added to this, there is hardly any scientist to undertake research in specialized areas. Deficiency of staff should, therefore, be corrected expeditiously and policy support with needed budget provision should be there for maintaining minimum research staff in all the institutions.
- For recruitment of research staff prospective candidates be invited to visit the department, present a seminar and discuss research interests with the faculty. Establishment of collaborations prior to recruitment can be helpful. A formal search committee could be instituted.
- Collaboration and interaction are essential ingredients for improving research productivity quantitatively. State of the Art Institutes are the need of the day, for carrying World Class Research. Initiatives be made to develop needed professional linkages with advanced laboratories and centres of excellence for cutting edge areas of science be established.
- There should be a visiting Scientists programme which would help build professional linkages with renowned Scientists and advanced centres of research in the World. Basic scientists invited as visiting professors. Scientists of repute visiting our institutions would provide an opportunity for investigators/students/faculty to discuss their research ideas at length. These visits can be co-sponsored by local sources too.
- Provisions and facilities now available to attract Young Indian Scientists engaged in areas of cutting edge sciences from developed countries be expanded with attractive salary structure and research grant with freedom to work in any part of the country. National Professorship for Senior Scientists of credible performance and policy decision at Government level to take advantage of retired scientists of repute with no age limit.

### **Clinical Research**

- No serious research activity is the problem in the medical field in India. Very few are largely because of its professionally unattractive kind to them. Change in the mindset and research environment in the medical schools is what is needed to strengthen medical research relevant to the country and the region.
- Encourage Medical Colleges/Institutions in clinical research. About 30% of the faculty be motivated to participate in clinical research as in many developed countries.
- Physicians involved in clinical research be provided more support from the department for pursuing their research and training the students. Attending an hour lecture monthly on research topics be made mandatory to undergraduate medical students and exclusive syllabus be prepared for this purpose.
- The door should remain open to older faculty, for the few productive people. There should be attractive incentives for junior faculty to do research by way of accelerated promotion and respectable personal pay.

- Student Research Rotation program should be implemented strictly. Good planning is essential. Background reading and protocol writing and submission must be done well before the rotation starts so that the protocol can be implemented when the rotation begins.

### **New Biology**

- Using genomic knowledge novel diagnostics/therapeutic/strategies be developed against inflammatory diseases, immune disorders, infectious diseases like combating tuberculosis, malaria, gastric carcinoma caused by *Helicobacter pylori*, behavioural disorders and more importantly personalized medicines. New insights gained on angiogenesis (formation of new blood vessels) and anthrax toxin-induced abnormal angiogenic agents; on apoptosis (programmed cell death), signaling cascades and immune modulation during infection, metabolism diversity in pathogens, plant pathogenesis be made use of in finding solution to cancer and killer infectious diseases. In the Systems Biology area, important theoretical models were proposed for gene expression in haploinsufficiency and designed biosynthesis of amino acids essential for mammals to be used as food additives etc.
- Achieving the millennium goal of World without hunger requires physical availability and economic accessibility to food to all. In the face of fast shrinking many a favourable growth factors of 70s and 80s the task ahead is the most challenging especially with the currently available technology. Advances in new bioscience provide a variety of innovate tools and techniques that are capable of finding solution to many of the problems impeding growth. To achieve the science driven growth the country should have a clear policy and commitment to promote and gain from the new bioscience or biotechnology and all related technologies.
- As sustained advance from biotechnology would depend on indepth basic knowledge about crop/animal/microbial genomes, there is need to strengthen areas like genomics, proteomics, bioinformatics etc. along with development of a large band of scientific man power.
- The students of physical, chemical, biological and social sciences and technology should be made aware of the anticipated future developments in Science and Technology by designing appropriate course curricula. Serving scientists and technologists also need such orientation so as to enable them to reengineer their research and technology development programmes more focused and ultimately benefit the society and ensure human welfare, peace and prosperity of nations.

## OTHER ACTIVITIES

### ISCA CHAPTERS

The Association started organizing popular science lectures in different centers in India from 1962-63. The scheme envisages some constructive work for the popularization and advancement of science throughout the year. Till 1985-86 these lectures were delivered at seventeen centers spread over the country. However, this was restructured with the formation of Regional Chapters.

One of the major objectives of the ISCA is to inculcate the temper of science among people and to encourage young scientists to grow up steadily in this direction involving them in the programmes relevant to fundamental, experimental and operational activities. With these objectives in view, ISCA started Chapters from 1986-87 in different places in India. At present ISCA Chapters (eighteen places) are at Bangalore, Baroda, Bhubaneswar, Bhopal, Bodh-Gaya, Chandigarh, Chennai, Delhi, Guwahati, Hyderabad, Jaipur, Kanpur, Karnal, Kolkata, Mumbai, Nagpur, Patiala and Shillong.

Some of the activities of the Chapters during the year under report are given below :

#### ***ISCA Bangalore Chapter***

*Convener* : Prof. Geetha Bali  
*Address* : Co-ordinator  
Department of Microbiology and Centre for Clean Environment  
Technology Bangalore University, Jnana Bharathi Bangalore-560056.

#### **Activities during the year**

*Celebration* : World Physics Day  
*Lectures* : On Medicinal properties of Indian spices,  
Recent Developments in Fermentation Technology,  
S. K. Mitra Birth Centenary Award Lecture.  
*Programme* : Interactive Programme with Corporation School Children.  
*Seminar* : On Einstein and his contribution.  
*Workshop* : On Practical Programme in Molecular Techniques for school and college teachers.

#### **ISCA Baroda Chapter**

*Convener* : Dr. Shashi Kanta Tuteja  
*Address* : Senate & Syndicate Member  
Reader & Coordinator Foods and Nutrition Department  
Faculty of Home Science M. S. University, Vadodara-390002

#### **Activities during the year**

*Celebration* : World Environment Day, National Science Day  
*Lectures* : On Cancer Prevailing in Women, Heart to Heart, Bones and Joints to Heart  
*Panel Discussion* : On Empowerment of Young Women through Nutrition based Knowledge  
*Programmes* : On Organo Phosphorus Poisoning and Implementations, Technology & Methods to Reduce Trans Fatty Acids in Processed Foods, Awareness Programme on Food Safety and Health, Demonstration cum Exhibition of Adulterants in Food  
*Workshop* : On Documentation of Traditional Knowledge, Tribal Knowledge and Practices.

### ***ISCA Bhopal Chapter***

*Convener* : Dr. S. K. Kulshrestha  
*Address* : Department of Zoology  
Govt. Motilal Vigyan Mahavidyalaya  
Near Old Vidhan Sabha  
Bhopal-462 003, M.P

#### **Activities during the year**

*Celebration* : National Science Day  
*Lecture* : (i) Pesticide Pollutions (ii) Role of Forensic Science in Crime Detection  
*Programme* : Madhya Pradesh Science Congress-2005 where over 600 delegates participated, 25 invited speakers delivered lectures and young scientists were felicitated.  
*Seminar* : National Seminar on Gemmology.  
*Workshop* : On Water Conservation.

### ***ISCA Bodh-Gaya Chapter***

*Convener* : Dr. Arun Kumar Singh (Jr.)  
*Address* : Reader in Physical Chemistry  
University Department of Chemistry  
Magadh University, Bodh Gaya-824234

#### **Activities during the year**

*Celebration* : National Science Day  
*Lectures* : Two lectures were organized. Speakers were Dr. B.Chakraborty, Retired Professor & Head of Chemistry, Kalyani University and Dr. S. C. Majumder, Secretary, National Research Council, Govt. of Canada  
*Programme* : Essay Competition, Debate Competition.

### ***ISCA Delhi Chapter***

*Convener* : Mr. V. M. Trehan  
*Address* : MEKASTER GROUP  
908, Ansal Bhawan  
16, Kasturba Gandhi Marg, New Delhi-110001

#### **Activities during the year**

*Lecture* : Jawaharlal Nehru Birth Centenary Award Lecture 2004-05  
by Mr. Kapil Sibal, Hon'ble Minister of Science & Technology Govt. of India

### ***ISCA Guwahati Chapter***

*Convener* : Prof. Umesh C. Goswami  
*Address* : Former Head of the Department of Zoology  
Gauhati University, Guwahati-781014, Asom

### **Activities during the year**

- Celebration* : National Science Day, World Environment Day, World Wetland Day, Earth Day, National Technology Day, World Health Day, World AIDS Day, World Tuberculosis Day, National Children Day.
- Lecture* : 12 Popular lectures were organized.
- Programme* : Environmental Awareness Camp, Aids Awareness Programme, Organizing Rural Science Club, Science Exhibition & Science Quiz in School.
- Seminar* : On Focal Theme 2005-06—Integrated Rural Development, Wetland Conservation, Information Highway.

### **ISCA Kanpur Chapter**

- Convener* : Dr. P. K. Mathur
- Address* : Head, Department of Zoology  
D. A. V. College, Kanpur-208001

### **Activities during the year**

- Celebration* : National Science Day.
- Lecture* : On Pathway Genomics in Medicinal & Aromatic Plants, Air pollution and it's management, Bio-diversity and it's conservation.
- Special Programme* : National Seminar was organized on 'Conservation of Bio-diversity and Environment in relation to Rural Development. Padmashree Prof. S. S. Katiyar, Vice-Chancellor, CSJM University, Dr. A. K. Saxena, Principal, D. A. V. College gave lectures. Other noteworthy special speakers were given by Prof. R. Ramamurthi, Prof. Geetha Bali, Prof. Santosh Kumar, Dr. R. Sahai.

### **ISCA Karnal Chapter**

- Convener* : Dr. R. Sahai  
Ex-Director  
National Bureau of Genetic Resources  
231 MIG, Old Housing Board, Sector-13, Karnal-132001 (Haryana)

### **Activities during the year**

- Celebration* : Children's Day.
- Lectures* : On Pesticides in Food Chain, Dental Hygiene and Oral Health, Global Warming and Impact on Environment, Biotechnology and Human-beings, Animal Resources and Sustainability, Animal Welfare-care and Compassion, Indoor Pollution, Cloning Technology, New Biology.
- Symposium* : On Mahatma Gandhi's Perspectives on Science and Technology, Science and Modern Life, Use of Modern Tools and Techniques, Bio-information Technology-Application in Teaching and Learning.
- Programme* : Career counseling in Science & Technology : Microbiology as a Profession, Inter-School Science Quiz, Declamation Competition.
- Special Programme* : National Symposium on Characterisation, Conservation and Sustainable Use of Animal Genetic Resource Biodiversity in collaboration with National Bureau of Animal Genetic Resources, Karnal, Dr. P. N. Srivastava, Former Member of Planning Commission, Govt. of India inaugurated the symposium.

### ***ISCA Kolkata Chapter***

*Convener* : Prof. N. C. Datta  
*Address* : Former Professor & Head  
Department of Zoology and  
Co-ordinator M.Phil in Environmental Science  
University of Calcutta  
110/20, B. T. Road, Kolkata-700108

#### **Activities during the year**

*Celebration* : World Environment Day  
*Lecture* : On Nanotechnology by Dr.H.S.Maiti  
*Seminar* : On Concept, Causes and Consequences of Tsunami, Environment and Biodiversity, Speakers : Prof. D. K. Sinha, Prof. A. D. Mukherjee, Prof. S. Basu Mullick, Prof. H. Mohan Ram, Dr. Asish Ghosh, Prof. Shelly Bhattacharya, Prof. Sudip Banerjee.  
*Programme* : Eassy competition on Biotechnological solutions to Environmental Problems.

