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NEWS

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Inauguration of NML-NPL Calibration Centre

The NML-NPL Calibration Centre, first of its kind set up jointly by two CSIR laboratories has been opened up at NML to the industries in and around Jamshedpur. Dr. R. A. Mashelkar, Director General, Council of Scientific and Industrial Research (CSIR), New Delhi, inaugurated the Centre on 3rd December 1999. The Centre has been jointly established by National Metallurgical Laboratory (NML), Jamshedpur and National Physical Laboratory (NPL), New Delhi, for providing calibration services to the industry in south eastern part of the country. The Centre will provide calibration services to the industry in the areas of temperature, pressure, selected fields of electrical parameters and dimensional and force metrology.

Calibration is the lifeline for sensors and measuring equipment. It determines the extent the measured value has deviated from the conventional true value. As the

● *Contd. on Page 14*

GOLDEN JUBILEE CELEBRATIONS



Inaugural function (from R-L : Dr. R. A. Mashelkar, DG-CSIR; Prof. P. Ramachandra Rao, Director, NML; Dr. J. J. Irani, MD, Tata Steel and Dr. (Mrs.) A. Bahadur, Scientist, NML)

The year long Golden Jubilee Celebrations of National Metallurgical Laboratory gets off to a flying start amidst an august gathering of scientists of national and international eminence. It pledges to fulfil many of its dreams in the years to come. A number of national and international seminars will be held to commemorate the 50th year of the laboratory. A galaxy of scientists & technologists of excellence are likely to deliver a series of the Golden Jubi-

lee lectures covering the time span over November 1999- 2000.

The year long celebration was jointly inaugurated by Dr. R. A. Mashelkar, Director General, CSIR and his wife Mrs. Vaishali R. Mashelkar in the NML auditorium. Dr. J. J. Irani, Managing Director, Tata Steel and Chairperson, Research Council of NML presided over the function. The function was traditionally invoked with the *Saraswati Vandana* followed by the *Prayogshala*



From (L-R) : Dr. R. A. Mashelkar, DG-CSIR seen with Dr. B. R. Nijhawan, Senior Consultant, UNIDO & former Director, NML



Dr. R. A. Mashelkar, DG-CSIR receiving mementos from Prof. P. Ramachandra Rao, Director, NML

song. Dr. B. R. Nijhawan, the former Director, NML and now a Senior consultant, UNIDO was also present at the function.

Extending a warm welcome to the gathering of eminent scientists, special invitees and the press, Prof. P. Ramachandra Rao, Director, NML said "Today we are at the beginning of the year long celebrations of the Golden Jubilee of the foundation of our laboratory. The year will take us well and truly into the next millennium. As a laboratory, we have seen the exploratory phase of childhood, experienced the raw enthusiasm of adolescence and have reached

an age of maturity. It is time to ponder about the past and dream about the future. It is time to evaluate the place of this national centre in the scientific and technological milieu of the country. It is also time to correct the course and charter the path for the future such that the trust reposed in us by the founding fathers is redeemed".

On this occasion, Prof. Rao remembered all those who laid the foundation and played the major role in the progress of NML. He said, "It was in December, 1940 that the Metals Committee of the Council of Scientific and Industrial Research recommended that

to ensure the progress and expansion of the country's metallurgical industry, a central organisation in the form of a National Metallurgical Research Laboratory was essential. A scheme for its establishment was drawn up by a Committee under the Chairmanship of Sir J. J. Ghandy during May 1942. Sir Ghandy also chaired the committee set up to draft detailed plans for the laboratory. In both these committees, Sir Shanti Swarup Bhatnagar, the visionary founder of CSIR, played a significant role. The committees also discussed the mandate for the laboratory and declared that when completed, the National Metallurgical Laboratory will cover all aspects of metallurgical research, both fundamental and applied and will also carry out research work in ores, minerals and refractories as applied to metallurgy. The Planning Committee opined that close contact between the research workers and the industry itself was also essential in order to maintain that outlook so necessary for the successful adaption of research results to industrial practice. Jamshedpur, the most prominent centre for metallurgical industry, was chosen for the location of the laboratory. The Tata Iron and Steel Company generously offered part of the building cost and the site for the location of the National Metallurgical Laboratory. One should also recall with gratitude, the generous financial support provided by Sardar Bahadur Sir Inder Singh of the Indian Steel and Wire Products, Jamshedpur. Continuing the great tradition of the close association of the House of Tatas in general and Tata Steel in particular, Dr. J. J. Irani has been actively supporting the efforts of our laboratory by giving us his precious time and support in his capacity as Chairman of the Research Council and we extend a hearty welcome to him." Prof. Rao further added that the policy of the then Government was clearly enunciated by Hon'ble Sri C. Rajagopalachari in his memorable speech — "The nature of research work to be carried out in the national laboratories of the kind that is not covered by the work of research that can be conducted by industries themselves - by individual concerns or on a cooperative basis. The Government has to be on the watch for new



Laboratory's Annual Report for the year 1998-99 being released

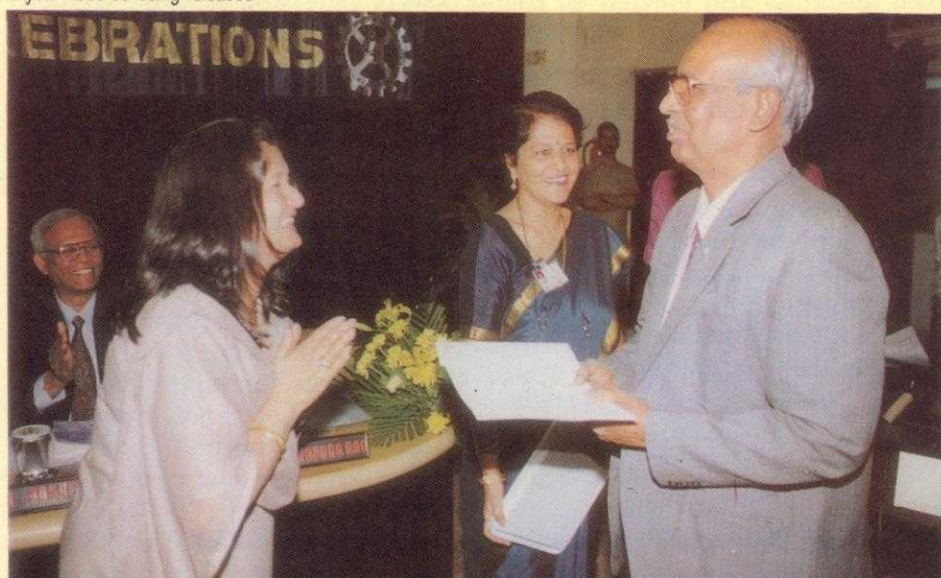
developments in scientific knowledge which may be of economic or social value to the nation".

