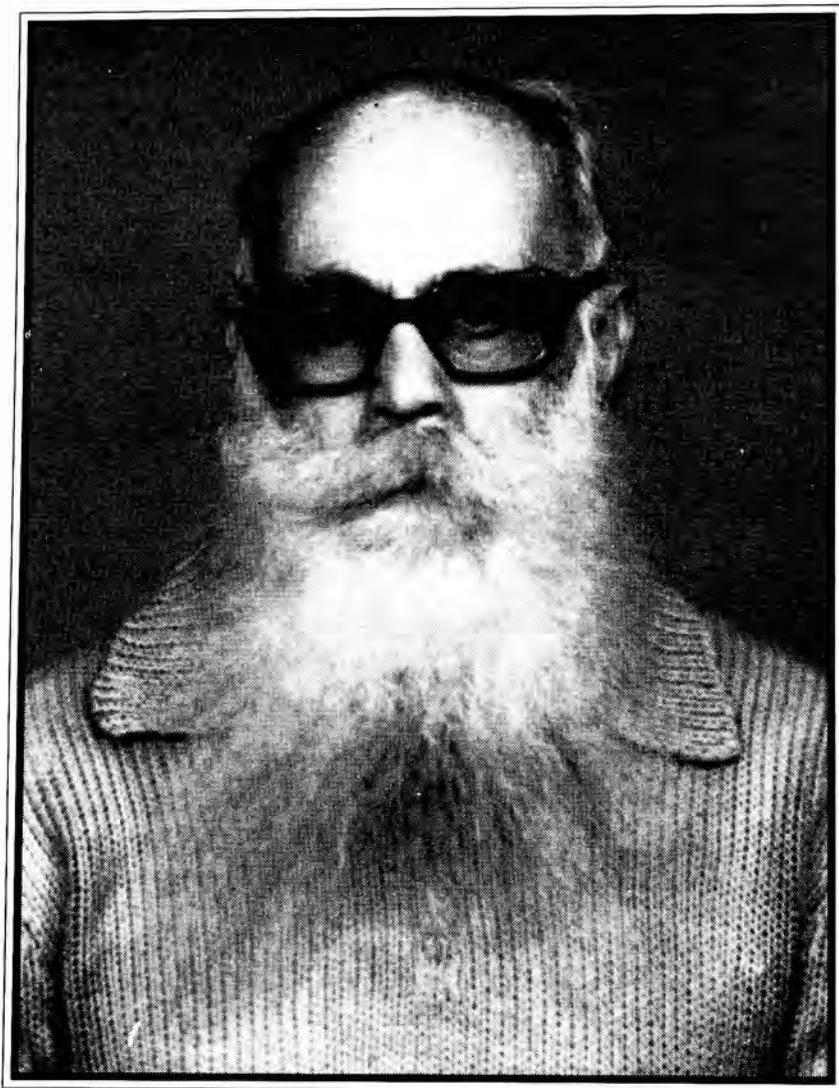


# **DILIP KUMAR BANERJEE**

**(16 January 1912 – 10 June 1993)**

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D. K. Banerjee



# DILIP KUMAR BANERJEE

(1912-1993)

Elected Fellow 1961

## FAMILY BACKGROUND AND EDUCATION

**D**ILIP KUMAR BANERJEE was born in Calcutta on January 16, 1912. He was the younger of two brothers and his father was a businessman and owned mica mines in the Dhanbad area of West Bengal and thus his early childhood on Lansdowne Road of South Calcutta was spent in relative prosperity. He went to school at the Mitra Institution in South Calcutta's Harish Mukherjee Road and graduated from St. Xavier's College. A little after this, the family transited to relative poverty as his father lost all that he owned through fraud. His elder brother left college to work and support the family, while he continued studying, under very trying financial circumstances, to obtain his MSc degree from Science College of Calcutta University, and then obtained his DSc degree from the same college in 1941 under the guidance of Dr. PC Mitter, whose other student during the same period was his very close friend, the late Bidyut Bhattacharjee. He married Kanak Mukherjee from Lucknow in 1945, a match that was the outcome of a close friendship between his brother's father-in-law and his bride's father. His only Child Dipankar Banerjee was born in Calcutta in 1952.

## PROFESSIONAL CAREER

His earliest effort provided the first synthetic confirmation of the structure of aloemodin, a unique and naturally occurring hydroxyanthraquinone. At this time, he came into close contact with both Prafulla Chandra Ray and Satyendra Nath Bose, of whom he often later talked with great reverence. He worked till 1946 as Sir PC Ray post-doctoral fellow in the Post Graduate Department of Calcutta University. In 1946, he joined the College of Engineering and Technology (now Jadavpur University) as Professor and worked there till 1954, His students during this period were Professor Jadugopal Dutta, the late Professor Pasupati Sengupta, Dr. Harinarayan Khasgir, the late Dr. Suprabhat Chatterjee, Dr. Sunil Kumar Dasgupta and Dr. Amarashwar Chattopadhyay. He enjoyed greatly a stint as a Watumull Foundation Fellow and post-doctoral fellow of the University of Wisconsin from 1947 to 1949. His collaboration there with William Johnson, one of the pioneers of Organic Chemistry, led to significant work on the synthesis of the female sex hormone, estrone and its isomers. Curiously, this was the only time Dilip Kumar Banerjee ever went abroad.