### ***ISCA Nagpur Chapter***

*Convener* : Prof. R. P. Thakre  
*Address* : Department of Botany  
Nagpur University Campus  
Amravati Road, Nagpur-440033

#### **Activities during the year**

*Celebration* : National Science Day, World Environment Day, World Population Day, International Year of Physics.  
*Lectures* : On Power Sector Scenario in India Impact of Non-conventional Energy, Environment Legislation—their need and effectiveness, Environment Management in India, Understanding Biology through Protein Structures, Tools of finite time Thermodynamics.  
*Seminars* : On Non-Conventional Energy Sources and Rural Economy, Emerging Trend in Plant Taxonomy, Recent Advances and Perspectives Challenges in Indian non Marine Late Cretaceous, Recent Trends in Estimation and Optimization Theory and Application.  
*Programmes* : Intercollegiate Poster Competition on : (i) Energy from Biomass (ii) Water Pollution (iii) Disaster Management (iv) Science and Society (v) Environmental Sanitation Awareness (vi) Scientific/Technical Vision of my Dream.

### ***ISCA Patiala Chapter***

*Convener* : Prof. I. J. S. Bansal  
*Address* : Department of Human Biology  
Punjabi University  
Patiala-147002

### **Activities during the year**

- Lecture* : Popular Science Lecture by Prof. R. Ramamurthi, Prof. R. C. Sobti and Prof. K. C. Kanwar.
- Seminar* : On Science and Technical Education in Rural Areas—Limitations and Perspectives—Speakers were Dr. S. K. Salwan, Vice-Chancellor, Punjabi University, Dr. R. D. Anand, Director, Research, Association of Indian Universities and Mr. V. M. Trehan, Chairman, Mekaster Group.
- Programme* : Science Quiz in school level, college level, Painting Competition, Declamation Contest and a competition cum exhibition on working Scientific models.
- Special Programme* : Seminar on Science and Technological Education in Rural Areas—Limitations and Perspectives. Speakers were Dr. O. P. Bajpai, Director, National Institute of Engineers, Dr. R. D. Anand, Director, Research, Association of Indian Universities.

### **AT HEADQUARTERS, KOLKATA CELEBRATION OF NATIONAL TECHNOLOGY DAY**

The National Technology Day (symbolized by the Pokhran tests, the successful test firing of the Trishul Missile and the maiden flight of the indigenous two-seater Hansa-3) was observed with proper dignity by the Indian Science Congress Association on May 11, 2005 at the auditorium of the Association, Kolkata. The programme started with the Welcome Address by Prof. B. P. Chatterjee, General Secretary (Hqrs.), ISCA. Dr. H. Majumder, Working President, West Bengal Council of Science & Technology and Director Grade Scientist delivered the inaugural lecture. After the inaugural lecture the two eminent speakers Dr. D. Dutta-Majumder, Indian Statistical Institute, Kolkata and Dr. S. Roy, Bose Institute, Kolkata delivered lectures on ‘Technological Development in Computer Sciences and Information Technology in India’ and ‘Science & Technology : Their Relationship in a Changing World’ respectively. The programme was attended by a large number of delegates and broadcast through different media.

### **CELEBRATION OF ENGINEER’S DAY**

The 38<sup>th</sup> Engineer’s Day was celebrated by The Indian Science Congress Association on September 14, 2005 in the auditorium of the Association, Kolkata. Dr. Jayanta Sthanapati, Director, Birla Industrial & Technological Museum, Kolkata inaugurated the programme and delivered the inaugural address. After the inaugural address three eminent scientists of different fields delivered outstanding lectures on different topics. Dr. Shankar Ghatak, Scientist, Central Glass and Ceramic Research Institute, Kolkata focused on “Intellectual Property Strategies for the Twenty First Century”. Prof. Sujay Basu, retired Professor, Department of Electrical Engineering, Jadavpur University emphasized on “Rural Electrification in India—Status & Compulsions” while Prof. Moley Banerjee of Govt. College of Engineering & Ceramic Technology talked on “Artificial Neural Network in Materials Engineering”. The programme was attended by a large number of people and got wide media coverage.

## **CELEBRATION OF NATIONAL SCIENCE DAY**

The National Science Day was celebrated by the Indian Science Congress Association, Kolkata on 28<sup>th</sup> February, 2006. The focal theme of the day was “Nurture Nature for the Future”. At the outset Prof. B. P. Chatterjee, General Secretary (Headquarters), Indian Science Congress Association welcomed the audience and guests. Prof. Dipak Kumar Bagchi, Vice-Chancellor, Bidhan Chandra Krishi Viswavidyalaya, Nadia delivered the inaugural address. Prof. R. L. Bramhachari, Unit of Embriology, Indian Statistical Institute, Kolkata and Prof. J. J. Ghosh, Ex-Chairman and Ex-Centenary Professor of Biochemistry delivered lectures on the focal theme. On this occasion Dr. A. Sujatha, Hyderabad delivered Dr. B. C. Deb Memorial Award Lecture for Popularisation of Science for 2005-2006. Dr. A. P. Mitra, Eminent Scientist of Eminence, National Physical Laboratory, and Past General President, ISCA presided over the programme. Prof. Avijit Banerji, Treasurer, ISCA gave the vote of thanks. This was followed by a Symposium on ‘Integrated Rural Development : Science and Technology’ wherein some ISCA Young Scientists participated. The whole day programme was attended by a large number of scientists and students and got coverage in media.

## **PARTICIPATION OF ISCA IN KOLKATA BOOK FAIR**

The Indian Science Congress Association participated in Kolkata Book Fair at Kolkata Maidan from 25<sup>th</sup> January to 5<sup>th</sup> February 2006. All the publications of the Association were displayed in the stall along with photographs of past General Presidents and charts on various activities of ISCA. Enrolment of new members was also done during the fair.

## **VISIT OF BEIJING ASSOCIATION FOR SCIENCE AND TECHNOLOGY (BAST)**

A delegation of five members from Beijing Association for Science and Technology (BAST) visited the Indian Science Congress Association Headquarters at Kolkata on March 9, 2006. The delegation gave details of their activities and made a power point presentation and discussed how links between the two Associations can be built up. Prof. Avijit Banerji, Treasurer and General Secretary (Headquarters)-Elect and Dr. Amit Krishna De, Assistant Executive Secretary, ISCA, represented the Association at this meeting. A power point presentation of the structure and activities of the Indian Science Congress Association was made.

## **COLLABORATIVE PROGRAMMES**

- ❑ The Indian Science Congress Association in collaboration with Jatiya Vijnan Parishad observed the 113<sup>th</sup> Birth Day Ceremony of the eminent scientist Prof. Meghnad Saha on October 6, 2005 with proper dignity.
- ❑ A National Conference on Encyclopaedia Making in Indian Languages was organised by the Viswakos Parishad and the Indian Science Congress Association during February 13-15, 2006.

## **PUBLICATIONS**

This is a very important and significant activity from the angles of both dissemination of scientific knowledge and projection of Association’s image. The year under report witnessed a significant number of publications brought out by the Association. Proceedings of the Ninetythird Annual Session of the Indian Science Congress Association were published. The bi-monthly journal Everyman’s Science (Vol.XL Nos.1-6) was brought out.

Other publications brought out were : ISCA Directory : 2005-2006, Annual Report : 2004-2005, List of Office-Bearers & Sectional Committees for 2005-2006, Honorary Member, Donor & Life Members for 2005-2006, Members (With Voting Right) for 2005-2006, Synopses of the Presentations of ISCA Young Scientist Awardees for 2005, etc.

## **LIBRARY SERVICE**

During the year under report, the Library of the Indian Science Congress Association subscribed to 8 Indian Journals and 15 Foreign Journals. List of these journals is given below :

<b>Indian</b>	<b>Foreign</b>
Current Science	Ambio
Down to Earth	American Scientist
Indian Journal of Experimental Biology	Endeavour
Indian Journal of Biochemistry and Biophysics	Interdisciplinary Science Reviews
Indian Journal of Marine Sciences	International Studies in the Philosophy of Science
Pramana	Journal of Environmental Planning and Management
PTI Science Service	Nature
Science Reporter	Natural History
	New Scientist
	Policy Studies
	Science
	Science & Society
	Social Choice and Welfare
	Technology Analysis & Strategic Management
	Tropical Science

In addition to those subscribed above, the following journals/newsletters are also being received by the Library in exchange of the Association's journal "Everyman's Science" :

Chemecology	Indian Science Cruiser
CSIR News	Indian Spices
DRDO News	JIMA
Environmental Awareness	Natural History (Bombay)
Environmental Health Perspectives	S & T Post
Gana Darpan	Science & Culture
Gyan Bigyan	Spices India
IASSI News	University News
INSA News	UNESCO News
ICSSR Newsletter	WMO Bulletin
Indian Journal of Physics	WISTA

The Library is open to all category of members of the Association as well as school, college and university teachers on all weekdays (except Saturday, Sunday and Public holidays) from 10.00 a.m. to 5.30 p.m.

## MISCELLANY

### OBITUARY

During the year under report the Executive Committee, the Council and the General Body recorded their deep sense of sorrow at the passing away of **Dr. (Mrs.) Anita Pakrashi**, Convener, Committee on Home Sciences in the year 1995-96 & 1996-97 (83<sup>rd</sup> & 84<sup>th</sup> Science Congress); **Dr. Nagendra Nath Roy Chowdhury**, President, Section of Medical and Veterinary Sciences (presently renamed as Medical Sciences including Physiology), 78<sup>th</sup> Session of the Indian Science Congress (1990-91); **Dr. D. Basu**, General Secretary (Headquarters) from the year 1979-80 to 1981-82 of the Association; **Dr. Syamaprasad Ray Chaudhuri**, Recorder (1946-47) and President, Section of Agricultural Sciences (presently renamed as Agriculture and Forestry Sciences), 53<sup>rd</sup> Session (1965-66) of the Indian Science Congress; and **Prof. B. Ramachandra Rao**, President, Section of Physics (presently renamed as Physical Sciences), 65<sup>th</sup> Session (1977-78), General Secretary (Outstation) from the year 1977-78 to 1979-80 and General President, 70<sup>th</sup> Session of the Indian Science Congress (1982-83).

### ISCA MEETINGS

Following meetings of different bodies were held during the year 2005-2006 :

<b>Name of the Body</b>	<b>Meetings held on</b>
<i>General Body</i>	January 7, 2006
<i>Council</i>	October 21, 2005 and January 2, 2006 (adjourned to January 7, 2006)
<i>Executive Committee</i>	May 21, 2005; October 21, 2005 and January 2, 2006 (adjourned to January 7, 2006)
<i>Advisory Committee</i>	April 11, 2005 and October 20, 2005
<i>Finance Committee</i>	May 20, 2005 and October 20, 2005
<i>Establishment Committee</i>	May 20, 2005 ; October 20, 2005 and January 2, 2006
<i>Publication Committee</i>	May 20, 2005
<i>Endowment Committee</i>	April 11, 2005
<i>Standing Committee on Science and Society</i>	April 11, 2005
<i>Sub-committee to Review Regulations &amp; Bye-Laws of ISCA</i>	October 19, 2005
<i>Sub-committee to examine the Activities of the ISCA Chapters</i>	October 19, 2005

Besides, two meetings of the General President with Sectional Presidents of 93<sup>rd</sup> Indian Science Congress were held on May 21, 2005 and October 21, 2005. Also, meetings of Conveners of ISCA Chapters were held on October 21, 2005 and January 2, 2006.

