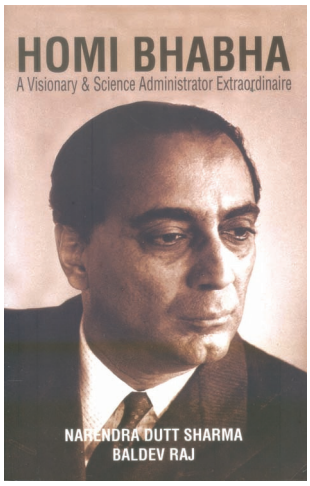


Homi Bhabha: A Visionary & Science Administrator Extraordinaire. Narendra Dutt Sharma and Baldev Raj. Vigyan Prasar, Department of Science and Technology, A-50, Institutional Area, Sector-62, Noida 201 309, UP. 2019. xvi + 135 pages. Price: Rs 250.

The idea of writing this book was conceived by Narendra Dutt Sharma (NDS) and Baldev Raj (BR) after both of them had superannuated from the Department of Atomic Energy (DAE), a few years after the commemoration of the Birth Centenary year of Homi Bhabha in 2009. They were very familiar with the mechanism of functioning of the DAE in minute details and also had access to the original files of early correspondence between Dr Homi Bhabha and Prime Minister (PM) Nehru, when the DAE was being set up and the Training School (TS) was being operationalized at the Atomic Energy Establishment, Trombay (AEET). G. Venkataraman, the author of the 1994 book *Bhabha and his Magnificent Obsessions* had stated on the occasion of Founder's Day celebration of BARC that '*a visionary does not merely dream but strives hard to transform dreams into reality*'. He had further surmised that 'the TS of AEET is regarded as one of the greatest contributions of Homi Bhabha as it enabled training of thousands of Engineering and Science graduates', who were full of self-confidence as they enrolled into TS. 'Such trainees got networked together from a young age, they were welded together to the organization(s) for life time of their careers to deliver'. The book under review elucidates the above in fair detail.

Late B. V. Sreekantan, has attested in the foreword of the book to the accuracy of the description of Bhabha's remarkable success in building an enterprise which serves as a model for other institutions in the country. He is forthright in stating that he was the beneficiary (as Director, TIFR) of wonderful administrative and management practices that Bhabha had introduced in TIFR in parallel to those in AEET. He adds that 'on any issue that cropped up, there was a guiding Office Order, or Standing Order or a memorandum that had been issued by Dr Bhabha'. He continues to surmise that 'the secret behind Dr Bhabha's management skill was the liberal attitude he took in decentralizing authority and power, at the same time defining unambiguously the limits. That gave a sense of responsibility and caution for everyone and improved efficiency at all levels.'

The book under review is a valuable addition to the string of inspiring and informative books on Homi Bhabha, several of them that came out during his Birth Centenary year. The authors acknowledge their familiarity with them. The main focus of the present book has a little overlap with the thrust of those books. I had co-edited (along with Dipan K. Ghosh) one of them, which was titled *Tribute to a Titan*. It comprised assessments from colleagues of Bhabha focusing on his contributions as a theoretical physicist, cosmic-ray researcher, promoter of instrument building culture, initiator of nuclear energy programme and a visionary. In addition, there were personal reminiscences and tributes by colleagues and associates of Homi Bhabha in that edited book. Our book also had reproduced some of the key writings of Bhabha, including a transcript of his last lecture titled 'Science and problems of development', delivered about a fortnight before his unexpected demise on 24 January 1966. Some of the contents of the said book do have an overlap with the material in the book under review. However, the present book brings out new aspects about Bhabha as a Visionary and Science Administrator in a focused manner, which is not in public domain in a comprehensive manner. The draft of the book under review was read through by a contemporary science historian, Rajinder Singh, who has himself written biographies of numerous scientists, several of them known to Bhabha. The book has been edited by Biman Basu of Vigyan Prasar, who had authored the biography of Yash Pal, another student of Homi Bhabha at TIFR. These facts further attest to the merit of the present book.

