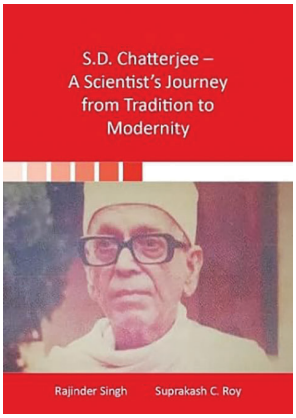

S.D. Chatterjee – A Scientist's Journey from Tradition to Modernity. Rajinder Singh and Suprakash C. Roy. Shaker Publisher, Germany. 2022. xvi + 178 pages. Price: 21.90 €.

Rajinder Singh has created history by writing biographical sketches of eminent and not so eminent Scientists of Calcutta School, starting with CV Raman, the Nobel Laureate, who was the best representative of this school. The biography of S. D. Chatterjee (SDC) has a special appeal to me for two reasons: (i) He was the best friend of my mentor, Piara Singh Gill, Professor and Head of the Physics Department at AMU Aligarh, and (ii) he happened to be my examiner in M.Sc. final Practical examination in April 1963. I was impressed by his simple living and high thinking.

Bikash Sinha, former Director VECC and SINP, in his Preface, pays high tributes to SDC in the following words: 'Professor Chatterjee's versatile nature of research is abundantly visible. He found deep interest in studying the Ionosphere, Lightning across the sky, Radiations in the Earth's Upper Atmosphere – Light of the Night Sky, Geiger Müller Counters, Proportional Counters, Thermally Emitted Electrons, Electrets, Liquid Crystals, and Amplifying the sensitivity of Galvanometers, Radon and Radium measurements in the waters of hot springs and along the entire seacoast of India, and Radioactivity in rain waters at Calcutta. He was a splendid man who covered wide areas in experimental physics'. SDC was a versatile genius who initiated research in many new areas, for example, an emanation of Helium in the thermal springs of India.

In the introduction to this volume, the authors describe his misfortune along with his achievements: 'SDC belongs to the group of tragic heroes of Indian science, as his discovery of spontaneous fission came to be known to the world quite late, and he missed the honour of being recognized as the discoverer of spontaneous fission. He was the first to attain a D.Sc. degree in nuclear physics from the University of Calcutta. According to the Website of Bose Institute, S. D. Chatterjee pioneered the study of nuclear fission phenomena, measurement of environmental radioactivity and radiocarbon dating, in addition to studying helium emanation in Indian hot springs.'

Chapter 1 gives an inkling of his early life and family background. SDC hailed from a wealthy family in the Nadia district. He was following a disciplined life in the footsteps of his father, who was in the legal profession. He was a schoolmate of Subash Chandra Bose, the great revolutionary. He was a brilliant student who did B.Sc. from Presidency College and joined the University College of Science for M.Sc. He joined the research group of D. M. Bose at Calcutta University and submitted his D.Sc. thesis under the title 'Investigations in nuclear disintegration' at the University of Calcutta. SDC visited Canada and USA and entered a research collaboration with William F. G. Swann, Director of Bartol Research Foundation in Pennsylvania. Swann was one of the few persons who influenced SDC's life and scientific work. After his return from the USA, SDC joined the University of Calcutta. In 1956, he joined as Professor and founder Head of the Physics Department at the newly created Jadavpur University. He guided 22 Ph.D. students in research before he retired in 1970 and joined IACS as a senior scientist in the project of National Professor S. N. Bose.

Chapter 2 describes the major contributions of SDC in the field of Radiochemistry, Nuclear disintegration, and Spontaneous fission of Uranium. SDC uses an exchange reaction to separate radioactive Cobalt-60, which has applications in various fields such as sterilization of medical instruments, treatment of cancer, and radiation sources for industrial radiography. The credit for discovering the spontaneous fission of Uranium is given to two Russian scientists, K. A. Petrzhak and G. N. Flerov, as they reported their findings to Physical Review. SDC discovered the same phenomenon and reported his findings to D. M. Bose, Director of Bose Institute, who discouraged him and rejected his findings as a fig of his imagination. SDC measured the half-life of spontaneous fission of U-238, which has been accepted to be accurate.

Chapter 3 reports the investigations of SDC on magnetic properties of liquids and electrets. He studied 21 samples, which were either non-polar liquids or monohydric alcohols. He found no change in the viscosity coefficient due to the magnetic field in the case of non-polar liquids. He also studied the effect of the magnetic field on the dielectric constant of some organic liquids. SDC and his collaborators at Jadavpur University studied the effect of electric and magnetic fields on nitrobenzene and carnauba wax, two typical polar electrets. The results of the variation of magnetic anisotropy of carnauba wax were reported in the *Indian Journal of Physics*. SDC wrote a Review on 'Magneto-Electret', giving a new explanation for charge separation/orientation on the assumption of polaron formation and crystallographic orientation.

