

“Kariamanikkam Srinivasa Krishnan- His Life and Work”, by D.C.V. Malik & S. Chatterjee, Universities Press, 2012. (Rs. 895/-).

One of the curious paradoxes of the sociology of science concerns the flowering of world class science in India in the early decades of the 20th century. With very little government support, working with improvised, in some cases discarded equipment, without much access to international journals, Indian scientists did some very high quality science - C.V. Raman and his eponymous scattering which not only fetched him the Nobel Prize but also remains an essential tool for unraveling molecular structure, J.C. Bose and his experiments with radio waves, M.N. Saha who propounded his famous equation which still forms a bedrock of stellar astrophysics or S.N. Bose whose work on quantum statistics is celebrated in a class of subatomic particles named Bosons. The paradox is essentially trying to understand what was it about that time which led to such intense, very high quality scientific research, albeit localized in a few centers.

Kariamanikkam Srinivasa Krishnan or K.S. Krishnan was very much center stage in this unfolding. Though possibly not a household name like some of the luminaries mentioned above, he was not only an outstanding scientist but also one of the builders of science and technology infrastructure in independent India. Born in 1898 in what was then the Madras presidency, Krishnan had his early education in the neighbouring town of Srivilliputtur and did his undergraduate degree at the American College in Madurai and the Madras Christian College at Madras.

In 1920, Krishnan came to Calcutta to work with the already well known C.V. Raman at the curiously named Indian Association for the Cultivation of Science, a voluntary body founded by the legendary M.L. Sircar. With the help of generous donations from the wealthy, the Science Association had set up laboratory facilities where Raman worked, first in his spare time while his day job was at the Accountant General's office and then full time after quitting his coveted government job. Besides the Science Association, the University of Calcutta, the Presidency College and J.C. Bose's Institute were the sites of vigorous intellectual activity. Malik and Chatterjee describe the intellectual atmosphere in Calcutta well in the book.

Working with Raman, over the next few years, Krishnan became a first rate experimental physicist with an equally keen interest in the theoretical underpinnings of the experiments on scattering of light that he and Raman were carrying out. On February 28th, 1928, the celebrated Raman Effect was discovered. Krishnan had played an essential role in the experiments leading up to the discovery and most people felt that Raman should have shared the credit with him. However, as the book eloquently describes “ Raman was extremely possessive of the discovery, ever so wary of sharing the real credit of it with anybody else”. Raman's almost obsessive desire for the Nobel Prize (he even reportedly got steamer tickets booked to Europe

since he was so sure he would get it that year- he eventually got it a year later) has been well documented elsewhere.

The physics of Raman scattering is discussed at some length in the book. In fact, the book, being a chronicle not just of the life of Krishnan but also his work, has several chapters explaining some of the main themes of Krishnan's scientific work. This turns out to be one of the strengths as well as weakness of the book- the explanations are by no means such that a lay reader would be able to follow them easily.

However, a reader with some knowledge of undergraduate science does gain an insight into the complexity of the work done by Krishnan. And the book does get enriched by these explanatory chapters.

After working with Raman, Krishnan got a job at the University of Dacca where he was a colleague of S.N. Bose. Here Krishnan turned to another field of exploration, namely magnetism in various substances. By now, Krishnan's reputation as a brilliant scientist was well established and soon he was back at Calcutta at the Science Association, this time, not as a research student but as the first M.L. Sircar research professor. Continuing his researches in magnetism, Krishnan soon became one of the foremost experts in the field in the world. He travelled to Europe in the late 1930s and gave lectures at various centers of excellence. The crowning achievement of course was the Fellowship of the Royal Society in 1940. Here he joined an elite club of the most respected scientists in the world. There had been just 6 Indians, including Ramanujan and Raman before him to get this honour.

