Dr Tuhin K Roy

(01.08.1923 – 04.08.2019)

An obituary to an illustrious Alumnus of Applied Chemistry, Rajabazar Science College, University of Calcutta

1. <u>Birth and childhood</u>

Dr. Tuhin Kumar Roy was born in Munghyr, Bihar, India, on the 1st of August 1923. This was his maternal home and his mother, Bijoyini (nee Gupta) had gone to her parents' home town from her husband's home in Burdwan, West Bengal, to give birth to her first born child as is the custom in several parts of India even to this day. His father, Shri Rakhal Raj Roy was a lawyer who practised in Burdwan.

Dr. Roy received an informal education at home until the age of seven. He was taught by his mother and a tutor who would come home to teach him. He had one younger sister, Arati and three younger brothers, Tarun Kumar Roy , Tushar Kumar Roy and Tapan Kumar Roy when tragically his mother died, leaving behind five very young children. At this point, the younger two siblings were sent to Munghyr, to be brought up by their maternal grandparents and the older three siblings, of whom he was the eldest, stayed with their father.

2. <u>School life</u>

At this point, aged seven, Dr. Roy was admitted to the Burdwan Town School for boys, one of the three main schools in Burdwan at the time, straight into grade III. In order to make the class cut off, age wise, his date of Birth was given as 1st September, 1923, a month later than his actual birthday, and this is the date which has always been celebrated as his birthday. He would walk a kilometre to school and back every day and after getting used to this new way of life and different modes of teaching, he shone in his studies, always topping the class of 30 students. Thus he was given a scholarship on merit, with free tuition fees from class V onwards to Matriculation.

3. <u>Junior College and Graduation</u>

After completing secondary school, Dr. Roy took up Physics, Chemistry and Mathematics along with Bengali and English for his I. Sc. course at Junior college at Burdwan Raj College. Dr. Roy topped in the entire Burdwan district in his I Sc final and received the much coveted 'Burdwan Silver Medal' from the Maharaja of Burdwan for his achievements. He was also awarded a full government scholarship to attend St. Xaviers College, Kolkata (one of the top colleges in India even today), for his under-graduate level studies in his three chosen subjects, Physics, Chemistry and Mathematics.

4. <u>Post Graduation in India</u>

For his post-graduate, Dr. Roy went to the University College of Science, Kolkata for a Masters degree in Applied Chemistry. This college is famous for the illustrious Scientists who were teaching there, one of them being Prof. Satyendra Nath Bose, famous for the Bose- Einstein theory. Another of his teachers was Prof. Meghnad Saha, a Fellow of Royal Society and Internationally renowned physicist who subsequently became a well known minister in the first cabinet of free India during Pandit Jawaharlal Nehru's tenure as Prime minister. At the end of his studies here he was presented with the University Gold Medal for topping the class.

5. Massachussets Institute of Technology, USA

Having completed his Masters Degree Dr. Roy worked at the Indian Lac Research Institute in Ranchi for a year and a half. India gained independence in 1947 and a new Indian government was formed thereon. The new Government, led by Pandit Jawaharlal Nehru decided to send the five top students of the country to MIT (Massachusetts Institute of Technology) for the course of their choice on a full and complete scholarship over three years. This included the fare and a stipend for food, books, clothes and other living expenses. Dr. Roy was interviewed extensively in Kolkata by a former MIT graduate for admission into the Masters in Chemical Engineering that he had applied for at MIT that fall. During his first year at MIT Graduate school he had to take some additional undergraduate courses to strengthen his foundation. He completed his Masters in two years in the class of '49 from MIT, staying at the Graduate house. His professor and counsellor was Professor Ashdown, who was very fond of him. The top nine students from his class of '49 were allowed to apply and take the Comprehensive exam for further studies (Doctor of Science degree) at MIT. Out of these, only three were admitted into the ScD course, of which he was one. Dr. Roy, in fact, began his research for his ScD topic during the final year of his Masters as he knew he was on a scholarship for only 3 years and time was running out.

Dr. Roy did his doctorate thesis at MIT in 'Fluid Bed Reactions and Fluid Bed Cracking' which are widely done nowadays in oil refineries. He worked under two splendid professors, Dr. Warren K. Lewis and Dr. E. R. Gilliland. Once his three years in the U.S. were complete, his scholarship funded by the Indian Government had lapsed, with him needing another year to complete his Doctorate. Fortunately, the Head of the Chemical Engineering Department, Professor Whitman wrote to the Indian Government asking for an extension as 'Roy was one of their leading students'. The Indian Government extended the scholarship for another year to complete his ScD. In spite of working very hard in the two years he had after his Masters, Dr. Roy still needed an extra month to fully complete his research. This time, his Professor, Dr. Lewis came to his rescue and arranged a fellowship for him from the Standard Oil Company.