## ISCA REPRESENTATION IN OTHER ORGANIZATIONS

ISCA Members represented in the following organizations during 2005-2006 :

**Indian National Science Academy, New Delhi :** Dr.Sandip Kumar Basu, Director, National Institute of Immunology, New Delhi (Upto December 31, 2005) and Dr. E. A. Siddiq, Distinguished Professor Emeritus, CDFD & Hon. Professor, ANGRAU, Hyderabad (from January 1, 2006)—*Member of the INSA Council;*

**Post Graduate Institute of Medical Education and Research, Chandigarh :** Prof. B. P. Chatterjee, General Secretary (Headquarters), ISCA, Department of Biological Chemistry, Indian Association for the Cultivation of Science, Kolkata—*Member of Institute Body of PGIMER;*

**All India Institute of Medical Sciences, New Delhi :** Prof. B. P. Chatterjee, General Secretary (Headquarters), ISCA, Department of Biological Chemistry, Indian Association for the Cultivation of Science, Kolkata—*Member of the Institute Body of AIIMS;*

**Indian National Academy of Engineers, New Delhi :** Dr. A. P. Mitra, Past General President, ISCA, Honorary Scientist of Eminence, National Physical Laboratory, New Delhi—*Member of the Governing Council of INAE.*

## MEMBERSHIP

The trend in Membership of different categories during the last three years can be observed from the following table :

	91 <sup>st</sup> Session (2003-2004)	92 <sup>nd</sup> Session (2004-2005)	93 <sup>rd</sup> Session (2005-2006)
<b>Life Member</b>	10,309	10,800	11,629
<b>Member</b>	2,920	3,855	5,290
<b>Student Member</b>	970	1,225	1,060
<b>Institutional Member</b>	09	09	24
<b>Institutional Donor</b>	...	01	26
<b>Total</b>	<b>14,208</b>	<b>15,890</b>	<b>18,029</b>

The increase in total membership by 2246—Life Members by 829, Members by 1435, Institutional Members from 9 to 24 and Institutional Donors from 1 to 26 during 2005-2006 is noteworthy.

## ORGANIZATIONAL SET-UP\*

### **The composition of GB/GC/FC :**

The composition of **General Body** of ISCA consists of all the Members (with voting right) and Honorary Members of the Association.

The **Council** consists of (i) Members of Executive Committee, (ii) all such Members or Honorary Members of the Association who have held office as General President, General Secretary or Treasurer, (iii) Sectional Presidents, (iv) seven members of the Association elected by the General Body, (v) one member to be nominated by The Kolkata Municipal Corporation, (vi) Co-opted members of the Finance and Establishment Committee, (vii) Editor-in-Chief of Everyman's Science, and (viii) a nominee of Indian National Science Academy (INSA) Council who is a member of ISCA.

The **Executive Committee** consists of the General President, the Immediate Past General President, the General President-Elect, the two General Secretaries, the Treasurer and ten members elected by the General Body, and Secretary or his nominee, Department of Science and Technology, Government of India.

ISCA has six Statutory Committees *viz* : (i) Advisory Committee (ii) Finance Committee (iii) Establishment Committee (iv) Publication Committee (v) Endowment Committee and (vi) Standing Committee on Science and Society.

### **Staff Welfare measures :**

Extended GOI Pension Scheme.

### **Implementation of reservation policy :**

The Association is following the policy of the Government of India in the matter of recruitment of its staff members. The roster showing the reservation of the post for SC/ST is maintained and given effect by the Executive Committee to this purpose.

Accordingly, a Special Recruitment Drive was taken to fill up the following posts (*vide* Resolution of the Executive Committee dated October 21, 2005) :

1. Group II(2) (Office & Supporting Technical Staff)—One post for S.C.
2. Group II(1) (Office & Supporting Technical Staff)—One post for S.T.
3. Group I (1) (Helper)—One post for S.C. and two posts for O.B.C.

### **Implementation of the Official Languages Policy :**

Steps to implement the provisions of Official Languages Policy as adopted by the Government of India from time to time, have been taken by the Association by way of printing of letterheads, title headings in different registers, name plates of different sections, membership forms, annual report, etc. in bi-lingual forms.

As per letter No.11020/3/2004 (O.L.) dated January 17, 2005 received from the Ministry of Science & Technology, Department of Science & Technology, Government of India, a post of Hindi Translator was created (*vide* resolution of the Executive Committee dated May 21, 2005). The incumbent joined on January 25, 2006 (*vide* Resolution of the Executive Committee dated January 7, 2006).

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\*In accordance with the suggestion given by DST in its letter No. AI/AR/004/2005 dated 31-03-2006 the above materials on organizational set-up are also furnished.

## ACKNOWLEDGEMENTS

The Executive Committee of the Indian Science Congress Association (ISCA) is grateful to the Department of Science & Technology, Government of India, for the generous grant-in-aid to the Association. The Committee would also like to record its deep appreciation of the continued help and cooperation received from officers and staff of DST.

The Executive Committee records its great appreciation of the personal interest for hosting and organizing the 93<sup>rd</sup> Science Congress by Dr. S. Raghu Vardhan Reddy, Vice-Chancellor, Acharya N. G. Ranga Agricultural University. Sincere thanks are also due to the Local Secretaries and their associates, Sectional Presidents, Sectional Recorders, Local Sectional Secretaries, and Members of the Sectional Committees for their untiring efforts to make the 93<sup>rd</sup> Indian Science Congress a grand success.

The Executive Committee also expresses its indebtedness to the Council and the Members of the General Body as also Members of different Committees and Sub-Committees for their guidance and advice. In referring to the success achieved at the Hyderabad Session, it is a pleasure for the Committee to record its gratefulness to the General President, Dr. I. V. Subba Rao for all his efforts to make the success of the 93<sup>rd</sup> Indian Science Congress a great success and memorable.

The Committee further expresses its gratitude to the family members of late Prof. R. C. Mehrotra, the past General President of ISCA for providing donation for instituting “Prof. R. C. Mehrotra Memorial Life Time Achievement Award” to be given annually to an eminent scientist for his/her outstanding contribution for development of Science and Technology.

Last but not least no record of acknowledgement could be complete without expressing the Committee’s deep appreciation of the work done by the staff of the Association throughout the year.

**THE PAST GENERAL PRESIDENTS OF  
THE INDIAN SCIENCE CONGRESS ASSOCIATION**

<i>Session</i>	<i>Year</i>	<i>Place</i>	<i>Name</i>	<i>Title of the Presidential Address</i>
1 <sup>st</sup>	1914	Calcutta	Hon. Justice Sir Asutosh Mookerjee	About Science Congress
2 <sup>nd</sup>	1915	Madras	Hon. Surgeon-General W.B.Bannermann	The Importance of Knowledge of Biology to Medical, Sanitary and Scientific Men Working in the Tropics
3 <sup>rd</sup>	1916	Lucknow	Colonel Sir Sidney G. Burrard	The Plains of Northern India and their Relationship to the Himalayan Mountains
4 <sup>th</sup>	1917	Bangalore	Sir Alfred Gibbs Bourne	On Scientific Research
5 <sup>th</sup>	1918	Lahore	Gilbert T. Walker	On Teaching of Science
6 <sup>th</sup>	1919	Bombay	Lt. Colonel Sir Leonard Rogers	Researches on Cholera
7 <sup>th</sup>	1920	Nagpur	Acharya Prafulla Chandra Roy	Dawn of Science in Modern India
8 <sup>th</sup>	1921	Calcutta	Sir Rajendra Nath Mukherjee	On Science and Industry
9 <sup>th</sup>	1922	Madras	Mr. C. S. Middlemiss	Relativity
10 <sup>th</sup>	1923	Lucknow	Sir M. Visvesvaraya	Scientific Institutions and Scientists
11 <sup>th</sup>	1924	Bangalore	Dr. N. Annandale	Evolution Convergent and Divergent
12 <sup>th</sup>	1925	Banaras	Dr. M. O. Forster	On Experimental Training
13 <sup>th</sup>	1926	Bombay	Mr. Albert Howard	Agriculture and Science
14 <sup>th</sup>	1927	Lahore	Sir J. C. Bose	The Unity of Life
15 <sup>th</sup>	1928	Calcutta	Dr. J. L. Simonsen	On Chemistry of Natural Products
16 <sup>th</sup>	1929	Madras	Professor C. V. Raman	On Raman Effect
17 <sup>th</sup>	1930	Allahabad	Col. S. R. Christopher	The Science and Disease
18 <sup>th</sup>	1931	Nagpur	Lt. Col. R. B. Seymour Sewell	The Problem of Evolution-Experimental Modification of Bodily Structure
19 <sup>th</sup>	1932	Bangalore	Rai Bahadur Lal Shiv Ram Kashyap	Some Aspects of the Alpine Vegetation of the Himalaya and Tibet
20 <sup>th</sup>	1933	Patna	Sir Lewis L. Fermor	The Place of Geology in the Life of a Nation
21 <sup>st</sup>	1934	Bombay	Professor M. N. Saha	Fundamental Cosmological Problems
22 <sup>nd</sup>	1935	Calcutta	Dr. J. H. Hutton	Anthropology and India
23 <sup>rd</sup>	1936	Indore	Sir U. N. Brahmachari	The Role of Science in the Recent Progress of Medicine
24 <sup>th</sup>	1937	Hyderabad	Rao Bahadur T. S. Venkatraman	The Indian Village—its Past, Present and Future
25 <sup>th</sup>	1938	Calcutta	Sir James Jeans (Lord Rutherford of Nelson dies prematurely)	Researches in India and in Great Britain

<i>Session</i>	<i>Year</i>	<i>Place</i>	<i>Name</i>	<i>Title of the Presidential Address</i>
26 <sup>th</sup>	1939	Lahore	Professor J. C. Ghosh	On Research in Chemistry in India
27 <sup>th</sup>	1940	Madras	Professor B. Sahni	The Deccan Traps : An Episode of the Tertiary Era
28 <sup>th</sup>	1941	Banaras	Sir Ardeshir Dalal	Science and Industry
29 <sup>th</sup>	1942	Baroda	Dr. D. N. Wadia	The Making of India
30 <sup>th</sup>	1943	Calcutta	Dr. D. N. Wadia	Minerals' Share in the War
31 <sup>st</sup>	1944	Delhi	Professor S. N. Bose	The Classical Determinism and the Quantum Theory
32 <sup>nd</sup>	1945	Nagpur	Sir Shanti S. Bhatnagar	Give Science a Chance
33 <sup>rd</sup>	1946	Bangalore	Professor M. Afzal Husain	The Food Problem of India
34 <sup>th</sup>	1947	Delhi	Pandit Jawaharlal Nehru	Science in the Service of the Nation
35 <sup>th</sup>	1948	Patna	Colonel Sir Ram Nath Chopra	Rationalisation of Medicine in India
36 <sup>th</sup>	1949	Allahabad	Sir K. S. Krishnan	—
37 <sup>th</sup>	1950	Poona	Professor P. C. Mahalanobis	Why Statistics?
38 <sup>th</sup>	1951	Bangalore	Dr. H. J. Bhabha	The Present Concept of the Physical World
39 <sup>th</sup>	1952	Calcutta	Dr. J. N. Mukherjee	Science and Our Problems
40 <sup>th</sup>	1953	Lucknow	Dr. D. M. Bose	The Living and the Non-living
41 <sup>st</sup>	1954	Hyderabad	Dr. S. L. Hora	Give Scientists a Chance
42 <sup>nd</sup>	1955	Baroda	Professor S. K. Mitra	Science and Progress
43 <sup>rd</sup>	1956	Agra	Dr. M. S. Krishnan	Mineral Resources and Their Problems
44 <sup>th</sup>	1957	Calcutta	Dr. B. C. Roy	On Science for Human Welfare and Development of the Country
45 <sup>th</sup>	1958	Madras	Prof. M. S. Thacker	Grammar of Scientific Development
46 <sup>th</sup>	1959	Delhi	Dr. A. L. Mudaliar	Tribute to Basic Sciences
47 <sup>th</sup>	1960	Bombay	Professor P. Parija	Impact of Society on Science
48 <sup>th</sup>	1961	Roorkee	Professor N. R. Dhar	Nitrogen Problem
49 <sup>th</sup>	1962	Cuttack	Dr. B. Mukherji	Impact of Life Sciences on Man
50 <sup>th</sup>	1963	Delhi	Professor D. S. Kothari	Science and the Universities
51 <sup>st</sup> / 52 <sup>nd</sup>	1964/ 1965	Calcutta	Professor Humayun Kabir	Science and the State
53 <sup>rd</sup>	1966	Chandigarh	Professor B. N. Prasad	Science in India
54 <sup>th</sup>	1967	Hyderabad	Professor T. R. Seshadri	Science and National Welfare
55 <sup>th</sup>	1968	Varanasi	Dr. Atma Ram	Science in India—Some Aspects
56 <sup>th</sup>	1969	Bombay	Dr. A. C. Joshi (Prof. A. C. Banerjee died prematurely)	A Breathing Spell : Plant Sciences in the Service of Man
57 <sup>th</sup>	1970	Kharagpur	Dr. L. C. Verman	Standardization : A Triple Point Discipline
58 <sup>th</sup>	1971	Bangalore	Dr. B. P. Pal	Agricultural Science and Human Welfare

