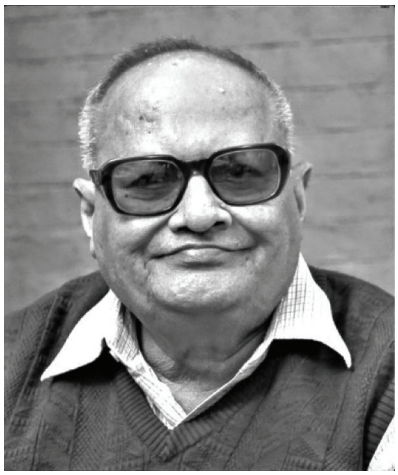
Sushil Kumar (1940–2021)

'His life was gentle; and the elements
So mixed in him, that Nature might
stand up
And say to all the world,
"THIS WAS A MAN!"'
– William Shakespeare

Dr Sushil Kumar, a renowned plant scientist of our country, breathed his last on 2 May 2021, leaving his colleagues, students, and admirers in deep grief. Kumar was popularly known for his breakthrough research in the field of genomics of crops and microbes, particularly his research on *Escherichia coli*, Lambda phage and mutants of *Rhizobium*. His research journey in India began after returning from the United States of America in 1971 after completing his post-doctoral research. He served as a senior scientist at the Indian Agricultural Research Institute (IARI), New Delhi till 1989. During the same period, he became a Professor of Molecular Biology and Agricultural Biotechnology in 1985. Then Kumar joined as a senior scientist in the Council of Scientific and Industrial Research (CSIR), New Delhi. In 1993, he was appointed as the Director of CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, where he held this position up to 2000. He was also the Director of CSIR-HRDG (1997) and CSIR-NBRI (1998–1999). He became an emeritus scientist at CSIR after his retirement and served in this position up to 2005. In 2006, he moved to the newly built National Institute for Plant Genome Research (NIPGR), New Delhi, a DBT-autonomous institute, as an INSA Senior Scientist where he stayed till 2010. After his tenure at NIPGR, Kumar carried out further research at SKA Institution for Research, Education and Development, New Delhi.

Kumar was born on 14 December 1940 in Delhi, and did his primary and higher schooling at Municipal Primary School and Dayanand Anglo-Vedic Public School respectively. He obtained his graduation degree in 1960 from Hansraj College, Delhi and M.Sc. from IARI, New Delhi in 1962. He was a gold medalist for securing the highest marks in his master degree from IARI. Young Sushil completed his Ph.D. in 1965 from IARI, New Delhi, under the mentorship of A. T. Natarajan. Then he moved for his post-doctoral research during 1965–66 with M. S. Swaminathan. He continued his research at Cold Spring Harbor Laboratory, US with Paul Margolin (1966–68). Later he moved to the University of Wisconsin-Madison, USA and there he worked with Wacław Szybalski from 1968 to 1970 and with C. R. Fuerstat University of Toronto till 1971.



Kumar was a Fellow of all four national academies of India: National Academy of Sciences, Indian National Science Academy, National Academy of Agricultural Sciences, India, and Indian Academy of Sciences. During his research tenure, he was recognized and awarded with several prestigious scientific awards including Shanti Swarup Bhatnagar award for Science and Technology in 1981, one of the most prestigious Indian science awards. The other noteworthy awards are the Indian Society of Genetics and Plant Breeding (ISGPB Genetics) Medal in 1965, NASI Distinguished Scientist Award in 1986, FICCI Award in 2000, Om Prakash Bhasin Award in 2000, NSA Shyam Bahadur Saksena Memorial Medal in 2002 and many more.

The work of Sushil Kumar was mainly focused in the area of biotechnology, crop breeding and microbial genomics. Overall, his entire work has been documented in over 300 research publications. He edited 25 books, and also managed to receive 132 international and national patents. His studies led to the understanding of chromosomal arrangement at an interphase stage. His microbial work on *E. coli* and Lambda phage described its transcription map. His early work elucidated the pleiotropic roles of cyclic AMP in *E. coli* and elaborated on the antiparallel transcription, anti-termination and transcription termination sites of Lambda phage. While working in the area of nitrogen fixation, Kumar discovered novel genes in *Rhizobium*, and developed several *Rhizobium* mutants with higher nitrogen fixing capabilities. In this way he tried to enhance the cultivation of crops such as pea (*Pisum sativum*), Madagascar periwinkle (*Catharanthus roseus*) and wheat (*Triticum aestivum*). Apart from this, he also did extensive research in underutilized crops such as sweet wormwood (*Artemisia annua*) and wild mint (*Mentha arvensis*). Through biotechnological approach he biofortified the levels of artemisinin in *Artemisia annua* and essential oil in *Mentha arvensis*. During his directorship tenure at the CIMAP, he established a regional field station at Uttaranchal and founded a Central Genetic Resources and Biotechnology Laboratory. He was the key person to start the *Journal of Medicinal and Aromatic Plant Sciences* while serving as the president of the Indian Society of Genetics and Plant Breeding (1994–97). He was actively associated with several other Indian science journals including *Indian Journal of Genetics and Plant Breeding*, *Journal of Genetics*, *Indian Journal of Experimental Biology and Proceedings of Indian National Science Academy*. He always advocated for the progress and prospects of Indian scientific journals.

