Famous Indian Chemists

Mrs. Sumangala Mummigatti

"There can be no progress in science without chemistry. Chemical research is changing in a big way Chemistry is no longer making a few compounds and studying their properties. We now design new materials with the properties that are desired by us. Someof the important problems faced by mankind will eventually be solved by the use of chemistry. There are many areas in chemistry related to biology as well as to adanced materials that constitute major directors of chemical research today. They are likely to continue to be major directions for many years to come."

These are the words of the famous Indian chemist of our time, Dr. C. N. R. Rao. Prof. Chintamani Nagesha Ramachandra Rao has inspired a generation of chemists in the country. Prof. CNR Rao was born in the home of his maternal grandparents in Bangalore on June 30, 1934. Rao's father Nagesha Rao, with an MA in history and degrees in education, worked for the education department of the old Mysore state. Rao's mother Nagamma was also a well read lady, considering that only a few girls attended school in those days.

Rao went to various schools in Mysore state as his father was frequently transferred. He attended schools in Channapattana, Chickmagalore and Shimoga and completed his high school from the National High School, Bangalore. He had a benefit of learning chemistry from excellent teachers who made the subject very interesting. Rao remembers particularly Shivarudrappa, PS Narayana Rao and S. Krishnamurthy as well as Thirunarayana Iyengar who was his physics teacher Rao's imagination was enriched by them and kindled his curiosity. Rao even made a spirit lamp and burnt sulphur in some of his experiments at home.

Rao joined Central College, Bangalore for his BSc course with Physics, Chemistry and Mathematics as the subjects of study. In 1951 he passed the BSc in First Class at the age of 19. Rao left for Benaras in 1951 to join MSc course at the Banaras Hindu University. Shortly after he joined the University, Rao worked in the evenings with a senior B R. Marathe. Rao was impressed by Professor Sahasrabudhe, an organic chemist, who guided the research of many students and published papers without his name on them After completing his MSc course with a first class and a second rank, Rao returned to Bangalore in 1953. Soon he joined the first Indian Institute of Technology (IIT) at Kharagpur. Rao worked in adsorption laborabory with Dr MVC Sastry.

In December 1953, Rao learnt that his favourite scientist Linus Pauling was visiting Indian science Congress in Hyderabad in January 1954. He went to Hyderabad to see Pauling, but the famous scientist did not come Later Rao secured admission with financial support from four Universities in the United States. He chose Purdue as he though he could work a professor who was from Pauling's School. In 1957, within a record time of 2 years and 9 months of joining, he secured his PhD. Soon after

completing the PhD in Physical chemistry he secured in Purdue itself a National Science Foundation funded Post-doctoral position and an instructorship. Rao had offers for post-doctoral appointments from several centres, but chose the University of California at Berkeley and joined there in 1958. He decided to return to India in late 1959. S. Bhagavantham had offered him a osition of lecturer and Rao accepted it.

Shortly after his return from states, Rao got engaged to Indumathi and married her in 1960. He joined as an associate professor in IIT Kanur in 1963. Rao received his first International recognition in 1967 when he was awarded the Marlow Medal by the Faraday Society of England for outstanding contribution in Physical chemistry by a young scientist. In 1968 he received the SS Bhatnagar Prize in Chemical Sciences given by the Council of Scientific and Industrial Research, New Delhi. Rao rejoined Indian Institute of Science in late 1976 and began a new department on Solid State and Statistical Chemistry. In 1982 he was elected as fellow of the Royal Society of London Kingdom. He is one of the few Indian scientists to have had this honour and the second Indian chemist. In 1984 Rao became the Director of Indian Institute of Science. Rao has been pursuing research in chemistry for over 60 years and at the age of 77 still continues to be active in the field of science being the National Research Professor and Linus Pauling Research Professor and Honorary President of Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore. His passion is nanotechnology, especially nanomaterials consisting of carbon molecules.

Padmashri Prof. CNR Rao is recipient of several national and international awards including the 2005 Dan David Prize for materials science in the future time dimension; the UNESCO Albert Einstein Gold Medal; the Royal Society, London's Hughes Medal for Physical Sciences among several others. He was also recipient of the India Science Award the highest scientific recognition of the Government of India. He was the first Laureate of the 21st Khawarzimi International Science Award by the Indian Research Organization for Science and Technology and the first International Prize for Material Science by MRSI (India). Prof. CNR Rao is currently also the Chairman of the Scientific Advisory Council to the Prime Minister on the occasion of the International Year of Chemistry 2011.