<i>Session</i>	<i>Year</i>	<i>Place</i>	<i>Name</i>	<i>Title of the Presidential Address</i>
59 <sup>th</sup>	1972	Calcutta	Professor W. D. West	Geology in the Service of India
60 <sup>th</sup>	1973	Chandigarh	Dr. S. Bhagavantam	Sixty Years of Science in India
61 <sup>st</sup>	1974	Nagpur	Professor R. S. Mishra	Mathematics—Queen or Handmaiden
62 <sup>nd</sup>	1975	Delhi	Professor (Mrs.) Asima Chatterjee	Science and Technology in India : Present and Future
63 <sup>rd</sup>	1976	Waltair	Dr. M. S. Swaminathan	Science and Integrated Rural Development
64 <sup>th</sup>	1977	Bhubaneswar	Dr. H. N. Sethna	Survey, Conservation and Utilisation of Resources
65 <sup>th</sup>	1978	Ahmedabad	Dr. S. M. Sircar	Science Education and Rural Development
66 <sup>th</sup>	1979	Hyderabad	Professor R. C. Mehrotra	Science and Technology in India During the Coming Decade(s)
67 <sup>th</sup>	1980	Jadavpur	Professor A. K. Saha	Energy Strategies for India
68 <sup>th</sup>	1981	Varanasi	Professor A. K. Sharma	Impact of the Development of Science and Technology on Environment
69 <sup>th</sup>	1982	Mysore	Professor M. G. K. Menon	Basic Research as an Integral Component of Self-reliant Base of Science and Technology
70 <sup>th</sup>	1983	Tirupati	Professor B. Ramachandra Rao	Man and the Ocean—Resource and Development
71 <sup>st</sup>	1984	Ranchi	Professor R. P. Bambah	Quality Science in India—Ends and Means
72 <sup>nd</sup>	1985	Lucknow	Professor A. S. Paintal	High Altitude Studies
73 <sup>rd</sup>	1986	Delhi	Dr. T. N. Khoshoo	Role of Science and Technology in Environmental Management
74 <sup>th</sup>	1987	Bangalore	Professor (Mrs.) Archana Sharma	Resources and Human Well-being—Inputs from Science and Technology
75 <sup>th</sup>	1988	Pune	Professor C. N. R. Rao	Frontiers in Science & Technology
76 <sup>th</sup>	1989	Madurai	Dr. A. P. Mitra	Science & Technology in India : Technology Missions
77 <sup>th</sup>	1990	Cochin	Professor Yash Pal	Science in Society
78 <sup>th</sup>	1991	Indore	Professor D. K. Sinha	Coping with Natural Disaster : An Integrated Approach
79 <sup>th</sup>	1992	Baroda	Dr. Vasant Gowariker	Science, Population and Development
80 <sup>th</sup>	1993	Goa	Dr. S. Z. Qasim	Science and Quality of Life
81 <sup>st</sup>	1994	Jaipur	Professor P. N. Srivastava	Science in India : Excellence and Accountability
82 <sup>nd</sup>	1995	Calcutta	Dr. S. C. Pakrashi	Science, Technology and Industrial Development in India
83 <sup>rd</sup>	1996	Patiala	Professor U. R. Rao	Science and Technology for Achieving Food, Economic and Healthy Security
84 <sup>th</sup>	1997	Delhi	Dr. S. K. Joshi	Frontiers in Science & Engineering and Their Relevance to National Development

<i>Session</i>	<i>Year</i>	<i>Place</i>	<i>Name</i>	<i>Title of the Presidential Address</i>
85 <sup>th</sup>	1998	Hyderabad	Professor P. Rama Rao	Science & Technology in Independent India : Retrospect and Prospect
86 <sup>th</sup>	1999	Chennai	Dr. (Mrs.) Manju Sharma	New Bioscience : Opportunities and Challenges as we Move into the Next Millennium
87 <sup>th</sup>	2000	Pune	Dr. R. A. Mashelkar	Indian S & T into the Next Millennium
88 <sup>th</sup>	2001	New Delhi	Dr. R. S. Paroda	Food, Nutrition and Environmental Security
89 <sup>th</sup>	2002	Lucknow	Professor S. S. Katiyar	Health Care, Education and Information Technology
90 <sup>th</sup>	2003	Bangalore	Dr. K. Kasturirangan	Frontier Science and Cutting-Edge Technologies
91 <sup>st</sup>	2004	Chandigarh	Professor Asis Datta	Science and Society in the Twenty First Century : Quest for Excellence
92 <sup>nd</sup>	2005	Ahmedabad	Professor N. K. Ganguly	Health Technology as Fulcrum of Development for the Nation
93 <sup>rd</sup>	2006	Hyderabad	Dr. I. V. Subba Rao	Integrated Rural Development : Science and Technology

TITLE OF ADDRESSES OF SECTIONAL PRESIDENTS OF 93<sup>rd</sup> SESSION

Section	President	Title
<i>Agriculture and Forestry Sciences</i>	Dr. Dipak Sarkar	Science and Technology Aided Natural Resource Inventorying : An Indispensable Task Towards Optimising Agricultural Production
<i>Animal, Veterinary and Fishery Sciences</i>	Prof. Nirupama Agrawal	Monogenean Helminth Parasites : A Class of Animals Class Apart
<i>Anthropological and Behavioural Sciences (including Archaeology, Psychology and Educational Sciences)</i>	Prof. R. K. Pathak	Perspectives from Nutritional Anthropology in Integrated Rural Development : Significance of Anthropometric Techniques
<i>Chemical Sciences</i>	Prof. C. S. Mathela	Molecular Diversity Aspects of the Himalayan Aromatic and Medicinal Flora : Role in Innovative Utilization
<i>Earth System Sciences</i>	Prof. Ravindra Kumar	Tectonic Evolution of the Himalayas Cenozoic Climatic Changes, Active Tectonics and Disaster Management
<i>Engineering Sciences</i>	Shri V. K. Mathur	Design and Seismic Rehabilitation of Housing and Buildings
<i>Environmental Sciences Information and Communication Science &amp; Technology (including Computer Sciences)</i>	Prof. Malay Chatterjee Dr. S. B. Nimse	Environment and Mankind Impact of ICT on Societal Transformation
<i>Materials Science</i>	Prof. Rajendra Kr. Pandey	Electrochemical Nanoprocesses for Inorganic/Hybrid Materials and Devices
<i>Mathematical Sciences (including Statistics)</i>	Prof. B. Ishwar	Restricted Three Body Problem in Celestial Mechanics
<i>Medical Sciences (including Physiology)</i>	Dr. S. K. Bhattacharya	Diarrhoeal Diseases : Emerging and Re-Emerging Pathogens
<i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</i>	Prof. Parul Chakrabarti	Functional Genomics, Proteomics and Bioinformatics for Food, Drug and Vaccines Development : Progress and Prospect
<i>Physical Sciences</i>	Prof. V. K. Farkya Gupta	Einstein, Twentieth Century Physics and Rural Development
<i>Plant Sciences</i>	Prof. S. P. Vij	Orchids : Ingenuity at its Best

93<sup>rd</sup> SESSION–PLATINUM JUBILEE LECTURES

Section	President	Title
<i>Agriculture and Forestry Sciences</i>	Prof. K. V. Prabhu New Delhi	Molecular Markers in Crop Improvement
<i>Animal, Veterinary and Fishery Sciences</i>	Prof. M. P. Yadav Izatnagar	Road Map for Livestock Development in the Post GATT Scenario
<i>Anthropological and Behavioural Sciences (including Archaeology, Psychology and Educational Sciences)</i>	Prof. P. K. Das Bhubaneswar	Biocultural Perspectives on Nutritional Status of Human Populations : An Overview
<i>Chemical Sciences</i>	Dr. J. S. Yadav Hyderabad	Development of Pheromone Technology as a Component of Integrated Pest Management for Sustainable Agriculture in India
<i>Earth System Sciences</i>	Prof. R. N. Singh Hyderabad	Thermal Modelling of Indian Lithosphere
<i>Engineering Sciences</i>	Prof. Ashok K. Jain Roorkee	Disaster Prevention and Mitigation through Engineering Build Environment
<i>Environmental Sciences</i>	Prof. Madhav Gadgil Bangalore	Science and the Art of Counting Tigers
<i>Information and Communication Science &amp; Technology (including Computer Sciences)</i>	Prof. K. K. Aggarwal Delhi	DNA based Computers
<i>Materials Science</i>	Prof. Neeraj Khare New Delhi	Spintronics : A New Dimension to Electronics
<i>Mathematical Sciences (including Statistics)</i>	Prof. Belmannu D. Acharya New Delhi	Mathematical Theory of Cognitive Balance in Social Systems
<i>Medical Sciences (including Physiology)</i>	Prof. G. Balakrish Nair Dhaka, Bangladesh	The Restless Genome of <i>Vibrio cholerae</i> Snapshot of Genetic Changes in the Past 25 Years and their Impact
<i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</i>	Prof. J. Gowrishankar Hyderabad	The Achilles Heel in Bacterial Transcription: R-Loops from Nascent Untranslated Transcripts in <i>Escherichia coli</i>
<i>Physical Sciences</i>	Prof. Ajay Gupta Indore	X-ray Based Characterization of Nanostructured Materials
<i>Plant Sciences</i>	Prof. Akhilesh K. Tyagi New Delhi	From Crop Genome to Gene Function : The Journey Begins

