Prasanna Mohanty (1934–2013): a pioneer and a loving teacher

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The passage of time brings with it the inevitable loss of people we love, respect, and depend on for guidance and advice. Today, we are faced with the loss of one such mentor, guide, adviser, friend and much more to many of us. Professor Prasanna K. Mohanty passed away on March 9, 2013, after a long illness in Cuttack, India. With this loss, his students and colleagues have lost not only a great mentor and friend but also a great scientist.

Prasanna Mohanty was born on April 1, 1934 in Keshpur, Odisha, India. He obtained his Bachelors and Masters degrees in Science from Ravenshaw College, Utkal University. Subsequently, he taught Botany at different colleges in Odisha. In 1965, he left India to study at the University of Illinois at Urbana-Champaign, USA, from where he obtained his M.S. in Botany, and Ph.D. in 1972. His Ph.D. mentor was another brilliant scientist in the photosynthesis field, Professor Govindjee, with whom he shared a personal bond for the rest of his life. His Ph.D. work dealt with the study of factors affecting changes in yield and emission of chlorophyll fluorescence in intact algal cells and in isolated chloroplasts. He was a prolific worker and published ten papers and three reviews from his Ph. D. work in reputed journals of the time. Some important papers from this period of his career include Mohanty et al. (1970, 1971a, b, 1972a, b); Mohanty and Govindjee (1973a, b, 1974). His output and achievements are summed up as follows:

“Prasanna’s thesis was one of the most detailed and thorough that was ever written under my supervision; very impressive performance, and unmatched in my

laboratory, or for that matter, anywhere in the World.”-

Govindjee, University of Illinois at Urbana-Champaign

His post-doctoral work, under fellowship of National Research Council, Canada at the Chemistry Department, University of Western Ontario, Canada was on EPR signal, arising from photochemistry of photosystem-I at cryogenic temperature. He also received several national and international fellowships such as DAAD-UGC, Senior Fulbright Fellow, Senior JSPS, etc. for his study. Prasanna Mohanty returned to India in 1973 and joined Jawaharlal Nehru University (JNU), New Delhi, as an Associate Professor at the School of Life Sciences and went on to become Professor of bioenergetics and the Dean of the school, where he taught and trained many students and post-doctoral fellows till his retirement in 1999. He continued his interest with the two photosystems till the very end. Among his many important contributions in the field was the first clear demonstration of fast chlorophyll (Chl) fluorescence changes in cyanobacteria (Mohanty and Govindjee 1973a). More importantly, he established that the slow chlorophyll fluorescence changes in cyanobacteria were related to structural changes (Mohanty and Govindjee 1973b). The first observation of the ‘O-I-D-P’ Chl fluorescence (Kautsky) curve in cyanobacteria, and the analysis of the non- Q_A -related chlorophyll fluorescence changes through the use of various uncouplers of phosphorylation, electron carriers, and inhibitors of electron transfer, also in cyanobacteria, were important studies that moved the field forward (Mohanty et al. 1972b, 1973). Professor Mohanty and his group made significant contributions in understanding the mode of action of heavy metals on photosynthesis *in vivo* as well as *in vitro*. In higher plant chloroplasts, Zn^{2+} affected reversibly the oxygen evolving complex (OEC) side of photosystem II, while Ni^{2+} affected light-harvesting antennae irreversibly (Tripathy and Mohanty 1980; Tripathy et al. 1981). These authors elucidated three types of heavy metal ion specific changes in chloroplast structure and function. Subsequent

