



Dr Ramchandra Das



# MUKKATTU RAMACHANDRA DAS

(1937-2003)

Elected Fellow 1992

## BIRTH, EARLY LIFE AND STUDENT DAYS

**M**UKKATTU RAMACHANDRA DAS was born in Tiruvalla, at present in the Pattanamthitta District, Kerala on July 2, 1937 as the first child of his parents, Sri NK Sivasankaran Nair and Smt N Gowri Amma. Mukkattu was the 'Family Name', used traditionally as initials by some of the Nair families. Joint Family System was in practice, and Das had his early upbringing in a traditional Nair family setting, in a rural milieu. His father NK Sivasankaran Nair was a Science Teacher and Headmaster of a school, and mother N Gowri Amma, a Hindi and Sanskrit Scholar. Both his parents were deeply influenced by the teachings of Mahatma Gandhi, and his father always wore Khadi clothes. He had two sisters, Vijayalakshmi and Rajalakshmi, who were younger to him. Das's ancestors were agriculturists and owned acres of land. The tributaries of the river Pamba passed close by his ancestral home at Kavumbhagum, Tiruvalla. The daily walk to the river with his father for a bath gave him the opportunity to encounter with colourful plants, beautiful ferns and birds, which blossomed in him an everlasting love for nature. Bathing in the river and the necessity of canoeing across the river during monsoon floods developed into a life long passion in him for swimming, including swimming in the ocean. His father had a special influence on Das in cultivating an interest in English Literature and Science. He encouraged Das to read the English newspaper 'Hindu' and to translate the editorial into Malayalam every day, and often helped Das with his elocution speeches in school. It was also his father who introduced Das into the world of 'Nature Study' by pursuing simple experiments at home 'on the development of frogs from eggs', and 'on the metamorphosis of butterflies'; thus arousing the sense of awe in him about how things evolve in nature.

*"The man dies in all who keep silent in the face of tyranny"*

*Wole Soyinka, Nobel Laureate in Literature 1986*

*"For the triumph of evil it is only necessary that good men shall do nothing"*

*Edmund Burke*

*Das believed in working together for rationally and ethically right causes*

Both at the Hindu English High School at Kavumbhagum, Tiruvalla during the primary education and in the Syrian Christian Seminary (SCS) during high school education, Das maintained a consistently excellent academic record. Recalling the school days, one of his contemporaries remarked that Das was shy, simple and straight forward; he steered away from envy, and was serious minded and meticulous in his



studies. He used to take part in drama and elocution. He won several prizes in elocution competition, essay writing, recitation and in poetry. A poem written by Das for the school magazine was published recently in the Centenary Souvenir of SCS, along with his obituary. It was at SCS that Das developed major interests in Science and Literature. While addressing school students, as the Chairman of Science and Technology Department, Government of Kerala, Das often used to narrate about Mr TK Iype, a committed science teacher at the SCS, who encouraged students to ask as many questions as possible in the science class, and admitted that Mr Iype had a major influence for his interest in Science and in his opting for the Science Group in College. In 1952, Das passed the 'matriculation examination' with first class and stood first in order of merit in school and won the prize for the "Best Outgoing Student"

### UNIVERSITY EDUCATION

On completing matriculation from a Protestant School, Ramachandra Das entered a Catholic College, the St. Berchmans College at Chenganachery in 1952. There were excellent teachers in Chemistry, Physics and Mathematics and at the end of the two years of Intermediate; he developed a special interest for Chemistry. He passed the Intermediate Examination with 100 per cent marks in Mathematics, and scored above 90 percent for Chemistry and Physics; stood first in the college and was fourth in position in the university, which had several affiliated colleges. Despite social pressures for opting for a career in Engineering, Das decided to pursue his studies in Science and chose Chemistry as the Main Subject for BSc at the St Berchmans' College. Das often discussed with his daughters the wonderful teaching skills of Professor TT Chacko and Professor KC Papoo in Chemistry and Professor CA Sheppard in English. Sheppard with his poetry classes opened in Das the window of sensitivity to rich poetry, which has always been a joy in his life. He bought the complete works of TS Eliot in later years and enjoyed reading aloud TS. Eliot's "Old Possums Book on Practical Cats". The four years at St. Berchmans also stimulated a voracious reading of books – "War and peace," "Glimpses of world history," Nehru's autobiography and "Ulysess" were some of the books he read during this period, and remain in his collections even at this time. He was the recipient of three different merit scholarships during college days and passed the BSc examination with First Class and First rank in the Kerala University in the year 1956. In Kerala, Post Graduate Education in Chemistry was available at that time only at the University College, Thiruvananthapuram. Das enrolled for MSc as one of the seven students and there was a healthy competition among the seven students who were all highly positioned in their BSc from the various Colleges affiliated to the University. Das had a very sensitive nose. One of his classmates recalls that Das could identify an organic compound by its smell with a fair degree of accuracy and his skill in analyzing mixtures of inorganic salts were such that many times his values were taken as 'the standard' by the 'skilled assistants'. He scored 100 per cent marks in the practical examination, passed the M. Sc examination securing First Class with First position in the Kerala University in 1958.