Chapter 4 describes the work of SDC as a repeat of experiments done by J. C. Bose to improve the performance of the 'cohering action' of a surface combination of metals exposed to Hertzian waves. A replica of JC Bose's magnetic crescograph was prepared by SDC and D. Ghose to measure the magnetostriction of ferrite and develop a theory of the device used by JC Bose. Solar cells were prepared by SDC using zinc oxide film/layer coated on metal zinc and studied its rectification (Zener diode) properties.

Chapter 5 'SDC and Cosmic Rays Investigations' opens with a photograph showing AH Compton in PU Lahore for his Cosmic Ray experiments in India. He was responsible for opening this new field for Indian scientists, viz. J. M. Benade and P. S. Gill, both from Forman Christian College, Lahore. D. M. Bose, Bibha Chowdhury and R. Ghosh were involved in the study of Cosmic Rays in Calcutta. SDC and IL Chakrabarti walked in their footsteps to study time variation and altitude-dependence of Cosmic Rays. SDC measured the neutron component of Cosmic Rays at Calcutta and Darjeeling. An increase in the intensity of Cosmic Rays was observed during a magnetic storm in concordance with the results obtained by other scientists. SDC developed his instruments to record Cosmic Ray showers and bursts and to measure their size-frequency distribution curves. SDC, along with S. K. Mondal and S. R. Ganguly, studied Cosmic Ray 'stars' using photographic emulsions. The composition of Cosmic Ray primaries was studied, and it was found that 70.5% of 'stars' are produced by neutrons.

Chapter 6 deals with the investigations of the Thermal Springs of India carried out by SDC for academic research and commercial exploitation as a source of Helium,

which is an important component for running the nuclear energy programme of India. In 1972, SDC studied thermal springs at Bakreswar and found the nitrogen emanated was more than 90%, whereas oxygen gas was negligible. SDC tried to explain the origin of different gases in thermal springs. His focus was Thermal Springs at Bakreswar of West Bengal, where Helium concentration was 1.88% by volume. He observed that a huge reservoir of Helium exists within the crust beneath the topsoil of the Bakreswar–Tantloi geothermal area. SDC undertook a survey of Indian rivers for measurement of Radium content in Ganges and Jamuna. He measured the Radium content of tobacco. Another landmark study by SDC was the measurement of the radioactivity of rainwater and atmosphere in Calcutta before and after the nuclear tests. SDC pioneered radiocarbon dating in India and set up a laboratory in 1951 after joining Calcutta University.

Chapter 7 is devoted to general investigations undertaken by SDC, viz. Ionosphere, Night Glow, Lightning Stroke, GM Counter and Galvanometer. India lacked the infrastructure for high-end research. Keeping this in view, SDC developed his own instruments. He remained in touch with his collaborator, Prof. Swann, in the USA for setting up Van de Graff in Calcutta but without success due to a severe financial crunch. He got Swann's help in the fabrication of GM counter and in improving the performance of the galvanometer. SDC also developed Ionization and Proportional Counters for use in laboratory.

Chapter 8 sums up the salient features of the life of SDC. He was privileged to collaborate and under the tutelage of topmost Indian Scientists like S. N. Bose and D. M. Bose. However, the second Bose proved to be a hurdle that did not allow him to publish his discovery of spontaneous fission of Uranium. From his correspondence with William F. G. Swann, it appears that SDC found his intellectual *guru* in Swann, from whom he sought advice for his research and his career.

SDC was a man of frugal habits. He donated his life-long earnings to Jadavpur University for creating Scholarships in the name of his father and his mentor, S. N. Bose. He created the S. D. Chatterjee Research Foundation on the premises of his house and donated all his instruments, books, and personal mementoes to it. In later life, he became increasingly philanthropic and donated his immovable properties to the Ramakrishna Mission and Government of Bihar to start some social work for women in memory of his parents. He was always helpful to his students.

The authors list 93 research publications and 7 general articles of SDC. An exhaustive bibliography of 25 pages is given by authors to establish their credentials as worthy historians of Indian Science. I regret to report that the volume under review needs proper vetting and editing. I only marked some mistakes in the Foreword without bothering about the main text. On page (viii), heighted needs to be replaced by 'heightened'; on page (x), work is programme needs to be written as 'work is progressing'; on page (x), 2nd para last line is incomplete. In my view, the authors have done full justice to the life and work of SD Chatterjee, the doyen of experimental Physics in India.

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