

International conference “Photosynthesis in the Global Perspective” held in honor of Govindjee, November 27–29, 2008, Indore, India

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The conference

An International conference “Photosynthesis in the Global perspective” was held in Indore, India, during November 27–29, 2008, in honor of Professor Govindjee. The conference provided an opportunity to felicitate him for the numerous significant and outstanding contributions in the field of photosynthesis research (also see Eaton-Rye 2007a, b). His dedication for communicating photosynthesis and his passion for the “History of Photosynthesis Research” has been commendable. He has been already recognized with the first *Lifetime Achievement Award* of the Rebeiz Foundation for Basic Research (Rebeiz et al. 2007) and with the prestigious 2007 *Communication Award* of the International Society of Photosynthesis Research (ISPR) (see Blankenship 2007). Just before the conference in Indore, University of Illinois recognized him on October 24, 2008, with an *LAS* (Liberal Arts and Sciences) *Alumni Achievement Award* (see <http://www.las.illinois.edu/alumni/magazine/articles/2009/govindjee>). Figure 1A shows Govindjee’s photograph with three of his graduate students (George Papageorgiou, Julian Eaton-Rye and Prasanna Mohanty) who actively participated at the Indore Conference. Figure 1B shows a group photograph of Govindjee with many of the participants at the conference.

The conference covered all the important aspects of photosynthesis, especially their relationship to global issues.

Prasanna Mohanty—Formerly Professor of School of Life Science, Jawaharlal Nehru University, New Delhi, India.

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Topics included: photobiology, structure and function of Photosystems I and II, stress responses & adaptive mechanisms, plant productivity, and artificial photosynthesis. Advances in structural and functional aspects of Photosystem II (PS II, the water-plastoquinone oxidoreductase, the only system on Earth that is capable of oxidizing water to molecular oxygen) was at the heart of many talks. This was highly appropriate for this celebration since Govindjee and co-workers were the first to measure the primary photochemistry of PS II, to provide an understanding of the PS II light emission from plants, algae, and cyanobacteria, to provide the theory of thermoluminescence from PS II, and to establish the unique role of bicarbonate/carbonate on the electron acceptor side of PS II. Stress responses of plants and their adaptive strategy to cope with stress was another key issue at the conference.

There were 32 talks and about 45 posters, presented by both established and young scientists from about 12 countries (listed alphabetically): Australia, Azerbaijan, Canada, (The) Czech Republic, Finland, Hungary, India, Japan, Korea, New Zealand, Switzerland, UK, and USA. Speakers included (listed alphabetically): Arjun Tiwari, Asako Kawamori, Atipally Reddy, Baishnab Tripathy, Basanti Biswal, Bhumi Nath Tripathy, Debashish Banerji, Eva Mari Aro, Gyoza Garab, Hiroyuki Mino, James Barber, Julian Eaton-Rye, K Padamsree, Kastoori Hingorani, Kumud Mishra, Louis Sherman, M.J. Baig, Michael Seibert, Munna Singh, Norm Huner, Pandit Vidyasagar, Prabhat Kumar Sharma, Prasanna Mohanty, Ralph Gasanov, Renu Khanna-Chopra, Reto Strasser, Shigeru Itoh, Subramanyam Rajagopal, Sujata Mishra, Suvendra Bagchi, Toshi Nagata and Uday Pathre.

The guest of honor at the inaugural session was James Barber, President of International Society of Photosynthesis Research (ISPR). Govindjee delivered his inaugural talk

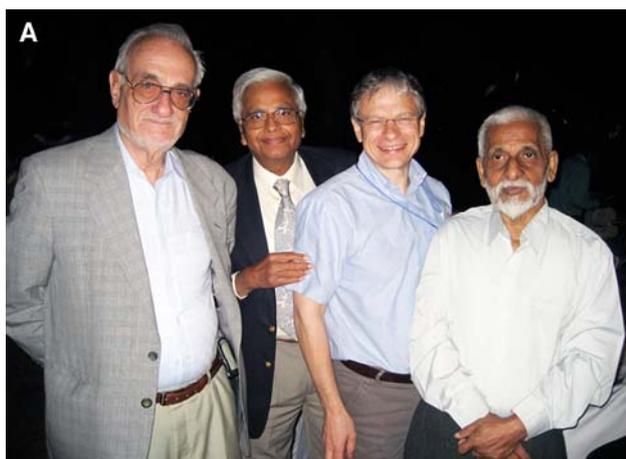


Fig. 1A Govindjee with his students. *Left to right:* George C. Papageorgiou (Greece), Govindjee (USA), Julian Eaton-Rye (New Zealand), and Prasanna Mohanty (India)

Most of the talks at this International Conference dealt with the state-of-the-art research, starting with a brief review of the current knowledge and the relevance of the topic to global issues, followed by a balanced presentation of the latest research results, concluding with views on the future course of research including the outstanding global issues and challenges facing us all. Further, the chairpersons emphasized the key points of the talks, steered the discussions by providing additional thoughts, and introduced related ideas.