The book under review comprises three parts: the first part constitutes over 60% of the book, and the second part puts together important office orders and administrative practices initiated by Bhabha in AEET. The last part titled 'Homi Bhabha as an Artist' is a very short description, inserted presumably for the sake of completeness, as without projecting that talent and characteristic of him, a description of him would be considered incomplete. An updated version of a special issue of *MARG* magazine titled 'Homi Bhabha as Artist', first published in November 1968, was reprinted during the birth Centenary year of Homi Bhabha at the initiative of TIFR Endowment Fund in 2009.

Part one has eleven chapters, appropriately titled, and these summarize important parts of Bhabha's life and his contributions in a concise manner. A read through them would refresh a reader about the greatness of the personality Bhabha was. A more inquisitive reader of course is advised to read through the famous biographical account of Bhabha by G. Venkataraman titled *Bhabha and his Magnificent Obsessions*. NDS and BR also acknowledge the said book for arousing their curiosity about exploring more about Bhabha.

The introductory chapter starts by recalling Bhabha's address delivered at the meeting of International Council of Scientific Unions (ICSU) on 7 January 1966. The authors have culled out portions relating to the administration in science from that address titled 'Science and problems of development'. Bhabha, who was nephew of Dorab Tata and whose father had worked for Tata Sons Ltd (chapter 2), was fully aware of the problem of administration in the fields of technology and science in pre-independent India. The colonial Government had not promoted scientific and industrial research in India prior to the acceleration of hostilities in Europe in 1939, which led to the Second World War and its permeation across the world. Bhabha was on a short summer vacation at that time in India and could not return to Cambridge (chapter 4). He had accepted a specially created position of Reader in the Department of Physics of the Indian Institute of Science (IISc), Bangalore. The authors consider this as a blessing in disguise for India.

It is my assessment that the colonial government had encouraged research only in the domain of agriculture from 1906 onwards. After the end of the First World War, young science teachers of Indian origin in the University Departments sought in vain the financial support for scientific and industrial research in 1920s and 1930s.

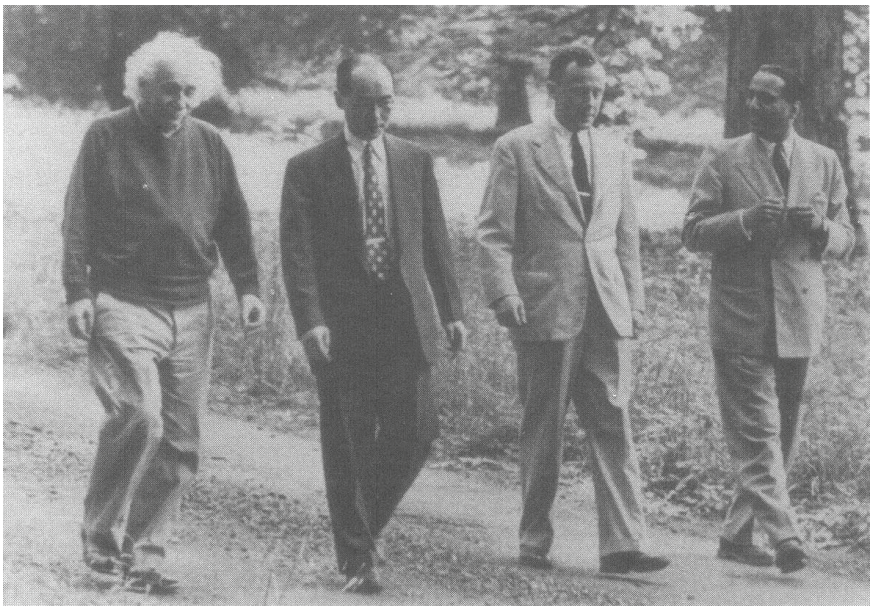
The commencement of the hostilities of the Second World War disrupted the trade between Europe and India, and this prompted the colonial rulers to entice the bright 'native' scientists in the universities of India to engage in research for the military, and to innovate import substitutions for manufactured goods whose supplies had got curtailed. The Council of Scientific and Industrial Research (CSIR) came into being with Shanti Swarup Bhatnagar as its first Director in 1942. Prompted by Megh Nad Saha, J. C. Ghosh, President of National Institute of Sciences (now known as INSA) convened a meeting of the well-known Indian scientists in Calcutta in September, 1943 to collate thoughts for scientific research, harnessing of hydroelectric power, fuel research and manufacture of steel, chemical industries, etc. Prominent Indian scientists and university teachers like D. M. Bose, S. S. Bhatnagar, P. C. Mahalanobis, K. G. Naik, Homi Bhabha, S. P. Agharkar, S. K. Mitra, J. N. Mukherjee, H. K. Sen, B. C. Guha, S. S. Sokhey, V. Subrahmanyam, and others had responded to the call of J. C. Ghosh, who served as the then Director, IISc. Amongst other aspects, they had specifically discussed how the war time infrastructure in S&T should be assimilated for peace time civil organization, and what ought to be the organizational model in S&T that could be adopted in the post-war and independent India.

