Preface

This book is the outcome of a science elective course offered at Indian Institute of Technology Kanpur by me along with another colleague of mine. The course used to cover both classical and quantum mechanics, but in this volume, only the classical part is being covered and the other part is expected to be penned down by my colleague. However, the motivation to design and offer a course on 'Conceptual Evolution of Mechanics' germinated from an interesting episode in the early life of the author of this volume. It may not be out of place to give a brief account of that here.

I was very fond of egg curry from my childhood, but my mother never gave me more than one egg at a time fearing it could cause stomach problems for me. As a young boy, I used to think that when I grow up and become independent, I would take as many eggs at a time as I pleased. Long after those childhood days, suddenly an opportunity came. I had a combined hand who used to do all cooking and other household chores for me during the last years of the 1960s when I was a young faculty at Bengal Engineering College, Shibpur, Howrah. In December 1970, when I decided to change over to IIT Kanpur, I had sent my combined hand to my native home 260 km away to take household belongings there. My wife was also there as my son was too young to undergo the problems of transferring residence to a faraway city. I was alone, and suddenly it comes to my mind the old desire of consuming as many eggs as I wanted. I had never learned cooking but prepared an egg curry with three eggs following whatever steps came to my mind. To my utter surprise, I could not eat the curry as it tasted horribly awesome. I realized that though I ate and digested (and enjoyed too) egg curry so much during the previous 25 years of my life, I did not know how to cook egg curry. This event gave me a realization that we teach our students only cooked science. As a result, it becomes difficult for them to create new science. From that time, I planned to design a course in which the students of mechanics can become familiar with the evolutionary process through which the science of motion developed and achieved maturity. Mechanics being a very basic subject and fundamental to many branches of physical science and engineering, I considered this subject to be the most suited for my experiment.

It should be noted that the 'conceptual evolution' is somewhat different from the 'history'. There are excellent books on history of mechanics. It is also not a textbook on mechanics. I have tried to emphasize the process through which the basic concepts evolved, transformed and led to the consolidation of the scientific principles involved. The course at IIT Kanpur was offered with a hope to give the students some taste of the process through which science is created. It was hoped that the effort would be somewhat useful in enabling the students to create new science when the occasion arises. As a secondary outcome, the course helped to remove many incorrect impressions about some major scientific discoveries in the field of mechanics.

Quite naturally, the major emphasis has been given on the development of Newtonian mechanics as that is considered as one of the starting points of modern science. The chapters on relativistic mechanics are much shorter as the evolutionary processes for the two theories were confined to a much smaller extent of 'space–time', to use a relativity terminology. The

period of their development was only a couple of decades and involved a much smaller group, Einstein occupying the predominant place.

While leaving IIT Kanpur, I was requested by many of my colleagues to compile a book using the material used by me in the part of the course I developed for the use by younger faculty members desirous of offering similar courses. Realizing the desirability of their suggestion, I planned this book. It is only the students of the subject can decide if I have been successful (at least partially) in my original endeavour. If this book is used for offering similar courses, it will be my greatest satisfaction. It goes without saying that there are many short coming and mistakes in this book and I will remain perpetually grateful for suggestions and corrections.

It has taken a long time in writing this book, and I gratefully acknowledge the help and suggestions I received from my students and faculty colleagues of IIT Kanpur. Professors Ashok Kumar Mallik, Pinaki Guptabhaya, Raminder Singh, H.S. Mani and Late Himanshu Hatwal are the most prominent among them. I also gratefully acknowledge the kind help and encouragement received from Professor E.C.G. Sudarshan of University of Texas at Austin. I also acknowledge the help received from the Physics Department of UT Austin by giving me free access to the library. It would not have been possible to complete the book without the active support from my wife Meena who took the whole burden of running the household with negative help from my side. I also gratefully acknowledge the help from my sister-in-law Sabita Ghosh of Asansol for providing me the necessary refuge at her home that gave me free and undisturbed time required to finish the work. The financial support from Indian National Science Academy, New Delhi, and National Academy of Sciences, Allahabad, India, during the period when the book was being written is thankfully acknowledged. The enthusiasm shown by Ms. Swati Mehershi of Springer in publishing the manuscript and the careful typing of the handwritten manuscript by Mr. Sourav Kundu also deserve my sincere thanks.

The preparation of the manuscript had many interruptions, and it has taken almost nine years to complete the book. I will remain grateful to the readers for their suggestions for further improvement of the book.

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