

## Chanchal Uberoi (1939–2019)

In the early 1960s, around the time Chanchal Uberoi joined the then Department of Applied Mathematics, the Indian Institute of Science (IISc) was passing through what may be called a transitional period. The IISc successfully provided not merely trained faculty over a crucial period in the history of higher Indian technical education, badly needed for the newly established institutes of research and technology, but also high-level technical staff for the similarly new public sector engineering enterprises.

A strongly felt need for training in the ‘use’ of mathematical methods in practical engineering, from aeronautical to civil aspects, led to an opening at the IISc of a ‘Department of Applied Mathematics’, intended primarily as a teaching body. Around this time many Master’s degree holders were recruited and Uberoi was one such. While being informed that there was some possibility of being selected as candidates for doctoral degrees in the not too distant a future, she and her colleagues were warned that they should expect to bear much teaching load. In later years Uberoi was to receive fond remembrances from her past students who had come to occupy eminent positions in academe and industry.

Uberoi came from a Punjabi business family, settled in Quetta, Baluchistan, that had a history marked by significant events in its business of retailing ‘fancy goods’ in a fashionable shopping place to colonial families, a business destroyed in the 1929 Quetta earthquake. Moderate prosperity that followed re-establishment of the business was only to be destroyed during the events happening on the partition of India. The family, together with 8-year old Uberoi, was forced to flee from a home set on fire at night. After much wandering in India the family settled in Hyderabad, the father setting up business and settling again in life.

Uberoi then found her abilities would let her take up mathematics and she was awarded the Master’s degree by Osmania University. Her career was launched when she joined the then newly created Department of Applied Mathematics where she was awarded the Ph D degree for her thesis titled ‘Small amplitude phenomena in conducting fluids and transport properties of plasmas’ in 1966. Soon after, she was to develop her re-

search interests on being selected, first, as a Leverhulme Trust Fellow at University College, Cardiff, Wales, UK, and then, as the first Donald H. Menzel Fellow at Harvard Observatory, Cambridge, Mass., USA. On her return to India she was appointed as Assistant Professor, soon promoted as Associate Professor and as Professor in the Department of Applied Mathematics, later renamed as Department of Mathematics.



Her technical publications, numbering over a 100, were in such reputed journals as *Astron. Astrophys.*, *J. Geophys. Res.*, *Phys. Fluids*, *Plasma Phys.*, *Solid State Commun.*, *Phys. Lett.*, *Phys. Rev.*, *Solar Phys.*, *Planet. Space Sci.*, and so on, the topics ranging widely from integro-differential equations, wave motion in ionized media and semi-infinite surfaces, the role of Alfvén waves, inhomogeneous plasmas, effects of assumed absence or presence of magnetic fields, etc. Her work has had applications in both space and laboratory plasmas. Thoughts on the mechanisms of heating of the chromosphere of the sun, the specificities of the activity of strong magnetic fields in the formation and behaviour of sunspots, confinement of plasma in magnetic ‘bottles’, space weather in the Sun–Earth system were always in the background of her research. A partial account of her interests can be found in the chapter titled ‘Space plasmas’ she contributed to a *Handbook of Solar-Terrestrial Environment* edited by Y. Kamide and A. Chian, published in 2007 by Springer.

She considered it an honour to have been invited to deliver talks at numerous seminars and workshops organized both in India and abroad. She travelled extensively, from Sydney, Australia, to Göteborg, Sweden, from Nagoya, Japan, to

Ohrid in what was ‘Yugoslavia’, to Foz di Iguacu (Rio de Janeiro) in Brazil, to Abuja in Nigeria, from Cambridge, England, to the Harvard Observatory, Cambridge, MA, USA, from the University of New Hampshire, to the Institute of Plasma Research, Princeton, NJ, USA, and so on, enjoying participating in numerous academic events.

She was also engaged in year-long periods as Visiting Professor, Institute of Physics, Puebla, Mexico, Research Consultant at AT&T Bell Laboratories, and later, at Lucent Technologies, NJ, USA, Research Associate, International Centre of Theoretical Physics, Trieste, Italy (1990–1995), Visiting Professor, Indian Institute of Astrophysics, Bengaluru, during a sabbatical year.

Besides writing scientific papers, Uberoi authored three books, deliberately chosen as soft-cover editions, titled, *The Alfvén Wave*, in collaboration with A. Hasegawa (DOE Critical Review Series, USA), *Introduction to Unmagnetized Plasmas* with problems to solve by students (Prentice Hall, NJ, USA), and *Earth’s Proximal Space* (Interline Publishing for JNCASR and University Press, Hyderabad), the last, with many illustrations in colour for the scientifically interested lay reader. *The Alfvén Wave* garnered the STC 1983 award by the Society for Technical Communications, Tennessee, USA, for the best technical book. Besides participating in nationally televised UGC-sponsored programmes, she authored many popular articles in newspapers with topics like the position of women in science, famines, thought caused by variability in solar activity leading to monsoon failure (the Maunder Minimum; 13–15 centuries) during Mughal Rule, especially when the Taj Mahal was being built, and so on.

Uberoi had undergone training as a vocalist in North Indian classical music. Combining her scientific interest, she prepared a compact disc using audio frequency radiation produced by ionized entities surrounding and interacting with magnetically active planets (Saturn, Jupiter, the Earth), then recently transmitted by Voyagers I and II and converted to sounds audible to the human ear. She prefaced each sound profile by a short rendering of a subjectively chosen musical piece, instrumental and vocal. She

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was correct in believing that this effort would interest young people in taking up research in topics related to ionized media.

She was always amused by the contrast of elaborate ensembles used in Western harmonic music and the simplicity of Indian melodic music in creating intended effects on the listener. The ensembles use such appurtenances as 'thunder sheets', 'wind machines', large drums, etc. in creating weather effects. She wrote about this in an essay, *The Melodies of Monsoons: Weather in Indian Classical Music* published in American Geophysical Union's journal

*Eos* illustrating, in transliterated lyrics, how onomatopoeia and setting in appropriate ragas and taala/laya, produce all the intended effects.

Appointed as Dean of the Science Faculty during 1999–2001, she was the first lady to have occupied the position in more than a century of the history of the IISc. She did experience a 'glass ceiling' in her career but, never one to support any kind of affirmative action, she simply wanted a person to be recognized for her/his intrinsic worth.

Not long after her formal retirement she was honoured by the Alumni Associ-

ation, IISc, by electing her as a Distinguished Alumna when she was Professor Emeritus in the Department of Mathematics.

One may say her life ran parallel to the history of India since the days of Partition to recent times.

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