Bhatnagar, working as Director, CSIR had been asked by his peers to generate an invite by the colonial Government for the Nobel Laureate Archibald Vivian Hill, the Secretary of The Royal Society, London and the British Member of the Parliament from Cambridge, to visit India. Hill travelled in India for nearly four months from November 1943 to April 1944 and submitted a detailed report titled 'Scientific Research in India' based on detailed discussions with the native scientists. It was natural for Bhabha to consult Hill on his thoughts on creation of a new institute in Bombay. Bhabha had been elected FRS in 1941 and the Hill had himself brought the register of The Royal Society, London to India to enable Bhabha, K. S. Krishnan (elected FRS, 1940) and Bhatnagar (elected FRS, 1943) to affix their signatures in it.

Bhabha had written his first letter to J. R. D. Tata about his desire to create a new Research School in August 1943, one month before the NIS meeting had been scheduled in Calcutta at the initiative of Saha.

The above description, though very relevant for what Bhabha started to do in 1944, incidentally is not a part of the RDS–BR book.

Bhabha wrote his first letter to Sorab Saklatvala, the Chairman of the Dorabji Tata Trust on 12 March 1944 (chapter 5), when Hill was still in India. His letter had mentioned about his discussion at length with Hill in the second paragraph. The name of Hill figures at three more places in that letter. The same letter also mentions about possible support to his proposed institute from the Board of Scientific and Industrial Research headed by Bhatnagar. The Dorabji Tata Trust accepted Bhabha's proposal of establishing TIFR in Bombay on 14 April 1944 (chapter 6).



Albert Einstein, Hideki Yukawa, John Wheeler and Homi Bhabha while he visited Institute of Advanced Studies at Princeton, USA during 1948.

Hill in a letter dated 3 April 1944 had shared with Bhabha the possibility of getting S. Chandrasekhar back to India as told to him by Saha. Bhabha sent a letter of invitation on behalf of TIFR (yet to be formally initiated) to Chandrasekhar at the University of Chicago in USA on 20 April 1944. Chandrashekar could not accept Bhabha's offer because of re-entry and visa issues (chapter 6). Bhabha tried to get Chandrasekhar once again to TIFR in independent India by seeking a generous financial support from CSIR for a Chair in Astronomy to be created in TIFR.

