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*Announcement*

# Calvin and Hill prizes: 2001

At the 12th International Congress on Photosynthesis (August, 18–23, 2001, Brisbane, Australia), the International Society for Photosynthesis Research (ISPR: http://www.photosynthesisresearch.org) awarded its Melvin Calvin prize and its Robin Hill prize for breakthroughs in understanding the molecular machinery of the largest solar power plant on the planet, the photosynthetic system. The Calvin prize was awarded to Krishna Niyogi of Berkeley, California, and the Hill prize was awarded jointly to Petra Fromme and Norbert Krauß of Berlin.

## The Melvin Calvin Award to Krishna Niyogi of the Department of Plant and Microbial Biology, University of California, at Berkeley, California, USA

Krishna Niyogi received the 2001 Melvin Calvin Award in recognition of his outstanding contributions to the understanding of mechanisms of photoprotection in plants and algae. The award was presented to him by Hal Hatch, known for the Hatch-Slack C-4 pathway of photosynthesis. On behalf of the entire international photosynthesis community, and the Editorial Board of *Photosynthesis Research*, we extend our heartiest congratulations to Kris, his mentors (Arthur Grossman and Olle Björkman), his research students, and his postdoctoral associates.

Our best wishes to you Kris for many future breakthroughs in your research.

The Calvin prize honors the late Melvin Calvin (1911–1987), who received the 1961 Nobel Prize in Chemistry for the contributions of his research team at UC Berkeley in elucidating 'how plants convert carbon dioxide into the building blocks of sugar and starch', also known as the Calvin–Benson cycle. The award noted 'Niyogi has done outstanding personal research in genetic explanation of how the yellow pigments in leaves dissipate excess absorbed sunlight before it causes damage. His work explains why leaves of evergreens become more yellow in winter, and how plants avoid sunburn.'

*Left:* Photo of Calvin from the web (http://www.nobel.se/chemistry/laureates/1961/). Also see: www.lbl.gov/Science-Articles/Archive/Melvin-Calvin-obit.html. A pdf file of Calvin's obituary, by Paul Loach, is found at http://www.life.uiuc.edu/govindjee/history/obit/ObitMelvinCalvin.pdf. *Right:* Krishna Niyogi (left) receiving the Calvin Award from Hal Hatch (right) at Brisbane, Australia (photo by Govindjee).

Genetics has played an important role in Kris' career in more than one way. He was born in Baltimore, Maryland, in 1965, the son of two successful biochemists, Salil Kumar Niyogi and Audrey Stevens (who was recently elected to the US National Academy of Sciences). After receiving a BA degree (1986) in biology with honors from The Johns Hopkins University, Kris developed a passion for plant biology with the help of a Churchill Scholarship during a year of graduate study at the University of Cambridge, UK, where his work led to an MPhil degree (1988). He returned to the US to attend the Massachusetts Institute of Technology (MIT) with a National Science Foundation (NSF) Graduate Fellowship and received a PhD in 1993 for molecular genetics research on tryptophan biosynthesis in *Arabidopsis thaliana*.

Supported by a postdoctoral fellowship from the Life Sciences Research Foundation, he began studies on photosynthesis and nonphotochemical quenching of chlorophyll *a* fluorescence in the unicellular green alga *Chlamydomonas reinhardtii* at the Carnegie Institution's Department of Plant Biology at Stanford, in collaboration with Arthur Grossman and Olle Björkman. There, he isolated *Chlamydomonas* and *Arabidopsis* mutants that are defective in nonphotochemical quenching and provided the first genetic evidence that zeaxanthin synthesized via the xanthophyll cycle is involved in nonphotochemical quenching.

For the past four years, he has continued to use molecular genetics in combination with biochemical and physiological techniques to study photoprotection, antioxidant metabolism, and photosynthesis in the Department of Plant and Microbial Biology at the University of California, Berkeley, where he is now an Associate Professor. In 1998, he was selected as Searle Scholar, and he also received a Presidential Early Career Award for Scientists and Engineers. By isolating more mutants and elucidating the molecular basis for the mutant phenotypes, Kris and his colleagues discovered that a Photosystem II protein, PsbS, is an essential component of the mechanism of nonphotochemical quenching *in vivo* [Li XP, Bjorkman O, Shih C, Grossman AR, Rosenquist M, Jansson S and Niyogi KK (2000) A pigment-binding protein essential for regulation of photosynthetic light harvesting. Nature (London) 403: 391–395]. Physiological characterization of various mutants by his laboratory and others has demonstrated the significance of nonphotochemical quenching for photoprotection, as well as an additional antioxidant function for zeaxanthin.

