

**RAJINDER SINGH & SUPRAKASH C. ROY**

**CLAY, CRAFT, MUSIC AND  
SCIENCE: PURNIMA SINHA'S LIFE**



**FOREWORD BY PROF. CHANDRIMA SHAHA  
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Purnima Sinha's Life**

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# Clay, Craft, Music and Science: Purnima Sinha's Life

## Contents

Preface .....	v
Acknowledgements .....	vii
Foreword.....	ix
About the Authors .....	xiii
Introduction.....	1
Chapter 1: Some Aspects of Purnima Sen-Gupta's/Sinha's Life .....	7
Acoustic and Biophysics Research in the U.S.A.....	9
Sinhas at the Visva-Bharati.....	11
International Guests at the Visva-Bharati.....	15
Purnima Sinha- An Artist .....	17
P. Sinha as Translator and Writer.....	19
Chapter 2: Study of Clays and Clay Minerals.....	23
Importance of Clay – A Historical Background .....	23
Purnima Sinha's Doctoral Thesis.....	24
X-Ray Diffraction (XRD) Method.....	25
Differential Thermal Analysis (DTA) Method.....	28
Base-Exchange Capacity Measurement .....	30
Chemical Analysis .....	31
Investigation of Montmorillonite Group.....	32
Study of Bentonites.....	33

Study of Vermiculite, Chlorite and Mica .....	39
Study of Illite .....	47
Kaolinite Investigated .....	48
Chapter 3: Research Work on Montmorillonites, Ceramics, Spinel and Panchmura Clay .....	55
Articles Based on Doctoral Thesis .....	55
Indian Montmorillonites .....	55
Vermiculites and Exothermic Peak in the Differential Thermal Curves .....	56
X-ray- and DTA Analysis of Some Indian Montmorillonites .....	57
A Review of the Classification of Ceramic Pigments .....	58
Study of Spinel.....	58
Properties of Panchmura Clay .....	60
Two Scientific Articles in Bengali.....	62
Chapter 4: Research on Music .....	65
Lectures at the University of Chicago.....	66
Categorizing the Songs of Tagore .....	76
Recognition of Sinha's Musical Work.....	76
Chapter 5: P. Sinha, S.N. Bose, and P. Dirac Interactions .....	81
P. Dirac and his Indian Connections.....	81
Paul and Margit Dirac in Kolkata.....	83
Connections with Dirac Family .....	89
Chapter 6: A Critical Observer and Translator.....	99
Science, Children's Education and Social Hindrances.....	99

Science Community of Calcutta.....	102
Pure Physics Department and Lack of Research Facilities .....	102
Summary of P. Sinha's Books.....	109
"Unravelling DNA" .....	109
E. Schrödinger's – "Mind and Matter" ("Mon O Jodobostu") .	111
S.N. Bose's Biographies in Bengali.....	113
Chapter 7: Conclusion .....	117
Chapter 8: Purnima Sinha - List of Publications.....	121
Scientific Papers – Clays and Clay Minerals.....	121
Scientific Papers - Music .....	122
General Articles.....	122
Books.....	123
Bibliography.....	125
Index.....	135



## Preface

The idea of writing a book on Purnima Sinha came to our mind soon after writing the book “A Jewel Unearthed: Bibha Chowdhuri - The Story of an Indian Woman Scientist”. Purnima Sinha was the first woman who did her Ph.D. in Physics from Calcutta University. She was one of the very few students of Professor Satyendra Nath Bose who did her Ph.D. under his supervision.

The idea matured when one of the authors (S.C. Roy) accidentally met P. Sinha's daughter Prof. Sukanya Sinha at Bose Institute, Kolkata on 26 November 2018 evening during the D.M. Bose Memorial Lecture in which Roy was the Chairman. The assurance received from Sukanya to provide us all the help needed in connection with the book gave us an impetus to move forward. The help received from Sukanya and subsequently from Purnima Sinha's younger daughter Supurna was extraordinary. We started working on this book to demonstrate to the world the achievements of a woman scientist in India in an era when very few women ventured for higher studies in science and that too in Physics.

Although the focus of the book is on the scientific contributions of Purnima Sinha as a research student and a scientist, we could not ignore highlighting her demonstrated skills in other areas of arts and music. In fact, in our opinion, her excellence in arts, music, painting etc. far supersedes her achievements in science. She was a multi-talented lady.

