

Wings to a Child's Dreams



Wings to a
Child's
Dreams

A Tribute to Govindjee

By Virendra Kumar

Acknowledgements

I wish to express my gratitude to all the people involved in the writing of this book, especially Dr Govindjee and his wife Rajni. who were very generous in sharing their time and knowledge with me.

I am thankful to my father for his tangible, but always unspoken support, for this project. My sincere thanks go to my friend and unsparing critic, Mohini Rana, for her tough comments, accompanied with her gentle support.

And finally, my deepest gratitude to my younger sister, Radha— for her unfailing emotional support during the writing, and because I seek in her that attitude towards life which Dr Govindjee admires, and want this work to reflect.

Virendra Kumar

Preface

I met **Dr Govindjee**, who prefers that I call him Govindjee, at The National Academy of Science (NASI), Allahabad, India, on **February 28, 2015**, during his lecture on photosynthesis. In this lecture, he vividly brought to our attention how the photosynthesis process works, and its importance for plants as well as for us, human beings.

His way of delivering this lecture (speech) was really full of joy. I was totally surprised to see his passion with photosynthesis. At that time, he was 82 years old, but his enthusiasm (love) with photosynthesis was like that of a youngster. He spoke for 90 minutes, bringing “alive” all the existing known aspects of photosynthesis, and challenged us to improve it for the benefit of us all.

At around four in the afternoon, his speech was over, and this was a time when many of the teenager boys and girls surrounded him and were talking with him and asking for *selfies* with him. I also requested for a *selfie* and introduced myself; he was very happy to hear that I came from the city of

Mathura (birthplace of **Lord Krishna**), and he gave me his e-mail id.

These few moments have been very precious for me; they changed my life, and my way of thinking. He became my role model.



Photo with Dr Govindjee and his wonderful wife Rajni at The National Academy of Science (NASI), Allahabad, India, on **February 28, 2015**

I met Govindjee again on **October 22, 2017** (2 days before his 85th birthday) at the Aravali Guest House, on the JNU (Jawaharlal Nehru University) Campus, when he was in New Delhi, India. At this time, he discussed with me about his published research papers and books. And, then, he encouraged me to work on my English; he also asked me about my studies and my plans for my upcoming future. During this discussion on his research and his enthusiasm for teaching photosynthesis, I informed him that I am interested in writing an article on him.

In USA, he had been called “**Mister Photosynthesis**” by many. He said—sure, you can start work on that. Thus, it is a pleasure for me to write this book on Govindjee, but at that time I was afraid to write this book, since it required greater skills than what I had. But I did not lose my courage; I started to write some simple paragraphs on him in Hindi.



Photo of the author with Govindjee when I met him on **October 22, 2017** at the Aravali Guest House, on the JNU Campus, New Delhi India; photo by Rajni Govindjee

Once again, in 2019, Govindjee came to India, and on the day (March 24) when he was leaving India for USA, he sent me an e-mail around 7 PM to say ‘goodbye’. (Actually, I was planning to meet him since I had heard that he was in India.) In my reply to his e-mail, I asked him for the time of his flight. He said—next day early in the morning at 3AM. After hearing this, I decided to meet him that late night.

I met him and his wonderful wife Rajni-- around 11 PM – again at the JNU Campus, when he was leaving the Aravali Guest House for the Indira Gandhi Airport; yes, it was a very short meeting, but it was a unforgettable for me.



Photo with Govindjee and his wonderful wife Rajni
at the Aravali Guest House, on the JNU Campus, New Delhi, India, on
March 24, 2019

When I sat down to write this book, I felt that it required greater skills than I had. But realizing the importance of this task and regarding it as an honor to have been allowed to attempt it, I prayed earnestly for the courage and caliber to complete it.

This book is written for **Govindjee (for me: Dr. Govindjee)**, who is a role model for me, a 17 years old young boy. (In 2015, I was 17 years old.)

For myself, writing this book has been like a pilgrimage. Govindjee has given me wings for my dreams. Through him, I have been blessed with the revelation that the real joy of living can be found in only one way—in one's communion with an eternal source of hidden knowledge within oneself—which each individual ventures to seek and find for himself or herself.

Many of you may never met Govindjee in person, but I hope you will enjoy his company through this book, and that he will become your spiritual and academic friend.

Please note that I have included in this book only a few incidents among the many I know directly or through others.

