



International Conference on “Photosynthesis and Hydrogen Energy Research for Sustainability-2017”

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On our planet, life is supported mostly by oxygenic photosynthesis. It provides organic substrates by converting solar energy to the energy of chemical bonds, releasing oxygen as a result of water oxidation. Several billion years ago, ancient cyanobacteria transformed anaerobic atmosphere of Earth, making it suitable for the development of the vast diversity of living organisms now inhabiting our planet.

Photosynthesis implements its planetary role by providing energy as organic compounds and maintaining the oxygen and carbon dioxide level in the atmosphere. Also, we know that it is the past solar energy, converted through photosynthesis and accumulated as fossil fuels, that is now being used by our industrial society. As is well known, there are two essential challenges for all of us in the nearest future—lack of energy supply and the ensuing environmental problems. We strongly believe that the possible solution for this is tightly connected with photosynthesis. In order to meet the energy demand and reduce the emission of greenhouse gases, it is important to learn the ways of artificial energy generation mimicking the natural photosynthesis process. For several decades, photosynthetic processes have been investigated, and the available knowledge has contributed to the development of the area of *bioenergetics*. However,

it is all-the-more essential now to exploit all aspects of the photosynthesis mechanisms, with full vigor, to reach our goal of solving the global problems facing us all.

In order to disclose the mysteries of photosynthesis, scientists use a wide range of modern methods and techniques of biophysics, molecular biology, biochemistry and theoretical chemistry. We do know quite a bit about the structure and function of photosynthetic complexes involved in numerous photosynthetic processes. About 7 years ago, the crystal structure of photosystem II was determined at 1.9 Å resolution. This has been extremely significant for the understanding of light-induced water oxidation, as well as in reaching the goal of artificial photosynthesis. In addition, this resolution has allowed investigation of large protein complexes at atomic level, providing us with solid data at the chemical level. However, there are still many questions concerning photochemical reactions and the photosynthetic apparatus of a large variety of photosynthetic organisms that need to be solved.

The 8th International Conference “Photosynthesis and Hydrogen Energy Research for Sustainability-2017,” in honor of Agepati S. Raghavendra (India), William A. Cramer (USA), and Govindjee (USA), held in Hyderabad, India, was attended by scientists from all over the world working in the area of photosynthesis, investigating light-induced reactions of photosynthesis in various photosynthetic organisms (see Figs. 1, 2). The conference was inaugurated by the Vice Chancellor Podile Appa Rao on October 30, 2017, at the School of Life Sciences of the University of Hyderabad, India, and lasted till November 03, 2017 (see Figs. 3, 4.) The organizing secretary of this conference (Rajagopal Subramanyam), Dean of the School of Life Sciences (Pallu Reddanna), and Head of the Department of Plant Sciences, (Venkataramana Chintalapati) of University of Hyderabad, as well as Suleyman I. Allakhverdiev (Russia), co-coordinator of this Conference attended the valedictory function. Further, this group extended a warm and hearty welcome to all the participants of the conference. In addition, James

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Fig. 1 A group photo of the participants of the 8th International Conference “Photosynthesis and Hydrogen Energy Research for Sustainability-2017.” Photo by Gandla Venkatesh, Sai Studio, Hyderabad

Fig. 2 Participants and delegates attending the 8th International Conference on “Photosynthesis and Hydrogen Energy Research for Sustainability-2017.” Photo by Gandla Venkatesh, Sai Studio, Hyderabad



Fig. 3 Inauguration session of the 8th International Conference on “Photosynthesis and Hydrogen Energy Research for Sustainability-2017.” *Left to right:* Chintalapati Venkata Ramana; Govindjee; Agepati S.Raghavendra; Appa Rao Podile; Pallu Reddanna; William A. Cramer; Suleyman I. Allakhverdiev; Rajagopal Subramanyam. Photograph by Gandla Venkatesh, Sai Studio, Hyderabad



Fig. 4 Inaugural of the conference by lighting of the lamp (*Jyoti prajwalana*) by Govindjee (University of Illinois at Urbana-Champaign, Urbana, USA), William A. Cramer (Department of Biological Sciences, Purdue University, West Lafayette, IN, USA) and Appa Rao Podile (Vice-chancellor, University of Hyderabad, Hyderabad, India). This ceremony is one of the traditional ways to start any event in India. In the Indian tradition, when any function begins by lighting of a lamp, and that too with the help of *atmajyoti* (internal spark), the respective *higher power*, from the Universe, is invoked, and a prayer is offered for this power to be present at the venue all the time. Photo by Gandla Venkatesh, Sai Studio, Hyderabad

Barber (UK), chairman of this conference, who could not be physically present, sent his greetings to all the participants and wished the organizers to conduct this event successfully in Hyderabad.

