

# PROFESSOR PRITI SHANKAR

*In Memoriam (September 1947 – October 2011)*

Just before the advent of Deepavali, the festival of lights, the Dept. of Computer Science & Automation at the Indian Institute of Science, Bangalore, lost one of its brightest stars – Professor Priti Shankar, who had made, over a career spanning almost half a century, signal contributions to the teaching and research of compiler design, formal language theory and algorithmic coding theory.

Priti was born into a celebrated Goan family, whose patriarch was the noted medical doctor Dr. Baronio Monteiro, known for his contributions to developing health services in the region. Incidentally, he was also primarily responsible for ensuring that the local tropically-appropriate loose-fitting gown “cabaia” returned to favour, supplanting the de rigueur Western attire introduced by the Portugese!

Priti’s father was Brigadier Innocencio Monteiro of the Indian Army and her mother, Sophia, was a maths teacher. She was part of a deeply socially-conscious family, with her siblings notably including Dr. Vivek Monteiro, the theoretical physicist turned trade-union leader and low-cost science educator; Prof. Anjali Monteiro, the documentary film-maker and professor of media studies at the Tata Institute of Social Sciences; and Dr. Nandita de Souza, the Goa-based developmental and behavioral paediatrician.

Priti, whose birth coincided with that of the newly independent India, fully imbibed the pervasive spirit of freedom and blazed her own distinctive trail throughout her life. In an era where the parlously few women in Indian science were largely confined to the biological disciplines, she pursued mathematics and engineering, culminating in her being the *first* female electrical engineering graduate from IIT Delhi. She then went abroad to the University of Maryland at College Park for her doctoral studies, returning soon after to the nascent School of Automation at IISc, and played a pivotal role in piloting it to a pre-eminent position in the country.

**Research Contributions.** Priti’s research contributions spanned both the theory and practice of computer science, an ability that can be laid claim to by only a select band of researchers. Her results on error correcting codes are characterized by deep and elegant mathematical insights, while her contributions in compiler design have been incorporated in high-performance computational tools. The lasting impact of her work is reflected in her papers being cited by influential authors, and featuring in the advanced graduate courses of leading international universities.

In the area of coding, Priti’s foundational contribution in 1979 dealt with generalizing the Bose-Chaudhuri-Hocquenghem (BCH) codes, which had hitherto been defined over finite fields, to be operational over Galois rings. This technique found application about fifteen years later in the award-winning paper on linearity of Kerdock and Preparata Codes by Hammons et al, and was acknowledged by the authors to be among the starting points for their investigation. Her later work dealt with “trellises”, layered graph descriptions for block codes that find applications in soft-decision decoding. In 2003, she brought out the organic and novel connection between trellis representations and finite state automata, leading to an abstract characterization of trellis state spaces in terms of equivalence classes of a bi-invariant equivalence relation on the Kleene-closure of the input alphabet set. This line of study was extended to developing an algebraic structure theory for the special class of “tail-biting” trellises in 2006. Her most recent work was on low-density parity-check codes (LDPC), where she proved an important negative result that computing the stopping distance of a Tanner graph is NP-hard.

In the area of automata theory and compilers, her contributions were mainly in the generation of automatic compiler and compression tools from formal specifications. Specifically she developed a theory for tree parsing that enabled the automatic generation of code generators from formal machine specifications in the form of regular tree grammars – this important result appeared in the prestigious ACM TOPLAS journal in 2000. She also co-edited with Y. N. Srikant the *first* handbook of compilers, published by the CRC press in 2002.

A few years later, Priti proposed, implemented and released as open source software, a scheme for automatically generating XML file compressors from formal syntax specifications. This scheme is based on recursive finite automata working in tandem with arithmetic compressors. A chapter by her on this topic appears in “Modern Applications of Automata Theory”, a soon-to-be-published volume of the IISc Research Monographs series that she co-edited with Deepak D’Souza.

**Pedagogical Contributions.** While Priti was an accomplished researcher, as highlighted above, it is as an educator par excellence that her talents really came to the fore. She was an exemplary role model to her colleagues and students, maintaining uncompromising technical standards tempered with compassion and humanity. Being a steadfast custodian of the noblest academic traditions of kindling and nurturing young minds, her students thought the world of her while her colleagues tried to learn and emulate her pedagogical skills. Several of the current CSA faculty were fortunate to themselves be her students, and experienced at first-hand her brilliant and inspirational teaching.

Priti conceptualized, introduced, and taught a rich portfolio of *over twenty* courses, exhibiting a remarkable flair for communicating complex concepts in an alluringly simple manner accessible to all categories of students. In fact, the new academic programmes introduced by CSA during the 70s, 80s and 90s, that kept pace with the rapidly changing landscape of computer science, were largely championed by her. Moreover, at an operational level also, her hand was at the tiller, chairing the Departmental Curriculum Committee (DCC) for several years, and serving on the Institute’s Senate Curriculum Committee (SCC).

Overall, she mentored close to thirty research students, and almost a hundred ME projects. Several theses were nominated for recognition, with the PhD dissertation of K. Muralikrishnan receiving the 2008 Alumni Award for Best Thesis. Further, her students have gone on to create names for themselves in academia and industry, the truest hallmark of a great teacher.

Institutional recognition of her teaching mastery came through IISc awarding her the Jaya Jayant Award for Teaching Excellence in 2007, and IEEE naming her as a Distinguished Lecturer during 2006-09. Priti also played a leadership role on the editorial board of Resonance, India’s primary journal of science education. She developed a coherent discourse tailored to stimulate the scientific temper in our college students, and authored as many as ten highly popular articles in this forum.

Evocative of her personality, even on the last day of her life, she insisted that her student, Rajesh Pillai, visit her home to obtain the signature on his PhD thesis submission form, and fulfilled an important official commitment in her final hours.

**Social Contributions.** Priti was a born nurturer, not just of students, but of the environment around her. She was passionate about gardening and many of the flowering plants that now adorn the CSA quadrangle were gifted by her. Three years ago, she introduced an avocado sapling and regularly monitored its health. During her last conversation with the CSA Chairman a week ago, although in great personal pain, she did not fail to enquire about the plant’s status and was gratified to know it was now six feet tall. Like these plants, she herself unstintingly gave the fruits of knowledge to generations of CSA students.

**Personality.** As no doubt already evident, Priti was an extraordinarily gentle humanitarian, generous to a fault, unfailingly polite and gracious to all, and warmly sympathetic and helpful to those in distress around her. She possessed outstanding communication skills, both spoken and written, and her quiet dignity and understated demeanour shone brightly through them. Anyone who came in contact with her went away a better person for the experience, and it would be hard to find a soul who did not cherish their interactions with this impeccable personality who was always exceedingly modest about her own achievements.

In a nutshell, Prof. Priti Shankar was a gifted teacher, researcher, and educationist, serving as an exceptional ambassador of computer science for the Indian Institute of Science and the nation. In everything she touched, whether technical or personal, she epitomized the phrase “grace and elegance”. We, at the CSA department, are truly blessed to have had the fortune of her association for close to four decades, and in her demise, have lost a long-standing pillar of our institution.

Perhaps the most befitting epitaph for Prof. Priti Shankar is the moving quotation:

*“A good teacher is like a candle – it consumes itself to light the way for others” ...*