One of these 6, Meghnad Saha was heading the Physics Department at Allahabad University. On Saha's shifting to Calcutta, Krishnan moved to Allahabad where he rejuvenated the Physics department. This was enormously difficult especially given the paucity of funds due to World War II. That it took a brilliant mind to think out of the box is possibly best illustrated by the anecdote of Krishnan using a bow and arrow to draw fine quartz fibers for his work on magnetism! Here Krishnan trained several brilliant students who went on to be very famous in their fields- Harish Chandra, one of the finest mathematicians of our times, A.N.Verma a crystallographer, A. Bhatia and interestingly, Rajendra Singh who impressed not only Krishnan by his exceptional brilliance but also C.V. Raman. Rajendra Singh, popularly known as Rajju Bhaiya, later left physics and became the Sar Sanghchalak of RSS!

The next stage of Krishnan's career was possibly the most interesting. With the impending Independence of India, Congress, and in particular Nehru were already planning how to set up a robust science and technology infrastructure. Science and Technology played a crucial part in the overall understanding of nation building of the leaders at that time. M.N. Saha, H.J. Bhabha, S.S. Bhatnagar and Krishnan were amongst the scientists who led this effort. Krishnan was deputed to build the premier physics laboratory in the country, the National Physical Laboratory (NPL).

Interestingly, as the book mentions, contrary to what is commonly believed, Gandhiji too believed that science has a major role to play in building a strong and prosperous nation. Equally noteworthy is the fact mentioned in the book about the importance of scientific institutions for Nehru. It turns out that whenever he was free, Nehru would “jump into his car and drive over to NPL...” where he alongwith Krishnan and Bhatnagar would have tea at a café. Given today’s political climate, this camaraderie between the Prime Minister and “mere” scientists, seems like a fairy tale!

Understandably, given the focus of the book, it doesn’t go into any detail about the conflicting views of the people who made science policy at this crucial juncture of our country’s history. The celebrated difference of opinion between Saha and Bhabha regarding how science should develop in the newly independent nation has been well documented by Robert Anderson and Itty Abraham. The contrasting ideas and personalities of these two stalwarts are mentioned in passing in the book. Saha, being essentially a University person, wanted first a strengthening of the university network to train a generation of scientists. He also was in favour of a more decentralized, open and democratic approach while Bhabha wanted to develop research institutes and centers of excellence where science would flourish. With Bhatnagar and Bhabha pitted against Saha, and Krishnan choosing to be non-committal, Bhabha’s ideas carried the day with the political leadership. As the authors note insightfully, “as a result, the human resource development for these very research establishments suffered immeasurably leading to a serious deficiency in skilled manpower”.

A related observation, by the noted crystallographer J.D. Bernal, during his speech at the inauguration of NPL in 1950 is also pertinent. Bernal, while appreciating the efforts taken by the country in setting up of the premier laboratory, cautioned that just setting up these institutions would not be enough to propel India to a scientific power. What was needed was a multipronged effort where science is integrated with industry and agriculture, where scientists are not just paid well and given the best facilities for their work, but also are cherished in society. Sadly, it is this devaluing of science in general over the last few decades that one has witnessed in our society. In the sixties, the likes of Bhabha and Sarabhai were icons for school children. I imagine it is a sign of times that these have been replaced by the likes of Gates and Jobs.

This is an excellent introduction to the life and work of one of the foremost scientist and institution builder our country has produced. The authors are to be complimented in bringing together a vast amount of material to present a vivid picture of Krishnan as a human being and as a scientist. The writing style is easy to read and not too bogged down by biographical details. And yet, there are enough delightful nuggets about people and events which make the book immensely enjoyable. Nevertheless, it is enormously insightful about this important period in Indian history. One hopes that the book would inspire other scientists to attempt to

chronicle the life and works of other stalwarts of Indian science, especially those who shaped Indian science in the early part of the 20th century. And who knows, maybe we would also get an insight into the sociological puzzle alluded to earlier- as to why, despite a many fold increase in investment in science and technology in the intervening decades, the 1920s and 1930s were still, in comparative terms, the golden period of Indian science.

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