Prof. Rao mentioned, following the inauguration of the laboratory on 26 November, 1950, Pandit Jawaharlal Nehru said "I think of the combination of this laboratory with the great steel works in this city, of the marriage of science with industry for the progress of both. This marriage of science and industry is important. Because that means that we utilise science to the immediate advantage of the betterment of our people and that is typified by this Metallurgical Laboratory being situated here in this city of Jamshedpur.

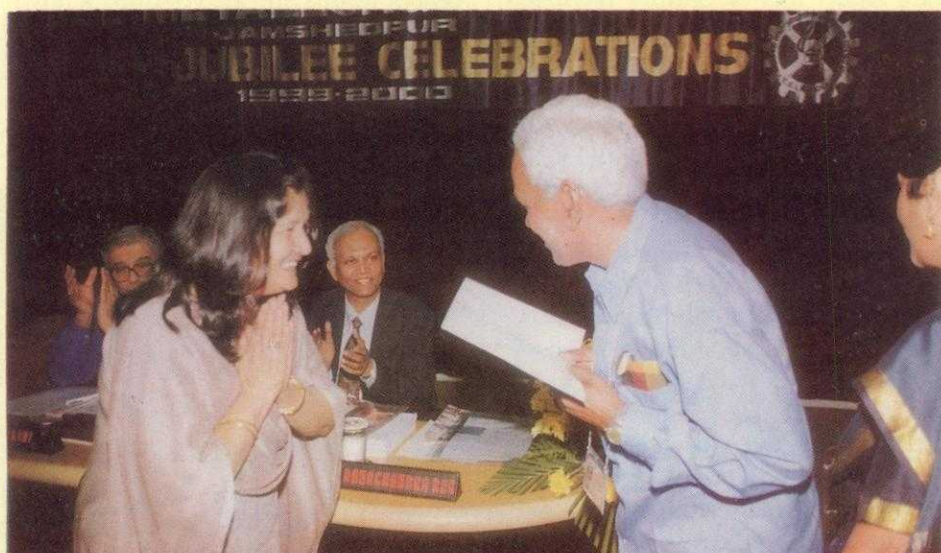
"Without prosperity industry cannot afford research and without research industry cannot prosper. This circle must be broken sometime or the other, and soon. The responsibility, therefore, falls on the Government to help scientific research in the cause of national progress". The view was further reinforced by Sir Shanti Swarup Bhatnagar who observed that - "the extractive and metallurgical industries depend for their very existence on scientific research. It is the realisation of this principle that has set the industry on firm foundation in every advanced country of the world".

Prof. Rao in his address highlighted some of the major technological achievements of NML over last 50 years. He said, "From its very inception, the National Metallurgical Labo-

ratory played a significant role and fulfilled the needs of the metallurgical and mineral industries which were rapidly growing and expanding under the impact of successive Five Year Plans. Discoveries of new mineral deposits and the establishment of plants for extraction demanded development of flow sheets and processes which are technoeconomically sound. The demand was met through the erection of several pilot plants, notable amongst them being — Low shaft furnace pilot plant for pig iron smelting with substandard ore and non-metallurgical coal; Mineral beneficiation pilot plant for beneficiation and agglomeration of low grade ores; Pilot sub-merged arc smelting furnace for production of ferro-alloys; Pilot



Prof. P. Ramachandra Rao is seen to receiving Dr. Nijhawan Award from Mrs Vaishali R. Mashelkar



Shri Bajinath Sharma, Tech. Asstt. while receiving the Distinguished Service Award

plant for hot-dip aluminizing of ferrous materials; Pilot plant for production of electrolytic manganese metal; Pilot plant for production of high purity electrolytic manganese dioxide; Pilot plant for production of refractories; Pilot plant for production of synthetic cryolite; Small scale unit for production of permanent magnets; Semi-commercial plant for production of magnesium metal; Production of steel in L-D converter; Vertical shaft furnace for gaseous injection treatment for iron production; Recovery of vanadium pentoxide from vanadiferous magnetic ores and so on. Each of these pilot plants contributed to the development and transfer of appropriate technologies. Several industrial plants have been designed and erected on the basis of know-how supplied by the laboratory".

While commenting on the present market driven economy, Prof. Rao anticipated the look for eco-friendly technologies that are globally competitive ensuring optimal utilisation of natural resources. He mentioned that the laboratory has committed to establish excellent interface with customer by adopting the stringent quality measures in research project and the technology development Programme.

The Presidential address was given by Dr. J. J. Irani, Chairman, Research Council & Managing Director, Tata Steel. While conveying his best wishes to NML and all those who had served in it for a number of years, Dr. Irani said, "this laboratory has been built on the hard work of many which is now being carried out by Dr. Ramachandra Rao". He expressed his pride that such an institution stood just beside Tisco's Research lab. with only a wall dividing the two labs, but then with goodwill and co-operation of both sides and the co-operation of all former Directors, starting right from Dr. B. R. Nijhawan, Dr. Banerjee and now Prof. P. R. Rao, it has been possible to scale the wall. He said that it was delightful to see so much interaction between the two organisations. Knowledge, he said no longer should be used as power, it should be shared. He stressed that there was tremendous strength not only in our manpower

but also in the quality of our manpower. He said opportunities come along with challenges. He also mentioned that our success here in the laboratory depends on the subsequent performances and success of our clients in industry.

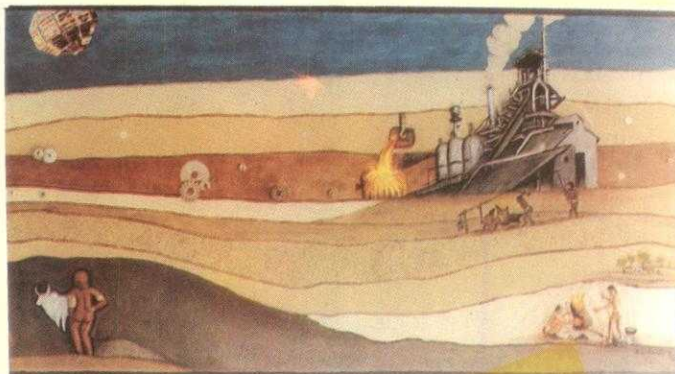
NML had always exhibited a commitment towards ethic and high value, in laboratory work as well as in business which it will exhibit in future also, he hoped.

