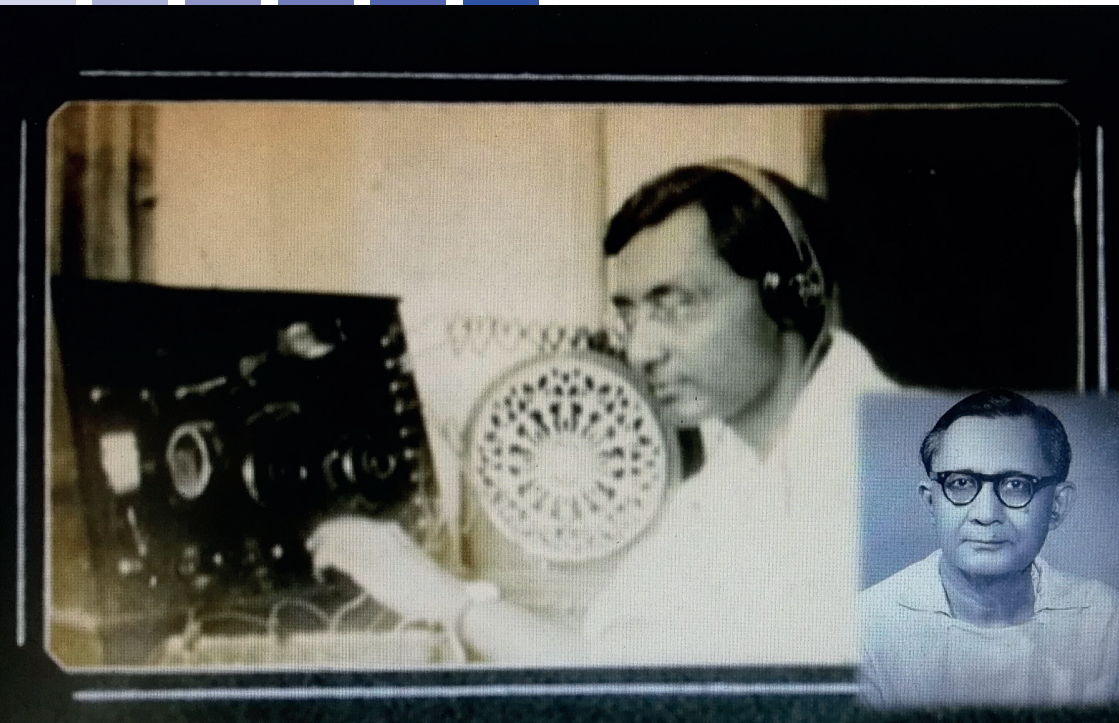
S.R. Khastgir – A Pioneer of Radio Physics and Atmospherics

RAJINDER SINGH



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Preface

While writing *The Dazzling Dawn - Physics Department of Calcutta University (1916-36)*, G. Gangopadhyay, A. Kundu, R. Singh, Shaker Publisher, Düren 2021, I came across the name Satis Ranjan Khastgir (abbreviated as SRK in the book). According to the documents of the University of Calcutta, young Satis Ranjan, from the laboratory of the Nobel Laureate C.G. Barkla, applied for a Research Scholarship. His application was declined. Later, I read an article by Brian Wynne, "Between orthodoxy and oblivion: The normalisation of deviance in science", *The Sociological Review* 27, 67-84, 1979 which deals with the controversy between A.H. Compton and C.G. Barkla, on the quantum nature of light. The article aroused my interest in the person 'Khastgir', who had worked in Barkla's laboratory during the 'critical' period of the controversy. I wanted to know – what was the role played by Khastgir in the controversy, and what did he do in his life? I started collecting information on his life, but with very limited success. However, I was able to obtain his PhD and DSc theses, which he had written under C.G. Barkla at the University of Edinburgh. His life story fitted my research project 'India's lesser known, though equally important, scientists.' Based on these reasons, I came to the idea of writing this book.

Remarks

Each publisher and journal have their own style of "Notes and References". Due to technical reasons, I have developed 'my own style', which might not fit to the taste of others.

Under "Notes and References", the dates given for websites are dates of retrieving them from the internet.

Acknowledgements

I am thankful to Prof. Suprakash C. Roy, former Editor-in-Chief of *Science and Culture* for sharing some articles. Heartily, I acknowledge

S.C. Roy and his wife Sujata Roy's effort in improving upon the language of the text.

Thanks are due to Prof. Arnab Rai Choudhuri, IIS Bangalore for sending information on the history of Banaras Hindu University. I thank Dr. Manoranjan Rao, one of the students of S.R. Khastgir, for sharing his thoughts about his teacher and writing the 'Foreword'.

Prof. Gautam Gangopadhyay, General Secretary of Bangiya Bijnan Parishad, Kolkata is thanked for sending information regarding S.R. Khastgir's activities in the Parishad.

Thanks are also due to S.R. Khastgir's granddaughters Rosinka (Rinka) Chaudhuri and Priyanka Khastgir for providing important information and some photographs.

I am greatly thankful to the workers of the Greek restaurant Santorini: Mayer Yalak, Serhat Oba, Susi Oba, Aram Yussef, Nienke Bloy, Shilan Hori, Mikail Yalak and Laila Sulaiman for providing an inspiring atmosphere.

I thank my wife (Birgit Krah) and children (Amer Simone and Hira Michael) for moral support. It is my pleasure to acknowledge the support of my colleagues Prof. Michael Komorek, Dr. Falk Riess, Dr. Kai Bliesmer, Dr. Christin Sajon, Dr. Chistiane Richter, Anatasia Striligka, Jonas Tischer and Jana D. Schmitz, Research Group – Physics Education and Public Understanding of Science, Physics Institute, University of Oldenburg, Germany for research facilities.