## PROFESSIONAL CAREER

### Tata Institute of Fundamental Research, Mumbai, 1958-1979

In 1958, immediately after his Masters, Das was selected to join the prestigious Bhabha Atomic Research Centre (BARC) Training School, and also as a Research Assistant at the Tata Institute of Fundamental Research (TIFR). He chose to join TIFR, as a Research Assistant in the Microwave Spectroscopy Group, in September 1958. The Microwave spectroscopy group was then housed in one of the military hutments, converted into laboratory blocks, on the land acquired for putting up the permanent buildings of the Institute, at Holiday Camp, Colaba. Das worked for his PhD, in one of those hutments, under the supervision of Professor Balu Venkataraman, the well-known Spectroscopist. In the early stages of his research career (1958 to 1969), Das was interested in the study of biologically important molecules using **magnetic resonance** methods. Normally unseen today, science of this nature in late fifties relied heavily upon innovations in not only the design and fabrication of equipments, but also on the synthesis of novel chemical entities in one's own laboratory, to successfully compete with the west. Das rose to the challenges. The focus of interest was on understanding the geometry, structure, and mechanism of interaction of a group of molecules of biological interest - quinines and hydroquinones, which play a major role in biological oxidation-reductions. They also formed an ideal system in unraveling the mechanism of the magnetic interaction between the electron and nuclei in molecules and hence the results were of equal interest from the chemical theorist's point as well. He synthesized several novel, position specific, isotopically labeled compounds, like ' $C^{13}$  labeled hydroquinones', and obtained accurate values of  $C^{13}$  hyperfine splitting, using Electron Spin Resonance (ESR) methods, which provided considerable understanding in terms of electron nuclear hyperfine interactions in aromatic compounds. The accurate values obtained by Das for electron spin densities in semiquinones provided solid experimental support in choosing between different theories for interpreting the mechanism of electron nuclear hyperfine interactions in aromatic systems. Thus, some of the theoretical predictions made by Karplus and Fraenkel were substantiated by these early studies of Das and the values for the sigma-pi interaction parameters were refined using his experimental data.

While working in the hutments, he watched with awe, the magnificent building of the Institute coming up in front of his eyes, and the kind of attention that Dr Bhabha gave in building up the place, including the landscaping. The Institute was formally inaugurated by the then Prime Minister of India, Shri Jawaharlal Nehru on January 15, 1962 and by then they were already fully occupied. The experience of listening to visiting professors like George Gamov at the Physics Colloquium and the participation at the inaugural function of the Institute, where scientists like Lee, Block, Rosenblith and Bok lectured, left an indelible impression in Das. This was more evident in later years, when Das was involved in building institutions like CCMB at Hyderabad and RGCBS in Trivandrum.



After the completion of his thesis in 1962, Balu Venkatraman encouraged him to go to Columbia University in USA for postdoctoral studies in the laboratory of George Fraenkel. Das continued his interest in ESR at the Columbia University (1962-1965). Detailed and accurate understanding of ion-pair and solvent interactions with semiquinones, and the temperature dependence of hyperfine splitting, was another related area where he made substantial contributions while at Columbia University. The results were published in *Journal of Chemical Physics*. Das often recounted the excellent and engrossing lectures of Martin Karplus on quantum mechanics and quoted him as one of his best teachers. Upon his return from Columbia University to TIFR, Das was conferred with the doctoral degree from the University of Bombay in 1965. His interest on ESR based studies continued; he laid stress on making use of the new ideas and new theoretical developments taking place at that time. The doctoral work of few students, BS Prabhananda and MP Khakar, were based on these studies. They used alkali metal reduction techniques to prepare semiquinone-alkali metal ion pairs in aprotic solvents of low dielectric constants; estimated the empirical parameters required for determining spin density distributions in semiquinones and inferred the dynamic nature of the ion pairs from ESR spectra.

This period, namely, a decade after the discovery of the structure of DNA by Watson and Crick in 1953, was full of very exciting developments in terms of understanding the fundamentals of the functioning of biological systems. Das was fascinated by '*Modern Biology*'. He made a major decision to change the area of his research interest from Chemical Physics to Molecular Biology. Professor MGK Menon, the then Director of TIFR supported this idea.

