

Suprakash C. Roy: A Multidimensional Physicist. A Story of Courage and Determination. Rajinder Singh and Sujata Roy. Shaker Verlag, Düren, Germany. 2021. xvi + 192 pages. Price: €21.90.

This book deals with the life and achievements of a multidimensional physicist – Suprakash C. Roy (SCR), who can be considered one of the living legends of science in India. The authenticity of this biographical account is special on two counts. One that it is written by Rajinder Singh, a historian of Indian science and the other that is co-authored by Roy's wife, Sujata. The authors declare in the preface that they have tried their best to be 'objective' in their narration.

According to the authors, the life story of Roy could be a lesson for millions of poor students of India who want to become successful scientists. I am not sure why the authors consider him a role model for poor students. He was not poor, though he struggled to get a good education. The authors give full credit to Roy's mother for his successful growth: 'SCR sees his mother as a person who took the uphill task of bringing up her children with decent education given the environment at home, but she remained relentless in her effort against all odds to fulfil the wishes of her children in terms of education.'

Roy graduated from Ramakrishna Mission Vidya Mandira, Belur Matt, Calcutta (now Kolkata) and it was here that the good values of life, social service and discipline were inculcated in him. He passed B.Sc. Physics Honors in First Division and obtained his M.Sc. degree from the Raja Bazar Science College of Calcutta University. Roy joined the famous Bose Institute in 1967 as a research scholar, with Ananda Mohan Ghose as his supervisor. Roy started his research without a scholarship, but

got it later after he was interviewed by D. M. Bose, the Director of Bose Institute.

Ghose assigned Roy the work of measuring elastic scattering cross-sections of gamma rays from different materials and comparing the data with existing theoretical values. Theoretical calculations in those days were empirical, and Roy was asked to check their validity in comparison with measured values, which would help him understand the deficiency and arrive at suggestions for improvement in existing theories. Roy built an apparatus to improve the effective resolution of the NaI(Tl) detector, so that gamma rays of energies 1117 and 1332 keV emitted from the radioactive ^{60}Co source, could be completely separated. He published the results in *Physical Review*. Roy was awarded the Ph.D. degree by Calcutta University in 1972 for his thesis entitled: 'Investigations on the improvement of the effective resolution in scintillation spectrometers and its application to coherent scattering of gamma rays.'

Roy then joined Bose Institute as Research Assistant and began supervising research. He helped Ghose organize the First International Symposium on Radiation Physics at Bose Institute in 1974. This gave Roy a chance to get acquainted with many eminent scientists worldwide. In 1979, he left Bose Institute on study leave to work with R. H. Pratt from the University of Pittsburgh, USA, as a Research Associate. He returned to Bose Institute in 1983 and was promoted as Reader in the Department of Physics. He worked until his retirement in three different areas simultaneously, namely photon-atom scattering, radiation damage in solids and liquids, and superheated drop detectors (SDDs).

Roy was appointed as a Professor in 1986 and Chairman of the Physics Department in 1987. He was against 'inbreeding' and asked his Ph.D. students to do postdoctoral research in other institutions and then return to serve in Bose Institute. As seen from his research papers, he had 62 collaborators.

Roy was a strict disciplinarian in life and made others follow the same dictum. He was involved in the administration and played an important role in the functioning of Roy Institute. He was the founding Editor of the *Bose Institute Newsletter*, which was started in 1993 during the 75th year of its existence. He retired from Bose Institute in 2004 at the age of 60 years.

The research work of Roy started with Rayleigh scattering, also called elastic scattering. He published 30 research papers in this area along with his associates. His

findings established 'the power law dependence of elastic scattering cross sections of gamma rays with atomic number (Z) and the variation of power index (n) with momentum transfer (q)' in terms of the cross-section using the method of Johnson *et al.* method. One of his conclusions was that the power law might not be valid for the periodic table. Pratt and Roy presented a comprehensive theoretical treatment of Rayleigh scattering from atoms in the range 100 eV–100 MeV. The polarization effects in the elastic scattering of gamma rays in the energy range of a few kiloelectron volts to a little above 1 MeV were studied from the targets of atomic number (Z) in the range 13–92.

The next area of research by Roy was Compton scattering. Calculation of Compton scattering cross-sections for bound electrons is complicated. A numerical method to calculate Compton scattering from bound electrons was developed by Pratt's group at the University of Pittsburgh. Roy and Pratt demonstrated a huge difference in the inelastic scattering cross-sections measured using synchrotron sources and conventional measurements using radioactive sources. Roy and Chatterjee resolved the asymmetry problem of the Compton profile. Roy was also involved in the development of SDDs for neutron dosimetry. SDD can be considered as a miniature bubble chamber. In contrast to the bubble chamber, SDD 'offers continuous radiation sensitivity, portability and adaptability, direct reading capability, and low cost'. SDDs are 'sensitive to fast neutrons and have an energy threshold that can be adjusted by varying the temperature, pressure, or drop composition'. At Bose Institute, a new method was developed to determine the nucleation rate of superheated drops and the lifetime of metastable superheated drops. Also, he proposed a new method to find the limit of superheat of liquids. In 2001, Roy wrote a lengthy article on the history of SDDs, their applications and the work done by him and his associates.