**TITLES OF SYMPOSIA ON SPECIALISED TOPICS  
ORGANISED BY THE SECTIONS OF 93<sup>rd</sup> CONGRESS**

Section	Topic(s)
<i>Agriculture and Forestry Sciences</i>	Development of New Agricultural Technologies to Combat Malnutrition and Hunger
<i>Animal, Veterinary and Fishery Sciences</i>	Animal Diversity, Rural Technology and Sustainable Development
<i>Anthropological and Behavioural Sciences (including Archaeology and Psychology &amp; Educational Sciences)</i>	Science and Technology in Integrated Rural Development : The Role and Contribution of Anthropological and Behavioural Sciences
<i>Chemical Sciences</i>	Bioactive Molecules and their Role in National Development
<i>Earth System Sciences</i>	Frontier Technologies in Earth Resource Management and Natural Hazard Mitigation
<i>Engineering Sciences</i>	Physical Amenities and Infrastructure in Rural Areas
<i>Environmental Sciences</i>	Environment Impact Assessment
<i>Information and Communication Science &amp; Technology (including Computer Sciences)</i>	Role of ICT in Integrated Rural Development
<i>Materials Science</i>	Science and Technology of Nano Structured Materials
<i>Mathematical Sciences (including Statistics)</i>	Space Dynamics
<i>Medical Sciences (including Physiology)</i>	Maternal and Child Health in Rural Development Issues and Challenges
<i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</i>	Functional Genomics, Proteomics, Bioinformatics for Food, Drug and Vaccine Development
<i>Physical Sciences</i>	Physical Amenities and Infrastructure in Rural Areas
<i>Plant Sciences</i>	Plant Biotechnology for Rural Development

**SPEAKERS OF THE SYMPOSIA/INVITED LECTURES/SPECIAL LECTURES  
ORGANISED BY DIFFERENT SECTIONS OF 93<sup>rd</sup> CONGRESS**

Section & Speaker	Topic/Title
<i>Agriculture and Forestry Sciences</i>	<i>Symposium on : Development of New Agricultural Technologies to Combat Malnutrition and Hunger</i> Chair : Dr. S. K. Sanyal, Dr. S. P. Wani Dr. A. Subba Rao
Dr. Anil Kumar Singh	Role of Water Resources Development in Enhancing Rural Livelihoods
Smt. Poonam Malakondaiah	Innovative Approaches in Strengthening Research-Extension Linkages
Dr. Y. S. Ramakrishna	Improves Agricultural Technologies for Combating Malnutrition in Rain Fed Areas
Dr. S. S. Negi	Participatory Natural Resource Management and Rural Development
Dr. S. K. Sanyal	Sewage Farming : Potential and Problems
Dr. B. N. Singh	Integrated Rural Development Through Participatory Research : A Case Study of Rainfed Upland Rice from Drought Prone Areas of Mahboobnagar District, Andhra Pradesh
Dr. A. Subba Rao	Innovative Nutrient and Water Management Options for Livelihood Security of Small and Marginal Farmers
Dr. R. K. Samanta	Empowering Rural Women New Vista for Integrated Rural Development
Dr. D. M. Hegde	Tree Borne Oilseeds : A Potential Component in Agro-Forestry
Dr. T. N. Lakhanpal	Conservation of Genetic Bio-Diversity in Agro-forestry
Dr. B. R. M. Rao	High Resolution Satellite Data for Management of Micro Watersheds
Dr. S. P. Wani	Opportunities and Challenges for Improving Rural Livelihoods Through Integrated Natural Resource Management Approach
Dr. K. S. Dhillon	Biogeochemical Cycling of Selenium in Soil-Plant-Animal Systems
Dr. Rajendra Kumar	Chickpea Genetic Improvement Through Biotechnological Means
Dr.A.Srinivasa Raju	Integrated Nutrient Management for Sustainable Agricultural Production and Integrated Rural Development

Section & Speaker	Topic/Title
<b><i>Agriculture and Forestry Sciences (contd.)</i></b>	
Dr. V. Nath	Conserving Biodiversity of The Country
Dr. V. Krishnamurthy	Natural Resources Management for Sustaining the Tobacco Quality, Exports and Rural Prosperity
<b><i>Animal, Veterinary and Fishery Sciences</i></b>	
	<b><i>Symposium on: Animal Diversity, Rural Technology and Sustainable Development</i></b>
	<i>Chair :</i> Prof. Aparna Dutta Gupta
	<i>Co-Chair :</i> Prof. U.C. Goswami
Dr. W. S. Lakra	Conservation and Management of Fish Genetic Resources : Status and Perspectives
Dr. Satish Kastury	Environmental Regulatory Compliance and It's Significance in the Protection of Ecological Environment
Prof. M. H. Khan	Vector and Diseases
Prof. G. G. Agarwal	Rural Development and Technology A Statistical Perspective
Prof. Vinod Kumar	Keeping Life Trail on Rail
	<b><i>Special Invited Lecture :</i></b>
	<i>Chair :</i> Prof. R. A. Agarwal, Geetha Bali
	<i>Co-Chair :</i> Dr. Ashok Saxena, Dr. V. L. Saxena
Dr. Prasad Dhulipala	Whole Genome Amplification (WGA) Technology and Applications
Prof. Aparna Dutta Gupta	Non Genomic Action of Steroids and Its Implication in Veterinary and Medical Sciences
Prof. Geetha Bali	Regulation of Egg Laying Behaviour in <i>Helicoverpa Armigera</i>
Prof. N. K. Subhedar	Central Regulation of Reproduction in Teleosts
Prof. Asha Chandola	Management of Himalayan Peasants in Uttaranchal
Dr. B. S. Prakash	Application of GRF Administration for Enhancing Growth and Early Puberty in Buffaloes
Prof. R. A. Agarwal	Studies on Snail Control : An overview
Prof. B. D. Manna	Newly Emerging Zoonotic Diseases in India
Prof. R. C. Sobti	...
	<b><i>Invited Lectures :</i></b>
	<i>Chair :</i> Prof. R. C. Sobti, Prof. B. D. Joshi
	<i>Co-Chair :</i> Dr. B. N. Pandey, Prof. B. Jadhav
Dr. S. Krupanidhi	Blue Nonheme Proteins as Carriers of Pathogenic Antigenic Verify Peptides

Section & Speaker	Topic/Title
<b><i>Animal, Veterinary and Fishery Sciences (contd.)</i></b>	
Prof. B. D. Joshi	On the Status of Asiatic Elephant <i>Elephas Maximus</i> in the Rajai National Park of Uttaranchal
Prof. R. Ramamurthi	Biodiversity Loss-Threat Posed by Invasive Alien Species
Dr. J. R. B. Alfred	Animal Bioresources and Its Utility
Prof. H. S. Rose	Some Comments on the Animal Diversity Conservation and Environment Issues and Focus on Insects
Dr. A. K. Chopra	Fish Life : Diseases and Their Control
Prof. U. C. Goswami	Biopotency of Naturally Occurring Vitamin A, Analogues of Freshwater Fish Liver Oil in Controlling The Chemically Induced Tumor Lymphocytic Leukemia Cell
Dr. A. K. Jain	Integrated Carp-giant Prawn Culture : The Future Face of Aqua-farming in India
<b><i>Anthropological and Behavioural Sciences (including Archaeology, Psychology and Educational Sciences)</i></b>	
Dr. Christian Strumpell	<b><i>Symposium on : Science and Technology in Integrated Rural Development - The Role and Contribution of Anthropological and Behavioural Sciences</i></b>
	A Peasant at Heart ? Discourses on Development, Tradition and Modernity Among Rural Migrants in India's Public Sector Undertakings and Ethnographic View from Orissa
Dr. Sankaraiah Chamala	Need of Transformation of Mind Set Among All Stakeholders to Achieve Peace and Sustainable Development : Role of Anthropological and Behavioural Sciences
Prof. Gopala Sarna	Science, Technology and Development Strategy
Prof. A. S. Patel	A statistical Re-test of Impact of Behavioural Effectiveness of Working and Non-Working Married Women (Mothers) on that of Their Younger Adolescents–A Case to Illustrate Relative Efficiency of the Statistical Technique for Analysis of Covariance (ANCOVA) Over the Technique of analysis of Covariance(ANOVA)
P. Dash Sharma	Contribution of Anthropological and Behavioural Sciences in Developing Rural Technology Park in Jharkhand
Prof. B. A. Parikh	Role and Contribution of Behavioural Sciences in the Era of Science and Technology

Section & Speaker	Topic/Title
<b><i>Anthropological and Behavioural Sciences (including Archaeology, Psychology and Educational Sciences) (contd.)</i></b>	
Prof. D. K. Bhattacharya	The Development Dilemma in Tribal India
Prof. B. G. Banerjee	Indian Traditional Medicine Era of Science and Technology : Prospects and Challenges
Prof. S. N. Banerjee	Scientific Education System : A Tool for Rural Development
Prof. K. K. Basa	Museums in Changing World
Prof. H. K. Bhatt	Taking Science and Technology to Rural Areas : Conceptual and Methodological Contribution or Social-Cultural Anthropology
Prof. B. N. Roy	Integrated Rural Development : Needed Socio-psychological Dimensions and Quality of Life
Prof. A. K. Kapoor	Tribe, Technology and Trend : Harnessing Science for Social Good
Prof. G. P. Thakur	Management of Depression : Indian Perspective
Prof. K. K. Misra	Traditional Knowledge, Western Science and Development
Dr. D. P. Sen Majumdar	Science and Technology in Integrated Rural Development
Prof. C. G. Hussian Khan	Wither New Reproductive Technology : An Anthropological Perspective
Dr. V. R. Rao	Human Genetics and Extension Programme Health by Awareness
Prof. Upinder Dhar	Integrated Rural Development : Role and Contribution of Behavioural Sciences
Prof. A. Papa Rao	Anthropometry and Nutritional Status of Tribal Populations in Andhra Pradesh
Dr. A. K. Sinha	Forest and Sustainable Development : A Case of Integrated Rural Development in Three States of Himalayan Region
Dr. Tarni Jee	Behaviouristic Approach: Elder's Abuses in Villages
Dr. Kaushik Bose	Undernutrition Among Some Tribal Populations of Orissa and West Bengal
Dr. S. John Michael Raj	Mental Health Status Among the Western Ghats Tribals with Special Reference to Attukkal Village
<b><i>Chemical Sciences</i></b>	<b><i>Symposium on : Bioactive molecules and their role in national development</i></b>
	<i>Chair : Prof. A. K. Singh</i>

Section & Speaker	Topic/Title
<i>Chemical Sciences (contd.)</i>	
Prof. K. K. Bhutani Prof. Pahup Singh	Bioactive Molecules and National Perspective Recent Development In Plant-Derived Antineoplastic Agents and Their Analogues as Clinical Anticancer <i>Chair</i> : Prof. Avijit Banerjee
Prof. Anil K. Singh	Caging of Bioactive Molecules Strategies and Applications
Dr. Diwan S. Rawat	Synthesis and Thermal Reactivity of Cyclic/ Acyclic Ene Diynes
Prof. M. S. M. Rawat & Dr. Geeta Pant	Isolation and Characterization of Plant Bioactives <i>Chair</i> : Prof. K. K. Bhutani
Dr. S. C. Dubey	Developing Active Pharmaceutical Ingredient Challenges and the Art
Prof. Anil K. Pant	Chemical and Pharmacological Studies on Some Wild Collection of Family Zingiberaceae from Himalayan Region of Uttaranchal
Dr. Saibal K. Das	Role of PPAR in Cardiovascular Diseases <i>Invited Lecture</i> : <i>Chair</i> : Prof. Pahup Singh
Prof. Subhas C. Roy	Radicals from Epoxides In Organic Synthesis Towards Bioactive Natural Products and Related Compounds <i>Chair</i> : Prof. M. S. M. Rawat and Prof. Sheo Satya Prakash
Dr. A. P. Mishra	Bioinorganic Chemistry : Metal Chelates in Medicine
Dr. Kamaluddin and Avnish Kumar Arora	Role Of Metal Oxides In Chemical Evolution : Interaction of Zirconium Oxide with Ribose Nucleotides and NADPH
Prof. R. D. Kaushik	Kinetics and Mechanism of Mn(II) Catalysed Periodate Oxidation of Aromatic Amines With Particular Reference to Substituent Effect
Dr. A. B. Melkani	Mono and Sesquiterpenoids from Agrimonia Aitchisonii
Prof. R. C. Sharma	Confirmation of Bonding in Molybdenum Containing Enzymes by Synthetic Route
Dr. Surendra Prasad	The Mercury (II) Catalyzed Ligand Exchange Between Hexacyanoferrate (II) and Pyrazine in Aqueous Medium