The concluding session included remarks on ‘*memorable moments with Govindjee*’ from many of his collaborators; Rajni Govindjee was the guest of honor of this special session. Since her birthday fell on Nov. 29, we celebrated it as well (see Fig. 3).



Fig. 1B Govindjee (*1st row, 5th from right*) with many of the participants at the Indore Conference

that was dedicated to his teachers Eugene I. Rabinowitch (1959–1960) and Robert Emerson (1956–1958). He not only talked about their scientific discoveries, but about their human qualities (also see Govindjee 2004). Figure 2 shows Govindjee lighting the lamp before the conference was inaugurated.

The messages

Several messages were received at the time of the conference honoring Govindjee. Our apologies to the following for not being able to include their messages: *Andrei Rubin* (Russia); *Kazimierz Strzalka* (Poland); *Lars Björn* (Sweden);



Fig. 2 Govindjee lighting of the lamp before the statue of the goddess of learning and education, Saraswati. *Left to right:* K.N. Guruprasad, Sudhakar Bharti, James Barber, Govindjee, A. Gnanam, and the Vice Chancellor Bhagirath Prasad



Fig. 3 Anjana Jajoo presenting a bouquet of flowers to Rajni Govindjee on the latter's birthday that fell at the time of the conference

Navik Karapetyan (Russia); *Vladimir Shuvalov* (Russia), and many others. We reproduce below excerpts from several messages (*italics* are by one of us, AJ).

- **Suleyman Allakhverdiev** (Russia): “Dear Professor Govindjee, On behalf of all the members of my research group, my family and myself I would like to join the photosynthetic research community [in honoring you at your] great 75 year jubilee [75th birthday] and to take this opportunity to extend our sincere and heartiest congratulations to you on the outstanding contributions that you have made to our understanding

of photosynthesis. We wish you very good health and long-long, many-many years of further activities as a scientist and a teacher, and lot of success and fun. Please keep your health and continue your contribution, which is very important for the Society. I am sure the meeting will be enjoyable and profitable With my very best wishes and kind regards.”

- **Andrew A. Benson** (USA): “Professor Govindjee has, for years, guided my interests in publicizing parts of the history of photosynthesis research. Our unique experience of association with pioneers of photosynthesis research, Otto Warburg and Robert Emerson, have provided strong bonds and mutual interests. My colleague Peter R. Yankwich, a student in the laboratory of Sam Ruben and Martin Kamen, discoverers of long-lived Carbon-14, taught Govindjee Physical Chemistry [at the University of Illinois] ... He recalled that Govindjee was a ‘*unique student*’. *Govindjee is, by far, the international leader in communication and of communicators in the field of photosynthesis.* He is the catalyst for important interaction of scientists and laboratories in the field of biology.”
- **Robert E. Blankenship** (USA): “Please accept my very best wishes for a successful conference I want to take this opportunity to congratulate my good friend and colleague Govindjee on this wonderful testament to his career, which has lasted more than 50 years. *Govindjee has had a powerful positive effect on the field of photosynthesis for many years.* This influence has taken several distinct forms. First, there are his many research publications, which have illuminated numerous aspects of photosynthesis, perhaps most dramatically his work on chlorophyll fluorescence, bicarbonate effects, and his early work on quantum yields. Secondly, his tremendous accomplishments in terms of communication and editing, including his numerous books and especially *Advances in Photosynthesis and Respiration Series* (Springer) which is an *unparalleled collection of books* that define the field today in much the same way as his former mentor Eugene Rabinowitch did in the 1940s and 1950s with his treatise. *Finally, his tremendous energy and enthusiasm has inspired several generations of students and colleagues alike.* It is never boring when Govindjee is in the room! Hearty congratulations and very best wishes to both you [Govindjee] and Rajni.”
- **Howard Gest** (USA): “It is my understanding that the November 27–29, 2008 conference on Photosynthesis at the University of Indore is honoring Professor Govindjee. This provides the occasion for me to say a few words about Govindjee’s unique contributions to a major field of biological research. Aside from his noteworthy experimental research on photosynthetic processes, Govindjee stands out as a savant who

realized a long time ago that the history of research advances and the acumen of scientists who made them is an important aspect of continuing scientific progress. *There are, in fact, very few scientists who can match his record as an editor and educator.* As a long-time colleague and friend, I am very pleased to have this opportunity to express congratulations to Govindjee on an exemplary scientific career.”