Roy did some interesting work in applied areas as well; for example, biophysics, medical physics, astrophysics and ultrasonics. He was also involved in the developing instruments for use in his experiments. In 1981, Kundu, Roy and Mitra constructed an apparatus to measure free radicals. They found that 'at high gamma dose rates, the lyoluminescence value can be utilized to predict reaction rates relative to a value obtained by direct measurement of oxygen consumption'. Among all his research areas,

Roy considers his work on SSDs as the most important because it was cited in the graduate student textbook titled *Radiation Detectors and Measurements*, Wiley Press, 2000.

International connections began for Roy in 1974, when he participated in two international conferences: Fifth International Congress on Radiation Research in Seattle, USA, and First International Symposium on Radiation Physics (ISRP) at Bose Institute. He established a life-long friendship with Pratt. Roy writes: 'What I most admire in him and Mrs. Pratt is their magnanimity to accommodate all visitors in their house for months together.' He worked at Yale University, USA with R. E. Apfel for two years (1981–83) in developing a 'practical' neutron dosimeter using superheated drops. According to Roy, the period at Yale was one of the best in his professional life. He developed close connections with John H. Hubbell and David A. Bradley through the International Radiation Physics Society with which he was associated from 1974 till his retirement.

During his long stint at Bose Institute, Roy honed his skill in editing by bringing out the Institute's *Newsletter*. His association with *Science and Culture* started when he became a member of its editorial board in 2000 and started writing editorials. An analysis shows that Roy wrote 58 editorials, 35 general articles, 21 book reviews, 35 'Notes and News' and four research articles for the journal. He left no stone unturned to improve the quality of the journal and its propagation by contacting scientists, politicians, bureaucrats, authors and columnists. He served as the Chief Editor of *Science and Culture* for the longest duration and made the journal financially independent. In 2017, he became a member of the National Commission of History of Science and thus his journey into the history of science started.

One of the chapters of this book (chapter 6) is the longest with personal opinions of Roy's foreign and Indian friends, relatives and students. My first impression was to ignore this chapter as most of these opinions could be subjective and may touch the fringes of flattery. However, I decided to give the opinion of his student, Rakesh Das, as a sample. Rakesh writes: 'As a student I was deeply fascinated by his sense of punctuality, soft-spoken nature, and flawless teaching methodology. I have been in touch with him all these years; whenever I meet him, his words enrich and motivate me. I will forever be inspired by

his teaching and analytical approach to solving the fundamental problems of Medical Physics. He taught us not only to be better researchers, but also to be self-disciplined and moral human beings.'

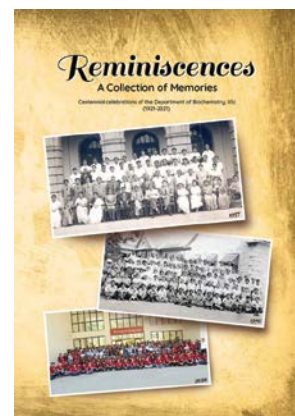
An analysis of Roy's published research papers leads to conclusion that most of his publications are co-authored with his research collaborators. Out of 100 papers listed (in chapter 8 of this book), only 4 are authored by Roy alone, 30 are with his life-long collaborator Pratt, 33 are with his Ph.D. students and the rest with his colleagues in Bose Institute. The quality of papers can be judged from the journals in which these are published. In modern parlance, we can say these are published in high-impact journals. There is another list which includes 25 papers published in the conference proceedings. In addition, Roy has published 21 book reviews, 58 editorials, 35 popular articles of general interest, and 36 'Notes and News'. These publications reflect Roy's wide range of interest in areas other than his chosen field of scientific research.

This book has nearly 100 photographs, some of which seem to be superfluous. On p. 78, there is a mismatch between the text and caption of figure 33. Since I was personally present in Dubrovnik, Croatia, during ISRP-5 in 1991, I could identify this discrepancy. One more suggestion: The gist of news items may be given in larger font for the convenience of readers.

The authors of this book deserve praise for their efforts. Its narrative justifies the subtitle, *A story of courage and determination*. I hope our younger-generation scientists will read this biography to get motivated to perform good research.

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Reminiscences: A Collection of Memories – Centennial Celebrations of the Department of Biochemistry, IISc (1921–2021). Department of Biochemistry, Indian Institute of Science, Bengaluru 560 012. 2021. x + 248 pages.

The establishment of a Department of Biochemistry at the Indian Institute of Science (IISc) in 1921 is an example of the remarkable far-sighted vision of IISc, making it a unique institution in India. Reminiscences of its alumni, compiled in this e-book as part of the department's centenary celebrations, justify the vision with which this department was started. A historical account of hundred years of an academic institution provides an interesting panoramic view of its path through the ups and downs. When written independently by many who have been part of the centennial journey, the narration becomes more interesting than when compiled by an outsider. Although the latter may provide a critical assessment of the progress, the reminiscences penned by alumni bring out subtle, yet significant facets of the journey and document the changing perceptions, attitudes and missions.

My interactions with faculty members in life science-related departments of IISc started in the 1970s and have continued since then. It is indeed satisfying to note that the new faculty members have maintained the high scholastic benchmarks that were set up by the pioneering researchers. The Department of Biochemistry, the oldest life sciences unit at the IISc, has been remarkable in terms of the diversity of topics that have been and continue to be researched, which result in high quality of the research output. Reading through the present collection of reminiscences makes me nostalgic about those with whom I had the privilege of interacting in the bygone days, but who are now no more.