Former NML Director & Senior Consultant UNIDO, USA, Dr. B. R. Nijhawan in his speech conveyed his best wishes to NML and shared the reminiscences of his tenure at NML. The midnight Foundation Day celebrations of 25th Nov., 1950, the erection of iron pillar on the instance of Sir Shanti Swarup Bhatnagar, erstwhile Director General of CSIR and the UNIDO sponsorship for installing the high temperature creep laboratory of NML were some of the events that he nostalgically enumerated. He complimented Dr. Mashelkar for his innovative technology and business ethics which are today governing the CSIR laboratories including NML and producing results. Speaking about Prof. P. R. Rao, he ranked him as the most dedicated and dynamic Director of NML giving him due credit for the remarkable job done. Dr. Nijhawan said that Prof. Rao had been holding up NML as an example not only within CSIR, but globally as a leading innovative R&D centre producing excellent results and also training a host of scientific workers within India and the overseas. Dr. Nijhawan credited Prof. Rao and colleagues of NML for their hard work on the cokeless cupola which he said was possibly the best

innovation among the lots of cokeless cupolas developed all over the world.

Dr. Nijhawan appreciated the achievements of NML in the field of technological innovations and development in the last fifty years and its role in various developmental activities of Tata Steel. He congratulated NML for celebrating Golden Jubilee and wished a very best in its future endeavour as it steps into the new millennium.

Dr. R. A. Mashelkar, DG CSIR & Secretary DSIR in his inaugural address greeted Director and all NML employees and everyone else present on the occasion of Golden Jubilee celebrations. He said that there was a sense of excitement, and the smell of pride in the air, on this magnificent occasion. He thanked NML for making CSIR proud with its tremendous achievements over the last 50 years. Speaking about Prof. Rao he said that NML couldn't have a better leader than him. He said that NML had pioneered many inventions which are too numerous to mention, but some of them worth mentioning were, the first sponge iron plant and magnesium plants, the first adventures in ferroalloys, and in aluminium conductors, nickel free steels and many more of them. NML had made a difference in every nook and corner of the industry in India, which was very satisfying. He said that NML had done more than its bit to contribute to the development of the country, both economic and social. Talking about the cokeless cupola, Dr. Mashelkar said that NML was saving several industries, saving jobs of these who depend on these industries for a livelihood & above all saving the great heritage that India has, namely, the Taj Mahal. □



A collage painting on metallurgical view on the occasion of NML Golden Jubilee Celebrations

Dr. Mashelkar delivers First NML Golden Jubilee Lecture



Dr. R. A. Mashelkar, DG-CSIR, while delivering NML Golden Jubilee Lecture

NML has been very lucky to find the head of its family, Padmabhusanee Dr. R. A. Mashelkar, FRS, DG-CSIR and secretary, DSIR, Govt. of India to deliver the first lecture in the Golden Jubilee series. He spoke on "*Innovation Engineering — The New Paradigm*".

At the beginning of his lecture Dr Mashelkar said "If a new India is to be built, then there has to be a new paradigm. I think that one of the paradigms is going to be the emergence of *Innovation Engineering*" While drawing distinction of an Engineer, Scientist and an Innovator, he said, Engineer is one who uses the earth and tries to capture sun's energy more efficiently, he controls the rate of destruction of matter and tries to find alternative sources of energy and new materials. He invents the new shapes of matter and tries to improve the quality of life. You can now look at these definitions rather closely. We find that the scientist explores what it is, whereas the engineer creates what never has been. I think the key job that an engineer does is harnessing to one's advantage, harnessing the natural forces like the wind, the sea, the soil and the tide and so on and so forth. An innovator is one who does not know that it cannot be done. Further, an innovator is one who sees what everybody else sees but thinks what no one else thinks.

While commenting on "Nature" and "Natural Engineering" he said, "Nature

is fantastic. I had experienced myself some very interesting instances, where because of our rigid curricula, because of our rigid thinking, because of our living life experiences aside, we have lost quite a bit. And my judgement is that if we have to convert our "engineering" into "innovation engineering," then this issue of observation of life, its analysis and synthesis and integrating it into engineering is going to be extremely important".

Citing few cases, he said, "Nature's way of doing engineering was something very inspiring". Dr. Mashelkar mentioned the defence mechanism exhibited by a bombard beetle. He added, "You disturb it and it will spit on you. When it spits on you, you find that the temperature is something like 120°C. Now when it spits on you, it spits in a microsecond. Can you imagine starting with body temperature, it is possible to raise the temperature to something like 120°C? When one did an analysis, one found how that particular beetle was storing a special enzyme. How it was mixing it in a microsecond after you disturbed it, and how it was creating a hot spray. And do you know this particular design was used in the Jet bomber that was used in World War-II. The Americans are very clever, when they pick up a principle like this, they create patents by using this phenomenon. On a cold morning, when you want to shave, your cream is rather cold, you want it to

be warm. So they mimicked the bombardier Beetle system, which was such that on squeezing the tube, an exothermic reaction created a warm cream. I think that is an interesting innovation engineering. I can give half a dozen of such examples but I hope I have already made a case. It has to do with this particular issue of observing, analysing and synthesising. For this we need to have the introduction of the biological phenomenon in engineering. I think some of the most fascinating things can be learned by seeing how nature does its engineering.

Commenting on the new emerging areas, bordering engineering sciences, Dr. Mashelkar said, "While doing engineering, we develop different languages and each time we say we are developing new paradigms. But are they really new? Or are we rediscovering things from each other's disciplines. This is the key issue that I am concerned about. Therefore, I say no polymer engineer, no bio-engineer, no chemical engineer, only an innovation engineer who is able to seamlessly blend this particular knowledge of engineering and science into a whole for problem solving. And indeed it is only the problem solving engineer, who will be the winner. I suspect that terms like chemical engineering, mechanical engineering, civil engineering etc. will not exist. Already new terms are emerging. Have you heard the terms tissue engineering, metabolic engineering and so on? You will find many terms will keep on appearing. Let me talk about the new engineering that is likely to come in because of internet, for instance. By the year 2020, there is the prediction that half of the world's population will be connected by internet. Then we will not be talking about citizens, may be we will be talking about Netizens. A whole new world will be emerging. I think it is already happening. If that is so, then just as you have the chemical industry, and a chemical engineer, you will start having a content industry, a content engineer. You may not have heard this word 'content engineer' so far. But it will come soon. So tissue engineering, metabolic engineering, content engineering etc. will keep on coming. Just as the word computer engineering, let us say, was not heard 40 years ago, but gradually we

moved from electrical engineering to electronics engineering to computer engineering, it came in. But to me, all these are sub-branches of 'innovation innovation will come to the centre stage'.

