Photosynthesis of prokaryotic and eukaryotic organisms

(Under GIAN, Global Initiative on Academic Network, Ministry of Human Resources, Govt. of India)

February 9, 2016 –March 2, 2016, Jawaharlal Nehru University (JNU), New Delhi

OVERVIEW

Photosynthesis is the only process that converts solar energy into chemical energy on a massive scale; almost all life on this Earth depends on it. In 2050, we expect to have ten billion people, and it is predicted that we will not have enough energy and food to support their lives; this is a grave problem. However, there is hope & solution: we expect to improve photosynthesis to meet this challenge. We ask: what can we do to make our future free from the impending disaster of not having enough energy (and food) needed to support our lives, and that of the future generations. Our Sun provides more energy in one hour than the energy consumed by the entire planet in one year. In 2050, we will need 30 Terawatts of energy, and the Sun has much more! We know photosynthesis in great details; however, our attempts to improve it are still in infancy. We list below some of the ideas (in random order) related to improving photosynthesis. (1) Engineer algae and plants to better utilize light energy- by changing chlorophyll content and redesigning the photosynthesis machinery; (2) produce hydrogen gas from green algae and cyanobacteria; (3) design artificial photosynthesis systems, using the native manganese-calcium complex for water oxidation; (4) use knowledge of photosynthesis to artificially convert light energy into (a) electricity; (b) chemicals including biopharmaceuticals, and what not; and (5) modify genetically C-3 plants to C-4 plants for efficient photosynthesis and food production." In order to achieve these goals, we need to fully understand all the bottleneck steps in the process of photosynthesis.

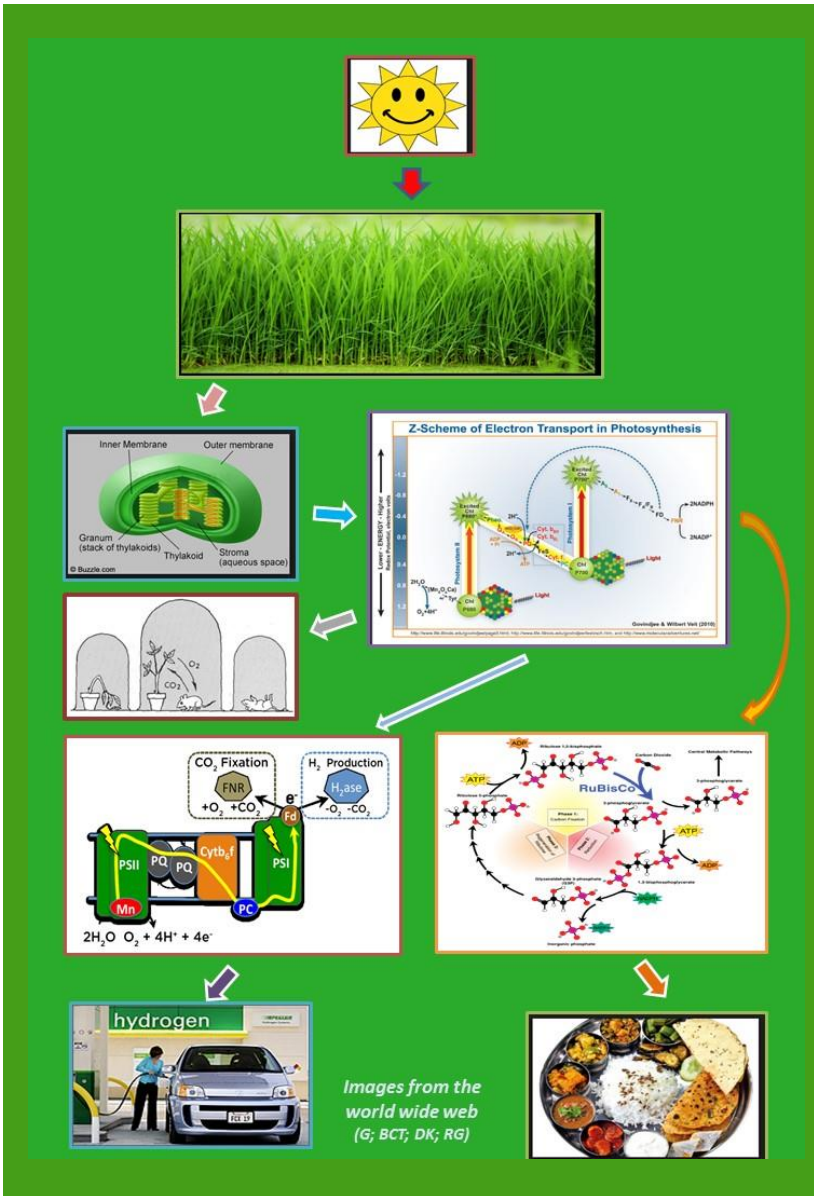
In this course of **20 lectures** on Photosynthesis, *students will learn the basics of photosynthesis (and its applications) in order for them to be equipped with knowledge to tackle the big issues before us. In addition to gaining knowledge on the physics, chemistry and biology of photosynthesis, we expect the students to have fun learning, and to be inspired and motivated to go forward in their lives to solve problems facing us all.* Here, in this course, they will have an opportunity to ask questions during the **10 planned tutorials**, after 2 lectures per day. The course includes a drama on photosynthesis where students become molecules themselves! Govindjee has explicitly stated, "Never be afraid to ask any question during the sessions reserved for it, but, more importantly, any time during or after the course."