This book is not an exhaustive exposition of her various skills but readers will find some examples of her talents in the book. She was a litterateur who published several books in Bengali and English. She translated into Bengali the excellent book on genetics titled “Unravelling DNA: Most Important Molecule of Life” written by Maxim D. F. Kamenetskii at an advanced age out of her own urge. It is quite unfortunate that although the translation was almost ready for publication, it did not see the light of the day.



She came in contact with P.A.M. Dirac, who shared the Nobel Prize with Erwin Schrodinger in 1933, during his visit to Calcutta in 1954 when Sinha was a Ph.D. student under Satyendra Nath Bose. The narrative of Dirac's visit to Calcutta as noted in her diary is an excellent exposition of the interrelationship between theoretical physicists of Calcutta at that time. We could not resist the urge to publish the English translation of the document in full written in Bengali for the benefit of general readers as an Appendix. Sinha maintained contact with Dirac and his family till her very end.

She had an analytical mind to assess various societal issues hindering the development of Indian society. Her article titled "Social obstacles to science in India" published in *Science and Culture* expresses her ability to analyze and present her candid opinion boldly. She argued that the scientific output from a devout Christian or from an atheist is the same and therefore religion does not play any role in scientific output. She found American scientists who believe in the Book of Genesis synthesizing protein in the laboratory with equal sincerity. She was convinced that believing in Vedanta or Hindu religion is not the real problem of sluggishness of development of science in India; it was due to inadequate research facilities (equipment) and lack of cooperation between the scientists.

The book that you are holding in your hand today is the product of her daughters' dedication, love and passion for their mother coupled with our effort and reverence. While analysing the documents we have tried to remain objective as far as possible. If we have failed anywhere in this endeavour, that is purely unintentional. We will be happy if the readers find the book useful.

Rajinder Singh  
Suprakash C. Roy

## Acknowledgements

We are grateful to Professors Sukanya Sinha and Supurna Sinha for sending us: Doctoral thesis, Dirac-Sinha correspondence, and Sinha's Bengali document. We are thankful that they allowed us to reproduce family photographs.

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With pleasure, we acknowledge the help received from Dr. K. Muraleedharan, Director, Central Glass and Ceramic Research Institute (CSIR-CGCRI), Dr. Sitendu Mandal, Chief Scientist and Dr. Chandana Patra, Principal Technical Officer, Knowledge Resource Centre of the same institute for providing various information and documents from time to time.

One of the authors (S.C. Roy) thanks his wife Sujata for the arduous task of reading the manuscript patiently, for corrections, suggestions and discussions to improve upon the manuscript, in addition to providing moral support all through. Thanks are also due to her for translating Bengali documents into English.

One of us (R. Singh) thanks Prof. Dr. Michael Komorek, Head – Physics Didactic and Science Communication, University of Oldenburg, Germany, for providing research facilities. Thanks are due to my wife Birgit Krah, children Amer Simone and Hira Michael and my brothers and sisters in India for moral support. I appreciate the help of Ms. Petra Raue and Ms. Simone Treunert Head "Grund- und Oberschule", Syke for assisting me by one way or other.

We remain grateful to Dr. Chandrima Shaha, Professor Emeritus at the Indian Institute of Immunology, Delhi and the first woman

President-elect of Indian National Science Academy (INSA) for agreeing to our request to write the “Foreword” of this book.

Last but not the least, we thank Mrs. Kristina Ladwig and Shaker Publisher Dueren for publishing the present book.

## Foreword

It is hard to narrate history of those scientists who were not positioned among the higher echelons, but it is definitely more challenging and educational to take on such a task. The authors of this book, Dr. Rajinder Singh and Prof. Suprakash Chandra Roy, who have taken up the task of chronicling the journey of Dr. Purnima Sinha, an accomplished physicist, needs to be congratulated as this work details a missing chapter in history of science in India. In remembering Dr. Sinha today, we need to acknowledge the struggle and determination that all such beginnings must have involved. This book is dedicated to an exceptional individual whose life serves as an elegant example for generations of scientists to come and also as an inspiring biography for other members of the society as well.

Curiosity drives the thirst for learning and a lot depends on the attitude of an individual on the subject he or she chooses to study. Dr. Purnima Sinha chose to study Physics in the mid 1940s when virtually no women students were interested in the subject and it was an all-male domain. Her decision to choose physics as a subject was a break from tradition as no woman had a doctoral degree in physics from Calcutta University at that time. She was perhaps driven by the thought of physics as the subject central to understanding the natural world. In many ways, Dr. Sinha was a unique personality in post independent India who grew up during turbulent times when the country was trying to gain independence and no doubt that deep nationalist sentiments would have influenced her substantially. She persisted with physics to claim her own professional space in her own right. It is indeed regrettable that she never featured in the National mainstream in her lifetime despite being an outstanding figure of her generation. A protégé of the famous physicist Prof. Satyendranath Bose, Dr. Sinha not only did excellent science but displayed her creative talents as an artist, writer and musician.