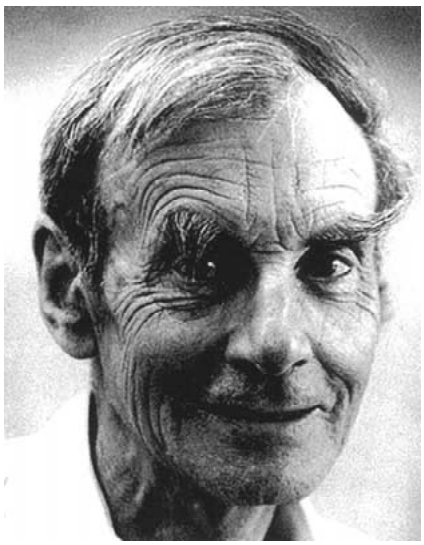
## The Robin Hill Award to Petra Fromme of the Max-Volmer Institute of Biophysical Chemistry and Biochemistry, Technical University, Berlin, and Norbert Krauß of the Institute of Crystallography, Free University, Berlin, Germany

Petra Fromme and Norbert Krauß jointly received the 2001 Robin Hill Award in recognition of their outstanding contributions that lead to the resolution of the molecular structure of the reaction centers of Photosystems I and II that catalyze the Hill reaction. The availability of these structures may help to design more stable light-energy-using systems and provide models for mimicking the process for artificial photosynthesis. The award was presented to them by Jan Anderson, known for the organization of the two photosystems in the thylakoid membrane. On behalf of the photosynthesis community, and the editorial board of *Photosynthesis Research*, we congratulate Petra and Norbert, their students, and their mentors (Horst Tobias Witt and Wolfram Saenger) for what they have provided us in terms of structures of the two major complexes of oxygenic photosynthesis, responsible for conversion of light energy into chemical energy. Robin Hill would have been proud if he were alive. These structures will keep a generation of young scientists busy for years to come.

Our best wishes to you Petra and Norbert for many future breakthroughs in your research no matter what systems you now plan to work on.

The Hill prize honors the memory of the late Robin Hill of Cambridge, UK, 1899–1991, who, in 1939, discovered the 'Hill reaction': chlorophyll containing membranes from leaves evolved oxygen when provided with exogenous electron acceptors, and when illuminated. Thus, biochemistry became possible outside the living cell. Further, in 1960, he, together with Fay Bendall, provided the so-called 'Z-Scheme' of oxygenic photosynthesis for the transfer of electrons from water to $NADP^+$, utilizing cytochromes in the chain that he had discovered earlier.

Petra Fromme was born on February 24, 1961, in Berlin, Germany, as the first child of her parents Walter and Helga Meyer, who had moved in 1957 from Saarbrücken to Berlin. Her husband is Raimund Fromme. They have two children: 16-year-old daugther Simone, and 12-year-old son Christoph. Petra started studying Biochemistry at the Free University Berlin in 1979, finishing with the Master's degree (Diploma) in March 1985. Her first aim to



*Left:* Robin Hill (from page 2 of 'Like Clockwork' by David Alan Walker: see http://www.oxygraphics.co.uk). Information on Hill's papers are available at: www.bath.ac.uk/Centres/NCUACS/html-rh.htm. *Right:* Petra Fromme and Norbert Krauss (left) receiving the Hill Award from Jan Anderson (right) at Brisbane, Australia (photo by Govindjee).

