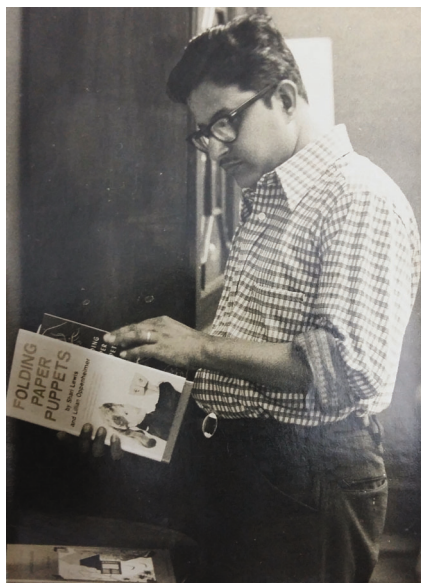


## Subramania Ranganathan (1934–2016)



With the passing away of Subramania Ranganathan (Ranga to most) on 8 January 2016 in New Delhi, we have lost a truly great enquiring mind, one who represented an era of organic chemistry itself. Sadly, it is hardly 13 months since Sathyamurthy wrote an eminently informative account of Ranga in his 'Living Legends in Indian Science' in the 10 December 2014 issue of *Current Science*<sup>1</sup> that this epilogue has to follow. Indeed, Ranga grew with the growth of organic chemistry in recent years and contributed to its growth himself. Until the 1950s, organic chemistry was in the 'classical' phase, where practitioners isolated and identified molecules from natural sources and attempted to synthesize them in the laboratory using conventional methods. Synthesis of complex molecules was a challenge that renowned organic chemists enjoyed doing, and taught their students. Questions such as 'describe how you would synthesize molecule X starting from carbon, hydrogen, oxygen and nitrogen' were common in examinations. It was in the 1950s that understanding the mechanisms behind molecular structures and reactions began getting clearer (using physical chemistry), and analysis of the details of the structures and shapes of molecules became easier thanks to advances in spectroscopy. And Ranga took to them eagerly and with success. Every lecture of his at the IIT Kanpur (where

he was between 1966 and 1994) was an example in clarity, wit, use of language and enjoyment; some of us fellow faculty members 'sat in' on some of the courses that he taught. Sathyamurthy<sup>1</sup> describes Ranga's influence in some detail including his work on vitamin B12 synthesis and his insistence – despite Woodward's (Nobel Laureate, 1965) apprehension – on a reaction mechanism that actually and crucially led to the establishment of the eponymous Woodward–Hoffmann Rules (for which Hoffman received the 1981 Nobel Prize).

Such a feel for Ranga's teaching and practicing science is best illustrated in his monograph *Metamorphosis of camphor to Vitamin B12* (for a shortened version, see ref. 2). He writes: When one dissects the efforts that went into the sculpting of the vitamin B12 molecule in the laboratory, one finds two kinds of sculpting – one of the plastic or clay kind where material is added or fused into shape and the other the stone kind where material is chipped off to shape. Bonds, substituents and moieties, and where necessary, bonds and groups were also removed from the molecular framework out of which the final molecule was made. Similar strategies were used by the composer Johann Sebastian Bach in his 'Art of the Fugue' and 'the Well Tempered Clavier', and by the artist M. C. Escher in his 'Encountering Men' or his woodcut 'Snakes'. Alas, we no longer see such prose in science!

Ranga himself created complex molecules – some spherical, some knotted and some twisted into double helices – for the fun of it. He too used pre-sculpted

(clay kind) molecules as building blocks (called 'synthons') to make such complex ones. While his mentor Woodward used camphor as the synthon for vitamin B12, Ranga used the components of castor oil and sculpted them into prostaglandins, and found ways to understand how plants solubilize and use the silicon there for growth, and was able to reproduce this in the lab and propagate it in field trials.

No wonder he was an enthusiast and practitioner of the Japanese art of paper folding called Origami. Many of his origami-based articles appeared in *Resonance* in 2000, 2002 and 2003.

No account of Ranga can be complete without mentioning his dear wife, the late Darshan Ranganathan whom he married in 1970. Together they made an inseparable couple, each inspiring the other, and admired by all. She came on her own as an equally outstanding molecular architect after 1994, when she moved as a scientist at the Regional Research Laboratory (now renamed as the National Institute of Interdisciplinary Science and Technology or NIIST) in Thiruvananthapuram (thanks to M. V. George), while Ranga took on a senior scientist position there. She blossomed there and synthesized some spectacular molecules with pleasing architectural patterns. Her work in the field of supramolecular chemistry established Darshan as among the best Indian scientists of her generation, and an inspiration for women scientists<sup>3</sup>. The couple later moved to the Indian Institute of Chemical Technology (IICT) at Hyderabad during 1998–99, continuing their outstanding researches.



## PERSONAL NEWS

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The loss of Darshan to cancer in 2001 (see a tribute to her in *Current Science*<sup>4</sup>) broke Ranga both in body and spirit, and with his Euridice lost, Ranga turned into an Orpheus. He became a saintly recluse, taking some comfort only in the research that he continued to carry out. Such was his love and devotion to her. It was at this time that the then Director of IICT, K. V. Raghavan made the remarkable move of offering Ranga an apartment in campus, a laboratory and facilities to carry on his research for as long as he wanted. This offer of Raghavan had been carried on by J. S. Yadav, M. Lakshmi-kantam and S. Chandrasekhar, who followed as Directors of IICT. We thank all these colleagues for displaying and upholding of the Indian tradition of respect and regard for 'gurus'.

Ranga and Darshan's son Anand Ranganathan has followed their footsteps and

after obtaining his doctoral degree in bio-organic chemistry from Cambridge, UK, has moved on into the area of molecular biology and drug design (at the International Centre for Genetic Engineering and Biotechnology and now at the Jawaharlal Nehru University, both in New Delhi). And in the tradition of the family, he too sculpts molecules, but this time shuffling triplet codon pairs of the DNA molecule in order to generate protein and polypeptide chains that are drug candidates against malaria and tuberculosis.

Anand and his wife Sheetal rushed to Hyderabad on 28 December 2015 when Ranga fell in his apartment and broke a bone. They took him to the hospital to fix this and later flew him to Delhi to stay with them (to which he finally yielded and consented) but, alas, right in the recovery room at the hospital in

Delhi, Ranga breathed his last in the afternoon, 8 January 2016. In his death, India has lost someone who possessed a brilliant and inquiring mind, and one who blurred the man-made line that separates arts and science.

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1. Sathyamurthy, N., *Curr. Sci.*, 2014, **107**(11), 1892–1896.
  2. Ranganathan, S., *Resonance*, 2014, **19**(7).
  3. <http://www.thealternative.in/society/10-indian-women-scientists-you-should-be-proud-of>
  4. Balasubramanian, D., *Curr. Sci.*, 2001, **81**(2), 217–219.
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