Speaking on knowledge domain and the advancement in information technology, he said, "I also believe that with the advent of information technology, it is going to revolutionise — the way knowledge is imparted, disseminated and absorbed. Let me give you some exciting examples. Teaching to us was always speaking, and learning to us was always listening. We assembled in a class room for 55 minutes the bell rang, and everybody ran out. That was the process of teaching and learning. What will be the new process of teaching and learning? Already education to home is coming. Portals have been built. Content is delivered at home. Earlier, all of us sat in the same class and heard the same lecture, but now what is going to happen is that the knowledge content of what is delivered through IT assisted teaching will change from person to person and therefore, you can learn at your own pace. Not only that, you can get evaluated at your own pace. Previously it was all batch processing. In March, all of us sat for exams burning

midnight oil and waiting for the June results. You knew, who stood first, and who stood second, who passed and who failed. But now evaluation can be done practically everyday. Now what will rank themselves but some ranking system will come, by which your intelligent quotient, innovation quotient will be defined practically everyday. Then you will not have to wait for 17 years till that physical age is completed before which you go into, let us say, a professional college. How about a 11 year old acquiring the same level of intellectual maturity that a 17 year old has. The central point I am trying to make is that you are going to see a total transformation in the way knowledge will be generated, disseminated and acquired, absorbed. These revolutionary processes will also effect the way engineering will be taught, assimilated and interpreted. I, therefore, feel that there is a time when we start looking at these things in a manner that is absolutely different. That is why I said Innovation Engineering is a new paradigm that is going to come. If innovation is going to be at centre stage, then how are we going to build innovative organisations, innovators, innovation leaders and so on? That is going to be the generic issue".

Risk taking is a part of innovation. In this connection he said, "Unfortunately our systems within the government, within the public funded R&D Institutions, is such that risk taking is not allowed. One of my friends from abroad don't shoot people who don't act but we shoot people who don't take risks. This is true of enterprises. This is true of Institutions. This is true of the whole system and therefore how do we create these systems, by which the risks could be taken. The other issue is going to be the management of innovation. How do you manage innovation? We have excellent schools of management of business, finance, marketing etc. But I don't think we have schools of management of knowledge and management of innovation. Innovation is a very different process. Through innovation, you create something which didn't exist. All management practices are based on what already existed and not on what did not exist at all.

Dr. Mashelkar concluded his speech by saying that 'I' in India will stand for Innovation and the only India that we would build will be not only the India Incorporated, but India that is "Uncomparable". □

NML hosts Shanti Swarup Bhatnagar Memorial (Indoor Finals) Tournament



Inaugural function of SSBMT (seen on the dias — L to R : Shri B. A. Rao, Secretary & Convenor; Prof. P. Ramachandra Rao, Director, NML; Dr. V. Prakash, Director CFTRI; Shri R. S. Saxena, Secretary, CSIR Sports Promotion Board and Dr. A. K. Vaish, Chairman, Organising Committee)

National Metallurgical Laboratory hosts the XXXII Shanti Swarup Bhatnagar Memorial Tournament (Indoor Finals), for the first time in its Golden Jubilee Year under the able and dynamic leadership of Prof. P. Ramachandra Rao. The tournament was held during December 1-3, 1999 at the JRD Tata Sports Complex and Mohan Ahuja Indoor Stadium in which the finalists in various events of the four zonal tournaments competed for the top honours.

The CSIR Sports Promotion Board (SPB) organises a number of sports and cultural events for the welfare of the staff. Amongst these, the SSBMT is organised in the memory of the founder Director General, Sir Shanti Swaroop Bhatnagar. It inculcates the quality of competition, endurance

innovation, team work and the desire to succeed against odds - all key ingredients for success in pursuit of research and development activities. Altogether 160 sportsmen/women, representing 25 laboratories of the CSIR family, participated in various events during the three day tournament.

The inaugural function of the tournament was held at the NML lawns on 1st December, 1999. Dr. V. Prakash, Director, Central Food Technological Research Institute, Mysore & President, CSIR Sports Promotion Board was the Chief guest. The programme started with the NML song followed by the March past in which all the teams that participated paraded in front of the NML building. The guard of honour was taken by the Chief Guest, Dr. V. Prakash. To mark the occasion a souvenir was also released by the Chief Guest.

Dr. A. K. Vaish, Chairman organising committee extended a hearty welcome to the distinguished participants and the guests. Shri R. S. Saxena, Secretary, CSIR Sports Promotion Board also addressed the gathering. Prof. P. Ramachandra Rao, Director NML in his address said 'The tournament organised every year offers an unique opportunity for the members of the CSIR family to interact closely and in a sportive atmosphere. Shri B. A. Rao, Secretary, organising committee proposed the vote of thanks.

The valedictory function was held at the JRD Tata Sports Complex on December 3, 1999. Dr. R. A. Mashelkar, DG-CSIR was Chief Guest. Mrs Mashelkar gave away the prizes to the winners and runners. Dr. R. A. Mashelkar congratulated the winners and runners up of the tournament and also encouraged the participants of all the 25 laboratories/institutes. Prof. P. Ramachandra Rao, Director, NML, Dr. V. Prakash and Sri R. S. Saxena, President and Secretary CSIR Sports Promotion Board graced the occasion and expressed their happiness over the function. Sri P. V. V. Satyanarayana, Sr. COA, NML proposed the vote of thanks. □



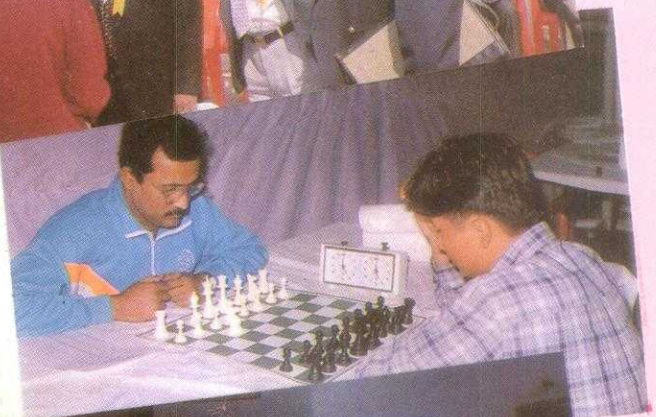
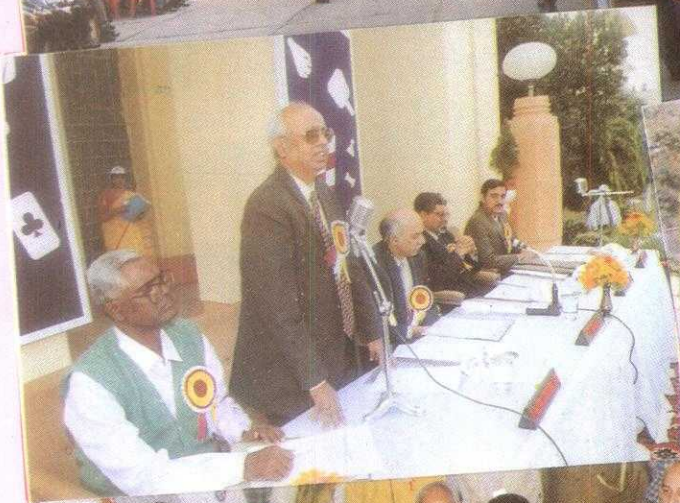
March Past by the participants