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work elucidated the effects of Co^{2+} , Hg^{2+} , Al^{3+} and Na^+ on the electron transport (e.g., Tripathy et al. 1983; Wavare and Mohanty 1985; Murthy et al. 1989). Another area of studies initiated by Mohanty's lab in JNU was photosynthesis during senescence, using chloroplasts as well as leaves of barley, wheat and *Cucumis*. They showed that OEC was damaged and the activities of key enzymes, such as *Rubisco* were affected during senescence (Biswal and Mohanty 1976, 1978). Further, senescence induces not only a loss of Chl-protein complexes, with differential sensitivity of various forms of Chl a (Grover et al. 1986), but also causes the migration (due to phosphorylation) of Light-Harvesting Complex II (LHCII) to Photosystem I in the stromal region (Prakash et al. 2001). Prasanna Mohanty studied the effect of various environmental factors and chemicals on PSII structure and function. He showed the susceptibility of PSII and changes in energy partitioning between the photosystems as a response to several environmental factors such as NaCl stress (Verma and Mohanty 2000), UV-B (Rajagopal et al. 1998), elevated temperature (Mohanty et al. 2002a) or heavy metals (Murthy et al. 1989). Cobalt ions enhanced the light tolerance and altered the energy distribution in the cyanobacterium *Synechocystis* (Tiwari and Mohanty 1993). Besides quinones, phycobilisomes serve as the primary targets of UV-B triggered dissociation of PSII in intact cyanobacteria (Rajagopal et al. 1998). His interest with studies on heat stress and UV-B engaged him continuously as evidenced by his publications after his retirement (Mohanty et al. 2002a, b; Subramanyam et al. 2005; Nellaepalli et al. 2011). He also contributed many chapters to several books on photosynthesis and authored and edited many more (Mohanty 1996; Chitnis and Mohanty 2000; Younis et al. 2000; Itoh et al. 2012).

Prasanna Mohanty regularly collaborated with international scientists and had several India-Russia, India-Japan and India-USA bilateral collaborations. He served on the Editorial Boards of several national and international journals including *Indian Journal of Experiment Biology*; *Indian Journal of Biochemistry and Biophysics*; *Photosynthesis Research*; *Physiology and Molecular Biology of Plants*, *Journal of Plant Biology* etc. He served as Council Member of National Academy of Sciences (India), Allahabad (1986). After his retirement from JNU, he remained actively engaged in teaching and research and continued to attend international conferences and publish papers till he was 78 (e.g.: Sireesha et al. 2012). He taught new innovative courses at the University of Hyderabad under the UGC programme 'University with Potential for Excellence' and established collaborative research in Plant Biophysics. Later, he directed his energies towards teaching Cell Biology and inspiring one more generation of students and researchers as an Adjunct Honorary Professor at the Regional Plant Resource Centre (RPRC), Bhubaneswar and later at the Dept

of Agricultural Biotechnology at Orissa University of Agriculture and Technology, Bhubaneswar. His associations with his collaborators always ended up as lifelong friendships. The following sentiments from some of his collaborators show what Prasanna Mohanty was to these people:

"I have known Professor Mohanty for more than 40 years. I met him for the first time in 1970 in Professor Govindjee's laboratory of University of Illinois. Since then, he and I were nice friends and saw each other in a number of conferences in US, Europe and other countries. He and I jointly published ten papers in highly reputed journals, such as EMBO Journal, Biochemistry, and BBA- Bioenergetics. (e.g., Tasaka et al. 1996) During the collaboration he showed to us his sharp and deep thoughts of research. We admired his excellence. In addition to the long-lasting collaboration, Professor Mohanty and I organized a Japan-India Binational Seminar in 1998 in New Delhi. I worked together with some of Prof. Mohanty's students, Dr. Prakash, now Associate Professor at the University of Hyderabad, Dr. Alia, now Associate Professor of Leiden University, Dr. Shivaji, Centre for Cellular and Molecular Biology. They were intelligent and hard-working researchers. I admired Professor Mohanty's outstanding talent to educate young scientists. Prof. Mohanty positively influenced my life in not only science but also his excellent personality and character. I am now missing him with all of my heart. Prof. Mohanty, thank you for your friendship, I will miss you but never forget the time we spent together" - **Norio Murata**

His name was nearly synonymous with the word 'Photosynthesis' in India. Prasanna Mohanty stood apart from the rest of the scientists in his thinking, attitude and way of life. His academic approach was distinctly student centric. His priority was academic pursuit of high quality and motivating youngsters for academic learning with no compromise of quality. His deep interest and preoccupation with science gave him no time to indulge in anything else in this world. Hailing from Orissa and having struggled with his own education, he was acutely aware of the economic conditions of the Indian students. He was determined to do everything to help them to pursue their higher education.