-Virendra Kumar



Govindjee – The Legendary perpetual student of Twenty First Century

*"We depend upon photosynthesis and
photosynthesis depends upon Govindjee"*

Govindjee, the greatest legendary Plant Physiologist in the world, who uses one name only, grew up in Allahabad (India). He was born on October 24, 1932 to (Mrs) Savitri Devi Asthana and (Mr) Vishveshwar Prasad Asthana. His father was first a college teacher, served as the General Secretary of the U.P. (United Provinces) Teachers Association, and then as

the representative of the Oxford University Press in Northern India. He was fluent in English, Hindi and Urdu. After his father's death in 1943, Govindjee's older brother Krishnaji was responsible for bringing him up and served as his role model. (Krishnaji passed away in August 1997.)

Govindjee's second brother Gopalji, who lived in Gurgaon (Haryana) with his wife Nirmala, is also no more with us. Govindjee's sister, Malati, lived in Bhagalpur (India) with her husband Radha Krishna Sahay: both are no more with us now. (Photographs and details of Govindjee's family in India appear in two informal family books: 'Amma and Babuji: Our Life at Allahabad', edited by Govindjee, 2007, printed by PDQ Printing, Urbana, Illinois; and, A Tribute: Professor Krishnaji, 2010, edited by Govindjee and S.L. Srivastava, Apex Graphics, Allahabad, India)

The family name, Asthana, was dropped by Govindjee's father in a response to the "Arya Samaj Movement" that was against the "Caste System," and believed in the ideals of the Vedic times. Govindjee came to Urbana, Illinois, USA, in 1956, with his name written on his Indian passport as "Govind Jee." He was not happy to be called "Mr. G. Jee", and, thus, he began to use "Govindjee" as his one and only name. This has caused problems in citations, and in many formal settings. He has been referred to by many names: N.F.N. Govindjee (where N.F.N. stands for No First Name); I. Govindjee (where I stands for Illini); Mister Govindjee; and once A.V.P. Govindjee (where A stands for Allahabad, and VP are the initials of his father). Since 2019, his formal name is: Govindjee Govindjee.

Quite often, his name has appeared with the initials of his doctoral students: the longest being J.C.M. Govindjee, Jr (where J.C.M. stood for John Clingman Munday).

Govindjee met Rajni Varma in 1953, when they were M.Sc. students at Allahabad University; she was a year junior to him. They were married on October 24, 1957 at Urbana, Illinois when both were PhD students of the late Robert Emerson. The Govindjees have two children: (1) Anita: she is a software engineer for IBM, and is married to Morten Christiansen, who is a Professor of Psychology at the Cornell University, Ithaca, NY; they have one daughter, Sunita. (2) Sanjay: he is a Professor of Civil Engineering at the University of California, Berkeley; he is married to Marilyn Hubbs; they have two sons: Arjun and Rajiv.

Govindjee was educated in Colonelganj High School (1943–1948), then Kayastha Pathshala (K.P.) Intermediate College (1948–1950), and finally Allahabad University (1950–1954), all at Allahabad, India. Several great teachers in Biology and in Chemistry influenced Govindjee's academic life. Two of his college teachers (Jalpa Prasad and M.L. Gaur) were responsible for igniting his interest in both Chemistry and Biology as they would loan him their personal books on the subject.

Govindjee received his B.Sc. (Chemistry, Botany and Zoology, in the first division) and M.Sc. (Botany, also in the first division, and first position) from the University of Allahabad, in 1952 and 1954, respectively. He specialized in Plant Physiology under the late Shri Ranjan (a former student of Felix Frost Blackman); Govindjee served as a Lecturer in Botany at Allahabad University from 1954 to 1956.

He came to the University of Illinois at Urbana-Champaign (UIUC), Illinois, USA in 1956, as a Fulbright scholar and a UIUC Graduate Fellow, to work for his PhD in Physico-Chemical Biology under Robert Emerson. After Emerson's untimely death in a plane crash in February, 1959, he worked with Eugene Rabinowitch, and obtained his PhD in Biophysics

from UIUC, in 1960, with a thesis on the '*Action Spectra of the Emerson Enhancement Effect in Algae.*'



This photograph was taken at the University of Allahabad, Allahabad, India, in 1955; from left to right: Govindjee, Manmohan Laloraya, Rajni Varma and T. Rajarao, graduate students of Professor Shri Ranjan, who had earlier worked with F. F. Blackman of UK

From 1960 to 1961, Govindjee served as a United States Public Health (USPH) Postdoctoral Fellow. Govindjee has also mentioned that he considers the time he spent discussing photosynthesis research with Bessel Kok, C. Stacy French, Louis N.M. Duysens, and William Arnold, during his visits to their laboratories, as extremely valuable in his training as a biophysicist.

