Recollections

P. M. Mathews

P. M. Mathews was a Professor at the Madras University from 1964. In 1965 he established an independent Department of Theoretical Physics and served as its Head. After his retirement in 1992 he worked as Emeritus Professor for 10 more years. He served as INSA (Indian National Science Academy) Senior Scientist during 1997-2001. Prof. Mathews has published 110 research articles in reputed journals, co-authored the books, Text Book on Quantum Mechanics and Precession, Nutation and Wobble of the Earth. He has guided thirteen PhD students. Prof. Mathews was the recipient of India's Meghnad Saha Award for Theoretical Sciences (1975). He was elected as a Fellow of the Indian Academy of Sciences (1975). In recognition of his work in the MHB model of nutation and precession, he was elevated to the Fellowship of the American Geophysical Union (2004).

At the outset, I want to thank Dr. Vinayak Jagadish and other organizers of this workshop for inviting me to speak as a guest of honor at this conference convened to celebrate the 60th anniversary of the fundamental paper entitled "Stochastic Dynamics of Quantum Mechanical Systems" that I co-authored with George Sudarshan and Jayaseetha Rao and submitted for publication in 1960. I was asked to share memories of my research interests and of my association with Prof. George Sudarshan.

My interaction with Ennackal Chandy George, his given name appearing last, started in 1948 when he joined the Physics B. Sc Honors program at MCC (Madras Christian College) which retained its name even after Madras was renamed to Chennai. I was a year junior, in the 2nd and final year of an Intermediate (pre-undergraduate) program at MCC; a year later, I too joined the Physics B. Sc Honors program. George organized activities in Physics and Science in general. High density balloons were being flown in the skies above by scientists from TIFR (Tata Institute of Fundamental Research) in Bombay (since renamed to Mumbai). George made contact with the scientists and got involved in their investigation. George completed a Master's in 1 year at the University of Madras and immediately upon graduation in 1952, was invited to join TIFR. He was outstanding in any scientific work he undertook there. He worked with Homi Bhaba on cosmic ray showers. Paul Dirac who taught Bhaba Physics at Cambridge gave lectures on Quantum Mechanics at TIFR in 1954. George and a KK Gupta served as Dirac's scribes preparing lecture notes. George married Lalitha Rau in 1954 taking on the Hindu name Sudarshan. Prof. Robert Marshak of the University of Rochester, who studied under 1967 Nobel Laureate Hans Bethe and later became President of CCNY, encountered him at TIFR and invited George to be his PhD student starting in 1955. Having completed a postdoctoral fellowship at NRC in Ottawa, Canada in 1958, I continued as a postdoctoral fellow from 1958 to 1959 under Prof DL Falkoff at Brandeis University in close proximity to Harvard University where George Sudarshan, having completed his PhD in 1958, was Prof Julian Schwinger's research fellow. George's wife's sister Jayaseetha Rau was a Physics PhD student at Brandeis, completing her dissertation in 1962 under Falkoff's supervision. The ensuing close contact between George, Jayaseetha and me gave us occasion to collaborate and author a paper together, the one this conference is about. George's subsequent work on the development of quantum correlations between parts of a large system led to the theory of stochastic semigroups from which emerged the Gorini-Kossakowski-Sudarshan equation that forms the basis for the study of large open systems. From 1969, George Sudarshan was a professor of Physics at The University of Texas at Austin. By his invitation I worked there as a visiting scientist in 1982-83.

Now, I will give an overview of my research. With my PhD advisor Dr. Alladi Ramakrishnan, I published a paper in 1953 entitled "Numerical Work on the Fluctuation Problem of Electron Cascades" on a class of stochastic integro-differential equations and "A stochastic problem relating to counters." One follow-on to these was a paper "Stochastic Equations for Nonequilibrium Processes" that my fellow postdoc Irwin Shapiro and I coauthored with Prof DL Falkoff at Brandeis University in 1959. I joined the Physics faculty of the University of Madras later in 1959. A brief break from research came soon after I became Head of the Theoretical Physics department in 1965 when Prof Falkoff honored me with a visit to India shortly before succumbing to terminal cancer. He coauthored a paper with Jayaseetha who had returned to India to work at TIFR and I took him on a tour of select places in India including my home state of Kerala. To select from my publications numbering about 110, I published "Localised States of a Dirac Particle" in 1971, "Arbitrary Spin Fields: Spectral Representations for Two Point Functions" coauthored with M Seetharaman in 1971, "On the Apparent Visual Forms of Relativistically Moving Objects" coauthored with M Lakshmanan in 1982 and "On the Admissible Lorentz Group Representations in Uniqueness" coauthored with B Vijayalakshmi and M Sivakumar in 1982. Vijayalakshmi tragically died of terminal cancer before she could finish her dissertation; 13 other students I advised did complete their PhD.

After retiring from my positions as Senior Professor and Department Head at Madras University in 1992, I was a Visiting Scientist at the Harvard Smithsonian CfA (Center for Astrophysics) from 1992-1995. Afterward, I

continued working there for several years during summers. At CfA, my field of research changed to Geophysics. One of my publications was "Modeling of nutation and precession: New nutation series for nonrigid Earth and insights into the Earth's interior" coauthored with TA Herring and BA Buffett in 2002. In 2004, AGU, the American Geophysical Union, honored me for developing the Standard Nutation Model by declaring me a Fellow at a ceremony in Montreal with a citation saying "For extraordinary work in the theory of Nutation and the development of the Standard Nutation Model adopted by the international scientific community." The model is named the MBH (Mathews Buffet Herring) model.

I have authored two books:
(1) "A textbook of Quantum Mechanics" coauthored with K Venkatesan in 1976, published by McGraw Hill, and
(2) "Precession, Nutation and Wobble of the Earth" coauthored with the Belgian Royal Observatory's director Veronique Dehant in 2015, published by the Cambridge University Press.

I have worked as a visiting scientist at numerous research facilities around the world. Aside from the ones already mentioned, these include the International Centre for Theoretical Physics in Trieste, Italy, the Nordic Institute for Theoretical Physics in Stockholm, CERN in Geneva, the Dublin Institute for Advanced Studies, the Paris Observatory, the Belgian Royal Observatory, MIT's Physics Department, the University of Alberta at Edmonton, the University of Hawai, Osaka University and Wuhan University.

In conclusion, I would like to say that I have had a most fulfilling career in Physics and that I am gratified at having been able to give this talk.