The Turning Point of the change to Molecular Biology was in Cornell University, Ithaca, New York where Das worked from 1968 to 1969 with Professor Jack Freed. The ESR work on simple semiquinones led to the work on the Electron Nuclear Double Resonance (ENDOR) studies of biologically important quinines like vitamine K quinines and co-enzyme Q-10. A combination of ESR and ENDOR studies of these molecules made it possible to obtain accurate values of spin densities in these complex systems. Two other projects that gave results of considerable interest and of fundamental importance were the investigations on the relaxation behaviour of highly symmetric organic molecules (Jahn-Teller molecules) with degenerate ground states and the studies of Heisenberg Exchange in neutral free radicals, one of the best investigations in this field. The findings resulted in highly cited publications in the *Journal of Chemical Physics* and in the *Journal of American Chemical Society* and found place in textbooks on ENDOR. While at Cornell, three important individuals had a major influence on Das and these included two Nobel Laureates, Manfred Eigen and HG Khorana, who were Visiting Scientists at Cornell University in 1968 soon after receiving the Nobel Prize, and Raould Hoffman, who later won the Nobel Prize in Chemistry.

Das shifted to the Cancer Research Institute of Columbia University in August 1969, with a distinguished fellowship, when Sol Spiegelman moved from University



of Illinois, Urbana, to the Cancer Research Institute in August 1969, as its Director. Here he did the most famous work of his career, on RNA tumour viruses. In collaboration with Prof Sol Spiegelman, Das's work unequivocally demonstrated nucleic acid homology between tumour viral RNAs of avian and murine origin, and their host DNA, which preceded the discovery of reverse transcriptase (RT). They had also confirmed and characterized RT in several RNA tumour viruses and showed that the DNAs synthesized by RT *in vitro* were true hetero polymers homologous to their viral RNA template. They demonstrated that the enzyme RT, in addition to having the ability to use RNAs as templates, can also copy hybrid templates and DNAs, eventually unraveling the mechanism by which acutely transforming RNA viruses cause cancer in animals. These results were published as a series of three papers in the August, September, and October issues of *Nature* in 1970. Similar work published a few days before by the Columbia Group from the laboratories of David Baltimore and Howard Temin was awarded the Nobel Prize in 1973.

Das returned to TIFR in 1971, and established a small molecular virology group in TIFR. LC Padhy, K Krishnamurthy Rao, Rajan Koshy and Akhil Vaidya were his students for PhD; and Satyavati Sirsat, (CRI, Bombay) and Dan-H Moore (Institute of Cancer Research, Camden, New Jersey) collaborated with him. His work demonstrated that there was an inverse correlation between mammary tumour incidence and the level of a ribonuclease present in human milk. They examined the protective function of this nuclease, which was present in low amounts or is absent in milk from Parsi donors with three times as much mammary cancer incidence compared to other Indian populations; they purified the nuclease to homogeneity and characterized it. They gathered early leads that this allosteric enzyme is regulated by the availability of nucleoside precursors. Severe technical difficulties such as the abundance of RNA hydrolyzing enzymes (RNAses) in milk and very low incidence when virus-like particles could be seen in human milk samples, made this quest an impossible task to be completed, and the viral aetiology of human breast cancers could not be proven, then. However, through subsequent work over the next decade by many workers revealed that normal human genome contained many copies of DNA sequences very similar to RNA tumour viruses, now christened as retroposons." Their findings were published in *Nature* and *the Journal of National Cancer Institute*.

On the basis of his accomplishments in tumour virology, in 1977 Das was offered the position to "Head the Molecular Biology group" of the Michigan Cancer Foundation in Detroit (an Institution famous for providing the MCF-7 cancer cell line and dedicated exclusively to human breast cancer research) and he worked there for two years. Here, Das's observation on the partial homology of the murine mammary tumour virus (MuMTV) genome and the Mason-Pfizer monkey virus genome with human tumour DNAs, based on careful experimentation preceded the important discovery of the existence of cellular oncogenes. This was the first observation on the homology between animal viral sequences and human mammary tumour DNAs and was later



substantiated using gene specific probes. And this work had opened up the possibilities of investigating oncogenes from mammary tumour DNAs. Marvin Rich, Furmanski, Bourguignon and Mink collaborated with Das.

In 1978, while Das was still at the Michigan Cancer Foundation, he received an opportunity that significantly changed the course of his scientific career. Dr Pushpa Bhargava who was visiting the US in search of committed individuals invited Das to join him in his efforts of building the Centre for Cellular and Molecular Biology (CCMB), in Hyderabad. On his decision to join CCMB, Das wrote, from MCF, to Dr BV Sreekantan, then Director, TIFR, that, "...I should make it absolutely clear that the only reason I would like to move to CCMB, Hyderabad is the immediate possibility of developing a sizable and viable group working in tumour cell biology. Being a new institute the funding situation would be little liberal. I feel that I should be able to do a good job with the additional freedom for action. Although I make the decision in favour of moving to Hyderabad, I shall always be grateful for all the support you have given me and would certainly be loyal to you and to TIFR....".

