AMARNATH MAITRA
(9 February 1943 - 14 April 2012)

AMARNATH MAITRA  
(1943-2012)  
Elected Fellow 2000

EARLY LIFE

A MARNATH MAITRA rose to highest scientific acclaim from a very humble beginning. He was born on February 9, 1943, in a small village named Amrah, located on the banks of the Mayuraakshi river in the Birbhum District of West Bengal. His father, Late Purna Chandra Maitra, was a conductor for Calcutta (Kolkata) Tram Corporation, and his mother, Late (Smt.) Santimoyee Maitra was a housewife. Professor Maitra was the eldest of six siblings, and throughout his adult life, he dutifully fulfilled the obligations of his parents and siblings being the family’s eldest son. During his childhood, Amrah was still a village that lacked electricity and running water, and Professor Maitra grew up as a true “child of nature”. He attended elementary and middle school in Amrah itself, in a one room mud building with a thatched roof, studying late into the night under the light of hurricane lamps. After completing elementary schooling in his native village, and high school in nearby Hetampur, he went to Kolkata for further studies. He obtained B.Sc. (Honours) in Chemistry from Ashutosh College, Kolkata University in 1962, and M.Sc. in Chemistry, with specialization in Inorganic Chemistry, from Kolkata University in 1964. Following that, he obtained a Ph.D. degree from Jadavpur University, Kolkata, in 1971, under the Supervision of Professor Debabrata Sen, in the subject area of boron and silicon heterocyclic chemistry.

TEACHER, RESEARCHER AND INVENTOR

After obtaining his Ph.D., Professor Maitra joined Ashutosh College, Kolkata, as a lecturer. However, his penchant for research soon brought him to the Department of Chemistry at the University of Delhi, where he joined as a lecturer in 1972, and this was his “home” where he spent the rest of his remarkable academic and scientific career. He devoted the initial years of his research endeavours at Delhi University in the area of corrosion chemistry. Later, he went to Europe for post-doctoral research fellowships, first in the laboratory of Prof. G Hertz at the University of Karlsruhe, Germany (1978-80) for conducting research in the area of nuclear magnetic resonance (NMR) relaxation spectroscopy, followed by a stint at the University of Basel, Switzerland (1980-82), in the laboratory of Prof. HF Eicke. While at Basel, Professor Maitra explored the structure and kinetics of microemulsions, an area of research which would play a critical role in shaping his future work and rise to
scientific acclaim. Later in his career he was also invited to several academic institutions in Europe and USA as a Visiting Professor, including Lund University, Sweden (1987); University of Florida at Gainesville, USA (1989); and School of Pharmacy, University of London (2004); to name a few.

Beginning in the early 1980’s, Professor Maitra started research on the various aspects of microemulsions, which included basic phase-diagram studies, exploring the biological activities of enzymes and other proteins immobilized in microemulsions, and the synthesis and characterization of various inorganic nanoparticles in microemulsion media. He synthesized a number of such nanoparticles, particularly gamma ferric oxides, barium ferrite nanocrystals, and silver halides. From the early 1990’s, he took a keen interest in nanoparticle-mediated drug and gene delivery for the treatment of various diseases, including infections and cancer, and thereafter, solely focussed his research in this area. Today, nanotechnology and nanobiomedicine are probably two of the most popular research areas in India and the world; however, twenty years ago these were newly emerging disciplines which many researchers were unwilling to embrace. Owing to his early recognition of the immense potential of nanotechnology and nanobiomedicine in the healthcare industry, Professor Maitra is widely regarded as one of the pioneers of these research areas in India.

In a short span of less than 20 years of research in nanotechnology and nanobiomedicine, Professor Maitra made prolific and significant contributions. He passionately worked at the interface of science and technology, as a result of which his work has been critically acclaimed by academia and industry alike. He developed and patented a number of drug-doped nanoformulations, most of which were licensed to pharmaceutical companies around the world. Professor Maitra has been granted five US patents, one EU patent and 11 Indian patents on targeted drug and gene delivery. Some of these are listed below:

Process for the preparation of highly monodispersed polymeric hydrophilic nanoparticles (United States Patent 5,874,111, year 1999) was licensed to Dabur India Ltd, New Delhi, India.

Formulations of paclitaxel, its derivatives or its analogs entrapped into nanoparticles of polymeric micelles, process for preparing same and the use thereof (United States Patent 6,322,817, year 2001) was also licensed to Dabur India Ltd, New Delhi, India.

Sustained release and long residing ophthalmic formulation and the process of preparing the same (United States Patent 6,579,519, year 2003) was licensed to Panacea Biotech, New Delhi, India.
Process of entrapping genetic materials in ultra-low size nanoparticles of inorganic compounds to form non-viral carriers (United States Patent 6,555,376, year 2003) licensed to Abraxis Biosciences (now Celgene Corporation), San Diego, USA.

