

Reminiscences of Manmohan Manohar Laloraya: A Great Friend to Many, and A Visionary Leader

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Dr. Manmohan Manohar Laloraya (September 1, 1932- February 18, 2023) was an outstanding teacher, researcher and administrator who mentored many scholars who themselves became leaders. He was gifted with a brilliant mind and unique research career, working with both plants and animals. He had received numerous awards and honours in his lifetime including the distinguished plant physiologist award in 1995, and being the Fellow of the National Academy of Sciences, India. We present below his brief biography, which is followed by his extraordinary research contributions on both plants and animals. We end this “In memoriam” with personal reminiscences of some of his class fellows, research collaborators, and life-long friends, and a 1958 group photograph with many at a conference.

Keywords: Anthocyanin, Plant hormones, Nitrogen metabolism, Paper chromatography, Phosphorus deficiency, Plant growth, Protein synthesis, Free radicals, Superoxide, Reproductive physiology, Shri Ranjan and Kenneth V. Thimann.

BRIEF BIOGRAPHY

Dr. Manmohan Manohar Laloraya was born in Allahabad on September 1, 1932. He obtained his B.Sc. in Botany, Chemistry and Zoology in 1952, his M.Sc. in Botany (specializing in Plant Physiology) in 1954, and his D. Phil. in 1957, all from the University of Allahabad. For his D.Phil. (Thesis title: “Chromatography studies on the nitrogen metabolism of *Nicotiana tobacco*”; see Laloraya, 1958), he had worked under Professor Shri Ranjan.

Figure 1 shows a 1952 photograph of Manmohan when he was a student at Allahabad University, and Figure 2 shows a 1989 photograph with his wife Maya.

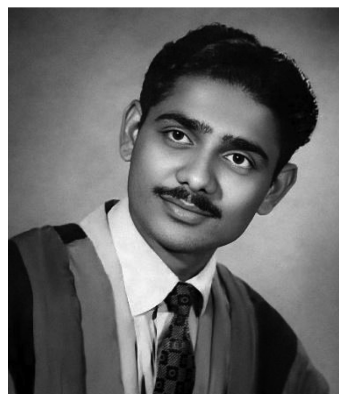


Fig. 1: A 1952 portrait photograph of Manmohan Laloraya, upon receiving his B.Sc. diploma from the University of Allahabad, Allahabad, India. Source: Family Archives; courtesy of Malini Laloraya

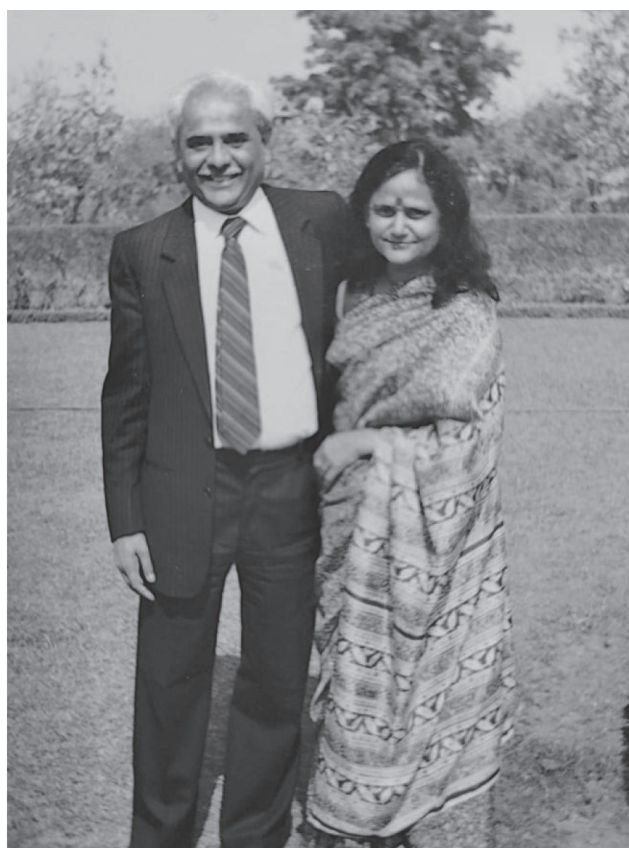


Fig. 2: A 1989 photograph of Manmohan and Maya Laloraya. Source: Malini Laloraya

Manmohan's academic work was followed by postdoctoral studies with Kenneth V. Thimann (1958-1959) in the Biological Laboratories at the Harvard University, USA. Then, he returned back to India in 1959 and joined as a Lecturer in Botany at Allahabad University (1959-1971). After that he held several academic positions and had a long illustrious academic career. He retired as a Professor in Life Sciences in 1994 from the Devi Ahilya Vishwavidyalaya (DAVV), Indore. In addition to being a teacher and researcher, he was an able administrator and served as the Dean of Life Sciences at DAVV (from 1974-1989); Acting Vice Chancellor at DAVV during 1978, and in 1988; and the Vice Chancellor of Pandit Ravi Shankar Shukla University (from 1989-1992). He became Emeritus Fellow, University Grants Commission (UGC) of Government of India, from 1994-1996; and Emeritus Scientist, Council of Scientific and Industrial Research (CSIR), Government of India, from 1996-1998, and lastly, Emeritus Scientist,

Department of Science and Technology (DST) from 2004 till 2006.

