

B. V. Subbarayappa (1925–2019)

Benjamin Franklin once said: ‘Some people die at twenty-five and aren’t buried until they are seventy-five’. Obviously he refers to those who do not have any zest for life – and are not uncommon to see around. Unlike such people, B. V. Subbarayappa is one among those who live even after their death. He remains, and would ever remain as a colossus in the area of history of science, culture and philosophy in India. We offer here a personalized appreciation of him as an individual and a multifaceted scholar.

Bidare Venkatasubbaiah Subbarayappa (hereafter BVS) was born on 18 May 1925 in Bidare, a small town in Hassan district, Karnataka, South India. He passed away on 8 April 2019 in Bengaluru at the age of 94 years. When BVS took up studies on the history of science in India, the subject was purely in its nascent state. He played a significant role in bringing the subject to prominence that it deserved. He seems to have clearly chalked out the purpose of his life, in the very early part of his academic career, and made remarkable strides towards achieving the same. Through his writings BVS amply demonstrated a continuing tradition of scientific thought and culture in India from almost pre-historic times through the Vedic period, unto classical Siddhantic period and then smoothly sliding into the modern period. In short, BVS was an excellent scholar of science and civilization, who tried to understand the relationship between science in India, its cultural foundation, and its civilizational quest for knowledge through the ages.

BVS had his early education in Madhugini, Tumkur and Central College, Bengaluru. His main subject was chemistry in which he obtained a gold medal in his final Honor’s degree. His first job was as a lecturer in chemistry at Vijaya College, Bengaluru. The subsequent job he took, led him to stay in Mysore where he was introduced to history of science through his visits to the Oriental Research Institute (ORI), which was, and still is, a treasure house of several manuscripts. (A fairly comprehensive biographical account of BVS, with details of his contributions, the laurels bestowed upon him, and various institutions that he had been associated with can be found in the book edited by Purushottama Billi-

moriam and M. K. Sridhar, *Traditions of Science: Cross Cultural Perspective*.) A paper he wrote in 1962 on ‘Indian atomism’ got recognition in the journal *Nature*. He obtained his doctorate from the University of Mysore for his thesis titled ‘Studies in Indian concepts in physical sciences’, probably the first Ph D thesis on the history of science in India.



BVS was a prolific writer producing several important treatises on the history of science, both as an independent author/editor, as well as in collaboration with others. His first major work *A Concise History of Science in India*, which he edited with D. M. Bose and S. N. Sen was published in 1971, in which he personally authored three chapters. This volume consists of authentic articles on several subjects: astronomy, mathematics, medicine, chemistry, agriculture, botany, zoology, and so on. BVS continued his work on this theme of the history of science in India in later years, and also motivated others to take up serious studies on this subject thereby significantly contributing to its advancement as an important discipline of study.

The contributions by BVS are both rich and varied. Besides several books, he also published nearly a hundred articles in journals as well as in the form of book chapters. His book on *The Tradition of Astronomy in India: Jyotiḥśāstra* brought out as part 4, volume IV, of a series of volumes of *History of Science, Philosophy and Culture in Indian Civilization*, is a useful resource book that nicely brings out the various facets of the *Jyotiḥśāstra*, its origin, growth and development in India, which even an uninitiated person can appreciate. He commences the volume with the social-cultural and religious setting in which *Jyotiḥśāstra*

evolved in India, then proceeds to explain the various aspects of the science without getting into too much of technical details. In the last chapter titled ‘On the transmissions’, BVS discusses at length (in about 40 pages) the exchanges that took place between Indian and other civilizations, wherein he coherently presents detailed arguments – perhaps inspired by P. C. Sengupta – against the unreasonable ‘Babylonian–Greek-centric’ views presented by many scholars.

Another volume titled *Indian Perspectives on the Physical World*, brought out as Part 3, Volume IV of the same series, provides a good introduction to the fundamental Indian ideas of physics based on the study of the ‘Sāṅkhya’ and ‘Vaiśeṣika’ systems of Indian philosophy. The first and the second parts of Volume IV, edited by BVS, aim to provide a systematic overview of the Indian contribution to chemistry, life sciences and medicine. It may be worth mentioning here that BVS was working on these volumes when he was in his late seventies and early eighties.

Yet another volume titled *Indian Astronomy: A Source Book*, brought out by BVS and K. V. Sarma in 1985, is a splendid compilation of about 3000 verses culled out from various source works on Indian astronomy. This volume published by the Nehru Centre, Mumbai, consisting of 22 chapters arranged in five parts, is an extremely handy reference for researchers working on Indian astronomy. Besides presenting quotations from various important astronomical works in Sanskrit, it also includes a lucid English translation for all the passages with short notes, wherever necessary. The six appendices provided in this volume are also extremely useful. Those who work on Indian astronomy would indeed be indebted to BVS and Sarma for providing a thematic overview of the variety of contributions made by Indian astronomers to the advancement of this subject.

