

**JYOTIRMOY DAS**  
(13 September 1939 - 26 July 1998)

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J. Das,



# JYOTIRMOY DAS

(1939-1998)

Elected Fellow 1988

## FAMILY LIFE AND EARLY EDUCATION

JYOTIRMOY DAS was born on September 13, 1939 at Calcutta, West Bengal, the second of the four sons and two daughters of Binoy Kumar Das and Usha Rani Das. He grew up in North Calcutta, the seat of traditional Bengali society. At that time, North Calcutta was the cultural capital of West Bengal, the influence of this atmosphere during his formative years stayed him all his life, inculcating in him a deep love for music, drama and other art forms. He was educated at the Keshab Academy, a small school in the locality, where the zeal and devotion of the teachers strongly influenced him, as also their teachings that truth is above all and the success of human life lies in the search and finding of truth, a doctrine that shaped his life and was instrumental in his choice of a scientific career. From school, he went on to study Physics at Vidyasagar College, Calcutta and then did MSc in Physics from the Calcutta University in 1960. From March 1961 to July 1964, he taught physics, first at Vidyasagar College, and then at the Jadavpur University, Calcutta. Later in life, he often mentioned these years, indeed it is not difficult to imagine that his excellent concept of the subject and the immense pleasure and satisfaction, he could derive from teaching made him an outstanding teacher, someone who could take his students along with him in the quest of knowledge, a rare quality that his PhD students never forgot and something that made learning with him such an enjoyable experience.

## RESEARCH CAREER

Although his formal education was in pure physics, he had an interest in life sciences that propelled him to start his research career in Biophysics. For his PhD thesis, he worked under the supervision of Prof. SN Chatterjee at the Department of Biophysics, School of Tropical Medicine, Calcutta. At that time inspired by a nationalistic spirit, Professor NN Dasgupta had indigenously constructed the first electron microscope in India. Most of Dr Das's thesis was on electron microscopy and morphological structures of cholera phages and *Vibrio cholerae*. After his PhD, he moved on to the Baylor College of Medicine, USA as a post doctoral fellow and then to the University of Rochester USA, first as a postdoctoral fellow and then as Assistant Professor in the Department of Microbiology. Although his work on Mycoplasma viruses with Jack Maniloff at the University of Rochester received wide acclaim and for which he later received a DSc degree, yet his deep and abiding



for the city of Kolkata made him impatient to return home. Finally, he came back and joined the Bose Institute, Kolkata in April 1978, and after a few months, he joined the Indian Institute of Chemical Biology (then Indian Institute of Experimental Medicine) in February 1979. In 1995, he was appointed Director of IICB, a position he held at the time of his sudden demise on 26<sup>th</sup> July 1998.

### AS A PERSON

A man of long range vision, Dr. Das set trends in formulating and executing research goals. He believed in hard work, his students remember being told frequently that 'there is no substitute for hard work', a dictum that he himself amply demonstrated. However, what anyone who came across him even casually would remember most, is his dynamic attitude. The attitude that could inspire, excite and move forward with a strong conviction, that is best expressed in the words of his favourite poet TS Eliot

*We shall not cease from exploration  
And the end of all our exploring  
Will be to arrive where we started  
And know the place for the first time*

Like a true man of learning, he had a multifaceted personality and diverse interests in music, literature, art, history and philosophy. He was passionately fond of poetry, especially the works of Rabindranath Tagore. Many would remember with awe, his ability to recite from memory, pages after pages of Tagore's poetry. In his own words, 'Science has its own meaning and style and its own sense of excitement. We are aware that somewhere within the jungle of valves and formulae and shining glassware lies a content, let us admit it, a culture'.

Dr Jyotirmoy Das is survived by his wife Kalyani and daughter Mousumi.

### SCIENTIFIC CONTRIBUTIONS

Dr Das' research interest was mostly on the development of the molecular biology and genetics of two organisms, *Mycoplasmas* and *Vibrio cholerae*. He and colleagues had demonstrated for the first time that wild type cells of *Mycoplasma gallisepticum* lack critical DNA repair mechanisms. His studies on the replication of a single stranded DNA phage infecting mycoplasma had been highly appreciated and a review of the work was included in the Cold Spring Harbor publication 'Single Stranded DNA Phages'.