study Biochemistry was to work in the field of cancer research, but during her studies she fell 'in love' with Biophysics, especially the areas of Bioenergetics and Photosynthesis. For her PhD thesis, she moved to the research group of Peter Gräber at the Max Volmer Institute for Biophysical Chemistry at the Technical University Berlin. She worked in the field of Bioenergetics, specifically on the structure and function of the ATP-Synthase from chloroplasts. She worked on 'unisite' catalysis of this enzyme, and identified for the first time subunit IV (which corresponds to subunit 'a' in *E. coli*) from the proton conducting intrinsic $F_0$ part of the enzyme. Petra finished her PhD (Dr. rer. nat.) in March 1988, 'summa cum laude', and, in 1989, received the prestigious Joachim Tiburtius Prize for her PhD thesis. In 1990, she decided to study the structure and function of the photosystems (PS) of oxygenic photosynthesis, joining the group of Horst Witt. She started crystallization experiments on PS I complexes isolated from thermophilic cyanobacteria. She was extremely successful and obtained, by systematic physicochemical studies, crystals of a very high quality that permitted an X-ray crystallographic structure analysis at 2.5 Å resolution [Jordan P, Fromme P, Witt HT, Klukas O, Saenger W and Krauß N (2001) Three dimensional structure of cyanobacterial Photosystem I at 2.5 Å rsolution. Nature (London) 411: 909–917]. This great achievement forms a sound basis for future studies on structure-function relationships in PS I. Petra actively participated in studies on excitation energy transfer between antenna pigments of the PS I complex, electron transfer processes, interaction with other proteins (ferredoxin, plastocyanin), among other topics. In 1993, Petra was appointed as a C 1 assistant at the Technical University Berlin. In 1995, she became leader of the project 'Structure and Function of Photosystems I and II', together with Horst Witt. In the group of P. Fromme and H.T. Witt, Athina Zouni was able to crystallize successfully PS II complexes, also from *Synechococcus elongatus*. The X-ray structure analysis of PS II at 3.8 Å resolution was performed in cooperation with the crystallographic group of Wolfram Saenger of the Free University Berlin, particularly by Norbert Krauss, and their students [Zouni A, Witt HT, Kern J, Fromme P, Krauß N, Saenger W and Ort P (2001) Crystal structure of Photosystem II from *Synechococcus elongatus* at 3.8 Å resolution. *Nature (London)* 409: 739–743]. In 1998, Petra finished her 'Habilitation' in 'Physical Chemistry', on 'Crystallization and structural investigations of Photosystem I'. Since 1999, she has a C 2 position at the Technical University, Berlin. Since August 2001, she is an Assistant Professor of Chemistry and Biochemistry at Arizona State University, Tempe, Arizona. At present, she is in Berlin, but will move to Arizona in August 2002. In 2001, Petra has received the Lemberg Fellowship of the Australian Academy of Science. Petra's research interests are not only focussed on the

Photosystems, she is also leader of research projects on transport proteins, the ATP-synthase and crystallization of membrane proteins under microgravity.

Norbert Krauß was born in Köln (Cologne), Germany, on March 19, 1960, as the second son of Gertrud and Franz-Josef Krauß. He received his Diploma in Chemistry from the University of Cologne in 1984. He became familiar with the application of X-ray crystallographic methods when he attended the Institute of Inorganic Chemistry at the same university, and started to investigate the crystal structures of new pseudo-polyhalide compounds during his PhD studies. After receiving his PhD (Dr. rer. nat.) in 1989, he moved to the Max-Volmer-Institute at the Technical University of Berlin and worked as a postdoc with Horst Tobias Witt and his wife Ingrid Witt (in cooperation with Wolfram Saenger from the Institute of Crystallography at the Free University of Berlin) on the crystallization and crystal structure analysis of Photosystem I (PS I) from *Synechococcus elongatus*. In 1991, he was appointed a research scientist in Saenger's laboratory and began cooperation with Petra Fromme from the Max-Volmer-Institute. Only one year later (in 1992) Norbert was able to obtain the first interpretable electron density map of PS I at 6 Å resolution. As a result of this excellent work, the first structural model of this complex could be presented, based on crystallographic data. His cooperation with Petra has continued up to now. Norbert was an outstanding supervisor to several excellent new PhD students in all of their crystallographic work. A milestone for all studies on PS I was the recent report on the 2.5 Å structure of PS I (Jordan et al. 2001; for reference, see Fromme, above). The present structural model shows details of the molecular interactions of 12 protein subunits, three [4Fe–4S] clusters, 96 chlorophyll, 22 carotenoid, two phylloquinone and four lipid molecules with each other and will form a basis for understanding the function of PS I at a new level. Norbert also played a key role in the successful structure analysis of PS II from *Synechococcus elongatus* at 3.8 Å resolution (Zouni et al. 2001; for reference, see Fromme, above). Norbert's interests are wide ranging as he has also worked on the structure of human arylsulfatase, cellotetraose and cyclocamylose-26. At present, he is a research scientist at the Charité, Institute of Biochemistry at the Humboldt-University of Berlin.

I am very thankful to David Knaff, Editor-in-Chief, of *Photosynthesis Research*, for his encouragement and help in preparing this Announcement. Thanks to Christa Critchley for providing the 'Press Release' from the Congress, and to Gernot Renger for his help in providing information on Petra Fromme and Norbert Krauß.

Govindjee
Editor, Historical Corner
*Photosynthesis Research*
265 Morrill Hall, 505 South
Goodwin Avenue, Urbana
IL 61801-3707, USA
E-mail: gov@uiuc.edu
URL: http://www.life.uiuc.edu/govindjee