He was quite an odd man out in many a scientific gatherings. He stood out in his simple dress in every large group of scientists often finely dressed in their suits. He had an aversion to choosing appropriate dresses and just wore anything and some of his dresses were forced on him by others especially friends and students. He almost looked like Mahatma Gandhi might have looked amidst his smartly dressed contemporary politicians of India and England. To Professor Mohanty, academics meant to live with students, to help them in all the

possible ways and work with them. He often joined the protest marches of the students if he found their demands genuine, breaching the protocol, to the dismay of his colleagues and authorities of the university. In the initial days, he used all his money for buying books and later to support the needy students; dresses had no place in his life.

He lived a simple life and his house was open to all students, a shelter to the poor students in particular. Students have lived for days and months at his home and it was rare to see this man not surrounded by a group of students whether in the lab or on the street or in the canteen or at home. His support for the students was never at the cost of compromising any of the academic values; in return he expected them to be honest and truthful to the core and do science of high quality.

“We have lost a unique man of science. His unassuming nature, simple life, ego less personality, obsession with the students, respect for the intellectuals and finally his commitment to quality research in science made him a scientist of no comparison.”- **K.N. Guruprasad, Devi Ahilya Vishwavidyalaya, Indore**

“Prasanna Mohanty is simple, honest, straightforward, down to earth person and on top of that he respects the dignity of the labor which paid for him so much of love by Karmachari’s” - **S. Rajagopal, University of Hyderabad**

“I do not have sufficient words to describe the superb qualities of Prasanna. He is an innovative researcher, excellent teacher, sympathetic mentor, and above all one of the greatest human beings. His presence has always been inspiring for both senior and young researchers, in terms of both teaching and research. Prasanna is one of the exceptions, where a person is

Fig. 1 Prasanna Mohanty was honored by Govindjee and other colleagues for his pioneering contributions in photosynthesis research at an International Conference on Plant Science in Post Genomic Era (ICPSPGE-2011), held on 17–19 February, 2011, at Sambalpur University, Sambalpur, India. Photo shows: *Left to right*: A.S. Raghavendra (*extreme left*), Govindjee (*with microphone*), S. Rajagopal, Prasanna Mohanty (*wearing a shawl*), A.R. Reddy, J. S. S. Prakash, T. Sarada, and K.P.M.S.V. Padmashree. Basanti Biswal was the organizer of the conference. In the background, is a slide that shows an earlier photograph of Prasanna Mohanty and a dedication to him

Fig. 2 Prasanna Mohanty with other researchers from India at the 15th International Congress of Photosynthesis (PS2010), Beijing, China, August 22–27, 2010. *Sitting (Left to right)*: Prasanna Mohanty, J. S. S. Prakash, R. Agarwal, N. Sridhar and Girish. *Standing (Left to right)*: B. C. Tripathy, A.R. Reddy and A. Srivastava. This was the last photosynthesis congress Prasanna Mohanty had attended

accepted with pleasure, respect and awe” - **A. S. Raghavendra, University of Hyderabad**

“A person of exceptional sincerity and passion for science Prof. Mohanty dedicated his whole life on research of photosynthesis and studying stress mechanisms on various plants and algal systems. A highly principled person, he stood for truth and fought all his life against mismanagement in the academic system”- **Sangeeta Mendiratta, Monsanto India, New Delhi**