Dr. V. Prakash, Chief Guest while releasing the Souvenir



Valedictory Function of SSBMT (Indoor Finals) 1999; Dr. R. A. Masheklar, DG-CSIR addressing the gathering



RESULTS

(The overall winners in various events and categories)

Name of Event	Winner	Name of CSIR laboratory
CHESS	Sri. M. Prakash	CDRI, Lucknow
BRIDGE	Sri. S. S. Bhattacharya (senior) Sri. S. S. Bhattacharya (junior) Sri S. C. Banerjee Sri N. B. Sarkar Sri S. K. Bose	CFRI, Dhanbad
CARROM		
Individual (men)	Sri S. Gururaja	CFTRI, Mysore
Team Event (women)	Ms. Jubita Sarmah Ms. Protima Borah	RRL, Jorhat
TABLE TENNIS		
Individual (men)	Sri D. K. Purushottam	NBRI, Lucknow
Team Event (men)	Dr. U. J. S. Prasada Rao Sri G. Subba Narasimha	CFTRI, Mysore
Team Event (women)	Smt. A. Lakshmi Krishnan Smt. Nandini N. Nagarajan	NGRI, Hyderabad
SHUTTLE BADMINTON		
Individual (men)	Sri K. Nagabhushanam	CCMB, Hyderabad
Team Event (men)	Sri P. D. Siddheshwar Sri. P. K. Purushottam	NCL, Pune
Team Event (women)	Smt. Poonam Gupta Dr. Asha Masohan	IIP, Dehradun



Environmental & Waste Management in Iron & Steel Industries (EWM-2000)

An International Workshop on "Environmental & Waste Management-2000" was held under the auspices of GOI-UNDP umbrella programme at NML. This workshop is a part of NML's initiative in the area of technical cooperation amongst developing countries (TCDC). The workshop was inaugurated by Dr. B. R. Nijhawan, Senior UNIDO consultant, USA and presided over by Dr. J.V. Krouzek, consultant, UNDP.

The last few years have seen phenomenal increase in the global awareness of the deterioration in environmental quality due to increased exploitation of natural resources. Heavy industries like the metallurgical industries have been under tremendous pressure to address environmental issues and follow stringent statutory measures to prevent pollution of the environment. With rapidly escalating pollution levels, there is an urgent need to develop new and innovative eco-friendly technologies and waste management strategies to ensure sustainable development. Analysis of the nature of pollution caused by iron and steel industries, equipment and process design, techniques and instrumentation for assessment of pollution and waste management are some of the issues that need focussed attention. Considering the need for supporting the efforts of industry in meeting the environmental norms, National Metallurgical Laboratory has given added thrust over the last five years to the area of environmental and waste management in metallurgical industries.

The Iron and Steel industry is as capital intensive as it is environmentally intrusive in multiple fields inter-alia of atmospheric, soil, water and hygienic contamination and pollution. Additionally, recovery and utilisation of metallurgical wastes have until recently been "back-yard" in character and the objectives of turning them into valuable and useful metallurgical and financial assets instead of useless cumulative disposal liabilities, have today



Inaugural function of EWM-2000 (seen on the dias L-R) Dr. A. Bandopadhyay, Convenor; Dr. B. R. Nijhawan, Sr. Consultant, UNIDO; Dr. J. V. Krouzek, Consultant UNDP; Prof. P. Ramachandra Rao, Director, NML and Dr. B. C. Sharma, Sr. Consultant, CSIR

gained wide-spread acceptance and practical implementation.

Speaking at the inaugural function of the workshop Dr. B. R. Nijhawan said that whilst the environmental aspects of the integrated iron and steel industry have been given basic emphasis in today's world, the same cannot be claimed for the direct reduction route to steel making. The need to study all environmental aspects of direct reduction and apply remedial measures is very imperative, he added. In his speech Dr. Nijhawan also recommended some steps to solve the prevailing crisis. He said that the sponge iron and steel industry based on direct reduction should make every effort to keep the natural environment as clean as possible particularly in relation to atmospheric pollution, water contamination and dispersion of solid waste. He further recommended that atmospheric pollution control standards should be established to ensure that the daily average atmospheric concentration of nitrogen oxides (NO) should be within or below the range of 0.04-0.06.

The application of high performance electrostatic precipitators, changing to low sulphur fuels and raw materials should be promoted. The increase of water recycling rates and in-

stallation of various water treatment facilities should be promoted to reduce water pollution. As for problems of residual solid wastes, the Steel industry should make the maximum use of all types of dust and sludges from sponge/steel making processes as well as endeavour to reduce the generation of these wastes themselves.

Dr. Nijhawan also dwelt on the present and future status of steel industries in India and abroad. He said that the steel industry has been continuously expanding in India after independence. But, the existing situation could have done much better if they had made themselves competent by all standards. Significantly, the South Koreans in the sixties followed Dr. Nijhawan's advice and subsequently went on to become the largest producer of steel. Dr. Nijhawan forced for new technology in the country and established it in the top slot as far as steel export is concerned. Dr. Nijhawan was of the opinion that steel is a by product and a nation building industry. Hence, there is little scope for earning profit. He stressed that Indian economy is restructuring in the global and national competition but this reform has come bit late, at least after 25 years compared to USA. Dr. Nijhawan stated that given

the opportunities, India can emerge as the leader among steel producing countries in the next millenium.

Earlier, in his welcome address, Prof. P. Ramachandra Rao, Director, NML, said that right from its inception the laboratory had been showing great concern towards environmental and waste management and endeavoring its best to train industries on this subject.

Dr. B. C. Sharma, a senior consultant with CSIR spoke on the various

programmes conducted by the parent organisation on environmental and waste management.

