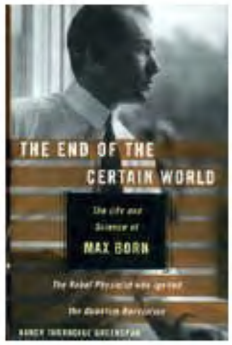


**The End of the Certain World – The Life and Science of Max Born – The Nobel Physicist Who Ignited The Quantum Revolution.** Nancy Thorndike Greenspan. John Wiley, The Atrium, Southern Gate, Chichester, England. 2005. 374 pp. ISBN 0-470-85663-7 (HB).

Nancy T. Greenspan is the first author to write a detailed biography of Max Born – the man to coin the term quantum mechanics and one of its founders.

The biography contains 14 chapters, Introduction, Prologue and Epilogue. The chapters are subdivided, but they do not have subtitles. The major topics dealt with are: Born's social, scientific and private life, reception of scientific work, scientific controversies and the story of his Nobel Prize.

With the example of Max Born's family, the author gives a glimpse of the social life of the Jewish community in Europe. Readers learn that discrimination of the community had a long tradition. It was exploited by the Nazis for their political objectives. In order to appease Germans, many Jews (including Max Born) actively supported the First World War, but the situation did not turn in their favour during National Socialism.

Born was known to be a pacifist. At a first glance, it appears as a paradox, when one reads that during the Second World War, he had the idea to design unmanned air-torpedos. He did not get the chance to materialize his idea as the British Government's regulations specified that researchers had to be British-born (p. 228). With Born's example, the biographer illustrates the dilemma of a pacifist scientist, who was confronted between an ideology and the sheer brutality of the Nazi regime. In the end, Born was left with no other choice but to combat with weapons.

Born, who was advised by his father to take up interdisciplinary studies, had to face difficulties in his career. During his studies in Göttingen, he was declared by the mathematician Felix Klein and physicist Max Abraham, as a person with scant knowledge of mathematics and physics respectively. Even Albert Einstein found a lack of physical concepts in Born's work. Later theoretical physicists, in particular Wolfgang Pauli, criticized his research style. Greenspan shows that the criticism was more for mathematical formalism than the physical aspect in Born's works. The conclusion is a reconfirmation of previous studies, which escaped her attention[1,2].

There cannot be a biography of Born without the mention of his stay in India. Greenspan throws new light on the issue. We also learn that under different circumstances, Born's son and nephew also came to India. As mentioned in Born's autobiography, he was told by C. V. Raman that due to the former, the latter had lost the Directorship of the Indian Institute of Science, Bangalore. Greenspan did not countercheck the statement. From the published literature we know that the resignation had nothing to do with Born's stay in India[3]. The famous Born–Raman lattice dynamics controversy is also mentioned in the biography. Unfortunately, the existing literature on the topic has been ignored[4,5].

In the present book, Max Born's wife Hedi plays a central role. Contrary to early existing information, Max and Hedi were an odd couple. Hedi felt neglected as Max was obsessed with his physics. She was forced to live a lonely life. For compensation, she sought the company of Gustav Herglotz, a mathematician in Göttingen. In India, she communicated with Swami Avinasananda of the Ramakrishna Mission in Bangalore. The contact continued even after her return to Edinburgh. She wanted to leave Born to stay forever in India. Hedi is depicted as an uncomfortable wife and a mother who did not give 'nest warmth' to her children (p. 156). Even in the last chapter we notice 'Hedi would not allow other family members to participate in their father receiving the Nobel Prize' (p. 299). Throughout the book, Hedi has been presented as the 'black sheep' in the family, with Born and the children as her 'victims'. Greenspan does not trace the roots of Hedi's 'cold behaviour' towards her children.

The last chapter 'A trip to Stockholm', presents the inner conflict of a scientist fleeing Germany during the Nazi regime and decides to come back after the war. In particular, Albert Einstein was critical of Born's return. Born was pragmatic. He thought of financial benefits as well as a private life to appease his wife, while she was of the opinion that her husband in the past had never given a thought to her needs.

In 1954, Born got the Nobel Prize. At the early stage, i.e. in the 1930s, his negligence by the Nobel Committee was because of opposition by one of its members. It would have been interesting to find out why Born did not get support like Werner Heisenberg and Erwin Schrödinger, who were awarded the physics Nobel Prize in 1932 and 1933 respectively. In the 1950s, Born's main supporters were Max von Laue and Enrico Fermi. Often Born was a nominator. In 1944, he told Otto Stern that '... you have been my first candidate every time I have been asked by the Nobel Committee...' (p. 252). Unfortunately, Greenspan does not reconfirm the statement. The fact is, that for the Nobel Prize in 1919, Born nominated Max Planck for the first time (Born to Nobel Committee, letter dated 20 November 1918). The next time in 1927, Born (jointly with James Franck) was of the opinion that either A. H. Compton from Chicago should get the Prize or it should be given to Otto Stern and Walter Gerlach (Born and Franck, letter dated 18 January 1927).

