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Team CSIR



Integrated Rural Development: Science and Technology

Prime Minister of India Dr Manmohan Singh inaugurates 93rd Indian Science Congress at Hyderabad

Prim Minister of India Dr Manmohan Singh, who is also the President of the Council of Scientific & Industrial Research (CSIR), inaugurated the 93rd Indian Science Congress at the Acharya N.G. Ranga Agricultural University (ANGRAU), Hyderabad, on 3 January 2006. The theme of the Congress was 'Integrated Rural Development: Science and Technology'. Around 5000 eminent scientists, researchers, academicians, and representatives from industry and media attended the congress. Shri Kapil Sibal, Minister of State for Science & Technology and Ocean Development, and Vice President, CSIR, also addressed the distinguished gathering.

We reproduce in this issue the addresses delivered by Prime Minister Dr Manmohan Singh and Minister of State for Science & Technology and Ocean Development Shri Kapil Sibal.

Also covered is the public lecture delivered by Dr R.A. Mashelkar FRS, Secretary, DSIR and Director General, CSIR, on the theme 'Making High Technology Work for the Poor', during the Congress.



"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."

— **Prime Minister Dr Manmohan Singh,
and President, CSIR**
93rd Indian Science Congress,
ANGRAU, Hyderabad,
3 January 2006



Address by Prime Minister Dr Manmohan Singh

I am delighted to be here in Hyderabad to inaugurate the 93rd 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.

“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.”

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 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.

“However, in spite of the advances made, there still remains the challenge of bridging the development gap between urban and rural India.”

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.

"The technologies and the strategies unleashed by the first Green Revolution have run their course. This requires, a Second Green Revolution, in non-food crops, in horticulture, in new plant varieties."

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

“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.”

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 handicraft 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 enthruse 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!

Address by Shri Kapil Sibal Minister of State for Science & Technology and Ocean Development



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, 93rd Indian Science Congress, Prof. C.N.R. Rao, recipient of the Indian Science Award, distinguished members of the scientific community, ladies and gentlemen,

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 Indian Science Award to a truly great son of India, Prof. C.N.R. Rao.

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 & Technology must meet the challenges of the future and when, in his address as the President of CSIR Society, on 26th July, 2005, he stated "Our S&T system can play a decisive role only when it advances the well

A ddress of Minister for Science & Technology

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, remove 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.

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 infra-structure covering a wide spectrum of disciplines.

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 on 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.

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.

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.

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.

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.

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.

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.

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.

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 per cent 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.

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.

Government is doing its 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 in-roads 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

A address of Minister for Science & Technology

toll-free number from across the country. I must say our farmers have shown remarkable 'learning' to benefit by this program.

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.

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 the 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.

I cannot help, but hark'en back to the Indian Science Congress of January, 1947 when the best minds of the national 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 why 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 fetters which prevent people from functioning as they ought to".

I would like to conclude by recalling the advice that Pandit ji 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."

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.

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

- 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.
- 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.

- To transform CSIR 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 CSIR a nimble, accountable and performance oriented organization, serving the nation better.
- 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, seribiotechnology and for translational research for technology relating to public health.
- 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.
- To set up 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.
- To establish regional clusters for developing linkages between Industry and research. The first such international cluster will be setup in Chandigarh, with a focus on nano-biology within a national nano-technology institute.

MAKING HIGH TECHNOLOGY WORK FOR THE POOR

Public Lecture by Dr R.A. Mashelkar, FRS Secretary, DSIR and Director General, CSIR



DR Mashelkar began his lecture by pointing out that while there has been tremendous progress in science and technology impacting all Socio-economic sectors, still 1.2 billion people in the world live on less than \$ 1 per day, 300 million people remain hungry and 120 million children do not attend even the primary school. The major concerns of the poor, Dr Mashelkar said, are poverty, illiteracy, education, water, energy, and connectivity, and these could be solved by innovations at the social, technological and political levels.

To show how social innovations could help the poor, Dr Mashelkar cited the examples of the excellent work of M.V. Foundation, Pratham and

Ekal Vidyalaya towards education and economy; Tarun Bharat Sanghe towards enhancing the water availability and Velugu, Kudamba Shree and Mahila Bank towards increasing the income generating capabilities. He also mentioned about the reforms in governance brought about by *Loksatta* (political reform), and in Surat (city reform) and Trichy (police transformation).