Hill had also advised Bhabha in 1944 to include Biophysics along with other branches of Physics. However, Bhabha waited to come across a right person in this field. This happened only after the new buildings of TIFR had been inaugurated on 15 January 1962, and Obaid Siddiqi joined the institute. Several senior physicists at TIFR were not in agreement with the Director's decision, and there was also no space identified for a modern molecular biology laboratory in the new buildings of TIFR. Bhabha was decisive and he made space available to Siddiqi for a Molecular Biology Unit (MBU) by approving construction of an additional floor above a three-storied block in the institute. The vision and faith of Bhabha in outstanding persons was amply elucidated by the nucleation of National Centre of Biological Sciences at Bangalore by Obaid Siddiqi, FRS, twenty five years later.

Hill had submitted a report titled 'Scientific Research in India' to the colonial government in August 1944, a summary of which was published in *Nature* (1945, **155**, 532–535). This exhaustive report had 24 sections. He had surmised in a speech delivered in London in October 1944 that it was due to the energy, skill, knowledge and the great influence that Bhatnagar had on his colleagues, industry and the Government in India, that he could produce such a report. These facts are also not included in the book under review.

A section of particular relevance in Hill Report to the NDS–BR book (chapter 12) is the one on 'Pay and status of scientific workers in India'.

Hill had recorded in his report that pay and status in scientific service under the then Government of India was not, in general, comparable with the pay and status in

the civil service. He had categorically stated that an administrator in India was being paid 50% more than scientific and technical person of the 'same standing, experience, training and ability. A scientist, however able and productive was unable to attain more than a limited position and salary without taking on administrative work, often to the exclusion of most else'. He, therefore, had surmised that 'it would be desirable to make the conditions of their employment such as to attract and hold a substantial number of best men, and to give all of them as good opportunities as possible for their work and its recognition by their colleagues outside'. It is indeed serendipity that Bhabha had written in the concluding para of his 12 March 1944 letter to Saklatvala that 'if proper appreciation and financial support are forthcoming, it is one's duty to stay in one's own country and build up Schools comparable with those in other countries'.

The above is what Bhabha set out to provide in the institutions and programmes that he eventually built. When the initial proposal for TIFR was submitted to the Dorabji Tata Trust, he had projected a very nominal annual budget of just Rs 75,000, in which the monthly emoluments of the Director or Head of the Department, Reader, Research Scientist and Research Student were pegged at Rs 1200, Rs 400, Rs 400 and Rs 200 respectively (noted from Rustum D. Choksi's letter to Bhabha on 2 February 1944). The total salary requirement of TIFR was projected as Rs 3500 per month and the Dorabji Tata Trust sanctioned a contribution of Rs 45,000 for the first year.

The National Laboratories under CSIR were yet to be initiated in 1944, and for Bhabha to make projections for the salary portion of financial requirement, the emoluments paid to the 'native' teachers in the Government Colleges, were the only yardstick.

Bhabha had to wait to create opportunities for himself to operationalize the recommendation of Hill pertaining to the salary structure and promotion avenues to scientific and technical persons, as the AEET and an independent Department of Atomic Energy (DAE) under the direct charge of the Prime Minister of India came into being in August, 1954.

Chapters 7, 8 and 12 describe precisely how Bhabha used his immediate access to the PM as Chairman, AEC and the Secretary, DAE to initiate many things. These chapters reproduce several notes written by Bhabha to the PM. He had begun writing such notes ever since the Board of Research on Atomic Energy was set up by the CSIR with him as the Chairman on 26 August 1947. On 26 April 1948, he had written a note to PM titled 'Organisation of Atomic Research in India'. Another important letter was written by Bhabha to Nehru on 11 July 1954 (chapter 7). The Atomic Energy Act was passed by the then Parliament on 10 August 1954. The proposal for creation of Training School for inducting Science and Engineering graduates from universities and institutions of India for a lifetime of job, with a starting salary, after one year of training, equivalent to Class-I officers in civil service was submitted in 1957. There were no quotas of any kind in this cadre just as for the officers in the armed forces of India, and the TS officers were entitled to career progression via merit promotion scheme. An officer of TS could reach up to the salary level equivalent to that of a Joint Secretary or above in civil service, without carrying any functional or administrative responsibilities except those doing one's own work. The first One-year Orientation Programme of TS was started as a Division of AEET in 1957 itself under the overall guidance of Raja Ramanna (chapter 8).

