Maroli Krishnayya Chandrashekaran (1937–2009)

On 2 July 2009, the field of Animal Behaviour and Chronobiology lost one of its most charming and effective leaders of the 20th century. Having headed the country’s first Department of Animal Behaviour and Physiology, at Madurai Kamaraj University (MKU), Madurai, India, for two decades, Maroli Krishnayya Chandrashekaran (popularly referred to by his friends and students as Shekar or MKC) moved to the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore in June 1996. The dedication he had for his work and attachment to the group which he put together at the JNCASR and nurtured for 13 long years is exemplified by the fact that he was at his office that fateful morning, and ‘feeling weak’ was the last entry in his personal diary shortly before he left his desk for lunch, became unconscious and was taken to a local hospital.

Born on 4 September 1937, in Salem, Tamil Nadu, India, MKC was deflected to study chronobiology purely by accident. After completing his college education in St. Aloysius College, Mangalore, he joined Presidency College, Madras, where he obtained his Bachelor’s and Master’s degrees. His academic pursuit led him to Madras University in 1960 where he chose to work with C. P. Gnanamuthu for his Ph.D. The same year distinguished chronobiologists from all over the world met in Cold Spring Harbor to deliberate on Biological Clocks. For his Ph.D thesis, MKC was trying to estimate the minimum amount of oxygen a crab would need to survive. He constructed respirometers in which fresh sea water could flow continuously at pre-calibrated rates. One Monday night, when MKC came to the lab to check on 400 freshly captured crabs, he was astonished to see all of them swimming beautifully in synchrony as soon as he switched on the lights. To verify this observation, he visited the lab again the next Monday night, and to his horror found that not a single crab stirred, even when they were prodded. Armed with this observation, MKC embarked upon systematic study of activity/rest behaviour of the crabs, and found that the crabs exhibit beautiful activity/rest behaviour almost in-phase with tides at the Madras coast – thus he accidentally hit upon tidal rhythms. Excited by this finding MKC entered his ‘vadyar’s’ (Professor’s) office and announced, ‘Sir, tidal and diurnal rhythms in the activity of Emerita!’ or something to that effect. Although Gnanamuthu did not discourage MKC, like many others at that time, he was sceptical about the existence of any kind of endogenous rhythmicity. Little did he know that in his own lab, his student had conducted the first experiment on tidal rhythms on Indian soil. However, MKC did not give up – he decided to pursue these findings further and completed his thesis on tidal rhythms in the crab Emerita asiatica. He remained emotional about his early work on tidal rhythms; he wrote series of scientific and general articles on it – his last scientific article, in a book published by Springer-Verlag was titled Ultradian Rhythms from Molecules to Mind. Out of his deep affection for the species he named his home in Bangalore as ‘Emerita’.

It was during his doctoral training that MKC came in touch with Gerhard Neuweiler, a brilliant German neurobiologist who studied echolocation in bats, who remained his close friend and collaborator until his death. It may be noted that some time ago MKC wrote an obituary of Neuweiler in Current Science (2008, 95, 1750–1755). Having received his doctorate, MKC was unsure about the next move. Fortune smiled on him when Erwin Bünning offered him a post-doctoral position at one of the few institutions in Germany which was known for its research in plant physiology; and MKC made ample use of this opportunity. Bünning was one of the pioneers of chronobiology, and a true role model for many including MKC. MKC was a great admirer of Germany and Germans, and had a wonderful time in Tübingen. He held Bünning in high regard and would talk untringly about his interactions with him. Among the things which I discovered in MKC’s drawers were letters, pictures and books written by Bünning. Bünning was primarily a botanist with a wide range of scientific interests – from rhythms in plants to fruit flies, from daily to seasonal types – topics towards which MKC maintained a lasting interest. MKC had the rare opportunity of collaborating closely with Bünning and his numerous visitors such as David Saunders, David Lloyd, Anders Johnson and Hans-Willi Hommeger, all of whom remained close friends of MKC. It was during these years that MKC got interested in the circadian timing system of Drosophila. In the seventies, he published most of his work on Drosophila circadian rhythms. Starting with studies on the effect of light, temperature, spectral composition of light, ‘dawn’ and ‘dusk’ to more conceptual studies on phase response curves, transients, coupled oscillators and the singularity. He was fond of talking about his Drosophila work, especially studies on the singularity. I still have fresh memories of MKC emphasizing in his lectures the importance of time and strength of perturbation as ‘S’ and ‘T’, which would push circadian rhythms into singularity, which he was fully aware that no one in the audience understood. The time when MKC decided to work on biological clocks could not have been more propitious. Shortly before Collin S. Pittendrigh embarked on phase response curves and transients in quest of understanding the properties of circadian oscillators, MKC had worked out his protocol to track the phase of circadian oscillators. During the pre-molecular era when much of the conceptual foundation of Drosophila circadian biology was laid, his contributions were significant. He witnessed the discovery of the first clock gene in 1971 by Konopka and Benzer, and the localization of the mammalian circadian pacemaker in 1972. He had seen the field grow from its primitive stage to its glory.