We all are pleased to note that the University of Hyderabad is one of the top Universities in India, with an outstanding academic ranking. The main purpose of this Conference was to disseminate knowledge in the area of photosynthesis. In addition, we honored the three distinguished scientists mentioned above who have made pioneering contributions to the field of photosynthesis. At this meeting, we discussed the past, the present, and the future research on Photosynthesis and Hydrogen Energy, ranging from molecular to global aspects. This conference had indeed an exciting scientific program covering key areas of photosynthesis as well as hydrogen energy research. Further, this meeting provided a forum for students, postdoctoral fellows, and scientists from many countries to broaden their knowledge and understanding of photosynthesis (Fig. 5 of the young awardees at the conference). The Conference also provided an excellent opportunity for all of us to meet researchers from around the world, to widen professional contacts, to create new opportunities, and establish new collaborations. The organizers in India did their best to make this event a grand success and to make the stay of all the participants a pleasant and memorable one (see Fig. 6 for a colorful depiction of the conference through what is called “Rangoli”). We know that everyone enjoyed the warmth of the people of the University of Hyderabad, as well those of the historic city of Hyderabad; an added attraction was the



Fig. 5 A group photograph at the ceremony held for the young researcher awardees (*) From the Top Row: Left to right: Nina G. Dyczmons-Nowaczyk* (Germany), Daisuke Takagi* (Japan), Mithun Kumar Rathod* (Japan), Srinivas Agurla* (India), Sureshbabu Marriboina* (India), Elshan Musazade* (Azerbaijan), Sai Kiran Madireddi* (India), Kaichiro Endo* (Japan), Shvaita Madhuri* (Germany), Rafal Białek* (Poland), Makoto Nakamura* (Japan), Shabbir Ahmed* (India), Roman Voloshin* (Russia), Sreeharsha Rachapudi V* (India), and Elsin Raju Devadasu* (India). Middle Row: Left to right: Mai Duy Luu Trinh* (Japan), Taejun Chin* (Japan), Sai Divya

Kanna* (Hungary), Alena Konôpková* (Slovakia), Nathan Brady* (USA), Jyotirmoy Mondal* (USA), Reona Toyofuku* (Japan), Misato Teramura* (Japan), Srilatha Nama* (India), Akanksha Mhatre* (India), Deepika Kandoi* (India) and Sunil Bobba* (India). Bottom Row: Left to right: Julian J. Eaton-Rye (New Zealand), Suleyman I. Allakhverdiev (Russia), Agepati S. Raghavendra (India), William A. Cramer (USA), Govindjee, Appa Rao Podile (India), Pallu Reddanna (India), Tatsuya Tomo (Japan), Anatoly Tsygankov (Russia) and Rajagopal Subramanyam (India). Photo by Gandla Venkatesh, Sai Studio, Hyderabad

world famous Hyderabadi cuisine, and even a grand traditional dance (Fig. 7).

There was a tremendous positive response from scientists from all over the world for this important conference, held for the first time in India, with participation of more than 150 from the overseas. In the five day packed event, we had about 70 lectures and 120 poster presentations. The speakers at the conference were world leaders in their fields and many as 350 participants came together from twenty-two countries.

This special issue of PRES includes papers of invited authors, who had attended the conference, and highlights the most recent advances in the studies of light-induced photosynthetic reactions such as absorption of light energy, light-induced charge separation and electron transfer, and water-oxidation. In this special issue, readers will find most updated information in field of photosynthesis research; in our opinion, it will take the field to the next higher level.

As organizers of this conference, we express our gratitude to all the speakers, chairpersons, and poster presenters for their wonderful participation during the congress. Two of us (TT and SIA) express our gratitude to our coauthor RS for organizing this meeting in a beautiful University and

for his efforts in hosting such an event including honoring 3 internationally distinguished scientists (see Figs. 8, 9). Furthermore, we thank the International Organizers: James Barber (Chairman of the Meeting, UK), Julian J. Eaton-Rye (Co-chair of the meeting and secretary of ISPR, New Zealand), Marián Brestic (Slovakia), Barry D. Bruce (USA), Győző Garab (Hungary), Nathan Nelson (Israel), Marc Nowaczyk (Germany), Sergey Shabala (Australia), Anatoly A. Tsygankov (Russia), and local scientific committees, for their fantastic work and great support.