In his keynote address, Dr. J. V. Krouzek said that if the steel industries have to be competitive in the world, they have to improve their way of production. Stressing that continuous research and development is very necessary for the existence of any company, Dr. Krouzek said that if the South Koreans are today the largest producers of steel in the world, it is only because of their continuous research and train-

ing upgradational programmes. He reminded that India has no dearth of talents. Recalling his visit to Jamshedpur 20 years ago, Dr. Krouzek said that the city has undergone a sea change as far as the rate of pollution is concerned.

A total number of seventy six delegates from national & international boundaries attended the seminar and made it a grand success. The proceeding of the EWM-2000 has been published and can be obtained on request from Director, NML, Jamshedpur with a DD of Rs. 800/- in favour of NML. □

Indo-Russian Microsymposium on

Nonferrous Metallurgy in the New Millenium (NEMNM99)

A three day long Indo-Russian Microsymposium on "Nonferrous Metallurgy in the New Millenium" (NEMNM-99) was held during December 7-9, 1999 at NML. The Microsymposium was sponsored by Department of Science and Technology, New Delhi under the scheme of Integrated Long Term Programme of co-operation in Science and Technology between India and Russia.

About forty delegates attended the seminar, among which twelve were Russians and the rest from all over India. A large number of Russian organisations, academic institutes and industries contributed in the Microsymposium. To mention a few : D. Mandel'ev University of Chemical Technology of Russia, Moscow; Institute of Chemistry and Chemical Technology, Siberian Branch of RAS, Krasnoyarsk; Institute of Organic Chemistry, Ufa Research Centre of RAS, Ufa, Russia; Institute of Solid State Chemistry and Mineral Processing, Siberian Division RAS, Novosibirsk; Kurnakov Institute of General Inorganic Chemistry; Russian Academy of Sciences, Moscow; State Research Centre of Russia; State Research Institute of Nonferrous Metals "GINTSVETMET", Moscow and so on. From Indian side premier institutes/govt. organisations like — Bhabha Atomic Research Centre, Mumbai; Defence Research Development Organisation (DRDO), Hyderabad; Department of Science and Technology, New Delhi; Indian Institute of Science, Bangalore; Indian Rare Earth Ltd., Mum-

bai; Institute of Plasma Research, Gandhinagar; Institute of Technology, Banaras Hindu University, Varanasi; Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur; National Metallurgical Laboratory, Jamshedpur; Nuclear Fuel Complex, Department of Atomic Energy, Hyderabad; Regional Research Laboratory (CSIR), Bhopal; Regional Research Laboratory, Bhubaneswar and Sterlite Copper, SIPCOT Industrial Complex, Tuticorin, Tamilnadu participated in the Microsymposium. The deliberations during the Microsymposium resulted in fruitful interaction in terms of the knowledge sharing and the identification of relevant areas/proposals for

collaboration with Russian experts/institutes. Some of the major recommendations were - (1) Scientific co-operation between the two countries be strengthened through specific collaborative projects in the areas like mechanical activation, autoclave processing, bioprocessing, and solvent extraction. Solvometallurgy, where we do not have any serious activity at present, holds strong promise in the extraction and processing of lean and complex raw materials and this should find a special place in our co-operation with the Russians. Other areas that need to be considered seriously include reagent synthesis for advanced mineral processing, synthesis of high purity mate-



Plenary session during the Indo-Russian Microsymposium (from L-R) — Prof. V. L. Kubasov (GINTSVETMET, Moscow), Prof. A. I. Kholkin (RAS, Moscow); Prof. P. Ramachandra Rao, (NML, Jamshedpur); Dr. C. K. Gupta (BARC Mumbai)

rials (especially from wastes), rare earth and heavy metals processing, precious metal recovery and titanium extraction. (2) Dissemination of the information on Russian technologies to Indian industries, (3) NML can serve as the nodal centre in India for Indo-Russian scientific and technological co-operation in the area of non-ferrous metallurgy, (4) The Microsymposium was the first effort in bringing together experts from the two countries in the area of Non-ferrous Extractive Metallurgy. A visit by a thematic delegation on Nonferrous Extractive Metallurgy to Russia would be of immense help in bringing specific Russian technologies and expertise to India, (5) Participants from both sides recommended that for continued interaction the Microsymposium be organised at least once in every two years alternately in India and Russia, (6) Director, NML would co-ordinate the submission of the detailed proposals to ILTP/DST for consideration.

The programme was inaugurated by Dr. L. K. Singhal, Chief Guest, Metallurgical and Engineering Consultants (India) Ltd. (MECON), Ranchi. In his address, Prof. P. Ramachandra Rao, Director, NML said 'Nonferrous metals are indispensable to the growth of our society. As we enter the new millennium, we carry with us huge tonnage of annual metal production with growing demands, and technologies, many of which are innovative at least in the present context. He said that associated with these facts are challenges emerging from depleting grade and complexity of ores and raw materials, more stringent specification for the end-products and growing concern for the energy and environment related issues. He emphasised that the next century is quite likely to witness metal extraction from non-traditional, non-exploited and may be entirely new resources of metals, and these will pose additional challenges. Most new processes that will need development will be based on a multi-disciplinary approach. He stressed that the Microsymposium would strengthen the scientific and technological ties between India and Russia. The proceeding has been published by NML, priced at Rs. 1,200/- and can be obtained on request. □



Dr. A. K. Nandi, Scientist JNARDDC, Nagpur and Prof. P. Ramachandra Rao, Director, NML in the interactive session with Russian experts during NEMNM99



Prof. V. L. Kubasov (GINTSVETMET, Moscow) making presentation during inaugural session



Prof. P. Ramachandra Rao, Director, NML presenting mementos to Prof. A. I. Kholkin

CSIR Programme for Youth on Leadership in Science



NML Scientists while interacting with the Youth Students under the Science Leadership Programme

Council of Scientific and Industrial Research (CSIR) has taken up a novel initiative to popularize scientific research amongst talented youngsters in the country. NML solemnized the formal inauguration of the programme at Jamshedpur on 29th September, 1999 and co-ordinated the CSIR's initiative for the state of Bihar.