A celebration. On September 1, 2022, friends, and family celebrated Manmohan's 90th birthday at the Narmada Jackson Hotel, in Jabalpur. The guests included his many friends, his family, and his former doctoral students as well as his class fellow Durga Prasad and his wife Manorama. For this celebration, his family, former students, and colleagues have compiled a wonderful tribute entitled "My days with MML" (Guruprasad and S. Laloraya (Eds), 2023). The highlight of the event included wonderful speeches on Manmohan's approach and insight into various research problems. There was an *impromptu* music program followed by a lavish dinner. Manmohan was extremely touched by everyone's presence and thoughtfulness. Figure 3 shows Manmohan with many friends at his 90th birthday party, and Figure 4 shows him with Maya and their three daughters: Madhuka (Meeta), Malini (Mala), and Shikha, right after the cake was eaten.



Fig. 3: A 2022 photograph at Manmohan's 90th birthday at the cake cutting event. Sitting: Left to right: Shikha Laloraya, Manmohan & Maya Laloraya, Madhuka Shrivastava and Arvind Shrivastava. Standing: Left to right: Abhay Kumar, Nehal Shrivastava, Pragati Kumar, Pradeep Kumar with little Vani, Niyati Kumar, Malini Laloraya, Ishan Kapila, and Pratik Mishra. Source: Malini Laloraya



Fig. 4: A 2022 photograph at Manmohan's 90th birthday, all are relaxing just after the cake was eaten. Left to right: Manmohan, Maya, Shikha, Madhuka, and Malini. Source: Malini Laloraya

Soon after his 90th birthday celebration, Manmohan started having breathing difficulties and was taken for a complete checkup. The doctors discovered that he had heart issues. Starting in Jan 2023, his health had started deteriorating. Sadly, for all of us, he passed away on February 18, 2023, in Jabalpur, India.

Manmohan was very proud of his family and all his students. Yes, we also have another thing: Manmohan was very happy with what was done for his 90th birthday when everyone had gathered for him. He told Govindjee during a phone conversation “When you will see the book, you will be jealous!”. We all have read this outstanding ‘book’ (Guruprasad and S.Laloraya (Eds), 2023) and have liked it.

RESEARCH CONTRIBUTIONS

To give just a glimpse of his extraordinary research and publications, we mention below chronologically, just a few selected papers. This is done just to give the readers a sense of his breadth in Life Sciences – not just working with plants, but with animals – from the biochemistry of tobacco to cancer biology!

1950-1960s. Ranjan and Laloraya (1955) published the very first observation on the amino acid metabolism of starving *Phaseolus* leaves. Laloraya and Govindjee (1955), in a paper published in *Nature*, provided the first observation on what virus infection does to the amino acid metabolism, in tobacco. Then, Ranjan and Laloraya (1956, 1960) provided detailed account of the complete metabolism of proteins, carbohydrates, and organic acids, in isolated tobacco leaves, both under light and dark conditions. With his student Sabra Abbas Naqvi, he published a paper in *Science* (Laloraya and Naqvi, 1961) on gibberellic acid controlling the hypocotyl growth of the seedlings. This was followed by a still another discovery, with R. M. Pandey and R.K. Srivastava, on how phosphorous deficiency changes protein metabolism in certain crop plants (Ranjan et al., 1962). Then, Kaushik and Laloraya (1963) explored a unique observation: accumulation of oxaloacetic acid in *Coleus* sp. With his student

Vinay Kumar Rai, the focus of Manmohan was on a thorough understanding of the biochemistry of how gibberellin induces growth in lettuce seedlings (Rai and Laloraya, 1965, 1967). Further, with Debashish Banerjee, another graduate student, Manmohan provided (i) key data on how *kinetin* uncouples both auxin-induced protein synthesis (Banerjee and Laloraya, 1966); and (ii) how kinetin functions biochemically causing changes in the growth of both stems and roots in plants (Banerjee and Laloraya, 1967). With R. N. Pal, Manmohan provided detailed information on nitrogen metabolism of tamarind (Pal and Laloraya, 1967). All the above research, and more, has been wonderfully reviewed by Laloraya (1969) in his presidential address at the Indian Society of Plant Physiology.

1970s. What ‘good is kinetin for’ was followed by research of Aishwarya Narain, another graduate student, who showed, using *Cucumis* cotyledons, that kinetin inhibits chlorophyll synthesis (Narain and Laloraya, 1970). Using *Celosia*, H.N. Srivastav showed that different gibberellic acids affect, to a different degree, betacyanin synthesis and seedling growth (Srivastav and Laloraya, 1973); soon thereafter, K.N. Guruprasad, another graduate student, looked deeper into ‘betacyanin biosynthesis’ in the hypocotyls of *Amaranthus* sp. (Guruprasad and Laloraya, 1976). On the other hand, D. Mukherjee provided novel information on the distribution of keto acids in different parts of the tamarind plant (Mukherjee and Laloraya, 1974). Sudhakar Bharti, another graduate student, explored, with Manmohan, the effect of light on manganese in cucumber cotyledons, using paramagnetic resonance tools (Bharti et al., 1978). Then, using *Trigonella* sp., B.M. Megha explored the effect of ethrel, a plant growth regulator, on the metabolism of *Trigonella* sp., kept in darkness (Megha and Laloraya, 1978). At about the same time, another graduate student Mahesh C. Saxena explored the effects of gibberellins on changes in respiration in lettuce seedlings (Saxena et al., 1978).