#### Centre for Cellular & Molecular Biology, Hyderabad (1979-1994)

Das returned to TIFR in early 1979 and joined CCMB in August 79, as Deputy Director and became Director Grade Scientist in 1984, a position he held until 1994.

In CCMB, Das's contributions were in diverse fields. His group was involved in two major research projects, which included Oncogenes and tumour suppressor genes, and Hepatitis C virus. In the first project, his group worked on aspects of nucleic acid enzymology, structure-function studies on reverse transcriptase, oncogene expression, transplantation antigen, heat-shock and gene regulation, and tumor cell heterogeneity. They used the Zajdela acetic hepatoma (ZAH), a chemically induced rat hepatoma as model to examine the role of G proteins in tumorigenesis. After having isolated and sequenced a cDNA clone for the beta-subunit of G proteins (GB2) from rat liver, they examined expression of GB2 in different rat tissues during rat liver development and liver regeneration. Using Western and Northern Blot analysis, they showed that GB2 was over expressed about five folds in ZAH as compared to normal liver. Upon performing nuclear run-off transcription assay, it was found that the rate of GB2 mRNA synthesis in ZAH was about three-fold more than in liver, indicating that the expression of GB2 is regulated at both transcriptional and post transcriptional levels. A Southern Blot analysis was done on genomic DNA of normal liver and ZAH using five different restriction enzymes. The results of this experiment indicated decreased copy numbers of the GB2 gene in ZAH. They also showed over expression of  $G_{\alpha_{i3}}$  (the alpha subunit of one of the adenylate cyclase inhibitory G proteins). The Southern blot analysis for  $G_{\alpha_{i3}}$  with three different restriction enzymes did not show any change in the organization of the gene. Specific transforming mutations in the  $G_{\alpha_s}$  (the alpha subunit of the adenylate cyclase stimulatory G protein) and  $G_{\alpha_{1s}}$  (the alpha subunit of one of the



adenylate cyclase inhibitory G proteins) have been shown in a subset of human endocrine tumours. It was of interest to check if such mutations in ZAH existed.  $G_{as}$  was chosen for this analysis because of its stimulatory effect on adenylate cyclase. For this analysis, a reverse transcriptase polymerase chain reaction (RT-PCR) was done on RNA isolated from ZAH cells. The RT-RNA product was cloned and sequenced and it was found that there was no mutation in  $G_{as}$ . They also examined the effect of enhanced expression of G protein subunits on the second messenger generating enzymes in ZAH.

The work on the isolation and purification to homogeneity of a tumour associated antigen from a chemically-induced tumour (ZAH), from his laboratory is one of the first purifications on such antigens. It broke ground (a) in basic studies for unraveling their structure and function and (b) in terms of application for the control of the disease by developing methods to induce the expression of immunogenic tumour antigen in the host as a means to control the disease. One of Das's PhD students, Pramod Srivastava, who subsequently showed in his own laboratory in the US, that these proteins are a class of stress chaperone proteins and are immunologically very significant and can be used in the immunotherapy of cancers. His studies on heat-shock induced proteins of ZAH, in comparison with those in liver cells, made a significant observation on the regulation of albumin. They observed that this protein is constitutively expressed in adult rat liver at normal temperature, and not expressed in embryonic liver. Upon heat shock at 13-14 days of gestation, albumin is expressed. This observation opened up new possibilities for future investigations.

In the second research project, Das's group in collaboration with the Osmania Medical College developed a RT-PCR method to detect hepatitis C virus (HCV). In immunosuppressed patients who are often seronegative for anti-hepatitis C virus, commercially available immunodiagnostic kits are not of particular use. In this connection, the development of the RT-PCR method has been advantageous, particularly for detecting Indian strains of HCV.

Das took some of the most demanding and critical administrative responsibilities and played a major role in setting up CCMB in Hyderabad. By the mid-80's, Das's administrative responsibilities in CCMB had increased considerably. The number of appointments at all levels had risen and Das took a keen interest in many activities of the Institute. He would never hesitate to help anyone who went to him with a problem, regardless of hierarchy. His friendly and approachable manner endeared him to one and all. There was a stream of distinguished visitors from all over the world at CCMB and there was a sense of tremendous excitement of building a first-class centre for education and research. The beautiful building that is now CCMB was still a gleam in many eyes as they operated out of shacks. The academic excitement was complemented with the abiding generosity of Pushpa Bhargava and Das and their families who provided occasions for numerous parties, lunches, dinners, music, and a sense of wonderful camaraderie prevailed.