It is well known to historians that it is extremely difficult to write an objective biography when the documents are in private hands. One has to take care of the sentiments of family members. Greenspan has made the best use of the circumstances and remained objective as far as possible. At some places the reader gets the impression that whenever there are criticisms against Max Born, the relevant information is either 'lost' or 'forgotten'. For instance, Pauli had criticized Born that he would spoil Heisenberg's physical ideas with futile mathematics. Born's response, if he made one, is lost (p. 126). Similarly on p. 140: '*In a letter lost and forgotten, except in Born's memory, Heisenberg called him a "traitor" to quantum mechanics because Born had used Schrödinger's wave equation in his analysis*'. At another instance, Born's wish to participate in war efforts has been discussed. We note: 'Lindemann's response is lost, but the British did not use Born's idea' (p. 232).

In spite of my criticism on some issues, Greenspan's book is indispensable to historians of science. That she has managed to arrange 'Born's archive' at the American Institute of Physics is laudable. For future work, it will be a major source of information for other historians and scientists. It is a matter of personal taste, but I still emphasize that the best point in the biography is that the wife of a physicist is 'allowed to speak' – a new trend in the history of science.

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4. Venkataraman, G., *Journey into Light: Life and Science of C. V. Raman*, Penguin Books India (P) Ltd, New Delhi, 1994, pp. 383–404.
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**Monte Carlo Methods in Statistical Physics.** K. P. N. Murthy, Universities Press, 3-5-819 Hyderguda, Hyderabad 500 029. 2004. 128 pp. Price: Rs 195.

The number of books on scientific and technical topics published in India per year is quite small, if we exclude the routine reprints of standard textbooks and consider books above the popular science level. Thus, this book by K. P. N. Murthy, is welcome. May this tribe increase.

In the preface, the author says that he hopes that that the book will be 'a useful addition to the bookshelves of researchers and students'. Note that researchers come before students. The book is intended as a reference book for researchers, and the style is more like that of a handbook, rather than a textbook. For the younger readers, who have never seen a handbook, it is a concise reference book covering a particular subject. These were quite popular in the earlier parts of the previous century, but the rapid growth of knowledge has made this genre a bit old-fashioned. A rather well-known series called *Handbuch der Physik*, published by Springer Verlag during 1955–84, ran into 55 volumes. Hardly a handbook. Of course, the rate of growth is even larger now. I am old-fashioned, not the type who would welcome the idea that soon we would be able to get a 'thumb-drive of physics' with many gigabytes of uncompressed information. So, a short monograph that can give the reader basic knowledge of a subject in a hundred or so pages, is welcome.

Even though the author seems to assume that the reader is already familiar with notions like ensembles, microstates, etc., the first section is devoted to a brief recapitulation of these ideas. The Monte Carlo method is a label used nowadays for any algorithm to simulate the behaviour of a system that makes use of random numbers. There is a discussion of different ways of generating pseudo-random numbers in a computer, and also how to test if a random number generator is satisfactory. Most of the random number generators give random numbers that are uniformly distributed between 0 and 1. If one wants a number that has, say, a Gaussian distribution, one has to make a change of variables. The book discusses some of these techniques. This is followed by a discussion of importance sampling, and Markov chains. The Metropolis algorithm for generating a sample with distribution given by the Maxwell–Boltzmann ensemble, and the crucial question of estimating errors in the calculated results are discussed.

The book does not deal with the Monte Carlo method only as a technique. There is a fairly extensive discussion of what kind of knowledge about behaviour of physical systems, modelled as systems in thermal equilibrium, can be obtained from Monte Carlo studies. So, there is discussion of critical phenomena, Ising systems, and how finite-size scaling techniques are used to extrapolate the results of finite-sized samples on the computer to much bigger systems of physical interest. There is a fair amount of discussion of estimating properties of clusters, in percolation, and in systems near phase transition, etc. The Hoshen–Kopelman algorithm for efficiently collecting the statistics about sizes of different clusters in a given multicluster system is discussed. Divergence of relaxation times near phase transitions, and the Swendson–Wang algorithm for updating clusters that reduce this difficulty are discussed. Other techniques that reduce computer time for Monte Carlo simulations, like histogram technique and multi-canonical sampling methods are discussed briefly.

The present book assumes some familiarity with the basic ideas of statistical mechanics on the part of the reader. For example, the book opens with 'A macroscopic system consists of a very large number of microscopic constituents'. This is a simple observation, but only if one is already familiar with the meanings of the various four-syllable words. A student wanting to learn about the subject for the first time would be better-off reading from a book that is not so terse. For example, there are well-known monographs on Monte Carlo methods by Binder and a more recent one by Newman and Barkema. On the other hand, a research scholar, who is working in this subject, but wants to know quickly what the histogram method is, would certainly find this book useful. Even for students, the price of this book makes it much more affordable than the others.

The choice of topics covered is, of course, determined by the interests and expertise of the author. Even so, I think that the different algorithms for constructing, counting and updating random clusters take a larger part of the book than justified. Some discussion of application of Monte Carlo methods to the study of problems in biology, or chemistry (conformations of biopolymers or determining rates of chemical reactions), or astrophysics, etc. would have made the book more useful to a wider readership. Or perhaps even more exotic applications, like simulations of a cricket match or the stock market could have been discussed. In the end, the author discusses the Jarzynski equality, an important recent advance in non-equilibrium statistical physics. However, this topic is rather disconnected with the rest of the book, as there is no discussion of non-equilibrium systems in the book.

Given the nature of the book, philosophical issues about the conceptual foundations of statistical mechanics are not discussed. For example, about the ergodicity hypothesis, the book has only this to say in a footnote on page 3: 'This is an axiom; the entire edifice of statistical mechanics is built on this axiom'. It would have been better if such an impor-