Coming to technological innovations, Dr Mashelkar cited the example of Tata Indica. "In 1950s, we had British Morris Oxford being sold as Indian Ambassador and 50 years later, Indian Indica is being sold as City Rovers in UK. Thus the wheel has turned full circle." And Ratan Tata's dream is to make an

easily affordable car – just costing Rs 1 lakh – through more use of plastics, very low-cost assembly operation and use of high-performance adhesives instead of welding. The delivering innovations envisaged include: assembly-cum-retail operations combined units, low-cost service, small satellite units for assembling, selling and servicing of cars to be set up through investment by the local entrepreneurs, thereby replacing the dealer and his margins.

To cite an example of innovation at the policy level, Dr Mashelkar mentioned the telecom policy initiative. VSNL was privatized, BSNL corporated and private companies were allowed in the telecom sector. The results: consumer price collapsed and telephony access spread enormously. How this helped the poor is amply depicted in the D.R. Memorial Lecture delivered by Dr Vijay Kelkar: “Today access to telephony has pierced below the rich and telephones are in more remote corners of the country than ever achieved by the erstwhile PSU. We got more done for the poor, by pursuing the competition agenda for a few years, than we got done by pursuing the poverty agenda for decades.” Lesson to be learnt from this, Dr Mashelkar said, is that innovative policy initiatives can give access of high technology to the poor.

Dr Mashelkar further said that just the availability of a technology is not sufficient. It should also be affordable, accessible and appropriate. For example, we have technologies for electricity, safe water and sanitation, but still a large number of people do not have access to these. India has 200 m illiterates

with illiteracy reducing at 1.3% per annum. At this rate, it will take 20 years to clear the backlog. But can we do it in five years? Yes, we can! Take the example of TCS Computer – based Functional Literacy (CBFL) initiative. Using discarded PCs, animated graphic patterns for visual and audio appreciation, it makes an illiterate read in 30-45 learning hours spread over 1-1.5 h sessions, 3 times a week over a period of 10-12 weeks. About 40,000 persons have already become literate. The government should launch CBFL mission at national level, with the participation of NGOs and private-public partnership to remove illiteracy, Dr Mashelkar suggested.

Coming to Healthcare, Dr Mashelkar pointed out that the basic healthcare concerns are: affordability, access to good healthcare facilities in remote and rural areas, preventive diagnostics, health awareness, access to safe drinking water and sanitation. While life expectancy has improved in most parts of the world, owing to poverty in many African countries, e.g. Uganda, Zimbabwe, Kenya and South Africa, it has gone down during the past 20 years. Drugs are costly, not affordable by the poor. To make drugs cheaper and still the drug manufacturing a profitable proposition, the drug companies could shift the location of their R&D and manufacturing to Innovative Developing Countries (IDCs) and use public institution capacity in IDCs in discovery and development. In this context, he spoke about the rich Traditional Knowledge available in India and cited the inspiring story of Gugulipid. Utility of guggulu in treating lipid disorders is mentioned in *Sushruta Samhita* (600 BC), BHU

showed the hypolipidemic effect of Guggul in 1964 and CDRI developed Guglip, a hypolipidemic drug in 1981.

Dr Mashelkar also highlighted the coordinated programme being pursued by CSIR in collaboration with universities, experts and user industry to exploit the natural resources through the fusion of Traditional Knowledge and Modern Science for cost-effective and quick drug discovery. Instead of the standard drug discovery process that involves target identification, lead identification, lead optimisation, pre-clinical and clinical studies (molecule → mice → man), it involves reverse pharmacology process, i.e. large evidencial base, pre-clinical studies, relevant science and large scale trials (men → mice → men) for drug discovery. Several bioactive molecules have been discovered and are at various stages of development. The difference that the reverse pharmacology process can make is evident from the drug discovered for treatment of Psoriasis (currently in Phase II) : while the drug, development in USA took around 10 years involving several hundred million dollars, in India it took just three years involving \$ 5 million and the cost of treatment is expected to be reduced from \$ 20,000 to \$ 50!