Veena Parnaik, Pramod Srivastava, Gopal Pande, Usha Srinivas, Hemavati, Ashok Hegde, Neeraj Jain and Shivkumar Sharma were few of his associates and students who contributed to the research programmes at CCMB. Most of his associates and students have excelled in their scientific careers and some head their own laboratories. As one of Das's colleagues narrated, *"I joined CCMB in January 1980, a few months after Das. With my Ph. D. training in enzymology from the Ohio State University in Columbus, USA, I became fascinated by the ability of reverse transcriptase to utilize a number of nucleic acid templates in vitro, and embarked on a project to study this in more detail. Using specific inhibitors it was possible to show that templates varying widely in composition and conformation could bind at a common site on the enzyme, although there were finite differences in the requirements for their optimal binding which also affected the rate of DNA synthesis. Das took enormous interest in the organization of the laboratory and in the procurement of materials so that our experimental work was not hindered. Setting up a group in Molecular Biology was not an easy task in the early 1980s, especially with power cuts and occasional experiments by candlelight in a crowded laboratory in the RRL Campus, but Das managed to keep us in good humour. We were always treated as members of one large family, and enjoyed his hospitality at frequent get-togethers at his home"*.

### **Rajiv Gandhi Centre for Biotechnology (1994-2001)**

In early 1994, the renowned physicist, Dr PK Iyengar, Chairman, Science, Technology and Environment Committee (STEC), Government of Kerala and Former Chairman Atomic Energy Commission sowed in Das the idea of creating a Centre of Modern Biotechnology in Kerala and this triggered in him a new passion. Their vision for such a Centre was to create a model of an organization that would enhance the use of science and technology to improve the well-being of the common man. In view of the major impact of biotechnology in agriculture, health, pharmacy and industry, and of its potential in harnessing the rich biodiversity in Kerala, the then existing Rajiv Gandhi Centre for Development of Education, Science and Technology ( RGCDEST) was restructured and brought under the umbrella of STEC to start an institution devoted solely for biotechnology and in the cutting edge of modern biology in this part of the country. The Government of Kerala, at the recommendation of Dr. Iyengar invited Das to come down to Kerala from CCMB to build this Centre. Das made the radical decision to prematurely leave CCMB in November 1994 and shift to Thiruvananthapuram to realize his new venture and accepted the challenge to build Rajiv Gandhi Centre for Biotechnology (RGCB).

By then, Das already had experience of building a Biology institution, the CCMB in Hyderabad and he had had the privilege of working at many world class biology and biotechnology laboratories (TIFR, Columbia University, Cornell University, Michigan Cancer Foundation, CCMB, Chester Beatty Laboratories, London), and he had visited and lectured in several renowned laboratories in India and in the US, UK



Germany, France, the Netherlands, Japan, China, Singapore, Bangkok, Czechoslovakia, Poland, Greece, Denmark and Italy. He was by then, the elected fellow of the three national academies of India.

Das conceived the details, drafted the charter for the RGCB, built the Centre, and directed it as its Founder Director, for over seven years. He received help from the Government of Kerala, from DBT, Government of India, from the Governing Council that consisted then of the Chief Minister of Kerala, Sri V Ramachandran, Vice-Chairman of the State Planning Board, eminent scientists like Dr PK Iyengar, the then Chairman STEC, Government of Kerala, Dr Raja Ramanna, former Chairman AEC and the then Director National Institute of Advanced Studies, Bangalore, Dr MS Valiathan, former Director SCTIMST and the then Vice Chancellor, Manipal Academy of Higher Education, Dr S Ramachandran, former Secretary DBT and from several scientists in India and from abroad. The then Prime Minister of India Shri PV Narasimha Rao laid the foundation stone of the Centre in November 1995 in a 4-acre land adjacent to the Poojappura jail at Thiruvananthapuram and the President of India, Dr APJ Abdul Kalam dedicated the Center to the nation in November, 2002.

The excellent infrastructure for conducting cutting edge scientific research and the magnificent building that one sees at Poojappura had a very modest beginning at a rented house in Sasthamangalam from where Das worked relentlessly. His dynamic disposition and superb organizational capabilities contributed to the establishment of the Centre. His approach was holistic. Along with the development of a sound infrastructure, he began selecting talented and committed scientists to work at the Centre. Under his leadership, RGCB laid emphasis on developing areas of research under Infectious Diseases, Environmental Biotechnology, Plant Molecular Biology, Transgenic Plants and Animals, Molecular Biology of Genetic Diseases, and Molecular Basis for Biological Functions. The choice of research areas at the Centre was based on three aspects of trends in modern biology, (1) immediately applicable research especially in those areas related to health, agriculture and industrial application (2) research related to basic understanding of the physical basis of biological phenomena and (3) research related to a in depth understanding of molecular biology in areas such as gene organizations in higher living systems and development of brain function etc. The choice was influenced by the fact that the relationship between basic research in modern biology and its application for practical needs, was very close. For the successful control and prevention of many communicable diseases prevalent in India, it is essential to understand the life cycle and biology of the etiologic agents. The application of biotechnology to agriculture and forestry needs research on plants that are important to Kerala and India.