From 1961 to 1965, he was an Assistant Professor of Botany; from 1965 to 1969 an Associate Professor of Biophysics and Botany; and from 1969 to 1999, a Professor of Biophysics and Plant Biology, all at UIUC. During 1998–1999, he also served as a Professor of Biochemistry.

On August 1, 1999, he became Professor Emeritus of Biochemistry, Biophysics, and Plant Biology at UIUC. His teaching and research career was celebrated in October, 1999, in a symposium at UIUC, organized by C. John Whitmarsh, where Gerry Babcock and Bob Blankenship were the major speakers.

When Govindjee gives wings to a 17-year boy's dreams

Everything happens for a reason; we just need to believe in ourselves. The journey was not planned; my destiny gave me this opportunity to meet Govindjee, a Guru(teacher), who inspired me to live a meaningful life, and became my Role model.

I met **Dr Govindjee**, at The National Academy of Science (NASI), Allahabad, India, on **February 28, 2015**, during his lecture on photosynthesis. It was a time, when I was 17 years old, and studying in the 11th class at a Hindi medium school, “Shree H L Inter College”.

In this lecture, Govindjee vividly brought to our attention how the process of photosynthesis works, and its importance for plants as well as for us, human beings.

His way of delivering this lecture (speech) was really full of joy. I was totally surprised to see his passion with photosynthesis. At that time, he was 82 years old, but his enthusiasm (love) with photosynthesis was like that of a youngster. He spoke for 90 minutes, bringing “alive” all the existing known aspects of photosynthesis, and challenged us to improve it for the benefit of us all.

At around four in the afternoon, his speech was over, and this was a time when many of the teenage boys and girls

surrounded him and were talking with him and asking for *selfies* with him. I also requested for a *selfie* and introduced myself; he was very happy to hear that I came from the city of Mathura (birthplace of **Lord Krishna**), and gave me his e-mail id. These few moments have been very precious for me; they changed my life, and my way of thinking. This was a turning point for my personal and professional life.



Above is one of the photographs, at The National Academy of Science (NASI), Allahabad, India

Words are not enough to express gratitude for such amazing and inspiring Guru (teacher) and a Role Model.

When distances do not matter- communication through e-mail

After 10 days of meeting him, there was a festival of colors, Holi. So, on March 7, 2015, I sent him an e-mail for Holi wishes and reminded him of our meeting. The way of writing my e-mail, to him, was very poor and fully informal; this is because I had never sent an e-mail to anyone, and also, I was not good at English. But his reply was full of kindness and an inspiration.

I wrote:

*Hello govindgee<A Holi wishes in Hindi>
i'm virendra from mathura.. I want to talk you on mobile please
call me..
Govindgee 86506XXXX4.. Mai virendra jo apse ' nasi'
Allahabad mai
milat ha 28 feb.Ko.. You are great for me..*

Dr. Govindjee replied:

Dear Virendra
Thank you much for remembering me.
I do appreciate your Holi greetings.
Please tell me more about yourself
Best wishes to you in everything you do

Best wishes,
Govindjee

Through e-mails, I was in touch with him for more than two years. During this time, Govindjee encouraged me to learn English. He sent me, many English language books to read. Also, he helped me financially from the USA.

I started to work hard and dreamed about my upcoming future. At every stage of my studies and achievement, I sent e-mail to Govindjee. But it was not too easy for me. Because whenever I sent in my e-mail, I made many mistakes in spellings, and sometimes in grammar.

But, Govindjee always appreciated me, and asked to write an email daily to him. Whenever I sent email to him, he would correct and send it back to me, so I could learn from my mistakes.

He also shared many of his published research papers, and photographs with me. Because he wanted to motivate me for a successful future. Thus, I learnt a lot from Govindjee.

After two years, being in touch with him, a day came when I met him again, on **October 22, 2017** (2 days before his 85th birthday) at the Aravali Guest House, on the JNU (Jawaharlal Nehru University) Campus, when he was in New Delhi, India. At this time, he discussed with me about his recent published research papers and the draft of the book he was writing. And, then, he encouraged me to work on my English again; he also asked me about my family, studies and my plans for my upcoming future.