He praised the Sustainable Access to Rural India (SARI) project in which close-up pictures of eyes transmitted from Internet kiosks are examined by specialists in Arvind Eye Hospital in Madurai. The digital transmission is done through WLL-based cordless digitally enhanced telephony developed by Ashok Jhunjunwala.

Dr Mashelkar also highlighted the various technologies

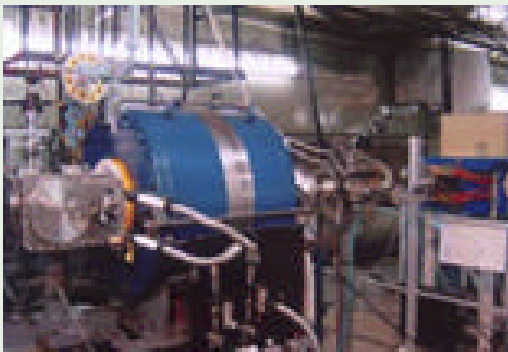
for producing drinking water, the reverse osmosis process (the plant can be operated using even camel/bullock energy), thin film composite membrane, etc.

A major PPP initiative to get best minds together is the New Millennium Indian Technology Leadership Initiative (NMITLI), which was launched by the Government in 2001 and is being coordinated by CSIR. NMITLI has led to several major developments of tremendous help to the poor. Just to cite an example, the initiative led to the development of a new anti TB-molecule that reduces treatment duration from 6 months to 2 months and reduces the treatment cost tremendously. The effort involved 12 institutional partners and are industrial partners. We need to create a global knowledge pool for global good through global funding, Dr M a s h e l k a r concluded.

CMERI signs MoU with VECC

THE Variable Energy Cyclotron Center (VECC) of the Department of Atomic Energy has signed an MoU with the Central Mechanical Engineering Research Institute (CMERI), Durgapur, to carry out the challenging task in system design, development, fabrication, and commissioning of Radioactive Ion Beam facility at VECC. The technology needed for developing RIB facility is extremely complex and it requires extensive R&D in the field of particle accelerators, ion sources, instrumentation and manufacturing technology.

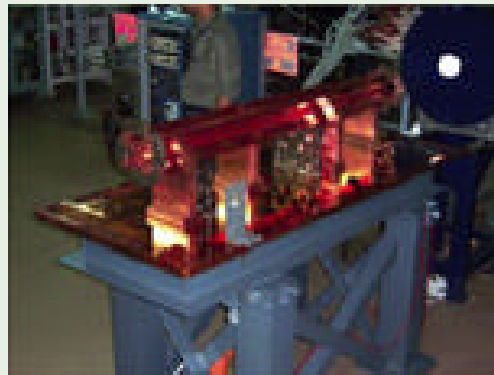
The conceptual and system design from accelerator physics and beam dynamics principles was undertaken by



ECR-IS installation at the VECC

the scientists of Variable Energy Cyclotron Center (VECC). The Institute of Physical and Chemical Research, Japan (RIKEN), was one of the collaborators. CMERI and VECC worked collaboratively for mechanical design, development, fabrication and installation of this system. CMERI was entrusted with the development of ECR (Electron Cyclotron Resonator), Ion Source, RFQ (Radio Frequency Quadruple) Modules and LINAC (Linear Accelerator), in three phases.

The first phase of the project consisting of the development of the ECR-



2kw RFQ under assembly with the ECR

IS has been completed and the ion source has been installed at the VECC. The objective of the on-line ECR-IS is to produce high charge states of radioactive ions with high efficiency in order to accelerate a wide mass range of Radioactive Ion Beams in the RIB facility being developed at VECC, Kolkata.

The installation of the on-line ECR ion-source has been completed and the first beam test have been conducted wherein an Argon beam has been transported to the first faraday cup. The desired RIB is selected after an isotopic separation in a magnetic separator (dipole magnet). The installation of the above assembly has been done using jigs and fixtures specially fabricated for the sequential and modular assembly of the components and subassemblies.