Das's standing amongst scientists was such that, 'during the period he directed the Centre, the Nobel Prize winner James Watson, the discoverer of the structure



DNA, and another Nobelist, Professor Harold Varmus, whose work made gene cloning possible, visited the centre and delivered lectures. Likewise all the heads of scientific agencies of India, without exception – DBT, DST, DAE, CSIR, ICMR and ICAR, and several leaders in Life Sciences in the country and from outside, visited the Centre and interacted with the students and staff, giving a big boost to their morale.'

### **Chairman STEC and Ex-Officio Principal Secy, Govt of Kerala (1998-2002)**

Das also held the position of the Chairman of the Science, Technology and Environment Committee (STEC), and Ex-Officio Principal Secretary, Department of Science, Technology and Environment, Govt of Kerala, during the period 1998 to 2002. He played a vital role to rejuvenate scientific infra structure and research and developments in the seven laboratories (including RGCB), in Kerala. The research activities of these institutions ranged in agriculture, molecular biology and health care, earth sciences, forestry, alternate energy, water resource management and road transportation. Wherever he addressed students, teachers and scientists in educational and science institutions and in universities, he expressed his deep concern with the decline of choosing a scientific career by bright students in Kerala and of the decline in the questioning attitude; and he urged, "to systematically promote a quest for excellence as a value in our scientific and educational institutions and for an all out effort to attract bright students to science. He often quoted the chapter 'value of science', an epilogue, from Richard Feynman's famous book "What do you care what other people think" (Feynman discusses the ethics of science, and the joy of working in science - 'the same thrill, the same awe and mystery, comes again and again when we look at any question deeply enough')."

Delivering the first Dr MR Das Memorial Oration for the year 2003, at RGCB on November 22, 2003, entitled 'Realizing the Potential of Biotechnology – a Mission', Dr Manju Sharma, Secretary, DBT said that "the late Dr MR Das, a good friend of mine, firmly believed that Biotechnology has had a significant impact in the world and will have an overwhelming impact in the coming decades. In fact, I had many discussions with him when he was at the Centre for Cellular and Molecular Biology and later, when he came to RGCB. His untiring efforts over 7 years led to the establishment of the RGCB, today recognized as one of the Centres of Excellence in this part of the region and in the country. He was also Chairman of the Science and Technology programme of the Kerala Government, which he successfully guided. His most famous work relates to the identification and isolation of the enzyme reverse transcriptase from murine leukaemia viruses. These papers were published in August, September and October issues of *Nature* in 1970. Dr Das was an extensive reader, and had a very sound knowledge about the world's painters and their work. In fact, he had a stylish personality, fond of good clothes and elegant way of living. Dr Das built a whole school of youngsters. The country would always remember him as a renowned scientist."



warm human being with artistic taste and deep concern for young students and scientists.

The author (BGU) narrated *“through this lecture I pay my sincere tributes to Dr Das whom I admired not only as a scientist, but as a delightful human being”*. *“Dr MR Das had many dreams; he could fulfill some of them. He has given a road map wherein emphasis of the RGCB has been on infectious diseases, plant molecular biology, molecular basis of biological functions, gene diseases and environmental biotechnology. It will also be necessary to selectively work on some missions looking at the regional issues and the rich biodiversity of Kerala.”*

In an important message upon his demise, Shri AK Antony, The Honourable Chief Minister of Kerala wrote that *“A reputed scientist who has contributed significantly for the development of Biotechnology in India, Dr MR Das has also proved his mettle as an eminent institution builder by developing Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram, as a prominent Research Centre. Biotechnology Research in Kerala was in its infancy when Dr Das assumed office as the Director of Rajiv Gandhi Centre for Biotechnology. When Dr Das impressed on us the scope and reach of Biotechnology research especially in the newly emerging scientific scenario, the state government was only happy to provide him with all possible help and encouragement to set up state-of-the-art research facilities at the Centre. As the Chairman of the State Committee on Science and Technology and Environment, he played a pivotal role in rejuvenating scientific research and science education in the State”*.

## MARRIAGE AND CHILDREN

In 1965, on return from Columbia University (USA), Das married Radha whom he had met in 1962 at the University College, Thiruvananthapuram where she was an MSc student in Chemistry. Das had just completed his work for PhD then and was to leave for USA soon. On the request of the Head of the Department, Das gave a Seminar on his work, for the Chemistry Colloquium. Radha was introduced to Das, by Professor Subramonia Warrior, the Head of the Department, as she was the recipient of a DAE merit scholarship during MSc and was to join BARC after completion of the course. Radha, soon after marriage, realized that Das identified himself with Science in such a way that his only interest was ‘in the freedom to search for undeniable truth to pursue knowledge and thereby its development.’ Despite her demanding profession, and the children, she adjusted to enable Das to pursue his research interests with total devotion. They have two daughters, Purnima (married to Dr Anand Kumar) and Jyotsna, (married to Dr Ravishankar Gopinath). Both daughters are well established in their profession and well settled with their families. Radha Das recollects the zeal with which Das taught his daughters the wonder of books early in life; he never interfered in their choice of profession; and he found time to enjoy travel, music and art with them.