1980s-1990s. A major change took place in Manmohan's research when he began to include, besides plants, animal systems in understanding the physiology and metabolism of living organisms. Prabha Agrawal used Luteinizing hormone (LH), which is one of three glycoprotein anterior pituitary hormones, and explored its function in the ovary of rats (Agrawal and Laloraya, 1980). However, during the 1980s, research on plants continued with Guruprasad (see Guruprasad and Laloraya, 1980); with S. Patil on solasodine yield and steroidal content of berries and roots of *Solanum viarum* Dunal (Patil and Laloraya, 1981, 1984); and with Neera Chaturvedi (Chaturvedi and Laloraya, 1982, 1983) these areas were further exploited. Research in animal physiology, particularly on the reproductive system, took a big jump when Malini Laloraya and G. Pradeep Kumar joined Manmohan's laboratory as graduate students. Highly original research of the beneficial role of superoxide radical especially in luteal steroidogenesis during estrous cycle and its impact on membrane fluidity during embryo implantation (M. Laloraya et al., 1988, 1989) and sperm maturation (Kumar et al., 1989, 1990) was published by these two graduate students. Then, a new aspect of terthienyl (isolated from marigold plant) phototoxicity in mosquito larvae was published by M. Nivsarkar et al. (1992); further, pilot studies on terthienyl's possible use for mosquito control were also conducted.

In addition, Manmohan continued his research on plants: (i) A. Dube et al. (1992) focused on showing inhibition of anthocyanin synthesis by cobalt ions in *Sorghum*; (ii) S. Purohit et al. (1992) provided new information on abscisic- acid induced changes in potassium concentration in guard cells; and (iii) K. Chandrakuntal et al. (2006) dug deeply into possible accessory photoreceptor function of polyphenolic compounds through FRET (Fluorescence Resonance Energy Transfer) methods, a technique of great interest to Govindjee (one of the authors) in his own photosynthesis research.

All of the above speak for Manmohan's depth as well as breadth in understanding and solving problems related to all living organisms – plants as well as animals.

Awards and Honours. Manmohan Laloraya has received numerous awards and honours. We list here just a few select ones. He was a recipient of (i) the E.G. Hill memorial prize for the best research work done in the Faculty of Sciences in 1955 at Allahabad University; (ii) Distinguished Plant Physiologist Award in 1995; and (iii) R.D. Asana Endowment Lecturer award in 1995. In addition, Manmohan had chaired and presided over many symposia, conferences, and committees during his academic life. His services to the "Indian Society of Plant Physiology" had included its 1968 presidency. He participated and attended many conferences around the world including Canada, USA, UK, Germany, and Hungary. In addition, Manmohan Manohar Laloraya was a Foreign Member of the American Institute of Biological Sciences through ASIA Foundation and an Elected Fellow of National Academy of Sciences, India.

REMINISCENCES

Govindjee's Early Connection and Friendship and Academic Collaboration with Manmohan

Manmohan (Munné as called by some of his elders) was a close friend of Govindjee since his school days, in the early 1940s. They both were together in Colonelganj High School (later Inter College) in Allahabad (now Prayagraj). Manmohan lived initially at *Katra* and then at *Bund Road* in Allahabad, while Govindjee lived not too far from there, in *George Town*. As the story goes, when Govindjee would walk to school, during 1942-1943, a group of delinquent boys would bully him. After a while, the bullying stopped unexpectedly, and Govindjee learned later that Manmohan (and his friends) rescued him from the bullying. To this day, Govindjee has remained thankful to Manmohan for his boldness and kindness, which made his school days a more pleasant experience.

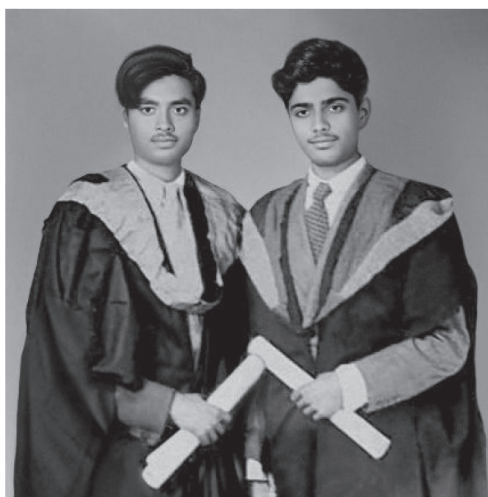


Fig. 5: Manmohan Manohar Laloraya (right) with Govind Ji (now Govindjee Govindjee) wearing their rented graduation gowns and holding their B.Sc. diplomas. A 1952 photograph by Tandon Brothers, Civil Lines, Allahabad. Source: Archives of Laloraya family; courtesy of Malini Laloraya

Manmohan and Govindjee remained in contact during their “Intermediate” years (1948-1950) at the Kayastha Pathshala Intermediate College, as well as during their B.Sc. years (1950-1952) at Allahabad University. Figure 5 shows Manmohan and Govindjee together, after they had completed their B.Sc. in Botany, Chemistry and Zoology in 1952. However, they got to know each other better when they were M.Sc. students in Botany, at Allahabad University (1952-1954). During the M.Sc. years, as Manmohan’s home was close to the Botany Department, Govindjee frequented his residence and would often stay over for snacks and tea. Manmohan’s entire family treated Govindjee as one of their own.