Resonant structure alignment of the first prototype (parabolic vane tip) at CMERI

New 500 MHz NMR Facility commissioned at CFTRI

A new NMR Spectrometer facility in the Plantation Products, Spices and Flavour Technology Department of the Central Food Technological Research Institute (CFTRI), Mysore, was inaugurated by Dr R. Chidambaram, Principal Scientific Advisor, Government of India, in the presence of Director and staff of the institute.



Dr R. Chidambaram, Principal Scientific Advisor, Government of India and Dr V. Prakash, Director, CFTRI at the inaugural function of the Nuclear Magnetic Resonance Spectrometer, 500 MHz facility

The 500 MHz NMR Spectrometer, a state of the art instrument, is equipped with three RF channels, Z-axis pulsed field gradients (PFG) and long-term high-stability variable temperature accessories. It has a state of the art superconducting ultra shielded magnet. The two probes available for this instrument are 5 mm BBO with Z-axis PFG, tunable to ^{13}P , ^{13}C , ^{15}N , ^2H and other nuclei and 5 mm triple resonance indirect detection TXI ($^1\text{H}/^{13}\text{C}/^{15}\text{N}$) with Z-axis PFG. These along with the powerful topspin software as well as the wave form generators and capabilities such as gradient shimming, indirect detection, over sampling and pulse shaping render it a very powerful analytical tool for structural elucidation of organic molecules. Other features include 2- and 3-D NMR and advanced analysis tools

structure of novel natural products and isolates and identification of active compounds in natural product extracts. Another area of interest is the structural investigation of food proteins and proteins associated with food metabolic pathways and their interactions with natural and synthetic inhibitors and activators. The instrument is capable

including linear prediction and spectral de-convolution which enable complete structural studies on molecules with complex structural features.

The instrument can contribute to R & D in the institute immensely through elucidation of

of structural elucidation of proteins of size 10 kDa and up to the size of 20-25 kDa proteins with labeling (^{13}C and ^{15}N). The technique could also throw light on the mechanism of interactions of flavours with taste receptors by study of protein-ligand binding.

RRL becomes an ISO 9001: 2000 Laboratory

THE International Quality Audit Organisation 'DET NORSKE VERITAS(DNV)' of The Netherlands has found the Quality Management System of Regional Research Laboratory (RRL), Jorhat, to conform to the Quality Management Standard and hence conferred the Management System Certificate to RRL-Jorhat. This certificate was formally handed over to the laboratory by DNV on the 63rd Foundation Day celebration of CSIR at RRL Jorhat.

Interactive Seminar to Assess the Commercialization Prospects of RRL-technologies

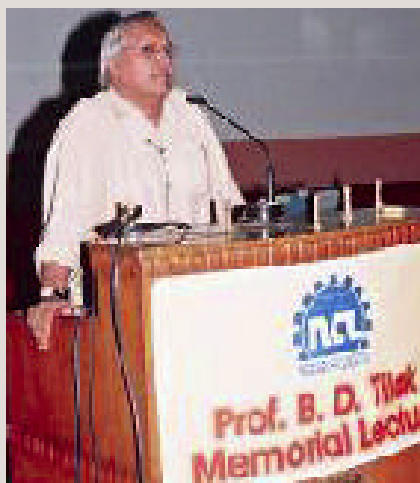
AN interactive seminar between the Regional Research Laboratory (RRL), Jorhat and the Federation of Industries & Commerce of North Eastern Region (FINER) was held in Hotel Landmark, Guwahati recently to assess the commercialization prospects of RRL technologies. The session was presided over by Shri Subhas Agarwal, President, FINER. Shri Mukesh Ch. Sahu, IAS, Director of Industries, graced the occasion as the Chief Guest while other members included Dr P. G. Rao, Director, RRL-Jorhat and Shri Amrit Jain, Director, FINER. Shri S. D. Lahkar, Sr. Consultant, FINER and Dr P. C. Tamuly, Scientist F & Head, Information & Business Development Division of RRL-Jorhat, coordinated the programme. Besides the senior scientific experts from RRL-Jorhat, CFRI-Dhanbad and NML-Jamshedpur, the interactive meet was attended by about 50 delegates and participants from FINER in presence of the members of press and media and other invited guests. The scientists of RRL included: Dr P. C. Borthakur, Dr R. K. Sharma, Dr P. C. Tamuly, Dr P. B. Kanjilal, Dr N. C. Baruah, Dr R. C. Boruah, Dr B. K. Gogoi, Dr Anjan Baruah, Dr S. D. Baruah, Shri R. Duarah, Shri B. P. Baruah and Shri Dip Saikia. Welcoming the audience the FINER President Shri Agarwal spoke about the objective of the