The inaugural programme was very well attended, with twenty seven top ranking students (twelve from Jamshedpur schools) from various parts of Bihar, accompanied by teachers and guardians. Prof. P. Ramachandra Rao, Director in his inaugural address made an inspiring speech touching upon the CSIR contributions towards proliferation of scientific interest, towards upholding Indian Scientific achievements and its multifaceted research manifesting to covering the A to Z of scientific and technological research. He urged the young talents to encounter and take up the challenges emerging from the humanitarian, societal and philosophical needs of the increasing technology reliant civilisations. In his words, Science was a never ending fountainhead of queries and questions to bewilder humanity. In an oblique reference to the famous quote ".... collecting pebbles from the seashore," Prof. Rao told

how the more we knew from scientific persuasion, the more were the questions left unanswered. He concluded by providing insights into metallurgical research.

Dr. M. L. Bhatia, a senior and distinguished scientist from the Defence Research Laboratory, Hyderabad, in his impromptu speech, talked about scientific inspirations. He stressed on the flexibility of work available to a material scientist, in tune with the emerging needs of humanity. He stressed that the technological advance of a country depended on proper emphasis on fundamental scientific research.

The inaugural programme was followed by various sessions spread over two days where the invited students were exposed to the scope, theme and execution of materials research. These sessions contained lectures by NML scientists and were structured so as to provide an overview of the research activities at NML as well as the emerging thrust areas of research like pollution control. Through a series of multimedia presentations, interactive laboratory demonstrations and exposure to the sophistications in materials investigations like transmission microscopy, energy dispersive spectroscopy, atomic absorption and direct reading spec-

troscopy, hydrogen analyser and others, the students were provided a glimpse of the joys and rewards of materials research.

The sessions and demonstrations were designed to impress upon the youngsters the broad spectrum of metallurgy and materials engineering. During these interactive sessions, the faculty members elaborated the various stages in the evolution of a metal starting from its natural ore and ending as a finished product and the investigations and developments involved at each stage of the evolution. The concluding event was an open house session where the students interacted with the faculty and sought clarification aspects.

It was evident from the spontaneous response of the students and the way they had enjoyed and benefitted from this maiden venture at popularizing science and specially materials science at NML and on that score alone the programme was a great success. □

STUP Programme

NML organises regularly Skill-cum-Technology Upgradation Programme (STUP) for Small Scale Industries and Rural Artisans/Technicians. During December 1999, the following three such programmes were organised.

- 'Eco-friendly production & modern marketing of quality ferrous & non-ferrous products' held at IIT, Kanpur, during December 15-18, 1999.
- 'Exhibition-cum-workshop on Gift items for metals & waste material' held at Behala, West Bengal during December 21-31, 1999.
- 'Production of Gift items from Metal & waste material' held at Sarisa, West Bengal during December 28-30, 1999.



Dr. R. A. Mashelkar, DG-CSIR while inaugurating NML-NPL Calibration Centre at NML Jamshedpur

industry became more export oriented and there was a need for uniformity against all products that were manufactured, calibration became all the more important. Calibration can play an important role in providing a competitive edge to the Indian Industry for enhancing its export potential by adding intrinsic quality value to the industrial products. Setting up of this centre will meet the longstanding demand for such a facility in this eastern part of the country.

NPL is the primary standards measurement laboratory of the country and the establishment of the centre will enlarge on NPL's interaction with industry in this region. In addition to providing calibration services to the industry, the centre will also act as a base for other knowledge based services from NPL.

The environment at NML-NPL Calibration Centre conforms to NABL standards and calibration is performed in a dust free environment under controlled conditions of temperature which is maintained at $23 \pm 2^\circ\text{C}$ & relative humidity of 40-60%.

Dr. Mashelkar expressed his happiness that the concept of Team-CSIR of harnessing the synergy of the CSIR sys-



(From L-R) Prof. A. K. Raychaudhuri, Director NPL and Prof. P. Ramachandra Rao, Director NML while signing the agreements. On their right, Dr. R. A. Mashelkar & Dr. G. Mukherjee

tem enunciated on the Technology Day, the 11th May 1998, in Bangalore has taken roots and is contributing greatly to the economic growth of India. He also stressed upon the crucial role that calibration of instrumentation and equipment used in manufacture plays in assuring conformance with the stringent international quality specifications. He hoped that the industries will fully utilise and benefit from the services of the Centre.

Earlier, a welcome speech was given by Prof. P. Ramachandra Rao, Director, NML. Speaking on the occasion Prof. Rao said that the industries of this region would get high quality service from NML. He hoped that NML will provide quality service to its customers in the new millenium. Prof. A. K. Raychaudhuri, Director, NPL, New Delhi and Shri Gautam Mukherjee MD, Fusion Engg. Products Ltd., also addressed the function. □

CSIR Young Scientist Award



Dr. S. K. Mishra (Pathak) receiving the Award from Dr. Murli Manohar Joshi, Hon'ble Minister Science and Technology & Vice President CSIR

The CSIR Young Scientist Award for the year 1999 in Engineering Sciences has been awarded to Dr. Suman Kumari Mishra (Pathak) of the National Metallurgical Laboratory, Jamshedpur. Her studies on thin film high temperature super conductors and nano-crystalline ceramics have been innovative and novel. The work has technological significance with respect to advanced ceramics, surface coatings and applied device fabrication.

NML Foundation Day Award

Dr. B. R. Nijhawan Award

Dr. S. Srikanth, Scientist and Prof. P. Ramachandra Rao, Director have been awarded the Dr. B. R. Nijhawan Award - 1999 for their best paper entitled "Construction and applicability of metastable field diagrams for the non-equilibrium processing of alloys" published in the Int. Jour. of Non-Equilibrium Processing, Vol. 10(3/4), pp. 219-240. This paper rigorously analyses the metastable field diagrams depicting the thermodynamic limits to co-existing interfacial solid and liquid compositions for non-equilibrium processing of alloys. Construction of paired diagrams by simultaneous consideration of both the competing phases of a binary eutectic has been demonstrated for the first time. A novel construction of non-isothermal metastable field diagram has been proposed to determine the thermodynamic limits to the distribution coefficient in alloys during freezing as a function of undercooling. This paper is likely to make a significant impact

to the understanding of the evolution of phases during non-equilibrium processing of alloys.

Distinguished Service Award

Shri Baijnath Sharma has been awarded the Distinguished Service Award 1999 for his outstanding contribution to the laboratory. Shri Sharma leads a team of electricians for routine and breakdown maintenance of the Large Scale Test Facilities (LSTF) in the pilot plant campus of the laboratory. He knows the entire wiring of these plants like a doctor knows the nervous system of his patient. It is due to his tireless efforts that equipment installed thirty eight years ago, at the time of his joining the laboratory, are still in working condition. When need arises, he is never found wanting. The first person to be thought of in an emergency is Shri Baijnath Sharma! His persistent efforts have made it unnecessary to contract out repair jobs of the pilot plant area to other agencies thus saving considerable sums of money.