Section & Speaker	Topic/Title
<i>Earth System Sciences</i>	<i>Symposium on : Frontal Technologies in Earth Resource Management and Natural Hazard Mitigation</i>
Dr. Pramod K. Verma	Frontal Technologies in Earth Resource Management and Natural Hazard Mitigation
Prof. G. S. Gill	Delineation of Shallow Sub-Surface Geological Structures Using Soil Parameters in Bist Doab Area of Punjab, India
Dr. Ashwagosh Ganju	Snow Harvesting Through Avalanche Hazard Mitigation Techniques
Prof. A. K. Mahajan	Shear Wave Velocity Profiles of Surficial Deposits in Dehradun City Using Multichannel Surface Waves Methods
Dr. Hema Achyuthan	Early Holocene Sea Level Changes Along the East Coast, Tamilnadu, India
Dr. Afsar Abbas	Extinction Events Arising from Large Volcanic Eruptions
Dr. R. Pavanaguru	Leading Edge Technology for Underground Exploration of Coal Deposits in the Godavari Valley Basin, Andhra Pradesh
Prof. H. S. Sharma	Desertification Hazard in Semi Arid Region of Rajasthan : A Case Study of Dausa District
Dr. Tapeshwar Singh	Variability, Summer Monsoon, Trends Rainfall, Indo-Gangetic Plain
Dr. Ashok Kumar Sinha	Role of Periodic Markets in Regional Development
Prof. Douglas K. Bingham	Turtle Mountain and the Frank Slide Monitoring A Potential Rock Slide in the Canadian Rockies
Prof. Sandy Colvine	Reducing Risk from Natural Hazards : A Canadian Perspective
Prof. Bruce Mitchell	Integrated Water Resource Management Cross Currents and Turbulence
Prof. Baleshwsar Thakur	Disaster Prone Areas in India
Prof. Pradip Kumar Dasgupta	Basin Dynamics and Depositional Model of the Neogene Prograding Sequence from Assam Arakan Orogen, India
Dr. Jai Krishna	High Resolution Stratigraphy in the Indian Shallow Marine Exposed Geological Record Exercise in the Indian Mesozoic

Section & Speaker	Topic/Title
<i>Engineering Sciences</i>	<i>Symposium on : Physical amenities and infrastructure in rural areas</i>
Mr. Suresh Chandra Bhatia	Integrated Rural Development : An Integrated Approach to Agricultural Development & Infrastructural Support
Dr. G. S. Mukherjee	Polymers & Composite Packaging Materials in the Perspective of Rural Development Programme
Dr. K. Satish Kumar	Base Isolation in Buildings Using Natural Rubber for Seismic Protection
Mr. Ramadhar Jha	Rural Development Present Scenario & Future Needs
Dr. S. K. Tandon	Physical Amenities and Infrastructure in Rural Areas In India A Need for Upliftment of Poor
Dr. Sandhya Farkya	Billboard Application through FM-DARC System
Masayuki Hyodo	Dynamic Response Test on Stratified Layers Consisting of Clay and Sand
Dr. S. R. Wate	Strategic Environmental Assessment : Futuristic Tool to Consider Environmental Concerns in Development Plans
<i>Environmental Sciences</i>	<i>Symposium on : Application of Biotechnology in the Management of Environmental Pollution</i>
	<i>Chair : Prof. Salil Kasturi</i>
Dr. S. P. Gautam	Biotechnology : As a Boon for Nature and Environment
Prof. R. Ramanibai	Impact of Tsunami on Coastal Marine Ecosystem an Overview
Dr. David Kothamasi	Evaluation of AM fungi for Glomalin Production and its Potential Application in Biotechnologies for Management of Soil Erosion in Arid and Semi-Arid Ecosystems
Dr. H. Sadeghifar	Environmental Problems in Iran
Dr. P. C. Pandey	Antarctic, Climate Changes and Consequences to Environment and Society
Prof. A. K. Mukhopadhyay	Management of Chromium/Toxic Metals by Unique Adsorption cum Biosorption Effect of Fermenter Waste Sludge
Dr. Balaram Ghosh	Chemopreventive Effect of Vanadium in Dimethylhydrazine Induced Rat Colon Carcinogenesis
Prof. Shishir K. Dube	Migration of Coastal Marine Hazards in India

Section & Speaker	Topic/Title
<i>Environmental Sciences (contd.)</i>	
Dr. Sukumar Devotta	Hazardous Waste Mangement Challenges
Dr. V. K. Vijayan	Environmental Respiratory Disease
Prof. Arunabha Roy	Nitric Oxide : Its Role in the Modulation Neurobehavioral and Immunotoxicity
<i>Information and Communication Science Technology (including Computer Sciences)</i>	
	<i>Symposium on : Harnessing ICT for Rural Knowledge Connectivity</i>
	<i>Chair : Prof. K. K. Aggarwal</i>
Dr. Amol C. Goje	IT for Common Man
Dr. Swarnalatha R. Rao	Significant Advancements in ICT for Rural Knowledge Connectivity in India
Dr. M. Surendra Prasad Babu	Information Technology for Integrated Rural Development—A Web Approach
Dr. Naresh Jotwani	Cost-Benefit Analysis of Providing Rural Knowledge Connectivity
Dr. V. Sundararajan	Evolutionary Computing
Dr. Suman K. Mitra	A Multiple Digital Watermarking Scheme for Copyright Protection
Dr. M. V. Kumar	ICT As a Change Agent
Prof. B. L. Deekshatulu	Leveraging Knowledge for Rural Development
Dr. S. C. Purohit	Scientific Advancements for National Socio- Economic Growth
Dr. Ganga Prasad GL	Harnessing ICT for Rural Knowledge Connectivity
Prof. Prabhat Ranjan	Sensor Networks to Monitor Quality of Life in Rural Area
Dr. Vivek Chitale	Application of Geomatics Technology for Sustainable Development in Rural Areas
Dr. S. Upendra Rao	Mobile Banking for Rural Development : Balancing Rural-Urban Divide Through ICT
Dr. N. Sarat Chandra Babu	Harnessing ICT for Rural Knowledge Connectivity
Dr. Bipin V. Mehta	ICT for Rural Knowledge Connectivity : Problems and Prospects
Prof. Yogesh Singh	The Art of Software Testing
Prof. B. V. Ramana Reddy	Wireless Network Evolution—Issues and Challenges
Dr. Deepak Shikarpur	Digital Future of 21 <sup>st</sup> Century

Section & Speaker	Topic/Title
<b><i>Materials Science</i></b>	<b><i>Symposium on : Science and Technology of Nanostructured Materials</i></b>
Prof. Hiroshi Iwasaki	STM-Excited and Plasmon-Enhanced Luminescence of Porphyrin Thin Films On Noble Metals
Prof. Prasenjit Sen	Nonlinear Process Towards Functional Nanomaterials
Prof. S. N. Sahu	Quantum Dot-DNA Systems for Molecular Recognition
Prof. A. C. Sharma	Many Particle Physics of Nanostructure Solids
Prof. R. C. Agrawal	Nano Composite Polymer Electrolyte Materials : Synthesis, Characterization and All-Solid-State Battery Applications
Dr. Amresh Chandra	Synthesis of BaTiO <sub>3</sub> Nanoparticles and their Use in Polymer-Ceramic Composites
Dr. V. Ganesan	A Powerful Tool for Imaging Features at Nano and Micro Meter Levels
Prof. Yosi Shacham	On the Effect of the Solid-Alloy Composition On the Cu Diffusivity and Oxidation Resistance in Electroless Cobalt Layers
Dr. R. K. Sharma	High Resolution XRD and SIMS for Nanomaterials
Dr. Shyama Rath	Optical Spectroscopy of Si and Ge Nanostructures
<b><i>Mathematical Sciences (including Statistics)</i></b>	<b><i>Symposium on : Space Dynamics</i></b>
	<i>Chair</i> : Prof. K. D. Abhyankar
Prof. V. Adimurthy	Earth Orbits and Beyond, the Quest for Optimal Trajectories
Dr. R. K. Sharma	On Orbit Predictions in Terms of KS Regular Elements
Dr. P. M. S. Namboodiri	The Dynamics of Colliding Galaxies
Dr. K. S. Sastry	Gravitational Interactions Between Galaxies
Dr. S. N. Hasan	The Three Body Problem and its Applications to Triple Galactic Encounters
Dr. B. K. Sharma	Engima of the Birth and Evolution of Solar System s May be Solved by Invoking planetary Satellite Dynamics

Section & Speaker	Topic/Title
<b><i>Mathematical Sciences (including Statistics) (contd.)</i></b>	
Dr. G. C. Sharma	<b><i>Invited Talk : Chair</i></b> : Prof. V. D. Sharma A Mathematical Model for Oxygen Transport in Peripheral Nerve
Dr. M. Jain	Queueing Modelling of Wireless Local Loop (WLL)
Dr. Pammy Manchanda	Non Uniform Haar Wavelets and its Applications
Dr. Poonam Singh	D-Optimal Designs in Two Orthogonal Blocks for Dharroch and Quadratic Model in Constrained Mixture Components
	<b><i>Invited Talks : Chair</i></b> : Prof. Bhudev Sharma
Prof. M. R. Adhikari	Group Actions and Their Applications
Prof. Bimal Roy	Combinatorial Designs and Sensor Networks
Prof. P. V. Arunachalam	Some Mathematical Implications of the Theory of Relativity
<b><i>Medical Sciences (including Physiology)</i></b>	
	<b><i>Symposium on : Maternal and child health care : Issues and Challenges in rural Development</i></b>
Dr. Bhaswati Sengupta	Maternal and Child Health Care Indian Perspective
Prof. R. N. Chaudhuri	Reproductive and Child Health (RCH) Approach in Maternal & Child Health Care
Dr. Uma Roy	Modulation of Fertility and Maternal Behaviour with Herbal Medicine and Mineral Lithium in Albino Rat
Dr. Amal Roy Chowdhury	Occupational Hazards Among Child Labour-Issues & Challenges
Dr. T. N. Naik	Emergence of Group B Rotavirus Infection in Children
Dr. Dipika Sur	Impact of Zinc Supplementation on Diarrhoeal Morbidity and Growth Pattern of Low Birth Weight Infants in Kolkata - Randomized Double Blind Placebo Controlled Community Based Study
Prof. Pratip K. Debnath	Mother and Child Health Care Provision With Rasayan Drugs, Parlance with Immunomodulation
	<b><i>Invited Lecture :</i></b>
Prof. Asoke Chowdhuri	Epidemic of Dengue Infection in Kolkata A Clinicians Perspective
Dr. Animesh Dhar	RNA interference (RNA): Is it a Novel Therapy for Pancreatic Cancer?