Govindjee and Manmohan became close “buddies” during 1954-1956, when they spent a great deal of time together doing research in Shri Ranjan’s laboratory of Plant Physiology at Allahabad University. This was an exciting and extremely enjoyable period in their lives. During the time between late 1954 to early 1955, Manmohan, with Govindjee’s occasional assistance, and advice from Tadimeti Rajarao, had developed a circular paper chromatographic technique to separate large number (8-16) of samples in one setting while simultaneously avoiding intermixing of bands from adjoining samples (see below for a story).

A Story. Manmohan vividly remembered when he and Govindjee went to Professor Shri Ranjan’s

home (on Beli Road in Allahabad) at 8.30 AM; Dr. Ranjan was in his verandah in a half sleeve shirt resting in his big chair after his early morning garden activity. He looked towards his students and shouted, as Manmohan had once recalled, “*What brings you so early in the morning to my house! Is there a fire in the lab?*” Quietly Manmohan and Govindjee unwrapped the chromatogram wrapped in the newspaper and put it in front of Professor Ranjan; he was excited beyond belief, he jumped out of his chair after looking at it and shouted, “*Oh it is beautiful*”. He held Manmohan and Govindjee by their shoulders, and virtually did a two-step swing. Dr. Ranjan rushed inside his home with joy saying “*Wait for 5 minutes. I will get ready and be with you*”. Looking dapper, Dr. Ranjan took his big Ford car out of the garage and asked them to sit by his side and drove them to the laboratory. Dr. Ranjan was excited and happy as a child, and unlike convention, made them forget that he was their great Professor (which delighted Manmohan and Govindjee). Immediately afterwards, Professor Ranjan ordered every supply that the two needed for their research work and granted access to the facilities and his time in connection with their research. This led to an extensive amount of novel research and Professor Ranjan was thrilled by the research separating large number of amino acids present in plant extracts simultaneously in multiple samples. To Manmohan and Govindjee, these early events in research success, under the guidance of Professor Ranjan, remain to this day the

most exhilarating story of their lives. Manmohan wrote an excellent tribute to Professor Ranjan (1899- 1969) in 1970 (Laloraya, 1970).

Collaboration. Manmohan’s ingenuity, dedication, drive, and positive spirit were responsible for the success of their research project. It led to multiple publications which he shared with his other colleagues (Govindjee, Raja Rao and Rajni Varma). See, for example, Ranjan et al. (1955) on *Croton sparsiflorus*; Laloraya et al. (1955) on *Acalypha indica*; Laloraya and Govindjee (1955) on *Nicotiana tabacum*; Laloraya et al. (1956) on *Carica papaya*; Govindjee et al. (1956) on *Abelmoschus esculentus*; and Raja Rao et al. (1956) on *Trichosanthus anguina*. Govindjee recalls that a large and comprehensive body

of work that was published in 1955 was generated by Manmohan; however, the order of authorship was decided, in the first detailed paper, by Professor Ranjan to be Ranjan et al. (1955) when it should have been Laloraya et al. (1955). However, Professor Ranjan gave permission to Govindjee and Manmohan to publish a key paper on virus infection in the journal *Nature*, without his name: Laloraya and Govindjee (1955). All of the above research was being performed and published in addition to their own individual research projects. Manmohan and Govindjee were joined by two other excellent scientists, Tadimeti Raja Rao and Rajni Varma, as mentioned above (see Figure 2 in Govindjee et al., 2022). Figure 6 shows a 1998 photograph of this group when they all met reminiscing their good old days.