- **Maria Ghirardi** (USA): “Dear Govindjee, you have been an example and an inspiration to many of us. I still remember meeting you when I was a graduate student in Berkeley, and being surprised to be recognized by you many years later when I was already a post-doc in Dr. [Autar] Mattoo’s lab! It has been a pleasure sharing ideas with you, and, through your kindness, being introduced to so many other first-class researchers. ... *To me, you will always represent the best in research and friendship.*” [The authors note that Maria’s research colleague Mike Seibert did come to Indore and delivered a symposium talk.]
- **Steve C. Huber** (USA): “Dear Govindjee: It is most unfortunate that I am unable to join you and your many other friends and colleagues in Indore to celebrate your many accomplishments in plant biology. I fondly remember the many trips we enjoyed together in India in the 1980s, and certainly have always wished that the PL480-sponsored projects could have been continued. [I am sure I am not the only one wishing that.] Being able to travel with you in India was really a special opportunity for me, and I will always remember the exciting projects that we reviewed together, the biophysics that I learned from you (it’s true!), and the many adventures of local travel and customs. *You are a true giant in the field and all of us who know you well have been truly blessed by your friendship.* I know how much you enjoy a party, and send my warm greetings to you and the others at the conference! See you when you (eventually) return to Urbana!”
- **Tasios Melis** (USA): “Dear Anjana: I cherish every single interaction I have had with Govindjee over the past 30⁺ years. Borrowing a tie and receiving Govindjee’s assistance prior to a formal lecture at a conference offers example of my personal interactions with my dear friend.”
- **Norio Murata** (Japan): “*I congratulate you on the great honor [you are receiving] for your excellent achievement in the field of photosynthesis research.* The Conference on-going in Indore has gathered a large number of photosynthesis researchers, many of whom have received your scientific guidance and are getting together to honor you. I had wished to be a participant in the Conference but am very sorry to be unable to be there since I must be at a symposium in Sapporo on ‘Plant Lipids’ at the same time (Nov. 27–30) since I am the current President of the Plant Lipid Society in Japan. I hope and am sure that you will enjoy your Conference with your many colleagues and your own students, George Papageorgiou; Prasanna Mohanty, and Julian Eaton-Rye. All the best wishes and kind regards.”
- **Jan Naus** (The Czech Republic): “It was my great experience to meet Prof. Govindjee already in 1976 in Prague during The Third International Seminar on Excitation Energy Transfer in Condensed Matter. Professor Govindjee visited Prague together with his family and for us, students, [he] was a representative of the renowned research in chlorophyll fluorescence in vivo. Prof. Govindjee has very positively influenced the research on photosynthetic models in Prague. My supervisor, Prof. Karel Vacek, returned at that time from U.S.A., from the Laboratory of Prof. Govindjee and their paper is still well known (Vacek, Wong, Govindjee: Photochem. Photobiol. 1977). During the last decades there were many contacts, mostly indirect, but [they were] very fruitful between Prof. Govindjee and our Laboratory in Olomouc, especially with my former students and nowadays research fellows Dusan Lazar, Pavel Pospisil and Petr Ilik. It is my great pleasure to send many greetings to Prof. Govindjee from myself and my colleagues from Laboratory of Biophysics at Palacky University in Olomouc, Czech Republic. We wish Professor Govindjee, as it is a custom in our country, good health, further success in the work and a happiness in his personal life.”
- **Itzhak Ohad** (Israel): “Dear Govindjee, *For me, you are a friend, a teacher and an example of an admirable scientist who has dedicated his career to excellent research* (PUBMED quotes 189 peer reviewed scientific publication and these maybe not all of them!!) as well as promoting for so many years the publication of an important number of reviews, organization of international meetings and editing of books dedicated to specific problems and different aspects of photosynthesis research, updating the accumulated information during so many years. I deeply appreciate this aspect of your work, we all need it, yet few of us dare to follow your example. This work has culminated a few year ago with the publication of the ‘Celebrating the Millennium, Historical high-lights of photosynthesis research’ that will serve for many years as a basic source for understanding the tortuous development of this research field, generously offering to those entering the field the perspective of how progress has been achieved as well as reminding us the older generation, our struggles as well as our mistakes. The Latin dictum ‘Errare humanum est’ accompanies the reading of this publication intertwined