Professor Maitra has supervised the graduate (Ph.D.) thesis work of close to 40 students, and published about 120 peer-reviewed articles in international journals of repute. The extraordinary standards of his research can be gauged by the number of citations received for some of his early seminal papers on microemulsions, including a 1995 publication in Advances in Colloid and Interface Science (cited 350 times), a 1989 publication in The Journal of Physical Chemistry (cited ~320 times), and a 1984 single-author publication in The Journal of Physical Chemistry (cited 293 times). Several of his more recent papers on nanotechnology and nanoparticle-mediated delivery platforms have been cited between 100-200 times in literature per Google Scholar, again underscoring the broadly felt impact of his research. In one of his most fruitful collaborations, Professor Maitra spent about one year (during 2006 and 2007) as a Visiting Professor in the laboratory of his son, Professor Anirban Maitra, at the Sol Goldman Pancreatic Cancer Research Centre at Johns Hopkins University School of Medicine in Baltimore, USA. This research collaboration resulted in the generation of one of the first ever formulations of the anticancer and anti-inflammatory agent, curcumin, encapsulated within polymer nanoparticles ("nanocurcumin"), and resulted in seven peer-reviewed publications in various international journals over five years, the last one as recently as 2012. In fact, the article describing the synthesis and characterization of nanocurcumin, published in the Journal of Nanobiotechnology in 2007, remains one of the highest ever downloaded publications for this journal, and has been cited over 260 times in literature.

In addition to being a prolific researcher, Professor Maitra was an extraordinary mentor, and many of his former students currently hold high ranking positions in academia or industry, including Professor or Director level positions. His counsel and expertise was actively sought by a number of pharmaceutical companies, as well as multiple academic institutions that have opened centres of nanotechnology research and education in the last few years. He was also associated with the Indian Nanoscience and Technology Initiative, and other nanotechnology-based endeavours in this country. Professor Maitra had an enduring passion for training India’s next generation of scientists in nanotechnology research and enterprise. To this effect, he initiated and established a Masters level (M.Tech.) course in Nanoscience and Nanotechnology at the University of Delhi.

Professor Maitra received numerous awards and recognitions for his scientific achievements, but none for which he felt more privileged than being named as a Fellow of the Indian National Science Academy (FNA) in 2000. He was also a recipient of the prestigious International Einstein Award for Scientific Achievement in the field of Nanotechnology and Nanomedicine from the International
Biographical Centre, Cambridge, United Kingdom in 2010, and the Materials Research Society of India (MRSI) medal in 2004. Professor Maitra was the Editor of the *Journal of Surface Science and Technology*, and a member of the International Advisory Board of the *Journal of Colloid and Interface Science*. He was also a council member of the International Association for Colloid and Interface Science and a member of The Controlled Release Society, USA. The former President of India, Dr APJ Abdul Kalam, himself a distinguished scientist, mentioned the laudable contributions of Professor Maitra to the fields of nanotechnology and nanobiomedicine research in several of his talks. Even following his retirement from Delhi University in 2007, he remained active in laboratory research in the capacity of INSA senior scientist, first at the Indian Association for the Cultivation of Sciences (Kolkata), and subsequently at the University of Delhi.

**THE HUMAN BEING**

Despite having achieved exemplary scientific recognition, Professor Maitra remained deeply rooted to his humble upbringings, and always came across as a simple man with simple needs. His simplicity was often reflected in his approach towards research, where he would seek the most elementary of tools to tackle the most complex of problems. He was always on the lookout for new and exciting areas of research, whose lessons could rapidly be translated for societal benefits. In fact, Professor Maitra insisted that nanotechnology research in this country have a strong translational bent, such that taxpayer-funded research would eventually benefit the common man.

Apart from his scientific achievements, Professor Maitra was also known for his humane and charitable side, which he confided only in those who were close to him. He donated all the money that he earned through his various patents and royalties to fund the construction of a science building and scholarships for women students in a higher secondary school near his birthplace in West Bengal. To his students and protégés, in whom he had inculcated his philosophy towards research and life, he was much more than just a research guide.

Sadly, Professor Maitra passed away on 14th April, 2012 in New Delhi, after a brief illness. Till the end, he was actively involved in research at Delhi University. Professor Maitra was an extraordinary mentor, whose fatherly presence, childlike enthusiasm, and undying optimism will be sorely missed.

I am indebted to Professor Maitra's wife, Professor (Mrs.) Krishna Maitra and his son, Professor Anirban Maitra, for providing valuable inputs in this memoir.

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