Soon after MKC came back to India after his first German stint as DAAD Fel-
low, he was selected as a Miller fellow to work with Werner Loher in Berkeley. With Loher, MKC worked on extracellular photoreception in cichlids. How much MKC liked Germany is clear from the fact that he went back once again to Tübingen to work with Wolfgang Engelmann on a few pending issues on Drosocephila circadian rhythms. Soon after his first daughter Sujata was born, MKC decided to return to India for good. He moved to MKU as a reader, with the possibility of working closely with German scientists under an Indo-German Cultural Pact. The arrival of a research student of R. Subbaraj’s calibre was a godsend to MKC and resulted in years of jam-packed action on rhythms in bats, mice and humans in his own lab at Madurai. MKC – aided by his never-absent, immensely caring, charming personality – was the leader; but without Subbaraj’s energy in applications, these extremely exciting studies would not have got off the ground. Subsequently, Sripathi Kan- dula, G. Marimuthu and N. Viswanathan joined him, and the years that followed filled his life with joy and adventures of behavioural research which reached its peak in the eighties. The first department of Animal Behaviour and Chronobiology of the country was inaugurated in Madurai by Yash Pal in the presence of S. Krishna- swamy. Most of MKC’s landmark studies on ecological and socio-biological significance of circadian clocks were performed in the eighties. He and his students showed that bats can communicate information about local time to each other, and that the mother mouse can regulate the activity/rest behaviour of her pups. Among the popular stories of that time that MKC was fond of telling young students, one was, ‘How bats tell bats time?’, and the other ‘Too much mother or too little mother’. He and his students were invited to exhibit different species of bats in Raj Bhavan by the then Prime Minister Rajiv Gandhi. This has resulted in MKC being also referred to as the BATMAN of India.

After the first human isolation chamber was up and running, MKC became a celebrity – with both print and electronic media in competition to cover his research. Every time a human rhythm experiment was concluded there was huge media presence trying to interview him and the subjects. I have personally witnessed MKC being passionately involved in these human isolation studies. In many ways it would be fair to say that MKC brought MKU to the world map of science; and MKU began to attract visitors from all over the world. MKC enjoyed these years the most and would often talk to me of his friends at MKU: S. Krishnaswamy, R. Jayaraman, J. Jayaraman and K. Jayaraman, K. Dharmalingam and V. R. Muthukaruppan.

MKC was always fond of neurobiology; with the help of the Fleissners (Gerta and Guenther) who brought German perfection, and his student Sripathi, he managed to set up a facility to record electrical activities from bat brain. MKC continued to have high regard for mathematicians, physicists and neurobiologists. He collaborated with several of them, made friends with them – was also responsible for introducing some of them to elite Institutions of India like MKU, IISc, JNC and JNU.

Towards the end of his stay in Madurai, MKC as an ‘elder statesman’ of science was called upon to perform many extra-curricular duties – first as coordinator of Biological Sciences and then acting Vice-Chancellor of MKU, almost in succession. All these duties took much of his time from teaching and more creative activities. As a result, the last few years of his term in MKU were perhaps, not marked by the same elan as the decade preceding them. His voluntary retirement from MKU in 1996 (although he continued to serve as research professor at JNCASR until his demise) brought to a close an era which kept Chronobiology and Animal Behaviour at MKU in the forefront of biological research. MKC survived his voluntary retirement for another 13 years; and saw the field of Chronobiology and Animal Behaviour evolve in India. After an extraordinary career at MKU, he started his second innings at JNCASR, Bangalore. He was appointed as the first chairman of the newly formed Animal Behaviour Unit. The years 1996–2009 which MKC spent at JNCASR, mark, in retrospect, the high noon of his scientific life. MKC did not distinguish himself only by research; we learned to know him as an outstanding scientist, an intellectual, a teacher, a friend, a charming and humorous human being. His attitude of giving a free-hand to his subordinates helped him develop a group at JNCASR which will always be remembered as his finest gift to the scientific community.

The qualities of MKC that I personally liked were his ability to make friends with people of all age groups, razor-sharp memory, excellent mimicry, quick-wittedness and intelligent humour. He was also a great story-teller; he could get an audience rolling on the floor with laughter even while narrating an apparently mundane story. He was well-read and loved talking about books. He was a regular visitor to ‘The Strand’, M. G. Road, Bangalore. Once we both happened to be in New York City and, while walking along Broadway, we passed by the famous Strand Bookstore and decided to ‘peep’ inside. MKC however ended up buying a large number of books, and had to borrow a suitcase from me to carry them back home. At home, his study is full of books of all kinds, and he loved reading his favourites again and again.

MKC continued to be active as an author, teacher and mentor until his last day. He died peacefully on 2 July in Bangalore, India. He is survived by his wife Shashikala – his faithful collaborator from his Berkeley days, and a gracious housewife who kept MKC away from the vagaries of family life, keeping all troubles to herself and Shouldering no small responsibility of taking care of a scientist and his two growing daughters (Sujata and Sonali).

MKC witnessed the growth of the field of chronobiology almost from its inception to its pinnacle by being in the thick of action. In the years ahead, some of his memories may gradually fade, and dust may settle on the many honours bestowed upon him for his outstanding contributions as a teacher and scientist, but MKC will always be remembered for his scientific contributions through the papers and books that he wrote.

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