## PERSONAL QUALITIES

Das combined scientific achievements with human values. He easily sparked and inspired students and fellow colleagues alike, with his academic brilliance and mastery over not only the subject of his specialization, but on any subject, with ease. He bore a strong sense of commitment and dedication in his day-to-day activities." The lasting impressions that Das left in those who came in close contact with him were his gentleness, simplicity, humility and equanimity of temper. He had neither prejudice nor favouritism and he viewed any issue with objectivity, and thoroughness. He accepted challenges with out worrying about consequences. His achievements carried no touch of ostentation or self-consciousness." He discovered the wonder of books early in life, was an avid reader and collected many good books. He had a good knowledge about the world's painters and their work and collected good paintings from where ever he travelled, for office and home. He was fond of wearing elegant clothes. Das was very fond of his daughters and this fondness reflected in his care for his students.

## LAST DAYS

Das succumbed to a massive heart attack on April 1<sup>st</sup> 2003. Till the last day, he continued his pursuit towards innovative knowledge and its translation for benefit to mankind though he had retired from major administrative responsibilities from Government, in March 2002. At the time of his sudden death, Das was holding a Senior Scientist position at the Indian National Science Academy and was also an Emeritus Scientist, at the Rajiv Gandhi Centre for Biotechnology. Scientific activity being the fulfillment of his inner need, **he was happy for the recognition he received from INSA**, which enabled him to continue with active science for the next 4-5 years.

He soon prepared an ambitious collaborative programme of research with CCMB, Hyderabad (on the genetic diversity of tribal population in Kerala, and on coastal ecosystem) and with Kottakkal Arya Vaidyasala (on medicinal plants). He expressed his happiness in a letter to the Chief Minister of Kerala in March 2003, "*....I am happy and I am hopeful of doing good research again with the fellowship. It is a credit to the RGCB. I am indebted to the Government of Kerala and to Dr PK Iyengar who invited me to set up this Centre of Excellence in the emerging areas of Biotechnology ....*". In a letter dated March 27, 2003, Das wrote to Dr Kshitish Majumdar, CCMB, that "*your fax message dated 26<sup>th</sup> March came in very handy as I have a meeting scheduled with the Principal Secretary to the Chief Minister and the Chief minister, coming Friday. In addition to possibilities of grants from Government of Kerala, this gives additional evidence that there is interest in inter laboratory collaborative programmes also with other first rate labs in the country under the INSA Senior Scientist's scheme.—*" Das was to visit and deliver lectures at the Department of Biotechnology, Mahidol



University, Bangkok on April 20<sup>th</sup>. Even on April 1<sup>st</sup> he travelled and worked for this goal.

His death was sudden, but he died the way he wished, in absolute peace. Many shared the grief with Radha. The President of India in his message dated 2 April, 03, wrote *"I am deeply grieved to learn about the sad and untimely demise of Dr MR Das. I had known him as a dedicated scientist who as the Director of Rajiv Gandhi Centre for Biotechnology had made significant contributions in the field of Biotechnology and put Kerala in the Biotechnology map. The good work done by Dr Das will live for ever. In his passing away, we have lost a true nation builder, and the void will be difficult to fill."*

In a different context, Dr MS Valiathan, the President INSA wrote, *"—— RGCB will always remain a monument of Dr. Das ——". Das left a legacy worth emulating. He was not known to wait till tomorrow, since he was a man of today. Das lived a scientifically full life, that began from Kerala and ended in Kerala. He had his share of both successes and failures in this course, but as a person he took them in his stride. Das will be remembered as a keen scientist, a warm human being who was consumed by his passion for scientific and artistic excellence'.*

### MEMBERSHIP OF PROFESSIONAL SOCIETIES

Dr MR Das was members of several professional Societies such as : President, Indian Society of Cell Biology (1993-1995); Indian Association of Cancer Research (1991-1994); Member, Editorial Board, 'Cell Research' published by the Chinese Academy of Sciences; Member, International Advisory Committee, APOCB Meeting Sydney, Australia, 1994; National Scientific Advisory Committee, Meeting of the International Union of Biochemistry and Molecular Biology, 1994; National Scientific Committee for the XVI International Cancer Congress, 1994; Society of Scientific Values (Elected Member); International Association of Breast Cancer Research; Society of Biological Chemists, India; The Indian Immunology Society; Environmental Mutagen Society of India; Indian Society of Cell Biology; Indian Biophysical Society; and Society of R & D Managers of India.