Section & Speaker	Topic/Title
<b>Medical Sciences</b> <i>(including Physiology) (contd.)</i>	
Prof. Arun K. Roy	Thyroid Hormone : Does it Modulate Adult Brain Function?
Dr. Tanya Das	Will Tea Cure Breast Cancer? A Tale of Failure and Promise
Dr. Gaurisankar Sa	The Immunobiology of Cancer Immuno-Surveillance and Immunoediting
Dr. Shekhar Chakrabarti	Development of a Candidate HIV-1 Vaccine Appropriate for India : ICMR's Efforts
Dr. Pradeep Das	Differential Gene Expression During Human Collagen and E.histolytica Interaction
Dr. Jyotiprakash Haldar	A SERO-Epidemiological Study of Lymphatic Filariasis in Colliery Areas Barddhaman District, West Bengal
Dr. Dhuryothi Majumdar	Ergonomic Issues in Nursing Operations in Indian Armed Forces
Prof. Amar Kumar Chandra	Chromium Induced Alternation On Morphological and Functional Status of Thyroid Gland
Dr. Manoj K.Chakrabarti	Involvement of Uersina Entercolitica Heat Stable Enterotoxin (YS Ta) in Regulation of Nuclear Calcium
Prof. Tushar Kanti Ghosh	Effect of Lesion of Amygdala on Some Immune Responses in Rats
Dr. Yogesh Dwivedi	Neurotrophins : Vulnerability Factors in Suicide
<b>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</b>	
<b>Symposium on : Functional Genomics, Preteomics, Bioinformatics for Food, Drug and Vaccine Development</b>	
<i>Chair</i> : Prof. Syed E. Husnain and Prof. Parul Chakrabarti	
Prof. Sankar Ghosh	N-kb : an Evolutionarily Conserved Mediator of Immune and Inflammatory Responses
Prof. Marsh Rich Rosner	Rap1 Activators are Novel Anti Angiogenic Agents Induced by Anthrax Edema Toxin
Prof. Manikuntala Kundu	The Secreted Peptidyl Prolylcis, Transisomerase (HP0175) of Helicobacter Phlori as a Modulator of Host Cell Signaling
Dr. Bhaskar Saha	MHC Class-II SIGNALS through G-protein and Regulates Macrophage Effector Functions
Prof. Indrani Bose	Why Gene Copy Number Matters
Dr. Somadatta Sinha	Manipulating Biochemical Pathways-a Theoretical Approach

Section & Speaker	Topic/Title
<b><i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)(contd.)</i></b>	
Dr. Amitabha Chattopadhyay	Role of Cholesterol in Leishmania Donovanii infection
Prof. Peter Glass	Impact of Drugs and Disease On Cellular Plasticity : Role of Genomics
Dr. Akas Ranjan	Application of Bioinformatics, Proteomics and Functional Genomics in Post Genomic Era to Understand The Molecular Basis of Physiological and Pathological Processes
Dr. Abani K. Bhuyan	Protein Folding – Where Empirical Patterns are Inconsistent with Theory-Based Ideas
Dr. Manish Biyani	Genome Profiling (GP) : A Universal Method for inter-and Intra-species Identification
Prof. Utpal S. Tatu	Heat Shock Protein 90 from Plasmodium Falciparum as a Potential Drug Target Against Malaria
Dr. Hemalatha Balaram	Purine Nucleotide Metabolism in Plasmodium Falciparum
Dr. Surekha Zindge	Proteomics in Cancer Biomarker Discovery
Dr. Sujata Ghosh	Proteomics in Cancer
Dr. P. M. Krishna Mohan	pH Induced Conformational Transitions in Dynein Light Chain Protein: Functional Implications
Dr. Harish C. Pant	Topographic Regulation of Neuronal Cytoskeletal Protein Phosphorylation & Role in Nervous System Function
Dr. Ghanshyam N. Pandey	Protein Kinase C (PKC) and Cyclic AMP Response Element Binding Protein (CREB) in Postmortem Brain of Depressed Suicide Victims and Bipolar Patients: Targets for Development of Mood Stabilizing Drugs
Prof. Dipak K. Banerjee	Differential Expression of Endoplasmic Reticulum chaperones (GRP-78/Bip & GRP-94) is a Key to Unfolded Protein Response-induced apoptosis in Capillary Endothelial Cells
Prof. P. R. Sudhakaran	Activation of Hepatic Stellate Cells Response to Extracellular Matrix
Dr. Pallab Chaudhuri	Development of DNA Vaccine Construct Using L7/L12 Ribosomal Protein Gene of Brucella abortus 544

Section & Speaker	Topic/Title
<i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)(contd.)</i>	
Prof. Bimal K. Ray	Molecular Mechanism of Metastasis in a Murine Prostate Cancer. Model: Metastatic Potential of Inflammation Responsive Transcription Factor SAP-1
Dr. R. V. Sonti	Attack and Defence in Xanthomonas-rice Interactions
Dr. Niranjan Chakraborty	Extracellular Matrix Proteome of Chickpea (Cicer arietinum) Illustrates Pathway Abundance and Novel Protein Functions
Dr. N. Sreenivasulu	Genomic Approaches to Study Complex Traits During Barley Seed Development
Dr. Jyoti D. Vora	Biochemical and Molecular Profile of Coral Reefs: An Indian Perspective
Dr. Mary Jackson	The Biosynthesis of Phosphatidylinositol Mannosides as a Target for Novel Anti-TB Drugs
Prof. Jaya S. Tyagi	Improved Laboratory Diagnosis of Tuberculosis
Dr. Rajesh S. Gokhale	Dissecting Metabolome Diversity and Chemical Complexity of Mycobacterium Tuberculosis
Dr. Amit K. Das	Structural Insight of Protein Phosphatases
Dr. Srinivas Pentyala	One Line Algorithms : Opening the Pandora's Box of peptide Drugs
Dr. K. P. Mishra	Cell Membrane Electroporation Based Proteomics and Genomics Research Prospects for Improvement of Cancer Treatment through Electrodelivery of Anticancer Drug
Dr. M. V. Rajam	The Enhanced Tolerance to Abiotic Stresses and Fungal Pathogens in Co-Transformants of Eggplant Expressing Polyamine Biosynthesis Genes
Dr. Sudipta De	3D Structural Analysis of Hypothetical Preteins in Lower Eukaryotes, A Study of DNA-Protein Interaction-Prediction of Base Excision Repair (BER) Activity by BER DNA Polymerases in <i>Gibberella Zeae</i> and <i>Tetraodon Nigroviridis</i>
Dr. Bala G. Unni	Novel Antibacterial Proteins from Non Mulberry silkworms
Dr. A. R. Podile	Cloning and Expression of an <i>Escherichia coli</i> and <i>Serratia marcescens</i> Chimeric Glucose Dehydrogenase Involved in Mineral Phosphate solubilization
Dr. Naheed Banu	Anti-oxidant/Pro-oxidant Properties of Khat ( <i>Catha edulis</i> Forsk) and its Constituents on DNA

Section & Speaker	Topic/Title
<b><i>Physical Sciences</i></b>	<b><i>Symposium on : Einstien, Advances in Physics and Rural Development</i></b>
Prof. A. N. Singh	New Class of Chemical Propellants : Polynitrogen
Prof. R. Nath	Recent Trends in Electrets and Their Applications
Prof. D. Suresh Babu	Magnetic and Transport Properties of Doped New Class of GMR Materials: Sr <sub>2</sub> Fe <sub>0.5</sub> MoO <sub>6</sub>
Prof. Rajmani Prasad Sinha	Einstein's Contributions in Physical Sciences and their Impact on Rural Development
Prof. Lalan Jha	Role of Antenna in Rural Upliftment
Prof. J. P. Shukla	Liquid Crystals: Some Dielectric and Optical Aspects
Prof. S. B. Rai	Optical Properties of Rare Earth Doped Glasses
Prof. J. N. Dahiya	Frequency and Temperature Dependent Studies of Nitrobenzene Using a Computer Controlled Microwave Resonant Cavity
Prof. Y. S. Jha	Thermodynamics of Lipb Liquid Alloy
Prof. G. D. Baruah	Theory of Reflectivity and Spatial Hole Burning
Prof. R. K. Gupta	Geospatial Technologies : Initiatives, Knowledge and Insights for Rural Development
Dr. R. P. Singh	Nanotechnology A Promising Discipline
Prof. S. R. Murthy	India Microwave Hydrothermal Synthesis and Characterization of Nanosized Materials
Prof. K. P. R. Nair	Microwave and Laser Spectroscopic Studies on Molecular Structure and Molecular Interactions
Prof. O. P. Pahuja	Statistical Thermodynamics of Crystalline Polymers
Prof. N. Veeraiah	Transition Metal Ions as Structural Probes in Certain Glass Systems
<b><i>Plant Sciences</i></b>	<b><i>Symposium on : Plant Biotechnology for Rural Development</i></b>
	<i>Chair</i> : Dr. P. Pushpangadan
Dr. S. Natesh	Plant Biotechnology and the Fulfillment of the Basic Needs of Rural India
Dr. S. M. P. Khurana	Biotechnology in Crop Improvement with Special Reference to Potato
Prof. V. S. Malik	Plant Biology : The Impact of Technology
	<i>Chair</i> : Prof. K. K. Bhutani
Dr. P. Pushpangadan	Plant Biotechnology in Rural Developments
Prof. G. M. Reddy	Recent Developments in Plant Biotechnology for Human Welfare

Section & Speaker	Topic/Title
<i>Plant Sciences (contd.)</i>	
Prof. D. J. Bagyaraj	Arbuscular Mycorrhizal Fungi in Sustainable Agriculture
Prof. P. C. Trivedi	Biological Control of Plant Parasitic Nematodes <i>Chair</i> : I. S. Dua
Dr. Rakesh Tuli	Synthetic Promoters and Genes for Application in Agriculture
Prof. A. S. Raghavendra	Genetic Manipulation of Photosynthesis in Higher Plants
Prof. K. V. Madhava Rao	Antioxidative Metabolism of Pigeon Pea Seedlings Under Heavy Metal Stress
Dr. B. R. Rajeshwara Rao	Ocimum Species Rich Sources of Flavour and Fragrance Chemicals <i>Chair</i> : Prof. D. J. Bagyaraj
Prof. C. Manoharachary	Diversity, Taxonomy, Prospecting of Fungi and Related Emerging Technologies
Dr. C. Sathish Kumar	Orchid Breeding in India : History, Current Trends and Prospects
Prof. R. N. Gohil	Buckwheat Some Challenges for Biotechnologies
Prof. P. Kaushik	Mycorrhizal Fungi as Bio-inoculants for Rural Development <i>Chair</i> : Prof. K. Y. Paek
Dr. M. Sanjappa	The Role of Taxonomy in Medicinal Plant Research
Dr. Renu Swarup	Plant Biotechnology-Emerging Trends for Rural Development
Prof. S. L. Kothari	Genetic Transformation : The Technology? To Feed a World Population of 10 Billion People <i>Chair</i> : Dr. M. Sanjappa
Prof. K. K. Bhutani	Joys of Natural Molecules : Campaigns in Herbal Medicines
Prof. T. N. Lakhanpal	Mycorrhizal Biotechnology and its Relevance in Reforestation Programmes
Dr. S. N. Hegde	Plant Biotechnology in Sustainable Development of Bioresource for Poverty Alleviation in Rural N.E. India
Dr. L. M. S. Palni	Rural Resource Centers for Improving Livelihood Options in the Indian Himalayan Region: Case Studies from Uttaranchal
Dr. Tarun Kant	Role of Tonoplast Transporters of the CAX Gene Family in Cellular Ionic Homeostasis