It was a time when science laboratories in India were being built after independence in the early 50's when Dr. Sinha started her

doctoral work with Prof. S.N. Bose, Khaira Professor of Physics at the Calcutta University and the Dean of Faculty of Sciences. His laboratory known as Khaira laboratory was studying crystal structures using x-ray crystallography and was a great place for enthusiastic young scientists. In her own recollections, Dr. Sinha fondly remembered the time spent at Dr. Bose's laboratory where there was enormous excitement centering on the X-ray analysis of various samples.

An inborn innovator, Dr. Sinha, fabricated instruments for her own doctoral research. She built her own x-ray laboratory apparatus from scraps of World War II surplus. This ability to make one's own instrument is difficult to achieve even today and marks the extraordinary ability of a scientist in the early 50's who happened to be a woman, to design and make her own instruments to carry on research. The deep interest in making her own instruments perhaps originated from her strong nationalist feeling of making something of her own in independent India rather than procuring it from elsewhere in the world. Working on 'clays', she investigated 50 samples of clay, a work that culminated in a paper published in 'Nature' on the study of Indian montmorillonite samples from Kashmir, Nimlinadi and Barne and black cotton soils from Satara and Indore. She used X-ray diffraction and differential thermal methods for this study. Dr. Sinha received her D. Phil in 1956 from Calcutta University, being the first woman in doing so. Her work on clay is extensively discussed in this book.

Having completed her doctoral studies, she spent a postdoctoral stint at the Stanford University working on Biophysical problems. On her return to India, she spent time at several National laboratories. Dr. Sinha had life-long connection with Paul Dirac and his family. Dirac, who made fundamental contributions to both quantum mechanics and quantum electrodynamics and is considered as one of the most prominent physicists of the 20<sup>th</sup> Century, must have had substantial influence on Dr. Sinha's thought processes. Dr. Sinha was very versatile and multitalented in several fields of human explorations. This book captures essential phases of her personal life that would have shaped her growth both as a scientist and as a writer and a musician. In the backdrop of

prevailing social status of women in the late 40s, her out of the ordinary desire to study physics was complemented by her unusual choice of learning a percussion instrument, the Tabla from Pandit Jnan Prakash Ghosh. Not only did she played the Tabla, but her well rounded interest in music led her to learn Hindusthani classical music as well. She authored books on music and also translated important books like Erwin Schrodinger's 'Mind and Matter' into Bengali. She must have inherited the interest to write from her father Dr. Naresh Chandra Sengupta who studied the social and legal structures of the ancient Indian civilization and was a substantial contributor to the Bengali literature during the early 1920s. A section of this book is dedicated to the writings of Dr. Sinha.

The two authors of the book are experts in the history of Indian Science. Prof. Suprakash C. Roy is a physicist who retired as Professor and Chairman of the Department of Physics at Bose Institute, Kolkata has published several books and he is currently a member of the National Commission of History of Science, Indian National Science Academy and has been the Editor-in-Chief of the journal *Science and Culture* for more than 15 years. Dr. Rajinder Singh has a great passion for doing research on the history of Indian Science and has more than 25 books to his credit touching upon the lives of many Indian Scientists.

It is always hard to develop biographies where materials are few. I appreciate the herculean effort of both the authors for bringing out an exceptional chronicle of an extraordinary woman that many Indians are not aware of.

Prof. Dr. Chandrima Shaha  
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1. Nobel Laureate C.V. Raman's Work on Light Scattering, Logos Publisher, Berlin 2004.
2. Nobel Laureate C.V. Raman's Science, Philosophy and Religion, Dharmaram Publications, Bangalore 2005.
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published by the Indian Science News Association and co-authored the following three books with Rajinder Singh: 1. 'DM Bose—A Scientist Incognito' published by Bose Institute, Kolkata 2. 'A Jewel Unearthed: Bibha Chowdhuri' published by Shaker Verlag Aachen. 3. 'D.M. Bose - His Life, Science and Connection with Global Elites', Shaker Publisher Dueren, Germany.