with the feeling of achievements and finding the truth, throughout this great 3 volumes of 'Photosynthesis Research, 73, 76 and 80'. The life of us all is marked by memories of small occasions when something unexpected occurs and shows the quality of those involved, in this case, yours, Govindjee. While spending a few days at a conference on Photosynthesis organized by Prof. Yorinao Inoue at Riken, Japan, maybe 23 years ago, one night, late past midnight, entering the coffee room, *I found you [Govindjee] sitting uncomfortably curled on a small table, being the last one 'staying in line' waiting for your turn to get access to the dark room where a thermoluminescence apparatus, the kind that did not exist besides this laboratory in the world, was available, and [ready to] do some measurements. At that time I had no knowledge of this technique, thermoluminescence research was at its beginnings in photosynthesis, and few laboratory had constructed such equipment. I learned then from you, while still waiting for the door to open, what interesting information can be obtained with this system and what are its limitations.* It took a few years before Prof. Inoue and Koike San found an opening of this apparatus work schedule and offered me the occasion to use it at Riken, and then I was able to construct my own apparatus with their advice, as well as that of Prof. Imre Vass at Szeged, Hungary. For my group and me, this event has certainly added a lot to my work until today. At this occasion, I wish you dear Govindjee, to be able and continue your work in all its aspects and enjoy your life with your family and the relations with your friends. *Waiting for your next publication.*"

- **Barry Osmond** (Australia): "Dear Gov[indjee], ... As a small compensation [to not being in Indore], *Cornelia and I decided to confer on you the long overdue honorary Vorname: "Irrepressible."* Henceforth we urge you to publish under the name I. Govindjee and thereby join us in doing our bit to confuse, and discredit, the impact factorists at Thomson Scientific (as illustrated in the signature line below). Ironically, the current Wikipedia listing is an appropriate commentary on the flawed minformation Thomson Scientific sells to the keepers of Academe, worldwide. With much respect, and with all good wishes to you and Rajni for an exciting, happy and memorable Indore meeting. Barry Osmond, Charles B Osmond, C Barry Osmond or B Osmond; Cornelia Büchen-Osmond, Kornelia Büchen-Osmond, Ulla Maria Cornelia Buechen-Osmond, UMC Buchen-Osmond, usw, usw ... PS: [Speaking about the defeat of Australia by India in the cricket] As your Indian colleagues may appreciate, there is another reason for our absence [from Indore]. Following the recent disastrous performance of my

countrymen with willow and leather between the sticks, the thought of having to endure a drubbing that would begin everywhere I opened my mouth in India, was simply 'more than up with which one could put'."

- **Jean-David.Rochaix** (Switzerland): "Dear Govindjee, I regret not to be able to be at the conference ... in your honor. I wish to congratulate and to thank you for your numerous contributions to the field of photosynthesis. *Throughout these years you have been a major driving force and more important you have been able to infect others with your contagious enthusiasm.*"
- **Alan J. Stemler** (USA): "Not content to rest after a long and distinguished career in research and teaching, Professor Govindjee took on the task of chronicling the entire field of photosynthesis. *It can safely be said that no one else living or dead could be more suited to this mission. Few come close to his breadth of knowledge of photosynthesis, and none match his personal acquaintance with so many contributors to our field.* Beside hundreds of original research papers, these historical accounts will stand as a unique and invaluable legacy to the field he so clearly loved."
- **Alison Telfer** (UK): "Over and above your long distinguished career and your enthusiasm for photosynthesis, I applaud how you achieve the minutiae of the photosynthesis community with your magnificent histories *and also do so much to promote young, new scientists.* I ... wish you and Rajni all the best for the future."
- **Hyungshim Yoo** (USA): "I have respected Dr. Govindjee as a internationally prominent researcher and a hard working scientist. He contributed in a big way to the knowledge of photosynthesis. He spent all his life to work on photosynthesis deserving the comment that *he is the world's most recognized photosynthesis researcher. He is also a warm person with good humor and a good mentor who has wisdom to guide the people in his lab [and elsewhere].*"

Young researchers and students

Three young researchers were given awards for the best posters. They were: **Ch. Dinakar** (University of Hyderabad; Title: Importance and relative contribution of COX and AOX pathways in optimizing photosynthesis during light, osmotic, or temperature stress); **M. Karthik Mohan** (University of Hyderabad; Title: Functional characterization of novel subunit proteins associated with PS II in cyanobacterium *Synechocystis* sp. PCC 6803); and **N. Sreedhar** (University of Hyderabad; Title: Application of the OJIP fast fluorescence transient to monitor state transitions in *Arabidopsis thaliana*). Govindjee presented each of them with one of the recently published books, from his



Fig. 4 Young researchers (see text) receiving book awards from Govindjee. **A** Sunil receiving award on behalf of Ch. Dinakar; in the background are: George Papageorgiou, Manmohan Manohar

Laloraya, Rajni Govindjee, and P. V. (Raj) Sane. **B** M. Karthik Mohan. **C** N. Sreedhar

well-known Series *Advances in Photosynthesis and Respiration*, provided to the conference by Springer, The Netherlands. Figure 4A, B, and C shows, respectively, Sunil (representing Ch. Dinakar), M. Karthik Mohan, and N. Sreedhar, receiving book awards from Govindjee.

