

Editorial

This double issue of *Photosynthesis Research* honors a genius and a pioneer in the biophysics of photosynthesis, William A. Arnold, who will turn 92 on December 6, 1996. It was Arnold's experimental and theoretical acumen as an undergraduate student of the great experimentalist of photosynthesis Robert Emerson, then an Assistant Professor of Biophysics at Caltech, that led in 1932 to the photosynthetic unit concept – that of a large number of chlorophyll molecules feeding an enzymatic conveyor belt. In 1936 Hans Gaffron proposed the idea of excitation energy transfer among these hundreds of chlorophyll molecules as a means of collecting energy at certain sites where chemistry takes place. Thus, the division into light harvesting (the antenna) and photochemistry (the reaction center) was born. Arnold is to be credited with several discoveries: the first reliable measurements of the minimum quantum requirement for evolution of one oxygen molecule approaching 8, not 4 as Otto Warburg had found; the very first concept of the mechanism of the excitation energy transfer that was the precursor to the current Förster theory (with Robert Oppenheimer); first measurements on the excitation energy migration by depolarization of fluorescence (with Eleanor Meek); the discovery of delayed light emission (with Bernie Strehler), of thermoluminescence (with Helen Sherwood), of electroluminescence (with James Azzi), and of the primary photochemical reactions at the reaction center down to 1 K (with Rod Clayton). Arnold is clearly one of the founding fathers of a physical basis for photosynthesis. Thus, we dedicate this special issue to him and his discoveries. They are the cornerstones of our present-day thinking.

This issue includes Dedications, a Personal Perspective, and Reflections that highlight the various contributions of Arnold and his distinguished co-workers. The physical reality and the details of the structure and function of the antenna and the reaction centers are now available and well ingrained in our current thinking. Major breakthroughs have been the determination of the X-ray crystallographic structure of the reaction centers of anoxygenic photosynthetic bacteria by Hartmut Michel, Johannes Deisenhofer and

Robert Huber, and, the earlier work of Lou Duysens, Bessel Kok, Rod Clayton, and Horst Witt on the reaction centers and their reactions before crystallization (B.C.). Advances in the structure and function of both antenna and reaction centers, including studies on the phenomena discovered by Arnold and co-workers, are discussed in this special issue in several minireviews and in original research papers.

William (Bill) Arnold is known to one of us (G) rather personally as a co-student of Robert Emerson, Bill being the first, G being the last. To G, Bill is a fabulous person for whom he has the highest respect and esteem; who is a peaceful and thoughtful scholar, unhurried and unaffected by the competitiveness of society. On a personal note: when Don DeVault and G sent Bill the second draft of a paper explaining the mechanism of thermoluminescence in plants and inviting him to collaborate and co-author it, Bill wrote only three lines: 'I think the latest draft of the paper is fine. I will be delighted to be a co-author; you must be sure that [it] is not too long.' This was the greatest honor G feels he received as he was unable to publish his work on the Emerson Enhancement Effect with Emerson due to his untimely death.

Jim Azzi, co-discoverer of electroluminescence, gave G some quotations from Bill to cite here: 'He wished he understood everything that he knew' and 'Science is basically mathematics (he meant thermodynamics) on one side and experimentation on the other.'

Bill has a never-ending desire to solve the problem of photosynthesis; and, he is still worrying about the 'ultimate understanding'. Bill believes in precision, simplicity and brevity. Bill's shortest published sentence is 'It does.' He told G in one of his telephone interviews a few years ago that scientists should be asked to write on stone; and then they will publish less. Recalling this admonishment, we hasten to conclude.

We thank Helen Herron, one of the two daughters of Bill and Jean, for agreeing to write the first dedication to Bill. Thanks are also due to Dave Mauzerall, Bob Blankenship and to Gilles Jonker (of Kluwer)

for their help in bringing out this special issue. Without Larry Orr and Ellen Girmscheid and Internet, this special issue would not have been possible. Finally, a large number of colleagues deserve our thanks since all papers including Dedications, Reflections and Minireviews were thoroughly reviewed before being accepted.

Govindjee
University of Illinois at Urbana-Champaign

Robert S. Knox
University of Rochester

Jan Amesz
University of Leiden