6. Meeting and marrying Silva Mardiste

Dr. Roy met Silva Mardiste at the International Centre, Harvard Square, Boston. Silva had just completed her graduation in Political Science from Bennington College, New England, Vermont, which in those days was an all girls' college. She was working at the famous Lahey Clinic in Boston. Dr. Roy and Silva Mardiste decided to get married although Dr. Roy's professor, Dr. Warren Lewis, strongly advised his student not to marry during his doctoral studies as he said it would be very difficult to complete his degree with a new wife in tow. Dr Roy however finished his doctoral study before time. Dr Roy finally married on 1st January 1951 in presence of their 25 closest friends.

7. Working in the US

Dr. Roy after completion of ScD Degree in June 1951, got a fantastic job offer with the American Cyanamid Company for the princely salary of $ 450 a month. This was considered a very high salary in those days. He was assigned to work at the Chemical Construction Company, a subsidiary of the American Cyanamid Co., and moved to Lynden, New Jersey for his first assignment to make phosphoric acid from phosphate rock. The first week, his main job was to personally unload 50 kgs of phosphate rock at the highest platform at the pilot plant in Lynden. Indians had a reputation of not working hard with their hands as they had abundant help back home, and Dr. Roy realized he was being put to test! He knew they could not pay him such a high salary for merely unloading phosphate rock at the Company, so he worked at it without a murmur, although he did mention to his boss that the weight of the Phosphate logs to be unloaded was exactly as much as his own body weight! However, once his 'initiation' was over, he was

promoted every week, first from 'unloader' to supervisor, and then very soon to being the leading engineer of the entire pilot plant, much to the envy of his initial supervisors! In 1953, Dr. Roy was ready to return to India as the rule in the US was that Indians needed to return after eighteen months of working in their country. His boss, Ed Roberts, the Vice President of the Company asked him to stay on and promised to double his salary if he agreed. Roberts wrote to the US Government seeking special permission for his very talented employee to stay on, on the grounds that he had specialized knowledge and was an asset to the US whom no one could replace. The US Government agreed and Roberts jokingly told Dr. Roy to return all the gifts he had received during the big farewell party that his company colleagues had given him!

8. Back and forth between India and the US

Finally, in 1954, Dr. Roy returned to India with his wife and eldest son, Dipak. He had applied for and got the post as the S. K. Acharya Chair and Head of the Chemical Engineering Department of the famous Jadavpur University, Kolkata at the age of 31. He worked there until his bond to the Indian Government was completed in 1958 and soon afterwards, went again to US on a two year full time consultancy with the Freeport Sulphur Company. Their head office was in New York, but Dr. Roy worked at the New Orleans office. Their third son, Alok, was born in New Orleans during this time. After almost two years there, the supplies of the raw material which the plant was based on (nickeliferrous laterite which came from Cuba) were cut off due to the Cuban revolution. Hence, having completed his consultancy period, Dr. Roy returned to India and re-joined Jadavpur University once again as the Head of the Chemical Engineering Department in early 1960. Dr Roy left Jadavpur university end 1960 and then moved with his family to Delhi.

In 1963, Dr. Roy, family in tow, made yet another trip back to the US with a generous job offer from the Scientific Design Co., living for three years in Greenwich, Connecticut.

9. Dr. Roy's Patents and Awards/Honours

Over the years, Dr. Roy got a number of patents, both in the US and in India for his outstanding work in chemical engineering. He also wrote several research papers which were published in American and Indian chemical journals, like the Industrial and Engineering Chemistry Journal and Scientific American Chemical Society, among others. Over the years, he presented several papers in his field all over the world, and even when his advanced age and illness had made it difficult to attend the Seminars himself; his colleagues would present his papers, the last one being in Quebec City, Canada, on the use of Hydrogen in Pressure hydrometallurgy.