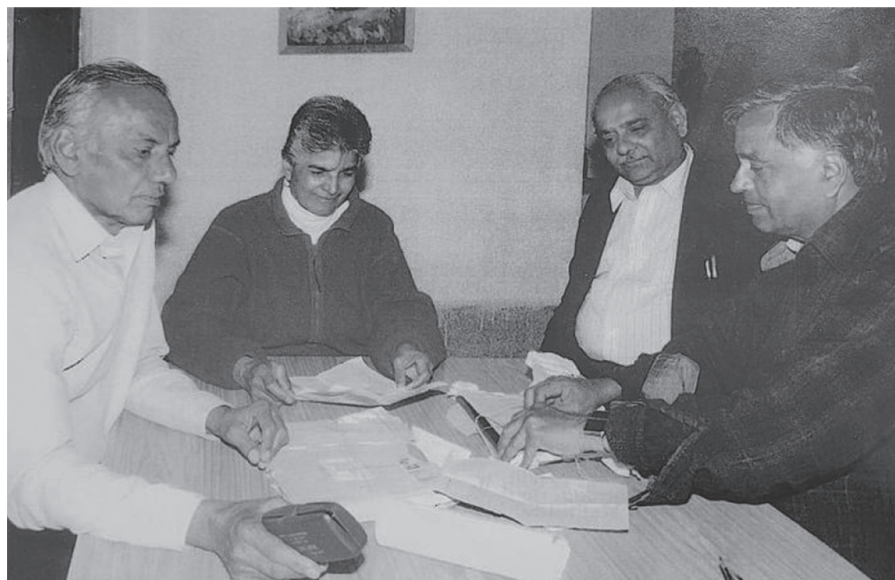


Fig. 6: A 1998 photo of Manmohan Manohar Laloraya (MML) with three of his coworkers from the 1950s. Left to right: T. Rajarao, Rajni V. Govindjee, MML and G. Govindjee reading their own letters from the past. Source: Malini Laloraya

Another Story. During 1955-1956, in addition to performing research, Govindjee was working as a Lecturer in Botany at the Allahabad University; he was teaching Plant Physiology and during the Exam period, he was doing ‘*invigilation*’. Here, he caught a student copying answers from a neighboring student and reported that student to the Registrar. Then, he went to see Manmohan at his home. As soon as he entered, Manmohan gave him a bear hug and pulled him to come inside his home. Here, Manmohan

relayed to Govindjee that the student who was reported for cheating by him was threatening to seriously *beat him to the bones*. Seeing Govindjee’s panic, Manmohan urged his older brother, Hari Manohar to help. Hari Manohar, who was well respected and revered, spoke to the student (and his friends) and requested the “cheating” student to keep away from Govindjee. Due to this, no harm came to Govindjee. To Govindjee, Manmohan was an incredible research colleague, a very dear friend, and his ‘savior’.

As mentioned in the beginning, after finishing his PhD under the guidance of Shri Ranjan, Manmohan became a Lecturer in Botany at the Allahabad University (1959-1971), then a Reader at the Gujarat University, Ahmedabad (1971-1974), and eventually joined the University of Indore, as a Professor (1974-1998). However, Govindjee, took a different path. In 1956, he went to the University of Illinois at Urbana-Champaign (UIUC), completing his PhD in 1960 under the mentorship of Robert Emerson and Eugene Rabinowitch. His thesis was in “*Photosynthesis*”. In parallel to Manmohan, Govindjee was hired as an Assistant Professor (1961-1965) at UIUC, getting tenured as Associate Professor (1965-1969), and then being promoted to

full Professor (1969-1999), reflecting the different systems in India and USA.

In addition to these parallel academic connections between Manmohan and Govindjee, they had a special personal connection through their marriages in the same family. Govindjee married Rajni Varma, at Urbana, Illinois, and Manmohan married Rajni’s first cousin, Maya Varma. Through marriage and their connection to Allahabad, Manmohan and Govindjee, cemented their relationship as research colleagues, friends, and close relatives. Figure 7 shows a 1989 photograph of several members of Manmohan and Govindjee’s families, when the Govindjees visited India.



Fig. 7: A 1989 photograph of some members of the Laloraya and Govindjee family. Standing: Left to right: Anita Govindjee, Sanjay Govindjee, Madhuka (Meeta) Shrivastava, Arvind Shrivastava, Malini (Mala) Laloraya, and G. Pradeep Kumar. Sitting: Left to right: G. Govindjee, Rajni Govindjee, Maya Laloraya and Manmohan Laloraya (who was then the Vice Chancellor of Pandit Ravi Shankar Shukla University). Source: Malini Laloraya

Manmohan and Govindjee remained close friends and stayed in constant contact since their time in Allahabad. First, they exchanged letters (although, it was realized later that Manmohan was not fond of letter exchange) and chatted regularly on phone.

It is important to mention that if others would have heard the two talking, they would have thought that they were ‘fighting’; yes, they disagreed on many things, but they had fun ‘arguing’ with each other. Govindjee attempted to get Manmohan interested

in communicating via 'e-mail', which was not as successful as was conversing over the phone and/or via video chat. They chatted about 'old times', and 'old friends' and kept each other abreast of personal life updates. Although they had similar political views, they never discussed it; instead, they focused on their scientific lives and their friends from the past. Govindjee misses conversations and the larger-than-life presence of Manmohan.

Connection of Durga Prasad Tiwari with Manmohan Laloraya

Manmohan and Durga Prasad (DP) were class fellows at Allahabad University while they completed their M.Sc. in Botany. Around a month into their classes, DP started running a fever, and it lasted for 4 days. Here Manmohan, his classmate, took him to the University dispensary for evaluation and informed his brother at Satna, regarding the illness: typhoid. The next day, DP's brother came to Allahabad and took him to Satna for evaluation, treatment, and recovery, which took a month. On his return to Allahabad, DP's classmates, especially Manmohan, inquired about the recovery. Additionally, DP was assured by Manmohan that if any help was needed, DP must ask him without hesitation since the two were neighbors.