We (Govindjee, Rajni and I) all visited JNU Campus and had lunch together.

Here are some photographs.



After this meeting, when I was leaving Delhi for Mathura (my home town), Govindjee said- Thank you “Virendra” and gave me one thousand rupees. I said - no sir, but with a wonderful

smile, he said “Virendra” you are like my grandson. Please take this money.

This was really a wonderful meeting with Govindjee and his wife Rajni. I found that although he lives in USA, his heart is purely Indian. Govindjee believes in simplicity and is in love with *nature*.

Govindjee message for the JNU Campus

“I love to be at JNU because of the natural environment and because of the dedicated, hardworking and friendly graduate students and faculty members. The songs and the calling of the peacocks and the wonderful birds makes it a heavenly place to visit and teach wonderful students the science and the future of photosynthesis research for the benefit of India.”

This was my second meeting, when I was a first-year engineering student. He asked me about my studies and told me about the online resources, from where I could study. I remember, one of them was “Khan Academy”.

During this discussion on his research and his enthusiasm for teaching photosynthesis, I informed him that I am interested in writing an article on him. He said—sure, you can start work on that. Thus, it is a pleasure for me to write few words on Govindjee, but at that time I was afraid to write it, since it required greater skills than what I had. But I did not lose courage; I started to write some simple paragraphs on him in Hindi.



Photo with Govindjee, taken on **March 24, 2019**, by Rajni Govindjee, at the Aravali Guest House, on the JNU Campus, New Delhi, India;

Once again, in 2019, Govindjee came to India, and on the last day (on March 24) when he was leaving India for USA, he sent me an e- mail around 7 PM to say ‘goodbye’. (Actually, I was planning to meet him since I had heard that he was in India.) In my reply to his e-mail, I asked him for the time of his fight. He said—next day early in the morning at 3 AM. After hearing this, I decided to meet him that late night.

I met him and his wonderful wife Rajni-- around 11 PM – again at the JNU Campus, when he was leaving the Aravali Guest House for the Indira Gandhi Airport; He said—Thank you “Virendra” and gave me one thousand rupees.

Yes, it was a very short meeting, but it was unforgettable for me.

After this late-night meeting, Govindjee sent me an e-mail me when he was at the Amsterdam Airport and wrote:

“Dear Virendra: It was a pleasure to meet you. I am sorry I could not spend more time with you.”

This e-mail shows how humble and kind he is, words are not enough to show gratitude for such amazing and inspiring Guru (teacher) and a Role Model. Govindjee is a person, who is not only a great scientist, but a great Indian and great role model. Whatever I am today, it is mainly because of his kind guidance and blessings.

I end this book with an Appendix that includes useful websites and some general publications.

Appendix

A randomly selected list of recent (2007—2019) websites and publications to give a feel of Govindjee’s interests is given below.

A. Web sites

Govindjee’s main page:

<http://www.life.illinois.edu/govindjee>

Govindjee’s publications (2000-2019):

http://www.life.illinois.edu/govindjee/recent_papers.html

Govindjee’s Fun Musuem:

<http://news.illinois.edu/view/6367/801235>

Interview with Annual Reviews, Inc (by Donald R. Ort)

<https://www.youtube.com/watch?v=cOzuL0vxEi0>

Interview by Rajya Sabha TV:

<https://www.youtube.com/watch?v=OBKusHejMzw>

Photos of student awardees (Govindjee and Rajni Awards):

<http://www.life.illinois.edu/govindjee/photooftheyear2019.html>

Sharma, Ravi (2015) Govindjee- The Living Legend I Met

<https://www.linkedin.com/pulse/govindjee-living-legend-i-met-dr-ravi-sharma>

Sharma, Ravi (2016) Govindjee and Rajni Govindjee - Confluence of Photosynthesis and Photobiology <https://www.linkedin.com/pulse/govindjee-rajni-confluence-photosynthesis-dr-ravi-sharma>

Wikipedia, 2019

<https://en.wikipedia.org/wiki/Govindjee>

B. Publications

2019

Govindjee (2019) A sixty-year tryst with photosynthesis and related processes: an informal personal perspective. *Photosynth Res* 139: 15-43; DOI 10.1007/s11120-018-0590-0

Govindjee, Papageorgiou GC and Govindjee R (2019) Eugene I. Rabinowitch: A prophet of photosynthesis and of peace in the world. *Photosynth Res*; available online: DOI 10.1007/s11120-019-00641-w