IIM Award



Dr. Arvind Sinha

- Dr. Arvind Sinha, Scientist, won the first Prize for his Best Metallography entry on Bio-mimetics at the National Metallurgist Day Award of the Annual Technical Meeting of Indian Institute of Metals, held at IIT, Kanpur during November 14-17, 1999.
- Dr. Suman Kumari Mishra (Pathak), Scientist, won the best paper presentation award at the National Metallurgist Day Award of the Annual Technical Meeting of Indian Institute of Metals, held at IIT, Kanpur during November 14-17, 1999.

JAL Award

Shri B. C. Bhakat, Tech. Officer (Photography), won the Japan Air Lines (JAL) Prize for excellence in the Photo Contest of Asia/Pacific Cultural Centre for UNESCO 1999.

KANO Award



Shri Ratnakar Singh (left) receiving the award

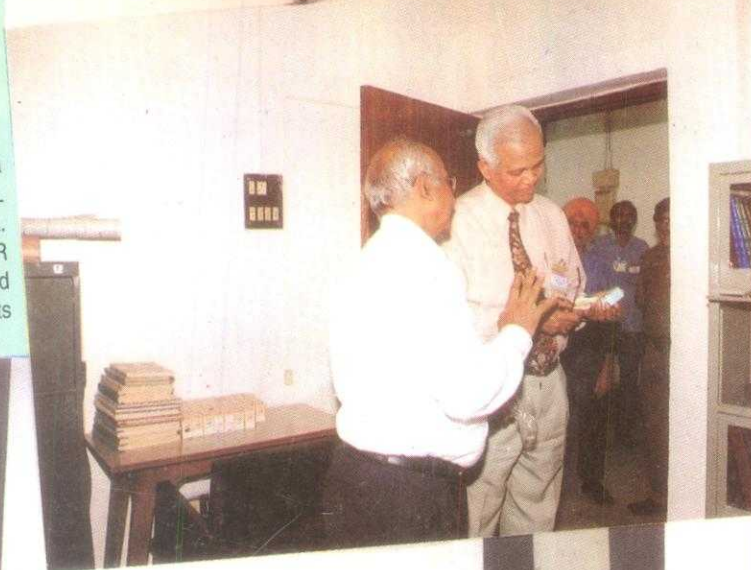
Shri Ratnakar Singh, Scientist, received the KANO Award for his outstanding performance in the training course on "Implementation of Total Quality Management and Standardisation Activities", organised by Japan International Co-operation Agency (JICA), Tokyo. Shri Singh has been deputed at Japan by the Laboratory to undertake the TQM.

S n a p s h o t s

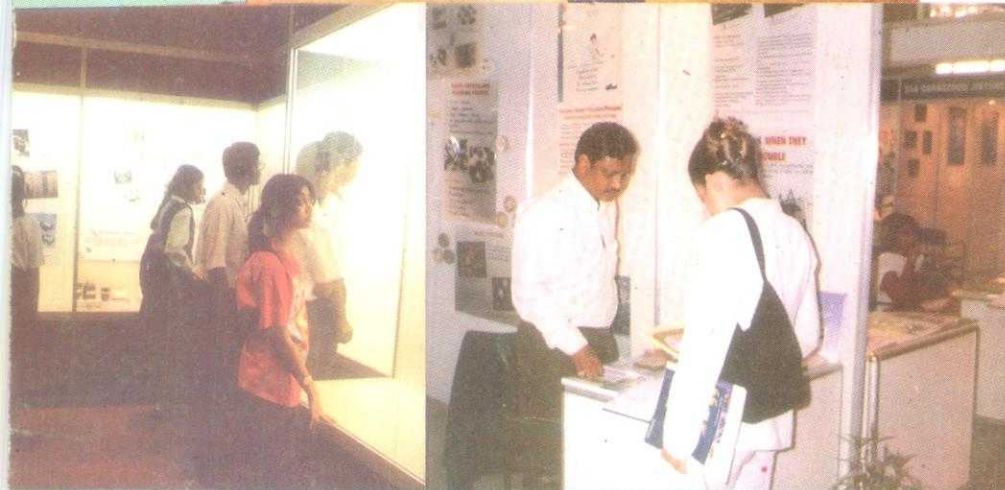
Dr. R. A. Mashelkar,
DG-CSIR, visits the
Laboratory



Prof. P. Ramachandra
Rao, Director, NML
explaining to Dr. R. A.
Mashelkar, DG-CSIR
about NML developed
products



Yoga demonstration
organised by
NML Staff Club



NML's stall at India International Trade Fair held at Pragati Maidan, New Delhi

New Projects

- Development of Pickling inhibitors for Tata Steel
- Beneficiation of barytes sample from Andhra Pradesh for Mineral Resource & Tech. Upgradation Trust, Andhra Pradesh.
- Reduction of Hydrogen Entry and consequent Hydrogen embrittlement in steel substrate by ion implantation sponsored by DST, New Delhi.

Papers Published

- Chatteraj I., Rao R.M., Das S. and Mitra A.; 'Anodic reaction of amorphous and devitrified Fe-B-Si-Nb-Cu alloys in buffered chloride and fluoride'; Corrosion Science, 41, pp. 1-16.
- Das S. K. and Ghosh S.; 'Failure analysis of an anvil block'; Indian Foundry Congress Bull., pp. 215-218.
- Kumar P. and Murthy G. V. S.; 'Assesment of interface in double poured chilled cast iron rolls by ultrasonic testing'; Indian Foundry Bull., pp. 198-200.
- Godiwalla K. M., Das S. K. and Sivaramakrishnan C. S.; 'Mathematical modelling of electromagnetic phenomena in alumina smelting cells'; Trans. IIM, 52(2&3), pp. 103-108.
- Kumar R.; 'Anomalous dependence of leachability on surface area during sulphuric acid leaching of Ni and Cu doped in brinessite; Hydrometallurgy, 52, pp. 71-79.

Patents Filed

- An improved process for the production of Copper, Nickel, Cobalt and other metallic values from polymetallic sea nodules using coke oven gas as reductant; S. Srikanth, T. C. Alex and Premchand. (Patent Appl. No. 63/DEL/99).

Wishing a Happy Retired Life

S/Shri S. Pramanik, Sct.; Md. Sirajuddin, TO(B); M. L. Mondal, Gr. III(4); V. N. Sharma; P. P. Shaw; Joginder Jha; A. R. Bhattacharya, Z. Islam, B. D. Singha; K. Rama Rao (all are Gr. II), and T. K. Appanna (Farash).