programme and appealed to the house to utilize the opportunity and outcome of the programme by way of interactions with the Director and the Scientists of RRL-Jorhat, experts from CFRI, Dhanbad and NML, Jamshedpur. In his speech Shri M. C. Sahu, IAS, mentioned that interaction of industries with academic institutions and R&D laboratories is essential for better development, functioning and performance of the industries and opined that centre of excellence like IIT, RRL-Jorhat, universities, etc. could help the entrepreneurs enormously in generating new ideas. Shri Sahu formally inaugurated the interactive session. Dr P. G. Rao, Director, RRL-Jorhat briefed the house about the objectives of the FINER-RRL-Jorhat interactive session and termed the session as a maiden step towards accruing mutual benefits by exploiting the knowledgebase of RRL by the efforts of FINER for putting to industrial uses for economic, industrial and social development of the region in particular and the country as a whole. Dr Rao hoped that RRL and FINER could together bring about changes to the industrial scenario of the region. As a step forward RRL and FINER signed a Memorandum of Understanding for future collaborative programmes on areas of mutual interests for industrial and economic development of the region.

The inaugural function was followed by presentation of Dr P. G. Rao in which a detailed presentation was made about RRL-Jorhat starting from its genesis, vision, performances in various R&D areas, development of knowledgebase & technologies, capabilities & expertises, infrastructure facilities and strength of the laboratory. He also apprised about the impact of RRL-Jorhat in the technological map of the country and its contributions towards rural development. The presentation was followed by question-answer session where enthusiastic members of the FINER put forwarded a number of important issues of industrial concern and asked for the possible solutions from RRL-Jorhat. Responding to RRL's presentation, Shri H. N. Das, IAS, the former Chief Secretary, Government of Assam, inquired whether RRL had taken any project on conversion of coal to petroleum. Dr Hazara of CFRI-Dhanbad, explained about the technologies available but conversion of coal to petrol was not still cost effective. He, however, informed that Assam coal was ideal for conversion to petrol. Shri Ranjit Chaliha, a participant, while discussing about the *Citronella* cultivation informed that cheaper yet high quality oil could be imported from China by the perfumery industries of India and therefore, he suggested to develop a superior variety of *Citronella* having high

quality and high yield. He also inquired about the plants having high value and demand in the market for introduction in tea gardens in place of tea. Dr P. B. Kanjilal of RRL informed that although citronella oil could be imported, yet some of the tea gardens were taking up citronella cultivation knowing fully well its demand. He also suggested that cultivation of medicinal plants like *Safed musli* by some tea gardens could be easily grown in tea lands under multiple cropping system. Shri Abhijit Baruah requested RRL-Jorhat to select specific technologies which could be suitable for industrial ventures in the region. Dr P. G. Rao flouted the idea that such forums could be organized at various point of time with joint efforts of both RRL and FINER. Dr Debdas Kakoty, former Vice Chancellor of Dibrugarh University for a meeting with entrepreneurs at Guwahati wherein necessary demonstration of the particular technologies could be given to the entrepreneurs. The FINER President Shri Agarwala informed the audience that FINER office and its facilities would be available to RRL scientists and experts for such purposes. Shri Abhijit Baruah further suggested to RRL for arranging and conducting short term training programmes for employed chemists of the private industries. Dr P. G. Rao agreed to the idea of organizing such training programmes provided such industries approach RRL Jorhat for training. The session ended with a vote of thanks by Shri Amit Jain, Director, FINER.

