



Dr. Rajendra Rathore colloquium of Chemistry

Department of Chemistry
Indian Institute of Technology Kanpur

Professor Sabyasachi Sarkar

Honorary Distinguished Professor
Nanoscience and Synthetic Leaf Cell
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Nanoscience and Synthetic Leaf Laboratory at Downing Hall
Indian Institute of Engineering Science and Technology,
Shibpur, Botanic Garden-711103

Title: “Coal as Tiffin Box Carry Drug near Neuron Crossing Blood Brain Barrier & It’s Aerobic Respiration under Radiant Energy to Generate Electricity”

Abstract Paul Ehrlich in the late-19th century used aniline dyes that stain all of the organs of an animal except the brain in 1913. Edwin Goldmann (one of Ehrlich's students) injected the dye into the spine directly. He found that in this case the brain would become dyed, but the rest of the body remained dye-free. This demonstrated the existence of barrier between the two sections of the body. This blood-brain barrier (BBB) is a highly selective semipermeable border of endothelial cells that prevents solutes in the circulating blood from non-selectively crossing into the extracellular fluid of the central nervous system where neurons reside. It is a physical barrier between the local blood vessels and most parts of the central nervous system itself, and stops many substances from travelling across it. The question: how to combat brain diseases like, Alzheimer's; brain tumors, Parkinson, Depression, Schizophrenia or Neuralgia? Drugs are available but the problem is with BBB. It is not possible to open the skull everyday to administer medicine in the brain. Receptors are designed to carry selective drug in selective pathway to cross BBB. But there is no general method to carry any drug or any combined drugs together confined in a non-interacting box which crosses the BBB and de-load the drugs at the site and excreted. We developed such a box or 'Dubba' made up with smart nanocarbon from ordinary coal that can keep the drug inside in "closed form" and crossing the BBB change to "open form".

A different service of such coal we have exploited. Nikola Tesla in 1901 suggested exploring radiant energy of the Earth. Solar light, beyond visible region, and cosmic radiation heated up the surrounding air of the Earth. This is augmented by infra red absorption by CO_2 and H_2O to enhance global warming. This total radiant energy is more than sufficient to activate coal to combine with aerial oxygen to produce electrical energy day and night, indoor and outdoor. We found to harvest that abundant energy using ordinary coal and the second part of my lecture will be based on "Aerobic Respiration of Coal" like 'living cell respiration' to generate chemical energy and exhale CO_2 to glow LED and to drive motor.

Dr. Sabyasachi Sarkar (born in West Bengal, 17.05.1947) did B.Sc. Honors (1964) at Rama Krishna Mission Vidyamandira, Belur Math and M.Sc. (1966) from Science College, Kolkata. He received his first research stint under the Late Prof. P.B. Sarkar of Calcutta University (1967-69) and thus is the lone living academic grandson of Acharyya P. C. Ray still practicing science. He completed his PhD (1975) under Prof. R.P Rastogi at Gorakhpur University and did his Post doctoral research in Germany with Achim Mueller of Bielefeld University (1976-1978) and joined IIT Kanpur in 1978. He introduced, for the first time in India, Bioinorganic Chemistry as a subject to teach as a separate course and conduct research at IIT Kanpur since 1978 that is two years' ahead of its global recognition as a separate discipline as done by the American Chemical Society and the Royal Society of Chemistry, UK by appointing Associate Editors starting from 1980. His research, over 50 years spans in the diversified fields in the biomimeticism of the metalloproteins originated from the chemical evolution (chemical Darwinism) of the extant life from Archaeal hyperthermophiles to latest mesophiles including Human. Based on functional mimicking of a series of molybdoenzymes he showed that even in model enzymatic oxotransfer reactions the participation of similar enzyme-substrate (E-S) complex is a real entity. Such a chemical species (E-S) responds to spontaneous intramolecular oxidative addition and reductive elimination to complete the oxotransfer reaction. Such a reaction differs from the conventional chemical oxotransfer reaction where the reaction between the starting reactants happens in Eyring activated complex. Besides, he focused on trapping solar energy designing synthetic leaf; modeling hydrogenases for energy and non-invasive bioimaging by non-toxic water-soluble fluorescent nano-carbon onions and in vivo drug carrier and delivery even across blood brain barrier. He used water soluble nano carbons to release micronutrients and adsorbed water to young plants in spoon feeding style. His research has shown the architectural marvel in silk cocoon with the natural thermostatic and humidity control with preferential oxygen gating inside cocoon suggesting the construction of green house architecture. He proposed a new magneto reception mechanism for nocturnal moth in sensing the Earth's magnetic field to navigate in the dark based on stable pool of carbon-centric free radicals along with ferromagnetic components intrinsic in the antennae and the wings to avoid the approaching bat like predators. He has developed low cost nano carbon technology based water filter to make potable water. He has keen interest on environment and so has done research on remedial of arsenic and fluoride from water and also to show the presence of carbon nano tubes in aerosols creating global warming, winter smog and breathing problem. He has done research to map the degradation of Taj Mahal. He has so far guided 50 PhD; around 150 M.Sc.; M. Tech. students for their theses with more than 250 publications; delivered several invited lectures in India and abroad including in Gordon Research Conferences. 2 US and 2 Indian Patents after leaving IITK. At this (74 yrs) age still passionate in guiding couple of PhD students. His diversified research has been highlighted by Nature India 13 times in addition with several other International and National press reports. He writes popular scientific articles in English and in Bengali and also writes short stories with satire in Bengali.

(<http://home.iitk.ac.in/~abya/>); (https://en.wikipedia.org/wiki/Sabyasachi_Sarkar)



About Professor Rajendra Rathore

“Dr. Rajendra Rathore Colloquium of Chemistry” seminar series has been established at the Department of Chemistry, IIT Kanpur in 2019 through an endowment fund created through generous contributions from Mrs. Rajni Nigam, wife of late Dr. Rajendra Rathore, and their family members and well-wishers. The first lecture was delivered by **Professor S. Chandrasekaran, INSA distinguished Professor** on March 04, 2020.

Dr. Rajendra Rathore, Pfletschinger-Habermann Professor of Organic Chemistry at Marquette University, Milwaukee, Wisconsin USA, departed this world on February 16, 2018, after a short but strenuous battle with pulmonary disease. Dr. Rathore was an alumnus of Indian Institute of Technology Kanpur who received his M.Sc. degree in Chemistry in 1986. Dr. Rathore was a scientist of the highest calibre. A pioneer in the field of organic and synthetic chemistry, he made key contributions to the areas of organic supramolecular and materials chemistry.



Date: March 26, 2021 (Friday)

Time: 5:00 PM

Mode of lecture: Through online