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Book Review

P.N. Ghosh – The Pioneer of Applied Physics in India

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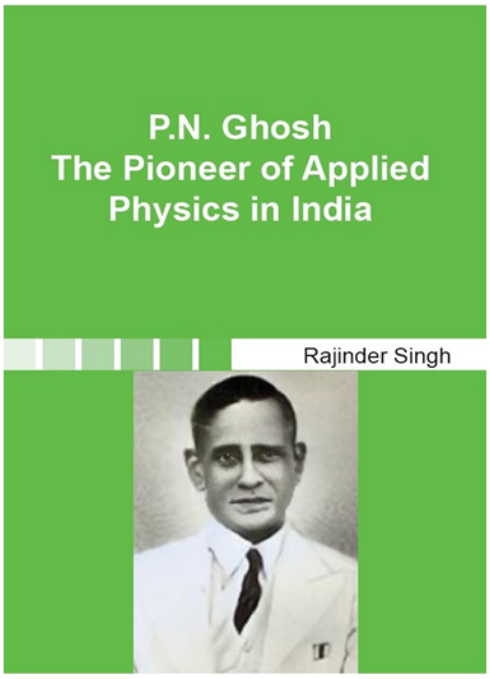

Book Title: P.N. Ghosh – The Pioneer of Applied Physics in India

Author: Rajinder Singh, University of Oldenburg, Germany

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Year of Publication: 2025; Price: €19.80 (Paperback); €14.85 (Digital);

Pages: xviii + 142.

Rajinder Singh's journey in history of science started in 1995 at University of Oldenburg in Germany and he has already completed half a century of historical biographies with this book under review, mostly focussing on non-descript scientists of Calcutta School of Physics. The book under review describes the achievements of P.N. Ghosh, one of the earlier students of C.V. Raman, who has been recognized as the founder of Applied Physics in Calcutta University.

In the Preface, the author writes: "The period from 1920 to 1930 is often referred to as the "Golden Era" of Indian physics. During this time, M.N. Saha formulated the Saha ionization equation (1920), which helped explain stellar structures; S.N. Bose co-developed the Bose-Einstein statistics (1924); and C.V. Raman discovered the Raman effect (1928), named after him. With this discovery, he laid the foundation for Raman Spectroscopy".

Rajinder defines his aim of writing this biography as follows: "The aim was to document the contributions of lesser known yet equally significant scientists. As part of this endeavour, I have authored biographies of Bibha Chowdhuri, B.B. Ray, S.C. Sirkar, K. Banerjee, S.K. Mitra, S. Datta, D.M. Bose, S.R. Khastgir, L.A. Ramdas, N.R. Sen, S.D. Chatterjee—contemporaries of Bose, Raman, and Saha. My work has been supported and sometimes co-authored by Prof. S.C. Roy, former Editor-in-Chief of the journal Science and Culture".

In his Foreword, Prof. Dr. Kaushik Das Sharma of Department of Applied Physics, University of Calcutta, writes: "At a time when applied sciences were still carving their niche in the Indian academic landscape, he had the foresight and determination to establish a department that bridged the gap between theoretical physics and practical applications. His vision laid the

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foundation for a multidisciplinary approach to physics, emphasizing its real-world relevance, which has since become a hallmark of modern education. Professor Ghosh dedicated himself to applied research and teaching in physics, ultimately founding our department in 1925".

Chapter 1 gives an overview of key aspects of life of P.N. Ghosh. He was born on Feb. 11, 1884, in the village of Mazilpur, Bengal. In 1905, Ghosh earned a Bachelor of Science degree from Bangabasi College in Calcutta and Master of Arts degree from Presidency College, Calcutta, which was affiliated with the University of Calcutta. In 1910, he began his career as a lecturer at Bangabasi College. Ghosh was appointed as the Rashbehary Ghosh Professor of Applied Physics in university of Calcutta in 1920. He was awarded a travel grant to visit Europe to study technological development in England and USA. He visited Germany and Italy and was awarded an honorary degree from Padua University in 1922.

In October, 1932, the Director of Public Instruction appointed P.N. Ghosh as Secretary of the University Students Information Bureau, a prestigious post held by TS Sterling. During 1933, several articles appeared in Ananda Bazar Patrika in which CV Raman was accused of favouring non-Bengali students. P.N. Ghosh remained loyal to him and Raman elected Ghosh as a Fellow of the Indian Academy of Sciences, Bangalore in 1934. Ghosh was one of the initiators of Indian Journal of Physics and Indian Physical Society along with Raman. A list of Honours and Awards bestowed upon P.N. Ghosh is given towards the end of 1st Chapter.