Kumar has mentored 32 doctoral researchers who are very successful in their scientific career today. He was always very keen to address the biological questions around him. He was an extraordinary orator, listener and enthusiastic to discuss scientific contents. He was open to scientific criticism, friendly to fellow and junior scientists, and an astonishing mentor to students. He will always be remembered for his passion towards science, great scientific achievements, and stimulating Indian scientific journals. His dedication for science and broad outlook towards the betterment of science made him the centre of attraction among his students and fellow mates during scientific debates and talks. He was always motivational and would encourage anyone that he would meet during seminars, lectures and other scientific gatherings. He was one of the backbones behind the establishment of NIPGR during the institute's initial days. He would always visit NIPGR during scientific gatherings

and ask very constructive and relevant questions to the presenters.

Speaking of my personal experiences with Kumar, he was a splendid mentor to me. Be it writing research proposals or any other scientific advice, Kumar was always there for me, and would enthusiastically share his expertise. I always admired the way he looked at the broader aspects of science considering all the minute details. He has been an inspiration to not only me but to everyone who knew him and followed his work. He was a great human being, father figure, always down to earth, and never boasted about his achievements. He was a man of science who lived all his life for the progress of science and for the betterment of the global society. We profoundly remember Sushil Kumar, not only for his scientific achievements but also for his valuable contributions to our community of geneticists.

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P. A. Sebastian (1956–2021)

P. A. Sebastian, the eminent Indian arachnologist, ecologist and conservationist, passed away due to heart failure on 13 January 2021. Indeed, he was one of the leading experts in India, who had sound knowledge on the taxonomy and biology of spiders.

Sebastian hailed from North Veliyanad, a remote village in Kuttanadu, famous for its green paddy fields in the Alappuzha district of Kerala, South India. He moved out of Kuttanadu at the age of 21 to pursue higher studies and his passion for nature. Getting what he called a 'precocious start', Sebastian became a college freshman at the age of 21, receiving a B.Sc. degree at 24, M.Sc. at 27 and Ph.D. at 33. After graduating from the University of Kerala in 1979, he moved to Belgium for a year to pursue a diploma in French. In 1983, he completed his M.Sc. in zoology from the University of Rajasthan. Then he moved to Bhavnagar University, Gujarat, for a Ph.D. under B. H. Patel. He graduated in 1989, studying the biology of some predaceous spiders on insect pests of major crops in north Gujarat. He was appointed Assistant Professor of Sacred Heart College, Thevara, Kochi in the Department of Zoology. In the same year, he married Elizabeth Chacko (currently Deputy Director, Department of Agriculture, Thiruvananthapuram). He became Director, Division of Arachnology (founder of this Division) in 2013, and served in that capacity until his demise. This is one of the leading centres in India where extensive research on spiders is on-going in a systematic and scientific manner, similar to the Zoological Survey of India.

The Division of Arachnology was established in 1998 and has since emerged as an acclaimed centre for research in taxonomy and bioecology of spiders. The Arachnology Division of PG and Research Department of Zoology (DST FIST-sponsored), Thevara, has all the basic infrastructural facilities for successful implementation of any project on spiders. Identifying and cataloguing the spider diversity of South India, particularly Kerala, has been the primary motive of the Division since its inception. Sebastian's efforts have led to

an impressive collection of spider specimens in the museum, which serves as a reference for spider enthusiasts across the country. The Division has developed modern facilities, multipronged strategies and technological capabilities to achieve its objectives related to identification, cataloguing, creating a repository of available spider fauna and database management.

Sebastian was a prolific scientist, publishing more than 100 articles in reputed journals, including two books and many book chapters over the course of his career. His early works include the influential book *Spiders of India*. This book was intended to popularize the study of spiders in India, correct many false impressions about these insects, create awareness and interest about their study and, more importantly, to provide an in-depth understanding with detailed information on selected species. It was an authentic book on Indian spiders after a gap of 40 years from the Indian subcontinent. Sebastian has several seminar papers to his credit on the biology of spiders, endemism, species concepts, spider diversity of the Western Ghats, synanthropic spiders, spinneret morphology. His prodigious contributions have added 2 new genera and more than 50 new species of spiders to the world spider catalogue.

In addition to his role as a teacher, Director and Chairman or Councilor of numerous scientific societies, Sebastian served on several editorial boards and scientific panels, leaving a rich legacy in conservation education. He advised over 25 students both for doctoral studies and research projects, many of whom now have illustrious careers in arachnology and systematics around the world. Sebastian also delivered many scientific lectures on different aspects of spiders, including topics like 'spider silk biotechnology and applications of spider venom' in India and abroad. To share research findings with arachnologists the world over, as well as with the general public, the Division has launched a website – www.southindianspiders.org – the first of its kind in India.

Keenly aware of the threats regarding biodiversity, Sebastian was actively involved in initiatives to address the 'taxonomic impediment' by accelerating the pace of species discovery and description, including programmes such as workshops on spider taxonomy, spider identification and spider collection techniques. He received grants, both major and minor, for implementing automated methods of species