Module	**Photosynthesis of prokaryotic and eukaryotic organisms:** ***February 9, 2016 –March 2, 2016***
You Should Attend If…	• You are a P.G., Ph.D. student, postdoctoral fellow interested in learning the fundamental concept and applications of the process of Photosynthesis • Faculty members, scientists from academic/research institution working in any of the following areas: plant biology; agriculture; microbiology; chemical biology; biochemistry; biophysics; computational biology • Industrial participants interested in the areas of improving and /or applying photosynthesis research for industrial applications

Fees	• Rs. 500 for registration (Compulsory for all) • JNU M. Sc. Students: Free • JNU PhD students/JRFs/SRFs/RAs/Scientists: Rs. 1000 • The participation fees for taking the course is as follows: Participants from abroad: US $500 • Participants from Industry: INR 10000 Faculty from Academic Institutions/Research Organizations other than JNU: INR 2000 • Students other than JNU: INR. Rs. 1000 *The course fee will be made half for SC/ST students. The above fee includes all instructional materials for tutorials and assignments, laboratory equipment usage charges.

Guest Faculty

Govindjee (one name only) is Professor Emeritus of Plant Biology, Biochemistry and Biophysics at the University of Illinois at Urbana- Champaign, Urbana (UIUC), Illinois, USA. He received his Ph. D. (in Biophysics) in 1960 under Profs. Robert Emerson and Eugene Rabinowitch. From 1961—1999, he served on the faculty of UIUC. His major achievements include an understanding of the relationship between Chl *a* fluorescence and photosynthetic reactions; a unique role of bicarbonate on the electron acceptor side of PS II, particularly in the protonation events; the theory of thermoluminescence in plants; the first picosecond measurements on the primary photochemistry of PS II; and the use of fluorescence lifetime imaging microscopy (FLIM) of Chl *a* fluorescence in understanding *Photoprotection* by plants against excess light. His honors include: Fellow of the American Association of Advancement of Science; Fellow and Lifetime member of the National Academy



of Sciences (India); President of the American Society for Photobiology (1980–1981); Honorary President of the 2004 International Photosynthesis Congress; Lifetime Achievement Award of the Rebeiz Foundation for Basic Biology, 2006; Communication Award of the International Society of Photosynthesis Research, 2007; and of Lifetime Achievement Award of the UIUC, 2008. For further information on Govindjee, see his web site at: http://www. life.illinois.edu/govindjee.

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For Registration apply online at http://www.gian.iitkgp.ac.in/GREGN/index

Host Faculty

Baishnab CharanTripathy is Professor of Life Sciences, Jawaharlal Nehru University (JNU), New Delhi. He received his PhD in 1981 in Life Sciences under Prof. Prasanna Mohanty. He has worked in the areas of bioenergetics of chloroplasts and mitochondria, on chlorophyll biosynthesis, and on space-grown plants in USA. Since 1987, he has been on the faculty of the School of Life Sciences at JNU. He is an authority on the regulation of chlorophyll biosynthesis, chloroplast biogenesis, and on environmentally safe photodynamic herbicides. His laboratory has genetically manipulated plants to improve chlorophyll biosynthesis, photosynthesis and nitrogen assimilation. He is currently working on converting C3 plants to C4. B. C. Tripathy is Fellow of the National Academy of Sciences, Allahabad, of the Indian National Science Academy, and of the National Academy of Agricultural Sciences, New Delhi. He is a former Vice-Chancellor of Ravenshaw University, Cuttack, Odisha.