After returning to India, he rekindled his interest in the enteric pathogen *Vibrio cholerae*, an organism on which he had worked for his PhD thesis. He simultaneously addressed several aspects of *V. cholerae* biology, DNA repair mechanisms



surface characterization, interaction with cholera phages as well as vaccine development.

Starting with the observation that *V. cholerae* was significantly more sensitive to ultra-violet light than *E. coli*, Dr. Das and his group elucidated the complex, multifactorial DNA repair pathways operative in *V. cholerae* including the excision repair pathway, SOS response as well as the methyl-directed mismatch repair pathway. A number of genes functional in these pathways were cloned, sequenced and their roles in the repair processes were elucidated. Of particular interest was the demonstration that certain subsets of the SOS response were absent in *V. cholerae* due to the absence of the *umuDC* gene system, the presence of a functional 'dam' directed mismatch repair system but complete absence of the 'very short patch (VSP)' repair pathway in wild type *V. cholerae*.

The outer surface of pathogenic organisms is of particular importance because of their key role in interaction of the pathogen with the host, the first and essential step for successful infection. Dr Das and his group together with Dr AN Chatterjee carried out some remarkable studies on the *V. cholerae* membrane demonstrating that the outer membrane (OM) has some atypical characteristics. They studied the OM lipopolysaccharide and demonstrated the presence of phospholipids on the outer surface of the OM which accounts for the observed sensitivity of *V. cholerae* to hydrophobic antibiotics and detergents. The murein network of *V. cholerae* is weak and the cells lyse rapidly in hypotonic medium. Major OM proteins were cloned, sequenced and characterized in his laboratory. An interesting outcome of this work was the demonstration that beta-lactam resistance conferring adaptive mutations arise at high frequency in *V. cholerae* due to the production of a protein that interferes with the OM porin OmpU.

Another area of research was cholera phages. Dr. Das and his group constructed physical maps of several cholera phages and also worked out the molecular basis of the differentiation between the two major epidemic causing biotypes of *V. cholerae*, El Tor and classical, based on susceptibility to cholera phage  $\phi 149$ .

In addition to basic research on *V. cholerae*, Dr. Das and colleagues constructed a potential oral vaccine strain for cholera, using a clinical non-toxicogenic *V. cholerae* isolate which was engineered to express the immunogenic B subunit of cholera toxin.

Just as in the 1970s, Dr Das was one of the first Indian scientists to take advantage of the then modern recombinant DNA technology, to address problems of his interest, in the 1980s he realized the potential of the genomics technology, and again was one of the first Indian scientists to initiate genome analysis. His group contributed significantly to the elucidation of *V. cholerae* genome structure, identification of genomic rearrangements and diversity, and went on to construct first a physical map and then an ordered cloned DNA map of the *V. cholerae* genome.



Probably because of his initial training in pure physics, Dr Das always had a desire to understand the physical basis of life, this prompted him to start the Theoretical Biology group at IICB. The emphasis of the group was primarily on computational molecular biology with a view to develop mathematical models of complex biological processes. Their studies on self organization and chaos deserve special mention. His group demonstrated for the first time the possibility of near equilibrium oscillation and multiple equilibria in a chemical system undergoing multiphasic and/or ionic interaction. They developed novel algorithm for mathematical characterization of chaos game representation (CGR) of nucleotide sequences. The group also developed a PC based software PROCGR for chaos game representations of protein sequences.

### AWARDS AND HONOURS

Dr Jyotirmoy Das was the recipient of the following awards, honours and memberships:

Fellow, Indian National Science Academy, New Delhi

Fellow, Indian Academy of Sciences, Bangalore

Fellow, National Academy of Sciences, India, Allahabad

INSA Golden Jubilee Commemoration Award

SHRI OM Prakash Bhasin Award for Science & Technology, 1990

Ranbaxy Research Award, 1991

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