In addition, posters of the Z-scheme (that had been designed by Wilbert Veit under the guidance of Govindjee) and copies of a book *Music of Sunlight* by Dr. Wilbert Veit, USA, were given to young college students. Further, the organizing committee provided financial support to several researchers.

The most exciting and significant feature of this conference was the energetic participation of young graduate and post graduate students from various teaching departments of Devi Ahilya Vishwavidyalay (University) and local science colleges. The students, accompanied by their college teachers took serious interest in research in the field of photosynthesis and its global impact. Figure 5A and B shows Govindjee mingling with the young researchers, signing note books, and Z-scheme posters.

A chlorophyll fluorescence workshop

Following the conference, a two-day (Nov. 30 and Dec. 1, 2008) workshop on “Intact Plant Photosynthesis” was organized by Prasanna Mohanty. Reto Strasser gave hands-on training to more than 25 young researchers from different parts of India (from Universities of Allahabad, Banasthali, Hyderabad, Indore, Mumbai, and Pune) to measure chlorophyll a fluorescence induction kinetics. Strasser explained, with great enthusiasm, the basic aspects of chlorophyll a fluorescence transients and the implications of the results obtained. In particular the OJIP fluorescence transient (see, e.g., an early “historical” paper of Reto Strasser with Govindjee: Strasser et al. 1995) was exploited to understand quantitative changes in various PS II reactions. The participants of the workshop benefited a lot as they practically carried out the experiment themselves by visiting the crop fields in the botanical garden of School of Life Sciences and taking measurements in situ by the portable equipment (Fig. 6).



Fig. 5 Govindjee talking with young scientists and signing their notebooks and the Z-scheme posters. **A** With students from the local science colleges. **B** With Monica Jain (2nd from right) and others



Fig. 6 Reto J. Strasser and some of the students at the chlorophyll fluorescence workshop

Concluding remarks

The conference was successful in strengthening contacts within photosynthesis community for all the attendees and

provided valuable opportunities for extensive discussion facilitating a rich exchange of ideas. Interrogation of the challenges in plant productivity in the global perspective, scientific approaches to face the changing climate, and the tools and methods to solve environmental problems brought together scientists and young students to provide a common platform to build the strategy needed to face the next challenges. This conference was a befitting tribute to Govindjee, who had studied (1950–1954) and taught (1954–1956) at Allahabad University and had later lectured at Indore University (1996). Finally, we end this report with a couple of light-hearted remarks: Govindjee had once told us that the late Professor Martin Gibbs had called him “Mr. Photosynthesis, and recently Neera Bhalla Sarin (of Jawaharlal Nehru University) jokingly said “He is the Shah Rukh Khan of the Photosynthesis Community.” With these comments, we rejoice this celebration we had held for Govindjee at Indore during Nov. 27–29, 2008.

Acknowledgments We thank each and every member of the International Advisory Committee, and The National Advisory Committee. We particularly thank all the students and the staff at Indore University without whose help, this conference would not have taken place. Further, we thank the Vice Chancellor Dr. Bhagirath Prasad of Indore University, and the following agencies that supported this conference: Department of Science and Technology (DST) India, Department of Bio-Technology (DBT) India, Council for Scientific and Industrial research (CSIR) India, Ministry of Non-conventional Energy Sources (MNES) India, Board of Research in Nuclear Sciences (BRNS) India, Madhya Pradesh Council of Science and technology, Indian Society of Plant Physiology and Biochemistry, Indian Society of Photobiology, Kolkota, India, and all the companies and the academic institutions who had given advertisement in the abstract book. We also thankfully acknowledge the following gifts: three books (of the *Advances in Photosynthesis and Respiration*, Govindjee, Series Editor) as prizes for the three best posters, by Springer, Dordrecht, The Netherlands, CDs of the equipment from Hansatech Instruments Ltd., UK, 100 Z-Scheme posters, and 100 books entitled *Music of Sunlight* by Dr. Wilbert Veit, USA. We are grateful to Mahendra Rathore for the photographs provided for this Report. We also refer the readers to a web site (<http://www.schooloflifesciencesdauniv.org>) for further information on this conference.

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