Some of his patents for the separation of metals from their ores are still being widely used all over the world. These are listed below:

• Patent no. 2720457 in the US in 1955 for the Leaching of metallic deposits • Patent no. 2726953 in the US in 1955 for Selective nucleated precipitation from acidic solutions • Patent no. 2722480 in the US on November 1st, 1955, for the catalytic precipitation of nickel, cobalt and zinc sulphides from dilute acid solutions • Patent no. 2767081, 2767082 and 2767083 in the US on October 16th, 1956, all three for uses of different catalytic and non catalytic nucleating agents in the reduction of salts to metals. • Patent no. 2785751 in the US in March 1957 • Patent no. 2753559 in the US, in 1961, for Industrial Engineering Chemistry • Patent Nos. 131614, 131615 and 135348 in India, in 1970, for the improved process for nickel and cobalt extraction from lateritic and limonitic nickeliferrous ores.

Dr. Roy was selected as man of the year in UK during the year 1998. He received Dr. B P Godrej Life Time Achievement Award from Mr. Adi Godrej in 2004 towards recognition for his illustrious academic and professional career as well as for his invaluable contribution in nurturing Indian Institute of Chemical Engineers (IIChE) from its very early days. Dr. Roy, in the year 2007, was conferred with the IIChE

Diamond Award. He was also an Honorary Fellow of Indian National Academy of Engineering, Indian Academy of Sciences and Indian Institute of Chemical Engineers. He served as INAE (Indian National Academy of Engineering) distinguished visiting faculty, and the Department of Chemical Engineering, University of Calcutta got the privilege of having him as INAE visiting faculty during 2003 – 2004. He was the honorary member of the Board of AIChE (American Institute of Chemical Engineers).

10. Opening his own Company

After moving to Delhi in 1960, Dr. Roy was approached by Mr. S. N. Mazumdar, an ex- ICS officer (and founder of Bani Jagtiani Trust) to start a Company to enable jobs for aspiring Chemical Engineering graduates in India. Thus, the Company, Industrial Consulting Bureau, was begun and several Indian Chemical engineers who had returned from the US, UK and Germany were employed. In 1965, the Company changed its name to Chemical Metallurgical Design Company or CMDC and Dr. Roy after his return from US joined as its Managing Director. CMDC had over a hundred employees, of which over sixty were engineers.

CMDC took over several famous projects, and among them was the Cuban job (mentioned ahead). This was a big one and would have kept Dr. Roy busy for at least ten years. However, it came to an abrupt end because of the Soviet Union who were practically financing the project but decided to use its own resources. Hence, Dr. Roy had to look for jobs in India where he was already settled with the family. Another very big project was the Nickel refinery project in Orissa where the deposits of Nickel and Cobalt were mainly found. That also never got off the ground as the Central government stopped the financing of the pilot plant since it was not proving to be economical.

11. Offer from Cuba

Che Guevara , the Minister of Industries in Cuba, had written to Jadavpur University to get in touch with 'the' Dr. Roy 'who had the patent to separate Nickel and Cobalt from the Cuban Laterite ore and had worked with the American Company, Freeport Sulphur, while doing this job in the US'. By this time, all the employed American workers had left the Moabay Nickel Plant in West Cuba and it was working at 10% of its full designed capacity.

Dr. Roy agreed to bring up the capacity of the plant, but insisted on the same fees and facilities that were being given to other foreign consultants for working there. This was agreed upon, and Dr. Roy and his team brought up the capacity of the plant production by 50% within the promised three months with very little additional expenditure, and then subsequently, with some more financial inputs, to 80% of its full working capacity. However, he was taxed 90% of the money he earned from his work in Cuba by the Indian Government and realized he was on the list of 100 top Indian tax payers. (he calls them the '100 fools'!)

12. Working in Cuba and meeting Mr. Fidel Castro

Travelling to Cuba was not easy in the early '60's as there was no direct flight and Dr. Roy had to travel via Moscow or Madrid to Cuba. On his first trip, Dr. Roy was made to sit between Mr. Fidel Castro's Deputy and the Rector of Havana University. Dr. Roy met Mr. Castro several times during his many visits to the country on work. It was around this time that Dr. Roy was questioned in India by some American officials from the CIA about the nature of his work in Cuba. He was told that he would not be allowed a US visa ever if he continued to work for the Cuban government. His answer was a nonchalant 'That's okay, there are a number of other countries to visit in this world.' Needless to say, he was always granted a visa by the US during his many visits there subsequently!

13. Honorary work

As a stalwart in his field, Dr. Roy did a lot of honorary work for various institutions. He was always invited to give speeches and talks at several universities and conferences. He set the entrance examination papers for the IIT's over many years and was the main external examiner for IIT, Kharagpur. He was actively involved with various organisations as well, such as, Indian Academy of Sciences, Indian National Academy of Engineering and American Institute of Chemical Engineers. Dr. Roy also served as a Resident Scientist at Indian Space Research Organisation, Research Advisor at Sriram Institute of Industrial Research and Distinguished Visiting Professor at Jadavpur University and Calcutta University in the '80's.