After graduating from M.Sc. (Botany), Manmohan finished his D. Phil. under the supervision of Professor Sri Ranjan in Botany at Allahabad University in 1958. Immediately after that he joined as a Lecturer in the same department. Due to a family financial situation, DP did not pursue his D.Phil. immediately and instead, took a lecturer's position as a government employee in Vindhya Pradesh (now Madhya Pradesh). During this period, DP temporarily lost contact with Manmohan. Annually, during Diwali, DP used to visit Allahabad and always made a point to visit the University, where he began seeing Manmohan again. Twice, Manmohan invited DP and his wife (Manorama) for dinner to his residence, where the two discussed, at length, both family life as well as academic life.

As mentioned earlier, in 1974, Manmohan was appointed as a Professor in the Department of

Life Sciences, at the Devi Ahilya Vishwavidyalaya (University) at Indore, MP. Here is where DP reconnected with Manmohan after many years. Manmohan stayed at Indore till 1994. However, during 1989-1992, he accepted the position of Vice Chancellor of Ravi Shankar University, Raipur. During this time, Manmohan visited Jabalpur University as an external practical examiner. To the great delight of DP, instead of staying at the University guest house, Manmohan would stay at DP's residence. Manmohan was extremely charming and had a wonderful relationship with DP's wife and the entire Tiwari family, who looked forward to Manmohan's visits.

After Manmohan's retirement, he purchased an apartment close to the University of Indore where he lived with Maya, his wife. It is remarkable that even after retirement, he was guiding and mentoring several research scholars. In 1992, after DP had retired, and he along with his wife started traveling and visiting family and friends, he again lost touch with Manmohan during this period.

Manmohan's daughters worried about their aging parents, Manmohan, and Maya. They would frequently visit Indore and check on the parents. Manmohan and Maya moved to Jabalpur in October 2019 to stay at their eldest daughter Madhuka's residence, fortunately for them, prior to the Covid pandemic. This move to Jabalpur meant reconnection of the two friends (Manmohan and DP). They started meeting regularly, enjoying each other's company—discussing past research and recent progress with modern techniques (see above, for **Research contributions**) as well as the past days.

Manmohan's absence is a nagging reminder of how much DP (and many others) cherished Manmohan's presence in Jabalpur during the last few years. Reconnecting with Manmohan and his family was a blessing for DP. As DP gets older, his thoughts go back to his M.Sc. days in Allahabad, when he spent great days with many of his classmates, including Manmohan. Manmohan is deeply missed by us all. Figure 8 shows a 1954 photograph of Manmohan with most of his class fellows from that time.



Fig. 8: A 1954 photograph of Manmohan Laloraya (2nd from right on the last row) with his classmates. Front row -sitting (left to right): Kishan Singh Pundir; Kamlesh Kohli; Narbada Gupta; two children: Ira Chandra (Govindjee's niece) and Vijaya Pant (Radha & D. D. Pant's daughter); Priyamvada Sharma; Savitri Srivastava; Lekhram Gupta. Second row -standing (left to right): Govindjee; S. Bishen; --; Rajendranath Vajpey; --; --- --; ---; ---. Last row (staggered); left to right: Durga Prasad Tiwari; Laxman Singh Rawat; Rai Bishvendra Prasad; --; Krishna Sahai Bilgrami; --; --; Manmohan Manohar Laloraya; --; Kulshetra; --. Source: Durga Prasad Tiwari; the quality of this photograph was improved by Sunita Christiansen.

Reminiscences by Raghuvveer Raj Prasad

"I am very sorry to hear about the passing away of Manmohan. During my short sojourn, in 1954-1956, in the Botany Department of the University of Allahabad, when I was a student in M.Sc. (Agriculture Botany), I often met Manmohan in the "Ranjan Lab". While I was working on my thesis on "*The Role of Auxins in Sugarcane*", I discussed, with him, about the use of the Pettenkofer tube method for measuring respiration in sugarcane setts. He was very helpful, kind, and cooperative during my research. At that time, he was also a D.Phil. student, working under the late Prof. Shri Ranjan. I also remember the great time we all had when Manmohan had invited all the graduate students in the *Ranjan Lab* to his home for a dinner party. I also enjoyed his friendly company when we all went on a trip to a Botanical Conference, in 1955, held in Sagar. In addition, we also had another important personal connection: my Late wife Shashi and Manmohan's wife Maya were good friends. May the Creator rest his soul in peace."

Raj Prasad added: "During my travel to USA, I once met Manmohan, when he was also visiting USA. Although I don't remember the dates and the place, but I vividly remember our discussion on research in plant physiology in India, and lack of modern facilities there. What impressed me most was that he was not critical but, instead, he felt very proud and patriotic for India; he clearly told me that '*India holds a bright future, and that we should repatriate to the motherland and that he is very happy to work there instead of staying abroad*'. While in USA, he had worked with the world-renowned plant biologist Kenneth Vivian Thimann (1904-1997; https://en.wikipedia.org/wiki/Kenneth_V._Thimann) on the topic of what kinetin does to changes in nitrogen in peas (Thimann and Laloraya, 1960). In addition, Manmohan spent time during 1985-1987 while on Sabbatical as a Visiting Professor in the laboratory of Prof. Constance Nozzolillo (University of Ottawa, Canada). His stint there led to interesting publications on the effects of phenolic compounds on ABA induced stomatal closure (Laloraya et al., 1986) and on the metabolism of guard cells (Purohit et al., 1992).