Jain K (2019) Govindjee: The One Who Revealed the Secrets of Photosynthesis. *Science India*, pp. 14-24

Shevela D, Björn L and Govindjee (2019) *Photosynthesis: Solar Energy for Life*. World Scientific, Singapore. **Book**

Stirbet A, Lazar D, Papageorgiou G and Govindjee (2019) Chlorophyll a fluorescence in cyanobacteria: Relation to photosynthesis. In: A.N. Mishra, D.N. Tiwari and A.N. Rai (Eds) *Cyanobacteria: From Basic Science to Applications*, Chapter 5, pp. 79-130; Elsevier Publishers Academic Press

Wungrampha S, Joshi R, Rathore RS, Singla-Pareek SL, Govindjee and Pareek A (2019) CO₂ and chlorophyll *a* fluorescence of *Suaeda fruticosa* grown under diurnal rhythm and after transfer to continuous dark. *Photosynth Res*; available online: DOI 10.1007/s11120-019-00659-0 (17 pages)

2018

Eaton-Rye JJ (2018) Govindjee—a lifetime in photosynthesis. *Photosynth Res* 122:121–158

Stirbet A, Lazár D, Kromdijk J and Govindjee (2018) Chlorophyll *a* fluorescence induction: Can just a one-second measurement be used to quantify abiotic stress responses? *Photosynthetica* 56 (1): 86-104

2017

Govindjee (2017) André Tridon Jagendorf (1926-2017). *Photosynth Res* 132: 235-243

Govindjee, Shevela D and Björn LO (2017) Evolution of the Z-scheme of photosynthesis. *Photosynth Res* 133: 5-15

Mircovic T, Ostrumov EE, Anna JM, van Grondelle R, Govindjee and Scholes GD (2017) Light absorption and energy transfer in the antenna complexes of photosynthetic organisms. *Chemical Reviews*; available online (45 pages): DOI 10.1007/10.1021/acs.chemrev.6b00002

Nonomura AM, Holtz B, Biel KY, Cooney R, Lorimer G and Govindjee (2017) The paths of Andrew A. Benson: a radioautobiography. *Photosynth Res* 134: 93-105

2016

Buchanan BB, Douce R, Govindjee, et al. (2016) Andrew Alm Benson, 1917 - 2015, Biographical Memoir of the National Academy of Science, USA

Govindjee and Pulles MPJ (2016) Louis Nico Marie Duysens (March 15, 1921-September 8, 2015): A leading biophysicist of the 20th century. *Photosynth Res* 128: 223-234

Elchuri SV and Govindjee (2016) Vallabhaneni Sita Rama Das, 1933-2010: teacher and mentor. *Photosynth Res* 128: 109-115

Kana R and Govindjee (2016) Role of ions in the regulation of light harvesting. *Front Plant Sci* 7: article #1849

Kandoi D, Mohanty S, Govindjee, et al. (2016) Towards efficient photosynthesis: overexpression of *Zea mays* phosphoenolpyruvate carboxylase in *Arabidopsis thaliana*. *Photosynth Res* 130: 47-72

Mishra KB, Mishra A, Klem K, et al. (2016) Plant phenotyping: a perspective. *Ind J Plant Physiol* 514-527

Mircovic T, Ostrumov EE, Anna JM, et al. (2016) Light absorption and energy transfer in the antenna complexes of photosynthetic organisms. *Chem Rev* 117: 249-293

Nonomura A, Lorimer G, Holtz B, et al. (2016) Andrew A Benson: personal recollections. *Photosynth Res* 127: 369-378

Stirbet A and Govindjee (2016) The slow phase of chlorophyll *a* fluorescence induction in silico: Origin of the S-M fluorescence rise. *Photosynth Res* 125: 219-231

2015

Govindjee and Frenkel S (2015) Albert W. Frenkel (1919–2015): photosynthesis research pioneer, much-loved teacher, and scholar. *Photosynth Res* 124:243-247

Lichtenthaler HK, Buchanan BB, Douce R and Govindjee (2015) Andrew A. Benson, 1917–2015. *Photosynth Res* 124:131-135

Mamedov M, Govindjee, Nadtochenko V and Semenov A (2015) Primary electron transfer processes in photosynthetic reaction centers from oxygenic organisms. *Photosynth Res* 125:51-63