A man of indefatigable energy, BVS extended his research into archaeology, as well as the Indus script, its nature and structure in 1996. According to him, the Indus signs are all numbers expressed in an ingenious manner, and that the Indus texts are a ciphered system involving additive–multiplicative approach to arrive at

and express the desired numbers. The proposed numeral system is decimal with base 10. There are different symbols for the numbers 1 to 9, for 10, 100 and 1000, and for their multiples. BVS continued his work on the Indus script until recently, collaborating with Mayank Vahia (TIFR, Mumbai).

Yet another theme that was dear to BVS was the relationship between science and spirituality. He seriously endeavoured to find the intangible and deep connections between science, spirituality and religion. Along with Bilimoria, around the turn of this millennia, BVS promoted Science and Spirituality Research in India to explore the interconnections between them with the support of Templeton Foundation, USA. An international conference 'Science and Beyond' was also organized in 2003 to discuss deeper questions, such as the origins of the universe, spirituality and various knowledge systems. BVS strongly believed in maintaining a dialogue between science and religion, and shared the conviction of the International Society for Science and Religion, UK that 'our fragmented and divided world would benefit more from a stronger dialogue between science and religion'.

One of his recent books (perhaps authored when BVS was more than 85 years of age) on *Modern Science: A Social and Historical Perspective* is also a useful and informative volume that provides a good and balanced introduction to the direction that has been taken by modern science in understanding the micro and macro aspects of the universe that we live in. In this volume, BVS amply emphasizes the need to have a multi-dimensional approach that includes a philosophical perspective in trying to appreciate and understand the functioning of nature around us.

BVS remained firmly objective in articulating his views. He also had a clear perspective of what we know and what we do not, and always remained sober in his judgments. At the same time, he had zero-tolerance for any baseless or incongruent argument presented. He would be the first person to strongly criticize, of course, in the most dignified manner, any unjustified claim or hyperbolic statement that was made to eulogize the contributions of a culture. He always emphasized that for a proper assessment of the scientific contributions made by a civilization, one must look into a variety of sources

(literary and otherwise), keeping in mind the time period as well as cultural context in which the various ideas emerged.

BVS was associated with several institutions during his long career. He served the Indian National Science Academy (INSA), New Delhi, for several decades and brought in significant improvements in its functioning in his capacity as Executive Secretary. He also had short, yet fruitful stints at the Nehru Centre (Mumbai); World Culture Institute, Bengaluru and National Institute for Advanced Studies, Bengaluru, among others. He was the recipient of several awards and honours. The most significant among them was his election as President (1998–2001) of the History of Science Division of the International Union of History and Philosophy of Science (a member of International Council of Scientific Unions (ICSU), Paris) – the first non-Westerner to be elected to this top position. In 1973, BVS was awarded the Copernicus Medal by the Polish Academy of Sciences on the occasion of the 500th birth anniversary of Copernicus. He was also bestowed with an Honorary Doctorate (1999) from the University of Bologna, Italy.

BVS showed great passion, and unabated enthusiasm for the promotion of studies on the history of science. He would never let go any opportunity to emphasize the need for the same. We illustrate this with a specific example from a recent correspondence that BVS had with one of the authors, notwithstanding his ailing health.

On receiving a copy of the 2019 Year book published annually by INSA, which presents an update of the members who have been inducted into various capacities, commissions, etc., having noticed the induction of two new members in the National Commission (NC), and realizing that one of the present authors (KR) is closely associated with the newly inducted members, BVS sent an e-mail (a fairly long one) addressing all the three of us on 15 February 2019. Commencing the e-mail with congratulatory remarks he notes:

'In this connection, I thought that I should share some thoughts with you as new Members of the NC, because I was associated with the National Commission since its establishment and worked there for nearly a decade. My concerns relate to the two main objectives for the realization of which the Commission was set-

up as an independent Apex body more than five decades ago'.

With this preamble, having offered a few valuable and concrete suggestions, BVS concludes the e-mail as follows: 'These are my views for your consideration as well as of the National Commission. Far be it from me to interfere in this manner with the programs and thinking of the National Commission which I hold in high esteem, when the other cultures like the Chinese, Islamic, Mesopotamian, Greek and Latin, have their enormous original sources on history of science published and studied, I feel sad that India, despite its extensive manuscripts heritage is woefully far behind in this respect. May I look forward to your response?'

This e-mail from BVS, at the ripe age of almost 94 years, when his physical health started deteriorating (from early 2019), clearly mirrors the immense passion he had for promoting studies on the history of science in India.

Besides the academic accomplishments, BVS was also blessed with excellent personal qualities. He was extremely gentle and polite in his interaction with others. He was kind and courteous to all, even at his ripe old age; a quality perhaps worth emulating. As editors of a volume of essays honouring BVS titled, *Traditions of Science—Cross Cultural Perspectives*, Bilimoria and Sridhar mention 'his monumental work and his sheer humanity have inspired the editors of this volume to find a way to honour him'; a real tribute indeed.

His pleasant disposition not only made others feel comfortable in his presence, but he also had the magical power to embrace people so as to get them drawn into his sphere of influence. BVS had a way to accommodate others, and get things done through them using his inimitable humble approach. His memory too was quite phenomenal for his age.