Chapter 2 describes the history of Applied Physics department of Calcutta University established by P.N. Ghosh single-handedly from a scratch. It was planned to spend a grant of Rs. 210,000 for its establishment. The focus was to carry out work in applied electricity, testing and standardizing instruments, applied optics (with an emphasis on illumination engineering), pyrometry, and applied thermodynamics, including analysing the efficiency of various heat engine types. In 1929, Applied Physics department became independent after it was separated from Applied Chemistry. In 1933, Ghosh proposed a new scheme for implementation to promote activities of Applied Physics in diverse areas, viz., repairs and standardization of all electrical measuring instruments, including voltmeters, ammeters, frequency meters, etc.; testing and repairs of resistance boxes, potentiometers, relays, circuit-breakers, fuses, switches, etc.; testing of different types of storage and dry cells; and repairs and testing of various types of transformers up to 50 Kilo-Volt-Ampere (KVA) for industrial applications. In the last section, a list of Theory Papers taught in Applied Physics is given. Practical Training for hands-on experience of M.Sc. students was organised in industrial firms.

Chapter 3 deals with Ph.D. Thesis of P.N. Ghosh and his research work under the supervision of CV Raman. P.N. Ghosh wrote a thesis on "The colours of the striae in mica and other optical investigations". He was one of the earliest researchers who worked on optics under Raman. They published a short article in Nature on "The colours of the striae in mica". The authors wrote that when mica was examined under diffuse reflected light, fine lines called striae appeared. Ghosh applied Topler Schlieren method to study mica, and published results in a paper entitled "On the colours of the striae in mica, and the radiation from laminar diffraction boundaries". His analysis of experimental results established the nature of the striae in mica.

Ghosh investigated the diffraction theory of microscopic vision and published his results in Physical Review. He repeated Young's interference experiment of R.A. Houston from the University of Glasgow for easy observation of changes in the fringe patterns. Ghosh further investigated the formation of Rainbows and Haidinger's rings in parallel plates of quartz. He observed that these rings are most prominent along hyperbolic arcs, corresponding to the isochromatic lines seen in polarized light.

Chapter 4 describes the research work done by P.N. Ghosh on Raman Effect. He studied Raman effect in carbon dioxide and carbon disulphide. Results were published in a paper "Raman effect in gases and liquids". Ghosh, Banerji and S.K. Datta investigated water surface layer in their paper "Determination of

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surface-tension by the method of ripples". The authors noted that to generate ripples, very often Lord Rayleigh's method was applied. They highlighted certain drawbacks of Rayleigh's instrument, noting that the stroboscopic arrangement was imperfect.

Chapter 5 describes the research work carried out by P.N. Ghosh on study of Dielectric Moment of Gases, Vapours and Alcohols. Ghosh and Mahanti investigated for substances like carbon dioxide, hydrogen sulphide, and methyl chloride. They determined the molecular structure of gases, alcohols and other chemicals. His group studied "Electric moment and its relation to chemical constitution". Ghosh and T.P. Chatterjee studied the electric moments of methyl amine, dimethyl amine, trimethyl amine, ethylamine, diethyl amine, and triethyl amine by using heterodyne null-beat arrangement. Ghosh and Bhattacharya studied various properties of Indian vegetable oils for their use in industrial applications. He studied castor, coconut, linseed, olive, poppy, and sesame oils, analysing how their viscosity changed with temperature.

Chapter 6 describes the research work of P.N. Ghosh concerning band spectrum of gallium oxide and isotope effect of gallium, magnesium oxide, phosphorus nitrides, aluminium monoxide and antimony oxide. He also studied ultraviolet absorption spectra of bicarbonates and mercaptans.

Chapter 7 gives an overview of Ghosh's general articles. He studied the distribution of ultra-violet intensity in the sunlight at Calcutta during the year 1931-32. Ghosh provided a critical review of techniques previously used to study solar radiation and introduced the photographic photometry method developed by him. It was observed that ultraviolet intensity pattern peaked in June and reached its minimum in December. Ghosh served as the Chairman of the subcommittee on "Industries Connected with Scientific Instruments" and wrote an exhaustive report to develop scientific instruments in India.

Chapter 8 "Concluding Remarks" sums up his personal achievements: "Ghosh was gifted with a sharp intellect and a natural aptitude for technology—qualities that defined his career and accomplishments. His passion for these fields led him to establish the first Applied Physics Department in India, a groundbreaking achievement at that time". He was an innovator, institute builder, skilled administrator, who significantly influenced the policies of the Department of Industries, Government of Bengal. Ghosh guided 17 Ph.D. students, collaborated with 15 scientists and published 43 papers in high impact journals. His legacy of creating Applied Physics department in Calcutta University has been kept intact by installing his bust at the University of Calcutta.

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