2014

Govindjee and Srivastava N. (2014) William A. Arnold (1904–2001)-A Biographical Memoir. National Academy of Sciences, Washington, DC. 18 pages; available free at: www.nasonline.org/memoirs

Hill J F and Govindjee (2014) The controversy over the minimum quantum requirement for oxygen evolution. *Photosynth Res* 122:97–112

Ostroumov EE, Khan YR, Scholes GD and Govindjee (2014) Photophysics of Photosynthetic Pigment-Protein Complexes. In: Demmig-Adams, B., Garab, G., Adams III, W. and Govindjee (Eds.) *Non-Photochemical Quenching and Energy Dissipation in Plants, Algae and Cyanobacteria*. Pp. 97-128; Springer, Dordrecht

Papageorgiou G C and Govindjee (2014) The Non-Photochemical Quenching of the Electronically Excited State of Chlorophyll a in Plants: Definitions, Timelines, Viewpoints, Open Questions. In: Demmig-Adams, B., Garab,

G., Adams III, W. and Govindjee (Eds.) Non-Photochemical Quenching and Energy Dissipation in Plants, Algae and Cyanobacteria. Pp. 1-44; Springer, Dordrecht

Stirbet A, Riznichenko G Yu, Rubin AB and Govindjee (2014) Modeling chlorophyll a fluorescence transient: relation to photosynthesis. *Biochemistry (Moscow)* 79: 291-323

Tiwari S, Tripathy BC, Jajoo A, Das AB, Murata N, Sane PV and Govindjee (2014) Prasanna K. Mohanty (1934–2013): a great photosynthetiker and a wonderful human being who touched the hearts of many. *Photosynth Res* 122:235–260

2013

Shevela D, Pishchalnikov R, Eichacker LA and Govindjee (2013) Oxygenic Photosynthesis in Cyanobacteria. In: A. Srivastava et al., eds.) *Stress Biology of Cyanobacteria*. Taylor & Francis, UK. pages 3-40

2012

Kalaji HM, Goltsev V, Bosa K, Allakhverdiev S, Strasser RJ and Govindjee (2012) Experimental *in vivo* measurements of light emission in plants: A perspective dedicated to David Walker. *Photosynth Res* 114: 69-96

Najafpour MM, Tabrizia MA, Haghghia B and Govindjee (2012) A manganese oxide with phenol groups as a promising structural model for water oxidizing complex in Photosystem II: A ‘Golden fish’. *Dalton Transactions*, Royal Society of Chemistry 41: 3906-3910

Shevela D, Eaton-Rye JJ, Shen J-R. and Govindjee (2012) Photosystem II and unique role of bicarbonate: A historical perspective. *Biochim Biophys Acta* 1817: 1134-1151

Stirbet A and Govindjee (2012) Chlorophyll *a* Fluorescence Induction: A Personal Perspective of the Thermal Phase, the J-I-P rise. *Photosynth Res* 113: 15-61

2011

Govindjee and Shevela D (2011) Adventures with cyanobacteria: a personal perspective. *Frontiers in Plant Science*, Vol. 2, article 28: 1-17

Najafpour MM and Govindjee (2011) Oxygen evolving complex in Photosystem II: Better than excellent. *Dalton Transactions* 40: 9076-9084

Nickelsen K and Govindjee (2011) The Maximum Quantum Yield Controversy: Otto Warburg and the Midwest Gang. *Bern Studies in the History and Philosophy of Science*, University of Bern, Switzerland; Institute für Philosophie.

Book

Papageorgiou GC and Govindjee (2011) Photosystem II fluorescence: Slow changes - Scaling from the past. *J Photochem Photobiol B: Biol* 104: 258-270

2010

Govindjee and Seibert M (2010) Picosecond spectroscopy of the isolated reaction centers from the photosystems of oxygenic photosynthesis-ten years (1987-1997) fun. A tribute to Michael R. Waisielewski on his 60th birthday. *Photosynth Res* 103:1-6

Govindjee, Kern JF, Messinger J, and Whitmarsh J (2010) Photosystem II. (February 2010) Photosystem II. *Encyclopedia of Life Sciences (ELS)*. John Wiley & Sons, Ltd: Chichester

Govindjee and Srivastava SL (Eds.) (2010) A Tribute: Krishnaji (January 13, 1922—August 14, 1997). xii + 266 pages, Apex Graphics, Allahabad

Sharma R (2010) Govindjee - The living legend we met (We depend upon photosynthesis and photosynthesis depends upon Govindjee) Story of the greatest living botanist of India in lands afar; Brajvani 27-32