Bhabha made available new salary structure(s) devised for officers of the DAE, to the scientists and mathematicians in the academic stream in aided institutions of DAE such as TIFR in the early 1960s. A (full) professor of TIFR was assigned a salary grade overlapping with that of the Joint Secretary, and there were possibilities to go up to the salary level of Director, TIFR for more distinguished academics. Director TIFR and Director BARC were assigned a salary grade equivalent to that of the Chairman, AEC. Professors in the Indian Institute of Technology had to wait till the implementation of recommendations of Fifth Pay Commission in 1996 to get a salary grade comparable to that of a Joint Secretary of Government of India (GoI).

Bhatnagar as the first 'native' Education Secretary in independent India was also sensitive to upgrading the salaries of university teachers. S. Radhakrishnan, as the Chairman of the first University Education Commission in India, had recorded in his report in 1949 that 'a university teacher should be helped to live in comfort, if a teacher is to devote to teaching, learning and research'. Only the British academicians were paid well by the colonial government, and there were no regulations to enforce salaries of teachers in non-government affiliated colleges. Bhatnagar was designated as the first Chairperson of the UGC in November 1953. In 1955, the UGC prescribed for the first time salary scales for Lecturers, Readers and Professors (/Principals in colleges) in the universities and colleges of India, which were equivalent to the salary structure that prevailed in the University of Panjab at Lahore, the parent institution of Bhatnagar.

Bhatnagar and Saha unfortunately passed away in 1955 and 1956 respectively. It was left to the credit of a student of Saha, D. S. Kothari, the Chairperson of the UGC and the Chairman of the second University Education Commission, to give starting salary to the Lecturers in the universities of India equal to that of Class-1 officers in the civil service in 1966. The upper end of the salary grade assigned to the University Professors in 1966 was however lower than the starting salary of a Joint Secretary of the GoI. Three more Pay Commissions had to happen to uplift the salary grades of Professors in the Universities to give them recognition accorded by Bhabha to the senior academicians of TIFR at the outset of the DAE.

Chapter 9 is devoted to the role of Bhabha in the first International Conference on Peaceful Uses of Atomic Energy held at Geneva in 1955. The General Assembly of United Nations had unanimously designated Bhabha as the President of the said conference in December 1954. Bhabha had just eight months to get the conference going from 8 to 20 August in 1955. The success of this conference led to setting up of 'International Atomic Energy Agency (IAEA)' at Vienna (once again city of Bhabha's choice) in 1955. The second and third Geneva Conferences were held in September 1958 and September 1964 respectively. Bhabha remained a permanent member of the Scientific Advisory Committee of IAEA till his passing away.

Chapters 10 and 11 focus on Architecture and appointment of Architects for AEET and Government Financial Rules. After Bhabha acquired 1200 acres of land for AEET, he wrote a note to the PM on 18 June 1956. The PM responded in affirmative on the very next day. By 21 June 1956, the file on payment of honoraria to the architects had been sent back to the Finance Ministry for their reconsideration and concurrence. The notes reproduced in chapter 12 are very instructive as well, to learn how to deal with the matters which could face resistance from bureaucracy. While

serving as a Vice Chancellor (2012–18) of a premier university from which I had graduated, before joining the TIFR in 1972, I put into practice several of Bhabha's ways in my exchanges with the officials of the UGC, MHRD, Ministry of Finance and the Chancellor of the university.

I may just recall here another remark of Bhabha in his address at ICSU on 7 January 1966 (chapter 1). I quote him: 'Government is spending large sums on supporting scientific research and technical development, and it is in the government's interest to study and devise *de novo* the best administrative and financial procedures for scientific institutions and for getting the maximum return on the money spent. To apply existing administrative and financial procedures, devised for an entirely different purpose, to scientific institutions is largely to defeat the purpose which the Government has in view by letting the tail wag the dog.'

