

Excellence by simplicity: life and contributions of Professor Ramesh Maheshwari (1940-2019)

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Professor Ramesh Maheshwari was surrounded by family and loved ones when he passed away peacefully in Bangalore on 30 March 2019.

Ramesh Maheshwari was born on 19 December 1940 in Delhi. He belonged to a family rich in scientific endeavors. His father, Professor Panchanan Maheshwari, a renowned botanist in Delhi University, is credited to pioneering the fertilization of angiosperms in-vitro, a technique that has led to development of hybrid plants (Maheshwari and Johri 1950; Maheshwari 1952; <https://royalsocietypublishing.org/doi/pdf/10.1098/rsbm.1967.0013>). His elder brother, Professor Satish Chandra Maheshwari, was a pioneer in areas of plant physiology and molecular biology.

Ramesh Maheshwari joined Delhi University and obtained his BSc in 1960 and MSc in 1962. He then moved to University of Wisconsin – Madison to study rust fungi as the subject of his PhD dissertation with Professor PJ Allen. This work created fundamental insights into uredospore germination and the infection of plants by rust fungi (Maheshwari and Hildebrandt 1967; Dunkle *et al.* 1969). It also kindled his interest in fungi and he continued these studies as a Research Associate in the lab of Prof AS Sussman at University of Michigan-Ann Arbor (Maheshwari and Sussman 1971). He moved back to India in 1970 to join the Department of Biochemistry at the Indian Institute of Science in Bangalore as a Research Associate. He continued to explore his passion for fungi, steadily moving up as a Lecturer (1972-1979), Assistant Professor (1979-1984), Associate Professor (1984-1990) and Professor (1990-2002). He led the Dept of Biochemistry as the Chairman from 1995 to 1997 and retired on 31 July 2002.

I worked under the supervision of Professor Maheshwari for my PhD studies from 1995 to 2002. I will always remember him for his discipline, inquisitiveness, scientific integrity and passion for fungi. He was a proponent of simplicity. He would ask the most fundamental questions about fungal biology and then try to obtain answers with simple and elegant experiments. He believed that intricate experiments can be performed using a minimalist approach and acquired only modest funding to support his research. He insisted that a modest economy like India justified a judicious use of available funds and believed that fundamental insight gained with simple experiments demonstrate excellence in thought and execution. He used these approaches to explore his passion for fungi and their multinucleate lifestyle.

His work has generated fundamental understanding in diverse areas of fungal biology including germination and infection of plants by rust fungi (Maheshwari and Hildebrandt 1967; Dunkle *et al.* 1969; Maheshwari and Sussman 1971), thermophilic fungi and their enzymes (Maheshwari *et al.* 2000), the life-cycle of *Neurospora* in its natural habitat (Pandit and Maheshwari 1996b), senescence (Navaraj *et al.* 2000; Maheshwari and Navaraj 2008), heterokaryosis (Pandit and Maheshwari 1996a; Maheshwari 2005) and microconidia in fungi (Maheshwari 1991; Maheshwari 1999). He was a member of many professional societies including the American

Society of Plant Physiologists, Society of Microbiologists of India, and the Indian Phytopathological Society. He also contributed as a member of the Editorial Board for *Journal of Genetics*.

Perhaps his most valuable contribution is that he taught and trained students to think, do, talk and present science. He nurtured scientific curiosity and encouraged self-learning. His thoughts and ideas have manifested in over 86 peer-reviewed scientific publications and thesis dissertation of 17 PhD students. He insisted and invested time and effort in personally teaching and training undergraduate students, Project Assistants, graduate students and post-doctoral fellows. A 30-minute or more one-to-one interaction with every lab member was on his daily schedule. This included designing experiments, making media and reagents, executing experiments, and collecting and analyzing data. Field trips were an exciting time to collect soil samples for isolating fungi or for studying *Neurospora* growing on sugar cane. Saturday morning lab meetings would include presenting reports, talks or recent exciting papers pertaining to fungal biology. Even with the availability of PubMed and internet searches beginning in the 1990s, he continued his Sunday morning ritual of going to the library to read new and interesting papers in various biology journals. He was a proponent of communication and sharing information and cherished his interactions with a large number of fungal biology and *Neurospora* researchers. He strived to inculcate these fundamental habits in his students and insisted that they continue to teach, train and spread scientific curiosity in their academic and non-academic careers.

Even though a medical condition forced his early retirement in 2002, he continued to pursue his objective of spreading knowledge about fungi in the form of over 23 publications including research papers and popular scientific articles in journals. He accomplished his wish to write a book to spread awareness of fungal model systems in experimental research and also updating it with new information in a second edition (Maheshwari 2016). These contributions after retirement were only possible because of hard-work, support and assistance from his wife, Mrs. Manjuli Maheshwari and his son, Govind Maheshwari.

Ramesh Maheshwari exemplified excellence by simplicity in his personal and professional life. He will be remembered for his fundamental contributions to *Neurospora* and fungal biology.

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