I also thank my colleagues Petra Raue, Aleksandra Bartels, and Simone Treunert, Heads of 'Grund- und Oberschule' Syke, for helping me in one way or other.

Last but not the least, I thank Ms. Heike Jansen, Shaker Publisher Düren for publishing this book.

Foreword

I never knew Dr. Rajinder Singh till I received a mail from him on April 16, 2022, in which he said he wanted to write a biography of my teacher and my doctoral guide, the late Prof. S.R. Khastgir. I first thought this was Dr. R.N. Singh who was also a doctoral student of Prof. Khastgir in the Banaras Hindu University (BHU). But no, Dr. Rajinder Singh is different!

I thought that Dr. Rajinder Singh was embarking on a futile project because most of the people who did their doctoral studies under Prof. Khastgir are no longer with us. As far as I know, only two of us, I and Dr. Suman Ganguly (now in the USA), are the surviving members!! Dr. Rajinder Singh is an exceptional researcher. He could dig deep into any archives available anywhere in the world.

Singh has discussed in detail all about research done by Khastgir under C.G. Barkla, the Nobel Laureate during 1920s − a period considered as the Golden Era of Physics. It was Barkla who proved through his polarisation experiments that X-radiation was part of the electromagnetic spectrum which meant that X-rays were waves. Soon enough, A.H. Compton in the USA showed that X-rays behaved like particles. This was difficult for Barkla to swallow. Barkla thought he discovered a new radiation for which he gave the name J-transformation. With hindsight we can see where Barkla went wrong but we must remember that in those days the dual nature of all elementary particles was yet to be accepted universally. Barkla stuck to his guns and so did his doctoral scholars, including Khastgir.

Around 1930s when Khastgir returned to India, he joined the Dhaka (Dacca) University (now in Bangladesh) where S.N. Bose, the famous discoverer of Bose-Einstein statistics was the Head of the Physics Department. There Khastgir switched over to radio physics and atmospherics. Beside radio physics and atmospherics, Khastgir & co did some experiments in measuring dielectric constants of various materials.

Khastgir pursued research in the ionospheric and atmospheric physics even after he left the Dhaka University to join the BHU. Indeed, he continued to study these two subjects till the very end of his life! Thus in 1970, just two years before his death in Santiniketan (West Bengal) he wrote me a letter in which he discussed his new ideas about the leader stroke of a lightning discharge. While I was doing my Masters in BHU, I met some of the scholars doing their doctoral research under Khastgir. These were: R.N. Singh, B.A.P. Tantry, R.S. Srivastava, Y.S.N. Murthy *et al.*

In 1958 Khastgir moved from BHU to the Calcutta University where he was the Professor and Head of the Department of Physics and Dean of Faculty of Science. In the early 1960s I joined him as the Khaira Scholar in the University College of Science, Calcutta to start my studies in atmospherics and lightning discharge. At that time my colleague was H. Bhattacharya who, I am sorry to say, is no more. Some interesting details of the happenings at the College of Science, Calcutta University can be found in this book.

After he retired from the Calcutta University, Khastgir joined the Bose Institute (named after the famous discoverer of microwaves, Jagadish Chandra Bose). Bhattacharya and I moved along with him. The Bose Institute is next door to the University College of Science. Khastgir was appointed as the Professor and Head of the Physics Department at the Bose Institute. Both Bhattacharya and I obtained our D.Phil. degrees of the Calcutta University while we were at the Bose Institute. Our main work consisted of the waveforms of atmospherics, computation of the waveforms after multiple reflections from the ionosphere, VLF (very low frequency) and ELF (extremely low frequency) radiation emitted by the lightning discharges, theoretical model of the C-field change in atmospheric waveforms, propagation of VLF waves, etc.

Suman Ganguly, exceptionally good at rigging up complicated electronic circuitry, also worked under Khastgir on ionospheric absorption of radio waves at the Bose Institute. He also got his D.Phil. degree as a student of Khastgir. Ganguly is now in the USA, running his own company.

Khastgir retired from the Bose Institute to settle down at the Santiniketan where he continued his work till the very end. R. Singh deals with Khastgir's work at the Bose Institute and Visva-Bharati (Santiniketan).

Dr. Singh writes about the so-called h-index as a means of evaluating a scientist's work. I agree with the author's view that h-index is not a reliable tool to judge the worth of a scientist. Even so, Dr. Singh has unearthed a remarkable amount of information on this aspect Khastgir's work.

In the concluding Chapter in this book, we are reminded that while recounting the recent advances made by India in radio science, ionospheric and atmospheric physics and allied fields, we should remember that the journey began with the work done by S.K. Mitra, S.R. Khastgir, *et al.* The book ends with the hope that the young generation of scientists would take the trouble to bring to light those scientists who, though not very famous, did pioneering work during their times.

I personally congratulate Dr. Rajinder Singh for doing just that in the case of Professor Satish Ranjan Khastgir, my teacher and *guru*. I am grateful to Dr. Rajinder Singh for perpetuating the memory of Professor Satish Ranjan Khastgir through this book.

Dr. P.V. Manoranjan Rao
Thiruvananthapuram, India
May 25, 2022.

About the author

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Dr. Rajinder Singh is: Member of Editorial Team: *Sci. Cult.*, Kolkata (Indian Science News Association), and *Scientific Voyage*, Kolkata.

Dr. Rajinder Singh has written more than 140 articles and the following books:

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