Dr. Roy was one of the Founding Members of Indian Institute of Chemical Engineers (IIChE) and his close association with the Institute since its birth was never loosened. Dr. Roy remained an integral part of the IIChE where course content, syllabus, etc., for various Chemical Engineering exams and courses were decided. He was the Honorary Editor of *Indian Chemical Engineer,* the quarterly journal of the Institute during 1959 – 1961. He held the position of Honorary Editor of the quarterly journal of the Institute, Indian Chemical Engineer during the period from 1959 to 1961. His deep insights and knowledge indeed enriched the quality of the journal. He was elected President of IIChE for a period of 2 years, i.e. 1969 & 1970. His profound wisdom and great vision elevated the Institute (IIChE) to a greater height during his President ship. He along with his colleague, Mr. J. P. Kapur, oversaw the complete construction of the IIChE building in the Qutab Institutional Area in Delhi. Till recently, Dr. Roy continued to be a guiding force for the Northern Regional Centre (NRC) of IIChE.

For several years Dr. Roy was also the managing trustee of the Bani Jagtiani Trust and Trustee of the Lovraj Kumar Memorial Trust. Several Trust meetings were conducted in his house. All these services were given free of cost by him to the Universities, except for a token honorarium to cover his basic expenses.

14. Shifting of residence

Dr. Roy and Mrs. Roy shifted to A-58 Gulmohur Park, a more compact home with lots of parks around the house. They sold their C-6/3 SDA house in 2004, as the existing service lane with large trees, on which the house was situated, had been removed to make way for a huge flyover to come up right in front of the house. Dr. Roy suffered a stroke in 2008 confining his movement to a wheelchair and with paralysis on his left side. Even with that affliction, he had a clear and sharp till he breathed last. He used to go to NRC Building of IIChE, attend different meetings of Board of Trustees and visit IIT Library regularly. Dr. Roy started writing very recently a book titled "Principles of Hydrometallurgy" in collaboration with his old colleague. He passed away on 4th August 2019 leaving this incomplete.

15. Projects undertaken by Dr T K Roy's company viz Chemical & Metallurgical Design co Ltd (Chemmetals and CMDC Design Private Ltd)

The consultancy engineering co. established by Dr T K Roy can be termed truly as process consultancy engineering company in India. The company prepared numerous Techno-Economic feasibility report (TEFR) for various industries across the country. Some of the projects executed by the company are as under:

a. Chemmetals prepared detailed project report for Haldia Petrochemicals in the year 1972/73.
b. Chemmetals developed several processes of National Laboratories such as CFRI, NCL, Pune such as β-naphthol, Ethylene Diamine, etc.
c. Gas /oil separator and wax removal from crude for Oil India – Design & Engineering.
d. Maleic Anhydride plant of Adarsh chemicals, Gujarat using Benzene as feed stock (process licensor was Scientific Designed Company.
e. Pilot Plant for recovery of Nickel from Sukinda Nickel ore under Hindustan copper Ltd.

f. Formed Coke unit of SAIL RDCIS Ranchi.
g. Secondary lead recovery with BHAS Technology for APL at Panskura, West Bengal.
h. Margarin plant of Bharat Margarin.
i. 3 Calcium Carbide plants in Orissa.
j. Alluritic acid/Ambrettolite/ Lac dye from Lac in a company viz Okhla Chemicals. This was 100% export oriented unit.
k. 100 TPD EDIBLE OIL extraction for government of West Bengal, Food department.
l. Pilot Plant for battery separator PVC as well as Polyethylene for Exide Industries.
m. Detail Engineering Sulphuric acid/Super phosphate plant for BEC Fertilizers , Bilaspur , Teezta Agro, Jalpaiguri, Expansion project of Phosphate Co. Ltd.
n. Technology & detail Engineering of 10TPD Sodium dichromate Plant for IDCOL with basic chrome sulphate plant.

The Alumni Association of Applied Chemistry & Chemical Engineering department are proud to reminiscence the manifold contributions to the academia and the industry as well as for the selfless service rendered by Dr. T K Roy for the growth of Chemical Engineering in India. On this auspicious day, with deep respect, we dedicate the Session of First Alumni Symposium (September 13 & 14, 2019) to the memory of Late Dr. T K Roy.

Compiled by Dr. Sital K Banerjee, Edited by Prof. P De.

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