Reminiscences by Harbans Kaur Kehri

“As I was compiling an Alumni Volume for the Department of Botany at Allahabad University, and, thus, gathering information on all our Alumni, I came to know about Professor M. M. Laloraya, and thus began our contact. We started exchanging information on the past. During whatsapp calls, audio as well as video, we developed a strong bond between us. He introduced me to most of the early plant physiologists who had worked in the Botany Department, of Allahabad University. And this gave me much affection and filled my heart with emotions. Gradually, I developed a wonderful association with his wife Ms. Maya Laloraya; she and I had (and have) a mother-daughter relationship. And, to top it all, I developed a strong family bond with his three daughters: Madhuka

(Meeta), Malini (Mala) and Shikha. Finally, we met in person in Jabalpur where he was living with his eldest daughter Madhuka. Gradually, I became a part and parcel of that family.

It is Professor Laloraya who has made me familiar with the Botany Department of Allahabad University, its students, teachers, and the culture of that era, i.e., from 1952 to 1970. On every occasion, may it be my Birthday, any festival or any family function, Prof. Laloraya, and Ms. Maya Laloraya used to always remember me. I thank the Laloraya family for their unconditional affection, love, and friendship. Figure 9 shows my photograph with Professor Manmohan Manohar Laloraya when I visited him at Jabalpur in 2022; fortunately, I was also joined by Sardol Singh Sandhu, who had also come to pay his respects.



Fig. 9: Manmohan Manohar Laloraya (center); Standing: left to right: Harbans Kaur Kehri, and Sardol Singh Sandhu. Source: Archives of H.K. Kehri

Reminiscences by Aishwarya Narain

“I was a graduate student of Professor Manmohan Manohar Laloraya (MML), in the late 1960s and early 1970s, while he was at Allahabad University. As noted above on “research contributions, he was asking questions such as “what is the function of kinetin

in the plants we were studying”? First, we (Narain and Laloraya, 1970) showed that kinetin inhibits chlorophyll synthesis in *Cucumis* cotyledons. Further, under the guidance of Prof. MML (as he was called by all his students), I not only developed a highly useful bioassay for a naturally occurring cytokinin

but completed my doctoral thesis in 1971 under his wonderful guidance. I will be a miss if I did not mention that we also had a personal connection: MML was married to Maya who was my mother's younger cousin. In an earlier visit to MML's home in Indore, he said to me that you have two uncles, one who lives

in USA that is Govindjee and the other referring to himself who lives in India. Now, I know more about the connection between these two uncles. My most memorable recent visit was at Jabalpur (Figure 10). MML shall live in my memory forever!"

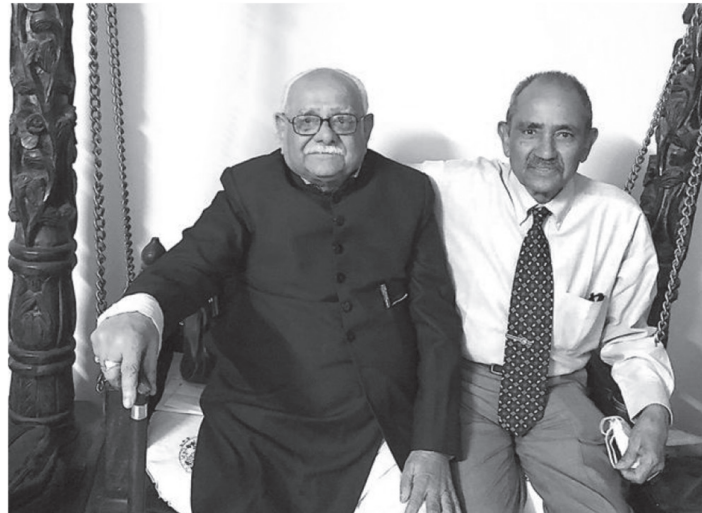


Fig. 10: A photograph of Manmohan Laloraya (on the left) with Aishwarya Narain, who visited Prof. MML, during December 17-19, 2021, in Jabalpur, M.P. Source: Archives of Aishwarya Narain

Reminiscences by Daya Prakash Sinha

“Long time back, during 1948-1950, Govindjee (then known as Govind Ji), Manmohan and I were class fellows in Intermediate class in Kayastha Pathshala Inter College, Allahabad. Together we joined, in 1950, Allahabad University for our bachelor's degree in biology. Govindjee was the brightest student of the class; not far behind was Manmohan. I was nowhere in the league with them. My interests lay elsewhere: Literature and Theatre attracted me. So, after graduation I heeded to my calling. I joined Master's program in History, whereas, Govindjee & Manmohan pursued their Master's in Botany, followed by Research and Doctorate degrees. Even though there was parting of ways in academic pursuit, our friendship continued unabated. Our houses were not very far from each other's, so we regularly met in the evenings. I would often visit Govindjee and Manmohan in the Botany Department of Allahabad University to meet them and have fun together.

