Sipra Guha-Mukherjee (1938–2007)

On 15 September 2007, India lost one of its widely respected members of the plant biology community – Professor Sipra Guha-Mukherjee – rather suddenly and prematurely on account of cancer of the brain. Born in Calcutta in 1938 but educated in Bombay and Delhi, Sipra Mukherjee served at the Jawaharlal Nehru University (JNU), New Delhi for more than 30 years, till retirement. A well-attended symposium on Developments in Cellular and Molecular Biology had been held in her honour at JNU. Little did we realize that her end was so near.

For me her demise is particularly sad, knowing her as I did for more than 50 years. Sipra was admitted as a student in the Delhi University in 1954. In those days, instruction in the Honours course was the sole prerogative of the main departments of the University. My career began with teaching plant physiology and elementary biochemistry in First Year Honours and later at a slightly higher level in the Third Year Honours. As she continued in the M Sc programme, it was a privilege to teach these subjects again with more advanced and intensive coverage. I remember Sipra, through all these years, as one of the most gifted and intelligent students we ever had. Her penetrating questions, in no small measure, contributed to my own interest and forays in research in plant physiology and biochemistry during my career.

Sipra completed her Ph D on tissue culture of onion under B. M. Johri, who had supervised my Ph D as well. Subsequently she joined my laboratory as a postdoc. It was during this period (1964–66) that she discovered the technique of production of haploid pollen plants through anther culture using *Datura innoxia* as experimental material. The American geneticist, Albert F. Blakeslee discovered the first natural haploid plants in 1920s in *Datura stramonium*, another related species. Since then, a reliable technique of production of haploids in large quantities had long been sought by plant breeders. Indeed, hoping that egg cells in unfertilized ovules could be induced in aseptic cultures – in medium fortified with hormones – to develop into plantlets parthenogenetically, the late Panchanan Maheshwari, had embarked in the late 1950s on a large research programme to culture unpollinated ovaries and ovules. This work led to the establishment of techniques of culture of young ovaries and ovules. Though no parthenogenetic plants could be raised at that point, subsequently success was reported by several laboratories.

Anther and pollen are good materials for raising haploids (a single anther contains thousands of microspores), but hardly anyone thought that this would be possible. Our idea of starting anther culture was to study physiology of male meiosis, and in particular to see whether physical or chemical factors (like hormones) could influence or trigger mitosis-to-meiosis transition. *D. innoxia* was growing in the Botanical Garden of the Delhi University and its large anthers seemed a good material to isolate cells preparing to undergo meiosis. When cultured, most of the anthers turned brown and died, but we were startled to find small plantlets coming out of some of the anthers. Although Sipra felt that they were of microspore origin, the idea seemed too bizarre and it took me some time to reject all other alternative explanations (a few colleagues thought that under culture conditions, 'connective' cells could have rounded up and undergone divisions). Finally, we succeeded in obtaining some good cytological preparations to make chromosome counts.

Anther culture technique was later refined in France and also our laboratory giving way to 'isolated pollen culture'. Collectively, both techniques have made a great impact internationally. Although anther or pollen culture is still difficult in many plants, agricultural research establishments in several countries around the world are employing this technique as a valuable additional tool for obtaining improved varieties of wheat, rice, potato and other crops, as documented by many original articles, reviews, symposia reports and books.

Apart from the widely recognized usefulness of haploids in gaining instant pure lines (in conventional plant breeding, selfing for several generations is required to achieve reasonable homozygosity), haploidy is of use in uncovering recessive mutations and isolating the desired material and also 'fixing' a line via backcrossing, since a much smaller population is adequate with haploids than is otherwise necessary.

Sipra went to USA in late 1966 and worked as a Research Associate with R. S. Bandurski at the Department of Botany and Plant Pathology, Michigan State University and later at the well-known MSU/DOE Plant Research Laboratory when Joe Varner and Anton Lang were there. Between 1970 and 1972, she served as an Assistant Professor in the Biology Department at West Virginia University in Morgantown. After her return to India, Sipra collaborated with M. S. Swaminathan (then Director, IARI), who greatly valued her collaboration for raising haploids in rice. However, subsequent to the establishment of JNU in the early seventies, Sipra joined the new Life Science Faculty there, as one of its founding members. Plant tissue culture, haploids, and plant biotechnology (after the advent of recombinant DNA techniques) were areas where she was an acknowledged expert. However, she conducted researches on the action of auxins, biosynthesis of aspartyl transcarbamylase (an enzyme well known for study of feedback regulation), glyoxalase, phytochrome regulation of nitrate reductase, polyamine biology, and satellite DNA in *Brassica*, training a larger number of students in the broad area of modern plant biology. Sipra was promoted as a full Professor in 1979 and served as Dean of Life Sciences during 1993–95.

During her career, Sipra received many honours and awards. She was elected a Fellow of the Indian Academy of Sciences, Bangalore, as also the National

Academy of Sciences, Allahabad. She received the Om Prakash Bhasin Foundation Award in Biotechnology and also Kanishka Award of the Lions Club. Right till the end, she was active, serving on several committees and governing councils of various institutions supported by both universities and the Government. However, specially noteworthy are her contributions as Member of the Task Force and Scientific Advisory Committee, Department of Biotechnology, Government of India, and more recently of the University Grants Commission.

Sipra Guha-Mukherjee will also be remembered for the great impetus and support that her work gave for better funding of plant science in India. Her discovery of pollen haploids attracted the attention of scientists like B. P. Pal and M. S. Swaminathan and their interest led to the establishment of special centres for plant research fully supported by the Government of India within and outside the university system. The first such unit was established by DST at the Delhi University. Later, more generously supported Centres of Plant Molecular Biology came up at various universities, including JNU and Delhi University.

Sipra was an extraordinarily hard working and dedicated person. Our mentors Panchanan Maheshwari and B. M. Johri knew no holidays and worked literally 365 days in a year, and she fully carried on this tradition. She leaves behind many pupils, several of Sipra's students occupy high positions in our universities and research establishments. In personal life, Sipra was a cultured, sensitive and refined person with great interest in arts, music and painting. But the most charming aspect of her personality was her openness, frankness and wit, which endeared her to us. She leaves a great legacy and will be remembered by all for many years to come.

Sipra is survived by her husband and twin daughters.

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