Further information on this meeting is available at <https://icprs.ru/archive/>, and <http://sls.uohyd.ac.in/index.html>. Abstracts of all the papers and posters presented are in a booklet, available from the organizers, as well as at <http://www.life.illinois.edu/govindjee/world-historical.html>.

We express our sincere appreciation to all the authors, who contributed papers for this special issue, and also to our many dedicated, hard-working reviewers. We are especially grateful to Terry Bricker Editor-in-Chief of PRES, and Carola Vermeeren, Meertinus Faber and Jacco Flipsen (all of Springer) for their advice in developing this exciting issue, and for their constant support.



Fig. 6 Rangoli (traditional Indian decoration and patterns made with ground rice, particularly during festivals) at the 8th International Conference on “Photosynthesis and Hydrogen Energy Research for Sustainability (PRES)-2017, depicting delegates from more than 20 countries who were invited to share their work related to photosynthesis and hydrogen energy research in Hyderabad, India. The center circle represents reviewable bioenergy resources. The green half represents algae currently being used for third generation biofuels and the light brown half represents renewable biofuels from various resources such as plants. The circle next to the center circle (filled with yellow and orange shaded color) represents sun/sunlight, which drives the primary food chain process i.e., photosynthesis. Next to the sunlight circle, four more circles merged with leaf rep-

resent genetic, physiological, biochemical and molecular breeding advances in the field of plant sciences. The outer-most circle is filled with flags of several countries (Taiwan, Romania, Hungary, Canada, Germany, Estonia, Sweden, Russia, Finland, Azerbaijan, Poland, Bulgaria and Japan, New Zealand, USA, Slovakia, UK, Greece, Spain, Singapore, South Korea, Australia, Iran and Israel and India). Finally, the whole concept was shaped into a Peacock design. Concept and design: Sureshbabu Marriboina [Rangoli makers were: Ashwini Vetcha, Smita Nandardhane, Vandana Bisoyi, Lakshmi Prasuna, Mohammed M Mujahid, Aparna Nerusu, Mahati Kandarpa, Divya K Unnikrishnan and Indu Basist]. We thank Sureshbabu Marriboina for the above description. Photo by Mahesh Gokra



◀ **Fig. 7** Kuchipudi dance, one of the eight major Indian classical dances, performed by Girish Chandra and Devi Girish at the cultural evening on October 31, 2017 held for the delegates and the guests of “Photosynthesis and Hydrogen Energy Research for Sustainability-2017” in the Department of Science and Technology (DST) Auditorium, University of Hyderabad, India. Photo by Gandla Venkatesh, Sai Studio, Hyderabad

Finally, we thank each and every author (to be precise 163) from 22 countries (Azerbaijan, Bulgaria, Canada, China, Czech Republic, Egypt, France, Germany, Hungary, India, Israel, Japan, New Zealand, Norway, Poland, Romania, Russia, Slovak Republic, Sweden, Switzerland, Taiwan, USA), for their valuable contributions in honor of three pioneers of photosynthesis: Agepati S. Raghavendra, William A. Cramer, and Govindjee. This honor includes more than 40 papers in this special issue, arranged under selected topics; we are delighted to mention that Bill Cramer wrote a wonderful review on his work on the cytochromes; Govindjee wrote a tryst with photosynthesis research, and Raghavendra participated in an original research paper on photorespiration.



Fig. 8 (Top) Felicitation of Agepati S. Raghavendra for his scientific contribution to photosynthesis research. Left to Right: Pallu Reddanna, Rajagopal Subramanyam, Suleyman I. Allakhverdiev and Appa Rao Podile. (Middle) Felicitation of William A. Cramer for his contribution to photosynthesis research (Center), Left to right: Rajagopal Subramanyam, Agepati S. Raghavendra, Ch. Venkataramana, Appa Rao Podile, Suleyman I. Allakhverdiev and Pallu Reddanna. (Bottom) Felicitation of Govindjee for his scientific contributions to photosynthesis research; it was also his 85th birthday. Left to right: Agepati S. Raghavendra, Rajagopal Subramanyam, Appa Rao Podile and Pallu Reddanna. Photos by Gandla Venkatesh, Sai Studio, Hyderabad



Fig. 9 Left to right: Agepati S. Raghavendra, William A. Cramer and Govindjee at the banner of 8th international conference on “Photosynthesis and Hydrogen Energy Research for Sustainability-2017”. Photo by Gandla Venkatesh, Sai Studio, Hyderabad

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