After some time, in 1956, Govindjee left for the USA. Manmohan became a Lecturer in the

University at Allahabad, and I joined the Government Civil Services. Luckily, I got posted as Magistrate in Allahabad. This enabled us, me, and Manmohan, to be together very often. After about three years, I was transferred to Delhi. This broke our physical togetherness, but not our friendship. Friendships of student days don't die with time or distance.

I again met Manmohan when he was working as Vice-Chancellor at Raipur University in Madhya Pradesh, and I was in the Government of Madhya Pradesh in Bhopal. We met as though we were always together.

I am now moving towards my nineties. I had the solace that my two friends were keeping pace with me in my life's journey. But sadly, Manmohan is not there anymore. I remember him as pleasant and smiling, with a touch of confidence in his voice. He was a recognized academician, with lots of students who had worked under him and obtained their PhDs. But there was never any hint of overbearing in his conversations. He was always the same, cheerful, smiling, joking, and endearing.

“I will always miss Manmohan, the third member of our trinity (the Trio) and never excuse him for breaking it.”

Comments by Sudhir Sopory and Satish Maheshwari

We end this *“In Memoriam”* with an earlier summary of Manmohan’s life and work. S.K. Sopory and S.C. Maheshwari (2001) had recognized Manmohan’s work, in a historical article

“Plant molecular biology in India – The beginnings” as follows.

“Laloraya worked with K. V. Thimann (at Harvard) and came back (to India) to continue pioneering work on the mechanism of action of plant hormones (Laloraya and Naqvi, 1961). Laloraya moved to Ahmedabad and then to Indore where his talents were utilized more to build a

School of Life Sciences and to administer the newly established university of which he became the Vice-Chancellor. He, however, continued to devote part of his time to research (and recently advanced a proposal to explain phototropism (Laloraya et al., 1999), but to support work on a broader front, he took up studies largely on animal hormones.”

A CONFERENCE TO REMEMBER

We end this *“In Memoriam”* for Manmohan Manohar Laloraya with a group photograph (Figure 11) with many who he had associated with, including his own teachers and later colleagues (Shri Ranjan; R.K. Saxena; R.N. Tandon; S.P. Naithani; B.S. Mehrotra; G.D. Srivastava; A.K. Mitra; and N.S. Parihar; and friends, e.g., K.S. Bilgrami and T. Rajarao) at the 1958 symposium on *“Recent Advances in the Study of Plant Metabolism”*, held at the University of Allahabad.



Fig. 11: A group photograph at the Symposium on “Recent Advances in the Study of Plant Metabolism”, University of Allahabad, held in January 1958. Sitting (L. to R.) -Dr. J.J. Chinoy, Dr. S. M. Sircar, Mrs. Kurt Mothes, Dr. Shri Ranjan, Dr. Kurt Mothes, Dr. P. Parija, Dr. P. K. Sen, Dr. Ram Kumar Saxena, and Dr. Ram Narain Tandon. Standing 1st Row (L. to R.)- Dr. Shabhu Prasad Naithani, Dr. Brahma Swarup Mehrotra, Dr. N. Prasad, Mr. K. L. Sawliney, Mr. S. N. Bharadwaj, Dr. S. C. Chakarvarti, Dr. I. M. Rao, Dr. P. V. Seshagiri, Dr. K. K. Nanda, Mr. Girja Dayal Srivastava, Dr. Anil Kumar Mitra, Dr. Ram Nagina Singh, and Dr. J. K. Chowdhury. Standing 2nd Row (L. to R.)-Dr. V. S. Rama Das, Dr. B. B. Biswas, Dr. Amar Singh, Mr. R. P. Saksena, Dr. Niranjana Das, Dr. S. P. Sen, Dr. T. Raja Rao, Dr. B. B. S. Raizada, Dr. Manmohan Manohar Laloraya, Dr. P. N. Avadhani, Dr. Krishna Sahai Bilgrami, Mr. Balkrishna Malaviya, Mr. K. Subbaramaiah, Mr. N. Appaji Rao, Mr. P. V. Bhiravamerty, Dr. S. Sarkar, Mr. Narain Singh Parihar, Dr. B. K. Kar, Dr. Mahesh P. Tandon, Miss Sabra Abbas Naqvi. Source: Malini Laloraya; the quality of the photograph was improved by Sunita Christiansen.

We all miss Manmohan Manohar Laloraya. Let us do our best to keep his spirit with us and continue to laugh and work – no matter what.

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Contributions of the Authors

Govindjee initiated the preparation of this manuscript and wrote the first draft of the manuscript; he was joined by Durga Prasad Tiwari; and then Raghuvveer Raj Prasad, Harbans Kaur Kehri, Aishwarya Narain, and Daya Prakash Sinha, who provided their *reminiscences*. Finally, Sushma Naithani reorganized the contents, and edited the manuscript. All the authors have read the manuscript and take full responsibility of its content.

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