Chapter 13 provides an update on Bhabha's great vision of realizing the 'Three-Stage Nuclear Power Programme' using thorium as a fertile material.

The second part of the RDS–BR book has put together important Administrative Orders issued by Bhabha in AEET. An exercise to collate such orders had been carried out before the commencement of the commemorative birth centenary period of Bhabha and these were disseminated in the DAE system. A selection from such orders has been put in wider public domain through this book. Bhabha was very particular about office orders issued by him. Many of these were in the form of speaking orders by him. He left a personal imprint of his concerns in these instructions. He personally wetted/drafted such orders carefully himself. In part 2, these orders have been divided into six-subgroups: (i) on AEET; (ii) on confidential reports and selection committees; (iii) on preparation of reports; (iv) on VIP visits and special arrangements for functions; (v) on travel & use of staff cars and (vi) on constitution of Trombay Council and Trombay Scientific Committee.

The first such memorandum chosen to be highlighted in the sub-group on AEET is on the word 'Establishment' as it is a part of it. The second one in the same subgroup is on usage of 'Shri' in preference to 'Mr.' as per direction of the GoI. A read through them would be educative for all the Heads of Institutions/Divisions/Departments/Sections. A standing order on visitors states that 'they should be asked to commence their discussions/talks after being enabled to acquire a fair knowledge of what has been achieved by AEET so far and what are the future plans. This was ordained to be followed as a general rule in Trombay as well as in TIFR, and deviations from it were to happen in exceptional cases'.

In another standing order, Bhabha ordained that 'the reasons for various decisions ought to be recorded, as many of the projects could take several years to complete'. He continued to add in the same order that 'a wider circle than Heads of Divisions should be associated with the basic thinking concerning each of the various projects undertaken by AEET'. Each of the 'Division Heads was asked to nominate one or two persons who will accompany him/her to the meetings of any particular group, so that they may listen to the discussions that take place'. This was Bhabha's prescription for nurturing younger colleagues.

A standing order on 'Arrangements for special functions' stated that 'all arrangements ought to be completely ready in every particular, 48 hours before the function, so that the same can be pre-inspected for their ready status at the time of the function. If that involved extra payment to the contractors providing the hired supplies, such expenditure was to be sanctioned'. Nothing was to be left to chance for embarrassment. This indeed was the style of the perfectionist Homi Bhabha.

The book ends with a list of references comprising all the important publications on Homi Bhabha prior to the writing of this book.

There are a few rare photographs of Bhabha with Nehru in this book. I, particularly liked the inclusion of one in which, Brahm Prakash is also present (chapter 7). Brahm Prakash had obtained his Ph.D. with Bhatnagar at Lahore, and Bhabha inducted him at TIFR first in 1949 for realization of his vision of nuclear energy. He later embedded him in the IISc, Bangalore on behalf of the AEC to build a team of metallurgists, who were moved to AEET in 1957 to set up a chain of metallurgical laboratories (chapter 7). Brahm Prakash had moved to Thumba Equatorial Rocket Launching Station (TERLS) at Thiruvananthapuram in 1972, and helped Satish Dhawan to integrate all the ISRO activities there, as a part of newly established separate Department of Space. Bhabha had the rare knack of identifying right persons at the right time and letting them grow as leaders. Several of the important persons inducted by Bhabha before the start of the Training School are mentioned in chapter 7 of the book.

I wish the authors had included an index at the end for easy access to the incidents, happenings, persons and places mentioned in the book, as I expect it to be read widely and referred to frequently.

Homi Bhabha, Brahm Prakash and Prime Minister Lal Bahadur Shastri at Atomic Energy Establishment Trombay in 1965.

ARUN KUMAR GROVER

Department of Applied Sciences,
Punjab Engineering College,
Chandigarh 160 012, India
e-mail: arunkgrover@gmail.com