Yusuf MA, Kumar D, Rajwanshi R, Strasser RJ, Tsimilli-Michael M, Govindjee and Sarin NM (2010) Overexpression of γ -tocopherol methyl transferase gene in transgenic *Brassica juncea* plants alleviates abiotic stress: Physiological and chlorophyll fluorescence measurements. *Biochim Biophys Acta* 1797: 1428-1438

2009

Björn LO and Govindjee (2009) The evolution of photosynthesis and chloroplasts. *Current Science* 96: 1466-1474

Björn LO, Papageorgiou GC, Blankenship R and Govindjee (2009) A viewpoint: Why chlorophyll a? *Photosynth Res* 99: 85-98

Pareek A, Sopory SK, Bohnert HJ and Govindjee (Eds.) (2009) *Abiotic Stress Adaptation in Plants: Physiological, Molecular and Genomic Foundation*. Springer, Dordrecht, XLI, 526. Page 25 illus. in color., Hardcover: ISBN: 978-90-481-3111-2

2008

Govindjee (2008) Recollections of Thomas John Wydrzynski. *Photosynth. Res* 98:13-31

Govindjee (2008) Teaching Photosynthesis: Some Thoughts. Allen, J.F., Gantt, E., Golbeck, J.H., and Osmond, B. (Eds.) Photosynthesis. Energy from the Sun, pp. 1619-1624. Springer, Dordrecht

2007

Björn LO and Govindjee (2007) The evolution of photosynthesis and its environmental impact. L.O. Björn (ed.) Photobiology: The Science of Light and Life. pp 243-274, Springer, New York

Blankenship RE and Govindjee (2007) Photosynthesis. The Encyclopedia of Science and Technology, 10th Edition, Volume 13, pp. 468-475. McGraw Hill Publishers, New York

Kiang NY, Segura A, Tinetti G, Govindjee, Blankenship RE, Cohen M, Siefert J, Crisp D and Meadows VS (2007) Spectral signatures of photosynthesis. II. Coevolution with other stars and the atmosphere on extra-solar worlds. *Astrobiology* 7 (1): 252-274

About the Author

My name is Virendra Kumar. I have been trained as an engineer. I was born in Mathura, Uttar Pradesh, India, in 1998. We are six members in our family. My father is a plumber and my mother is a housewife. I did my high school from Dr Panni Lal Higher Secondary School (2013-2014), then my Intermediate from Shree H. L. Inter College (2015–2016), and finally my Engineering from G. L. Bajaj Group of Institutions (2016-2020), all at Mathura, Uttar Pradesh, India.

In 2013, I received a special award from Mathura's chairperson Mrs Manisha Gupta for my social services. Then, in 2015, I was selected in a science contest for story telling from Mathura to the National Academy of Science (NASI), Allahabad, India, where I met Dr. Govindjee.

In 2016 and 2017, *Dainik Jagran* published many articles in its newspaper for my social service to others. In 2017, I started my journey as an entrepreneur, by developing a website for daily wage workers namely “*Digital Mazdoor.*” It was really a unique innovation for the welfare of daily wage workers. For this, I was recognized in 2018, when I received a special award from Dr A P J Abdul Kalam Technical University, and

Dr Kalam Centre. Further, I was also recognized by *Niti Ayog* and *Doordarshan*.

In 2019, I secured first position in Kalam Annual Project Summit – KappTeC-2019 for application Prototype, organized by Dr A P J Abdul Kalam Technical University, and won a cash prize of Rs 20,000.

For my innovation, I have received a grant of Rs 50,000 from the Government of Gujarat with the help of I-Create Foundation; and, I was the Second winner in *Dainik Jagran Startup City Pitch*.

In addition, I have received, for entrepreneurship, an award from the Regional Science & Technology Centre, Agra.

Now, I am going to start my career in a corporate sector as a Software Engineer.

Two of the many photographs from my Award ceremonies are shown below.



Photographs from the Award Ceremony at the Dr A P J Abdul Kalam Technical University and Dr Kalam Centre, in New Delhi, India

Author Contact

Author name: Virendra Kumar

Email Address : virendrakumar865065@gmail.com

Address:

New Ishapur, Pani Ki Tanki,
Laxmi Nagar, Yamuna Paar,
Mathura - 281001, Uttar Pradesh, India

Mobile Number:

+91- 8650651404; 7417476536