“Prof. Mohanty was truly an inspirational teacher who not only enabled his students to unravel the mysteries of photosynthesis with all the enthusiasm and excitement of scientific pursuit but also led them into the beautiful world which abounded in simplicity, trust, righteousness, courage and forgiveness. A teacher at heart, Prof. Mohanty has contributed so much to us in his cheerful and supportive ways.”- **Madhulika Srivastava, National Institute of Immunology, New Delhi**

“Prof. Mohanty is very special for many reasons, but the most important among them lately has been his yeomen

Fig. 3 *Left to right*: Prasanna Mohanty, R.J. Strasser and A.S. Raghavendra. This photograph was taken at the University of Hyderabad

service to this journal (PMBP) as a reviewer, editor and later as a member of the editorial board, when we were relaunching this journal of Indian origin into a truly global journal in its outlook, standard and outreach. Earlier, as a President of the JNU Teachers Association, he took uncompromising positions in the interest of the university and paid a heavy price for it, at a time when most of his peers were busy building their own careers. He showed how to take hard decisions with conviction and live a life without regrets – a personality worth emulating”-**N. Raghuram (Editor, PMBP), GGS Indraprastha University, New Delhi.**

“Prof. Mohanty was simple and religious in his personal life. But he embraced progressive ideas better than many of his generation. Even among all this, he never forgot his roots. Professionally, Mohanty sir had such a deep understanding of basic biochemistry and was a marvelous teacher of the subject. His contributions in spectroscopy of photosynthesis are enormous. He formed a strong professional and personal bonding with photosynthesis researchers across the globe. He is well respected by his peers for his contributions in the field. With limited funding, he had about 200 publications.”- **Balakrishna Kolli, Rosalind Franklin University of Medical Sciences, Chicago.**

What makes Prasanna Mohanty a remarkable person is not just his scientific output, but his human qualities; unpretentious, idealistic, honest, strong, tenacious, kind and helping. He stood tall among his peers. A great and dedicated teacher, he gently nudged his students to go the extra mile. He never wanted the students to suffer in any way and would come to give his lectures late in the afternoons even when the JNU faculty was on a strike called by the JNU Teacher’s Association. He took all the troubled students under his wings, nurtured them under his benevolent gaze and made their careers and lives. The affection and respect he received from his students can be understood from the fact that one of the authors of this tribute (J. S. S. Prakash) even named one of his sons as ‘Prasanna’ to remind him of Prof. Mohanty everyday. Prof. Mohanty was never a ‘supervisor’ but an ‘advisor’ to his students; students did not carry out their studies ‘under’ his guidance, he studied ‘with’ them; students were never ‘a pair of hands’, they were human beings who had a life to lead and needed a job to go to. In today’s world, many of these things are forgotten that should not be forgotten. He led a simple life that was enriched by opening his heart and home to all his students who became his extended family till the very end. Those of us who had the privilege to know him are richer because of the experience and his loss will be mourned by many of us for a long time to come.

During his distinguished career, Prasanna Mohanty received many awards including Robert Emerson Fellowship of the University of Illinois at Urbana-Champaign; Gold Medal of the National Academy of Sciences (India), Allahabad; Hari-Om-Trust-Jagadish Chandra Bose Award of the University Grants Commission (UGC) of India; P. Mahaeswari Memorial Lectureship of the Indian National Science Academy (INSA) (1996) and P. Parija Memorial Lectureship of Utkal University. He was a Fellow of National Academy of Sciences (India), Allahabad; Founder Fellow of National Academy of Agricultural Sciences (India) and Founder Member of Society for Scientific Values.

We end this tribute by mentioning three photographs of Prasanna Mohanty with others, taken at different times and different places. Figure 1 shows a 2011 photograph taken in Sambalpur, India, when he was honored there; Fig. 2 shows a 2010 photograph taken in Beijing, China, at the 15th International Congress on Photosynthesis Research; and Fig. 3 is a 2009 photograph taken at the University of Hyderabad, India.

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