### HONOURS AND AWARDS

Dr MR Das received many honours and awards such as : Fellow, The Indian Academy of Sciences; Fellow, Indian National Science Academy; Fellow, The National Academy of Sciences, India; Fellow Andhra Pradesh Akademi of Sciences; Fellow, The New York Academy of Sciences; Kurriallacherry Memorial Gold Medal (Intermediate), 1954; T.T. Chacko Memorial Gold Medal, 1956; N. Krishnaswamy Iyer Memorial Gold Medals (B. Sc.), 1956; K. R. Krishna Iyer Memorial Gold Medal (M. Sc.), 1958; Hari Om Ashram Award (Basic Research in Medical Sciences), 1983; ICMR Sandoz Oration Award



(Molecular Biology of Cancer), 1984; The Sreenivasayya Memorial Award of the SBCI (Outstanding contribution in Biological Chemistry and Allied Sciences), 1986; FICCI Award, (in the field of Life Sciences), 1988; Ranbaxy Research Award, (in the field of Medical Sciences) ,1988; T. B. Patel Oration Award of the Gujarat Cancer Society and Institute of Cancer Research (First of the Newly Constituted Award for Outstanding Contributions in Cancer Research), 1991; Annual Oration Award of the Indian Association of Pathology (1997); Biannual Award of the Indian Association of Cancer Research (1998); and Swadeshi Science Congress Award (2001).

### **MEMBERSHIP (BY INVITATION/NOMINATION) OF PROFESSIONAL COMMITTEES**

Dr MR was nominated as Member or several professional Committees such as : Scientific Advisory Committee, National Centre for Biologicals, New Delhi (Chairman); Research Council, Indian Institute of Chemical Biology, Calcutta (Member); Tata Memorial Centre, Bombay (Member); Hinduja Hospital and Research Centre, Bombay (Member); Institute of Cytology and Preventive Oncology, New Delhi (Chairman); Regional Cancer Centre, Trivandrum. (Chairman); Institute of Pathology, New Delhi (Member); Institute of Genetics and Hospital for Genetic Diseases Group, ICMR, Hyderabad (Member); National Centre for Cell Science, Pune (Member); Research Advisory Committee, The Gujarat Cancer & Research Institute (Member); ICMR Planning Committee for RMRC Laboratories, Belgaum (Member); ICMR's Centre for Advanced Research on Liver Diseases, New Delhi (Member); National Institute of Nutrition, Hyderabad (Member); LAIS Centre, ICMR, Scientific Advisory Committee, NIN, Hyderabad (Member); National Geophysical Research Institute, Hyderabad, Management Committee (Member); Jawaharlal Nehru University, New Delhi, Academic Council, Member; Madras University, Board of Studies (Molecular Biology & Zoology); Member; North Eastern Hill University, Shillong (Life Sciences), Member; Jawaharlal Nehru Technological University, Hyderabad (Molecular Biology), Member; Osmania University, Hyderabad (Genetics, Biochemistry and Microbiology), Member; Cochin University, Cochin (Biotechnology), Chairman; INSA Sectional Committee, INSA, New Delhi (Member); INSA-IUBMB Committee (Member); Medical Task Force, DBT (Member); Committee chaired by Dr APJ Abdul Kalam for planning science for the tenth five year plan constituted by the Planning Commission, Govt. of India, Member, (2000-2002); and Committee constituted by the Department of Science and Technology (DST) for planning DST activities for the tenth five year plan, Member.(2000-2002).

### **OTHER PROFESSIONAL COMMITTEES & DELEGATIONS**

Vice-President, Indian Society of Cell Biology (1984-1991); Member, Programme Advisory Committee (Molecular Biology) DST (1988-1991); Member, Programme



Evaluation Committee (Biological Sciences) CSIR (1989-1991); Member, Management Committee, Indian Institute of Chemical Biology, Calcutta (1988-1991); Member, Research Council, Indian Institute of Chemical Biology, Calcutta (1988-1991); Member, Advisory Committee, Asia Pacific Organization for Cell Biology (APOCB), (1988-1990); Member, Scientific Advisory Committee, National Institute of Immunology, New Delhi (1989-1990); Chairman, Programme Committee for International Association for Breast Cancer Research (1989); Member, DBT Delegation to UK for identification and placement of appropriate Centre for Biotechnology, Fellows on possible Collaborative Programmes (Oct-Nov 1988); Member, Management Committee, Institute of Microbial Technology, Chandigarh (1982-1987); Member, Dhar Committee for preparing feasibility report for the Institute of Microbial Technology, Chandigarh (1981); Member, Delegation to study work in biotechnology institutions in US and France (1982); Member, Delegation to study work at institutions carrying out work in biotechnology in Japan (1982); Member, CSIR Delegation to Poland and Czechoslovakia for evaluating projects and signing bilateral agreements between CSIR and the Academies of Sciences in the two countries (1981); and Member of several Selection Committees and Assessment Committees in research institutions in India.

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