Those who had the opportunity to meet BVS would feel a sense of deep personal loss at his demise, even though they may not have closely interacted with him. According to Vahia 'His absence will be sorely felt to all those curious about our scientific achievements. I had the pleasure of working with him on Indus Script and on ancient Indian astronomical records and I learnt a lot from his approach to the field'.

In short, BVS lived a full life and has left a huge legacy behind in the form of his writings. With his demise, India has

lost one of the great stalwarts in the history of science, and perhaps the only scholar in the country who had such an impetuous passion when it came to engaging himself in the activities to promote studies pertaining to the history of science in any form – editing manuscripts, preparing research monographs, authoring popular books, setting up re-

search centres, preserving archives, organizing public awareness programmes, and so on.

ACKNOWLEDGEMENT. N.K.R. thanks Purushottama Bilimoria and Mayank Vahia for their useful inputs. He also acknowledges the help of Hansa Kalyani, Librarian, IAS and Christina Birdie, former Librarian, IIA.

K. RAMASUBRAMANIAN¹
N. KAMESWARA RAO^{2,*}

¹*Indian Institute of Technology Bombay,
Powai,*

Mumbai 400 076, India

²*Indian Institute of Astrophysics,
Bengaluru 560 034, India*

**e-mail: nkr Rao@iiap.res.in*

P. N. Shankar (1944–2019)

We were dismayed to learn that our dear colleague and friend, P. N. Shankar, passed away on 15 April 2019. Shankar had been unwell for some time, and unable to be his usual effervescent self.

The Shankar we knew, and will always remember fondly, was sparkling, brilliant and animated. We remember conversations with him about beautiful experiments, astonishing mathematical proofs, the promise of parallel programming, the joy of building a telescope, and even about why a funny joke was not really funny.

Pattamadai Narasimhan Shankar was born on 13 August 1944 in Bombay. His early years were nomadic; the young Shankar studied in schools in India and Switzerland, obtained a B Sc in mechanical engineering from Imperial College (then in the University of London), UK in 1964, and a Ph D in engineering science from Caltech, USA in 1968.

Then Shankar did something rather curious: he took up position as a researcher in the R&D Center of General Electric at Schenectady, NY, USA, though he showed much more promise as an academic researcher in fluid dynamics. Fortunately, he quickly corrected the mismatch to become an Assistant Professor at the University of Maryland, USA, in 1970.

Almost immediately, Shankar began to glitter. In 1970, he published his first paper, on a kinetic theory of steady condensation, in the *Journal of Fluid Mechanics (JFM)*. The publication rush continued in 1971 and 1972, with five more papers in fluid mechanics and acoustic refraction, all in leading international journals, and in almost every case as a single author.

The two years (1970–72) that Shankar spent at Maryland must count among the

best in his life: he received the coveted Knapp Award of ASME in 1971, and, best of all, he met his future wife, the accomplished and gracious Priti Monteiro, who was completing her Ph D at the University.

Shankar returned to India in 1972 to join the National Aeronautical Laboratory (NAL; later National Aerospace Laboratories) at Bengaluru as a scientist; there were also overtures from IIT Kanpur, but NAL's Director S. R. Valluri proved to be more persuasive and welcoming. Shankar would go on to spend the rest of his working life at NAL, till his retirement in 2004.



Shankar's first years at NAL were – surprisingly – devoted to work on wind power. NAL had done some early pioneering work in this area and Valluri wanted Shankar to revive this effort by looking at opportunities using Savonius rotors. Shankar gave the project a perfectly good try, but somewhere along the way became convinced that wind power was not a feasible option. Valluri was not particularly amused to hear this, but allowed Shankar to change track as long as his work was relevant to NAL.

It was this happy fortuity that led to Shankar's immensely fruitful, and occasionally stormy, collaboration with U. N. Sinha. Young and confident when they started out, the duo decided to study turbulence, not inside some closed cylinder but along a wavy wall. While this work provided a splendid learning experience, and a well-cited 1976 *JFM* paper, Shankar and Sinha – always honest to the core – realized that they needed greater mathematical acumen before they could take their next steps forward. So, they teamed up with their colleague Anand Kumar to read every page, and solve nearly every problem, of the three celebrated Rudin books on mathematical analysis. It was a marvellous example of dedication and commitment to a subject they truly loved.

Shankar and Sinha went on to do more interesting work on rotational and separated flows, till NAL's new Director, Roddam Narasimha, asked Sinha to initiate the Flosolver parallel computing program in 1986. Sinha thereafter got completely immersed in Flosolver development. Shankar was not a member of the Flosolver team – although he did some work on fast solvers – but remained a strong supporter and well-wisher.

A heart-warming example of Shankar's support was when the Flosolver team suddenly realized that they needed to master PDP assembly programming, but had no guru to turn to. Shankar suggested that they ask his wife Priti, by now a teacher and researcher of great mettle and ability at the Centre for Automation, Indian Institute of Science (IISc), Bengaluru. The intense one-month teaching programme was invaluable and extremely generous.

Shankar loved doing experiments. He had reasonable success, although most