India in its history of chemical research has a number of chemists who have enriched the field with their contributions. They are not only the inspiration for the younger generations, but also the founders of the field of chemistry, and its research in India. Prafulla Chandra Ray is another name that is etched indelibly in the history of chemistry. He was a great visionary who set up the first chemical factory in India which later became the Bengal Chemical and Pharmaceutical Works Ltd., Prafulla Chandra was born on 2nd August, 1861 in Rarali-Katripura, a village in the district of Khalna which is now in Bangladesh. His early education took place in the village school. Later he studied in schools in Kolkata and the Presidency College. The lectures of Alexander Peddler at the Presidency College attracted Prafulla to chemistry. He completed his BSc and DSc from the University of Edinburgh, England.

In 1888, Prafulla Chandra returned to India and worked with Jagadis Chandra Bose in his laboratory. In 1889 Prafulla Chandra was appointed the Assistant Professor of Chemistry in th Presidency College, Kolkata. His publications on mercurous nitrite and its derivatives brought him recognition from all over the world. He inspired a generation of young chemists in India thereby building up an Indian school of chemistry. Famous Indian scientists Meghnad Saha and Shanti Swarup Bhatnagar were among his students.

Prafulla Chandra Ray believed that the progress of India could be achieved only by industrialization. He retired from the college in 1916 and was appointed the Professor of chemistry at the University science college. In 1921, at 60, he donated in advance all his salary of the rest of his service in the University to the development of department of chemistry and for creation of two research fellowships. He retired at the age of 75. He was a scientist as well as an entrepreneur and is considered as the father of Indian pharmaceutical industry.

Shanti Swarup Bhatnagar was born on 21st February 1894 in Bhera in the district of Shapur in Punjab (now in Pakistan). He studied at Bulandshahr of Uttar Pradesh. Even as a young boy SS Bhatnagar wrote a letter to the editor in "The Leader", Allahabad, on how to make a substitute for carbon electrodes used in battery by utilizing molasses and carbonaceous matter which got published. He joined Dayal Singh College of Lahore for inermediate and completed BSc and MSc degrees from Foreman Christian college. He obtained a DSc degree from the University of London where he studied the surface tension of oils.

SS Bhatnagar returned to India in 1921, and joined as professor in Benarus Hindu University. From 1924 to 1940 he was the Director of Chemical labs at Lahore and helped in addressing several problems of industrial and applied chemistry. In August 1940, Bhatnagar was appointed as the Director of the directorate of Scientific and Industrial Research. The organization became the Council of Scientific and Industrial Research later. During his tenure as CSIR's director, he set up 12 laboratories to assist the industry. The CSIR now has 38 laboratories.

Bhatnagar was conferred with the Order of British Empire, or the Knighthood, by the British Government in 1941. He was made Knight Bachelor in 1943 and he was elected as the Fellow of the Royal Society. As India attained Independence, Bhatnagar strived to provide the necessary scientific assistance to the then fledgling industries through the CSIR laboratories. He received Padma Vibhushan in 1954 from the Government of India.

Shanti Swarup Bhatnagar played a significant role in building the post-independence science and technology infrastructure and in the formation of India's science policies. Today he is remembered by SS Bhatnagar Award, the prestigeous award named after him and given by the CSIR for excellent achievement in different fields of science. The award is often termed as the Indian Nobel Prize.

Dr. Har Govind Khorana shated the Nobel Prize for Medicine and Physiology in 1968 with Marshal Nirenberg and Robert Holley for cracking the genetic code. He was a chemist turned biochemist and is known as the first scientist to synthesize oligonucleotides, the chain of nucleotide, outside an organism. Today oligonucleotides are indispensable tools in biochemisitry, helping scientists to understand the mechanism of protein synthesis, genetic information transfer and other mechanisms of life. Khorana has won many awards and honours for his achievements among which are Padma Bhushan, Membership of National Academy of Sciences, USA and the Fellowshi of the American Association for the Advancement of Science.

Another who have attained immortality by their contribution to chemistry are Yellapragada Subbarow. Born in a remote village of Andhra Pradesh, Subbarow travelled to USA to continue his studies While studying there, he devised a technique for the estimation of proteins in solutions. The procedure is still being adopted by chemists all over the world, though in a modified form, for the detection and measuring of proteins. Called Friske-Subbarow method, it is one of the longstanding chemical techniques that is followed worldover.

The Saga of Indian chemists is continuing. As the scene changes from individuals to team work, Indian chemists have time and again proven their prowess by developing alternative routes of synthesis of essential drugs to help the health services in the country. The effort has also spawned a vibrant drugs and pharmaceutical industry in the country are other areas where Indian chemists have contributed their efforts. There have been so many changes and the future is exciting. There are number of scientists working in various Universities, Indian Institute of Technologies, Indian Institute of Science and CSIR. Yet, the challenges of chemistry are unending and our journey continues.

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Address:
Mrs. Sumangala Mummigatti
1715, 30th Cross
19th Main, Rajajinagar 2nd Block
BANGALORE – 560 010