Shri Sanjit Roy delivers Prof Tilak Memorial Lecture at NCL



Shri Sanjit 'Bunker' Roy, Founder Director, Barefoot College, Tilonia, Rajasthan, delivering Prof. Tilak memorial lecture at NCL

SHRI Sanjit 'Bunker' Roy, Founder Director, Barefoot College, Tilonia, Rajasthan, recently delivered the third Prof. B.D. Tilak memorial lecture at National Chemical Laboratory, (NCL), Pune. Prof. Tilak was the Director of NCL for thirteen years from 1965 and was instrumental in shaping the R&D activities at NCL towards enhanced focus on industrially useful research. Shri Roy spoke on "Demystifying Technology to Meet Basic Needs: The Barefoot Approach". Shri Roy established the Social Work and Research Centre (popularly known as the Barefoot College) in Tilonia, a village in Ajmer District, Rajasthan, more than thirty years ago. The centre has trained two generations of villagers without

any formal paper qualifications to become competent health-care workers, solar engineers, hand-pump mechanics and teachers in their communities. He spoke mainly on the activities of the Barefoot College. His college addresses problems of drinking water, girl child education, health & sanitation, rural unemployment, income generation, electricity and power, as well as social awareness and the conservation of ecological systems in rural communities. The College benefits the poorest of the poor. In the process he taps into the local wisdom of rural communities and has helped them achieve greater empowerment. Shri Roy shared his experiences of how remote communities in Leh, Ladakh and Rajasthan have successfully adopted contemporary technologies based on solar energy. He said that success of technology in rural communities can only be assured if the community is prepared ahead of time to receive the technology by way of training and education. Educated at Doon School and St. Stephen's College, New Delhi, Shri Roy took up the cause of the education and empowerment of rural people in 1972. His focus is on imparting employment-generating modern skills to illiterates and school dropouts. He has proved how adept India's masses are with emerging technologies. Today there are twenty

such 'Barefoot Colleges' in thirteen states in the country. Shri Roy considers each of these colleges as multiplier forces that use traditional knowledge as a tool to reach goals that conventional Government policies have often been unable to achieve. Shri Roy informed that at Barefoot College everyone is expected to keep an open mind, try new and crazy ideas, make mistakes and try again. His college places tremendous value on the dignity of labour, of sharing and to those who are willing to work with their hands. In his welcome remarks Dr S. Sivaram, Director, NCL, said that for Prof. Tilak Memorial lecture we invite the people who are not necessarily scientist but who have contributed to the diffusion of technologies to the people who need them most. He further stated that one of the mandates of NCL is to develop S&T solutions which have relevance to society. Hence, NCL is expected to create social wealth through its R&D efforts. However, a scientific institution cannot create social wealth without active partnership with social entrepreneurs like Shri Sanjit Roy, Dr Sivaram added. "Prof. Tilak had a deep concern for this country and therefore at every juncture of his career he was deeply conscious that science and technology must make a difference for the people of this country. Subsequent to his retirement Prof. Tilak involved himself in trying to diffuse science and technology to rural people through the Indian Institute of Education, Pune, where he created a forum for S&T for rural education and development," he added further. The lecture was organized under the auspices of NCL Research Foundation, a non-profit trust created to foster all round excellence in science and technology.

CECRI holds CPYLS

THE Central Electrochemical Research Institute (CECRI), Karaikudi, recently organized the CSIR Programme on Youth for Leadership in Science (CPYLS). About 20 state rank holders of the Tenth Board examination along with their parents participated in the programme

Dr A. Rajendran, Deputy Director, CECRI, inaugurated the programme. In his Inaugural Address he briefed the participants about the programme and highlighted the research activities of CECRI and other CSIR Laboratories.

Earlier, Dr D. C. Trivedi, Deputy Director, CECRI, welcomed the gathering. Dr G. Venkatachari, Deputy Director and Chairman of the programme proposed the Vote of Thanks.

CECRI Scientists delivered lectures on various topics. The students visited the various facilities in the different divisions of the CECRI. A lively interaction between the students and the scientists was held. Scientific videos were also screened.

Dr A. Rajendran delivered the Valedictory Address and distributed certificates to the students. In his Valedictory Address, he appreciated the keen involvement of the students during the programme. Shri R. Meenakshisundaram, Scientist and Convener of the programme, proposed the Vote of Thanks.



Participants of CPYLS at CECRI

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