## RESEARCH CAREER

In 1954, Professor Banerjee joined the Indian Institute of Science as the Head of the Department of Organic Chemistry and held this position till 1971. He initiated work in the department on the stereoselective synthesis of steroids, against the background of intense international interest in this area of research. Early in this period (1956), he published his probably most cited work, a synthesis of the equilenin molecule that controlled its stereochemistry and yielded exclusively a stereospecific product. This was the first stereospecific synthesis of a natural steroid. The synthesis technique was immediately used by a French firm for the manufacture of a number of biologically active steroids. Stereoselective synthesis of dl-estrone (1961), synthesis of dl 8-isotestosterone (1960, 1964) and dl testosterone and its 9, 11 dehydro derivatives followed. The synthesis of steroids fascinated him till the end, and as late as in 1984, thirteen years after his formal retirement, he published a paper on 11- $\beta$ -cyano-D-homo-equilenin methyl ether. He has published over 50 papers on steroids and related topics.

Valeranone was synthesised in the field of terpenes, and the total synthesis of sesquiterpene was also reported. The absolute confirmation of the structure and configurations of the isomeric C-11 acids provided by their synthesis played a crucial role in diterpene chemistry. A new synthesis of a tricyclic synthone was accomplished giving improved yield from fewer steps than employed by previous workers.

Others studies examined mechanisms of important reactions. A careful investigation of the Dieckmann cyclisation and a set of decisive experiments revealed the processes that gave rise to different products in the cyclization of diethyl- $\beta$ -ethoxycarbonylpimelate. As a consequence of the study, several synthones were prepared by the cyclisation of different polyesters and used in the total synthesis of steroids. A novel dehydrogenation-addition reaction involving abietic acid and tetrachloro-*o*-benzoquinone was observed, and the structure of the product and the reaction mechanism were proved through UV, IR, NMR and mass spectral studies. The mechanism of a reaction involving the substitution of cyclopentanone-2-carboxylic ester was solved. Unusual UV absorption observed in saturated dicyano esters was explained as being due to the enolization of the dicyanoesters to form the ketimine group. Study of the IR spectra of polyhalophenols and their esters revealed the effect of overcrowding by halogen atoms and the inductive effects of halogen substituents. A crystallographic study of the synthetic dl-8-isotestosterone was carried to understand observations of its androgenic activity.

The work that has been described above led to over a hundred publications. At least three influences that shaped the course of Dilip Kumar Banerjee's research can be recognized: An approach to synthesis and structure prevalent at the



College of Calcutta University in the thirties and forties, his collaboration with WL Johnson at Wisconsin and his appointment to the chair of Organic Chemistry at the Indian Institute of Science, a position that did not involve teaching but provided abundant access to talented students and postdoctoral workers. Some of his students and associates in this department over the years were EJ Jacob, N Mahishi, Sivanandiah, V Paul, PK Sen, G Nadamuni, A Sarkar, V Angadi, MV Bhat, BH Iyer, TR Kasturi, SN Balasubramaniam, GS Krishna Rao, GS Subba Rao and KS Venkatesan. He interacted closely with Professor Govindachari, Professor Sukhdev and Professor PC Dutta. Chemists and others of his generation hold him in high regard as a person of outstanding human qualities and recognize his encouragement of younger scientists of his profession. One of his early students, Amareshwar Chattopadhyay remembers him "as a friend, philosopher and guide". During a discussion of this memoir, Professor CNR Rao noted "the important part Professor Banerjee played in his early career and the affection and encouragement showered on him". Indeed, Prof Rao considers Professor Banerjee "as one of the first modern, progressive organic chemists, somewhat ahead of his times" and emphasised his role in establishing steroid synthesis in India.

### AWARDS AND HONOURS

He was elected to the Indian Academy of Sciences in 1957 and the Indian National Science Academy in 1961. He received the Woodburn Gold Medal in 1950, the TR Sheshadri, 70<sup>th</sup> birthday Commemoration Medal, the PC Ray Memorial Medal and the JC Ghosh medal. He was deeply fond of the campus of the Indian Institute of Science and indeed refused several offers to move to Calcutta. He was the Director of the Indian Institute of Science in 1971-72 and later held the position of Honorary Professor till 1975. He served on the executive councils of the National Chemical Laboratory in Pune, the Regional Chemical Laboratory (now Institute of Chemical Technology) in Hyderabad and the Indian Association of the Cultivation of Science. He was a member of the Chemical Research Committee of CSIR.

In the first phase of his stay at the Indian Institute of Science, he participated actively in sporting events and socialized extensively. He was often found in the billiards room of the Indian Institute of Science Gymkhana, relished a good meal, and invited frequently his students and friends to his house in large gatherings. His approach to life changed gradually in the early sixties. He turned deeply religious in the sense of the advaita tradition, and his habits became spartan. He had strongly held and principled beliefs, and did not hesitate to declare them in less than diplomatic terms when aroused. He sought little for himself in terms of honours and positions of his profession. He led a physically active post-retirement life, taking great delight in turning his experimental skills towards the preparation of meals at his house, but a stroke in the late eighties left him partially paralysed. He passed away on June 10, 1993.



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