### List of Young Scientist Awardees for 2005-2006

Section	Name of the Awardee	Title of Paper(s)
<b>Agriculture and Forestry Sciences</b>	<b>Anirban Roy</b> Plant Virus Laboratory, Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata-700 120	Molecular Evidence for Association of Variants of <i>Citrus exocortis viroid</i> and <i>Hop Stunt Viroid</i> with Yellow Corky Vein Disease of Citrus
<b>Animal, Veterinary And Fishery Sciences</b>	No Award.	
<b>Anthropological and Behavioural Sciences (including Archaeology &amp; Psychology and Educational Sciences)</b>	<b>Syed Salman Ahmad</b> Osmania University, Hyderabad-500 007	Phenomenological Analysis of Selfhood : A Method for Exploring Self-Narratives
<b>Chemical Sciences</b>	<b>Ajay Kumar</b> Department of Chemistry, Kurukshetra University, Kurukshetra-136 119	Synthesis of Heterocyclic Compounds Involving the Reactions of Dehydroacetyl Acid and its Derivatives
<b>Earth System Sciences</b>	<b>Tejpal Singh</b> C.A.S. in Geology, Panjab University, Chandigarh-160 014	Significance of Mesoscopic and Macroscopic Structures for the Reconstruction of Deformation History ; Examples from Outer Himalaya, Northern Haryana
<b>Engineering Sciences</b>	<b>Manoj Khandelwal</b> Deptt. of Earth Sciences, I.I.T. Bombay, Powai, Mumbai-440 076	Evaluation and Prediction of Blast Induced Ground Vibration and Frequency in Surface Mine
<b>Environmental Sciences</b>	<b>Rathinam Aravindhan</b> Chemical Laboratory, Central Leather Research Institute, Adyar, Chennai-660 020	Removal of Acid Blue Dye from Wastewater by Wet Peroxide Oxidation in the Presence of Cv-exchanged Zeolite Catalyst
<b>Information and Communication Science and Technology (including Computer Sciences)</b>	<b>Animesh Mukherjee</b> Department of Computer Science and Engineering, I.I.T. Kharagpur-721 302	Accessibility for All : Adaptive Computer Access Tools for the Neuro-motor Disabled in India

<b>Section</b>	<b>Name of the Awardee</b>	<b>Title of Paper(s)</b>
<b><i>Materials Science</i></b>	<b>D. P. Singh</b> National Physical Laboratory, Dr.K.S.Krishnan Road, New Delhi-110 012	Investigation of Grain Boundaries in Controlling Magneto-transport of Magnetoresistance Materials Colossal
<b><i>Mathematical Sciences (including Statistics)</i></b>	<b>Y. M. Borse</b> Department of Mathematics, S.P.College, Pune-411 030	On Determination and Construction of Critically 2- Connected Graphs
<b><i>Medical Sciences (including Physiology)</i></b>	<b>Rajashree Patra</b> National Institute of Cholera and Enteric Diseases, Kolkata-700 010	Multiple Infection and Microdiversity Among <i>Helicobacter pylori</i> Isolates in a Single Host in Kolkata, India
<b><i>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</i></b>	<b>Manas Kumar Santra</b> School of Bio-Sciences and Bio-Engineering, I.I.T. Bombay, Powai, Mumbai-400 076	Dinitroaniline Herbicide Trifluratin Inhibits FtsZ Assembly and Bacterial Growth by Binding to FtsZ
<b><i>Physical Sciences</i></b>	<b>K. K. Choudhary</b> Department of Physics, Shri Vaishnav Institute of Technology and Science, Baroli, Sanwer Road, Indore.	Investigation of Normal State Transport Properties of Electron-Doped Cuprates
<b><i>Plant Sciences</i></b>	<b>D. Sundar</b> Centre for Bioinformatics, School of Life Sciences, Pondicherry University Pondicherry-605 014	Detection of a Rapidly Accumulating 50 Kda Polypeptide and Increased Rubber Accumulation in Guayule Under Low Temperatures

**List of Awardees judged as best poster presented  
during the 93<sup>rd</sup> Indian Science Congress-2006**

Sections	Name of the Awardee(s)	Title of Paper(s)
<i>Agriculture and Forestry Sciences</i>	<b>A. K. Sahoo</b> National Bureau of Soil Survey and Land Use Planning (ICAR), Kolkata	Soil Resource for Watershed Development in the Rainfed Agroecoregion of Chotanagpur Plateau, Jharkhand
	<b>K. B. Eswari</b> Agricultural Research Station Khamman, A. P.	Mutagenic Effect and Efficiency of Physical and Chemical Mutagens in Green Gram ( <i>Vigna Radiata L. Wilezek</i> )
<i>Animal, Veterinary &amp; Fishery Sciences</i>	<b>Shaveta</b> Punjabi University Patiala	Systematic Studies on the Family Nymphalidae (Lepidoptera : Papilionoidea) of Western Himalaya
	<b>Sweety Jain</b> A.S. College Mawana Meerut	Ultrastructural and Molecular Assessment of Hyperglycemia and its Prevention by <i>Coccinia indica</i> in Albino Rat
<i>Anthropological and Behavioural Sciences (including Archaeology &amp; Psychology and Educational Sciences)</i>	<b>Purnima Parashar</b> Deptt. of Anthropology Panjab University Chandigarh	A Study on Selection for Sex of the Offspring , Brood Size, and Birth Interval Among the Three Select Case Groups of Bhimtal (District Nainital, Uttaranchal)
	<b>K. Bhamini Raghavaiah</b> Department of Anthropology Mysore University Mysore	Palmar Minline, a-b Ridge Count and Atd Angle among the Medas of Coorg District of Karnataka, India
<i>Chemical Sciences</i>	<b>C. S. Chanotiya</b> Kumaun University Nainital	Bornyl Acetate and (3R,6R)-Linalool Oxide Acetate Bearing Two New Chemotypes of <i>Tanacetum Nubigenum Wallich Ex DC</i>
	<b>Surekha Kannaujia</b> Gurukul Kangri University Haridwar	Mn (II) Catalysed Periodate Oxidation of P-Toluidine in Acetone-Water Medium - A Kinetic-Mechanistic Study

<b>Sections</b>	<b>Name of the Awardee(s)</b>	<b>Title of Paper(s)</b>
<b><i>Earth System Sciences</i></b>	<b>V. Mahale</b> National Institute of Oceanography Goa	Acoustic Seafloor Classification Employing Artificial Neural Network Based Technique
	<b>S. N. Lal</b> Kumaun University Nainital	Inverted Metamorphic Sequence in Central Crystalline Kumaun Himalaya, India
<b><i>Engineering Sciences</i></b>	<b>A. Vaidya Soocheta (Kharkar)</b> University of Mauritius Mauritius	Reprocessing Rubber and Leather into Innovative Fashion Material
	<b>C. Ramana</b> Acharya N. G. Ranga Agricultural University Nandal, A.P.	Development of Parason Sprayer for Dwarf and Semi Dwarf Tree (High Density Planting) Orchards
<b><i>Environmental Sciences</i></b>	<b>Rajarshi Sankar Ray</b> Department of Pharmaceutical Technology Jadavpur University Kolkata	Suppression of Cell Proliferation and DNA Protein Crosslinks by Vanadium in Chemical Rat Mammary Carcinogenesis
	<b>Aradhana Mishra</b> Jabalpur University Jabalpur	Alkaline Lipase Production by <i>Monoascus</i> sp
<b><i>Information and Communication Science &amp; Technology (including Computer Sciences)</i></b>	<b>P. Ananth Raj</b> College of Engineering Osmania University Hyderabad	A Non-linear Filter for Images Corrupted with Impulse Noise
<b><i>Materials Science</i></b>	<b>Dikshya Kaushik</b> Bhopal University. Bhopal	Deposition & Characterisation of Highly Luminescent Cds Q-Dots on Silicon
	<b>G. P. Pandey</b> Pt. Ravishankar Shukla University, Raipur	Ion Conductance Behaviour of Hot-pressed/Solution-cast Nano Composite Polymer Electrolyte Membranes : A Comparative Study
<b><i>Mathematical Sciences (including Statistics)</i></b>	<b>L. K. Pramanik</b> Deptt. of Pure Mathematics University College of Science and Technology Kolkata	Centers in Inserted Graphs
	<b>B. S. Kushvah</b> B.R.A., Bihar University, Muzaffarpur	Linear Stability of Trangular Equilibrium Points in the Generalised Photogravitational Restricted Three Body Problem with Poynting-Robertson Drag

Sections	Name of the Awardee(s)	Title of Paper(s)
<b>Medical Sciences</b> (including <i>Physiology</i> )	<b>Bhaswati Sen</b> National Institute of Cholera and Enteric Diseases, Kolkata.	Molecular Characterization of Multi Drug Resistant <i>Salmonella enterica</i> Serotype Typhi Isolated from Cases of Typhoid Fever in Kolkata, India
	<b>U. Chatterjee</b> Indian Association for the Cultivation of Science Kolkata	Effect of Thermal Processing and Subsequent Pepsin Digestion on the Allergenicity of Hilsa and Pomfret Fish Extract as Evidenced by ELISA and Immunoblot
<b>New Biology (including Biochemistry, Biophysics &amp; Molecular Biology and Biotechnology)</b>	<b>B. Madhuri</b> University of Hyderabad Hyderabad	Induction of Male Sterility in Transgenic Tobacco by Expressing Harpin Pss Under the Tapetum Specific TA 29 Promoter
	<b>Sudipta Chatterjee</b> Indian Association for the Cultivation of Science Kolkata	Anti-fungal Effect of Water-soluble Chitosan on <i>Macrophomina Phaseo Lina</i> Causing Jute Seedling Infection
<b>Physical Sciences</b>	<b>N. K. Dabkara</b> Department of Physics Neemuch (M.P)	Cross Sections in Atom – Diaton Collisions and the Power – Gap Law
	<b>S. Bal</b> National Instt. of Technology Rourkella	Influence of Nanomodification on Physical Properties of Polymer Nanocomposites
<b>Plant Sciences</b>	<b>Sanjay Sharma</b> Department of Botany Panjab University Chandigarh.	<i>In Vitro</i> Propagation of the Medicinally Important Terrestrial Orchid, <i>Eulophia Dabia</i> D Don (Hochr) Through Rhizome Segments
	<b>K. Jaya Paul</b> Department of Botany Osmania University Hyderabad.	Enhancement of Vasicine-A Quinazoline Alkaloid, in <i>Justicea adhatoda</i> Cell Cultures by Elicitation and Immobilization

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72. Shri Nilangshu Bhusan Basu, Kolkata

**Co-opted Member of the Finance Committee**

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75. Prof. Col. Dr. Ranajit Sen, Kolkata

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76. Prof. S. P. Mukherjee, Kolkata

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Mr. Sandip Kumar Chowdhury

Mr. Kiriti Gopal Mukhopadhyay

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Mr. Prabhu Dayal Singh

**Group I (1)**

Mr. Subhas Das

***Retirement***on 31<sup>st</sup> August, 2005

Mr. Himanshu Kumar Banerjee

Group III (1)

on 31<sup>st</sup> December, 2005

Mr. Ramsadhan Mukhopadhyay

Group III (2)