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Book review

Chlorophyll *a* Fluorescence: A Signature of Photosynthesis, edited by George C. Papageorgiou and Govindjee. Advances in Photosynthesis and Respiration (Series Editor, Govindjee), Vol. 19, Springer, Dordrecht, The Netherlands, 2004, pp. 818 + xxxii including 8 color plates. ISBN 0-4020-3217-X (hardbound), ISBN 1-4020-3218-8 (e-book).

The reviewer of a large anthology must normally give an account of the chapters and authors contributing to the volume. For the current book, merely naming the 59 authors and describing the 31 chapter titles takes up nearly two columns! Govindjee has solved our problem by publishing such a description in this journal [see *Announcement*, Photosyn. Res. **83**, 101–105 (2005)]. I can therefore do my first duty by reporting that his description is accurate. A very brief summary of the contents will be given below.

How can a single molecule deserve such broad and deep attention? The answer becomes clear as one proceeds through the book. Chlorophyll-*a* (Chla) is always there to report the state of the photosynthetic apparatus on every time scale. It can do this because it occurs in very large numbers, it is chemically unchanged while performing its antenna function, it is in physical contact with the apparatus at all times by the nature of this function, and *in vivo* it emits into an open spectral window.

During the 1930s and 1940s the stage was set (by Robert Emerson and William Arnold, by Hans Gaffron and K. Wohl, and by theorists, notably Theodor Förster) for L. N. M. (Lou) Duysens to see incisively into the energy-transferring architecture of the photosynthetic unit. Lou's huge contributions to the subject, made with chlorophyll fluorescence as a central tool, are rightly celebrated by the dedication of this volume to him. As the editors say in their dedication, he '… pioneered the use of chlorophyll fluorescence as a powerful probe of photosynthetic function, in all classes of photosynthetic organisms… [It] is amazing to see how the concepts, developed by Duysens even 50 years ago, have survived as solid foundations of our current models of photosynthetic activity'. Duysens was honored earlier in this journal by a collection of standard research articles in a special issue (Vol. 9, No. 1, 1986). The present book differs not only in size but also in character. The articles have been prepared with pedagogy in mind.

In the first two chapters, editor Govindjee writes a general introduction and editor Papageorgiou describes Chla proteins. Govindjee's chapter includes photographs of nearly all the chapter authors. The next seven chapters cover early, or primary, processes, i.e., those involving the antenna proteins and reaction centers. Chapters 10–13 cover a variety of topics including regulation of electron transfer, pulse-amplitude-modulation fluorometry, fluorescence transients, delayed light emission, and thermoluminescence. The next three chapters discuss the role of Chla in imaging and remote sensing. State transitions and responses to stress are thoroughly covered in chapters 17–25 and 28. Chapters 29–31 move to the very broad use of Chla fluorescence in studies of large ecosystems such as the oceans and inland waters. The remaining two chapters (25 and 26) deal with the role of chlorophyll-*b* in building light-harvesting chlorophyll proteins and with transport in cyanobacteria.

This reviewer finds little to criticize. One or two chapters have only marginal connections to Chla; one or two are heavy with symbolic kinetics that may not be appropriate for the average researcher's toolbox. In the early chapters, it was surprising to see that no author found it important to discuss the Stepanov fluorescence analysis, a technique frequently applied to Chl in solution and in aggregates. Its features and limitations are worth spelling out.

Govindjee provides two interesting historical diversions in the form of translations from the German by Margitta and Robert Clegg. The first, appearing in the Editorial of the series editor,

recounts Goethe's 1810 description of what we now know as the Stokes shift. The second, appearing in Govindjee's chapter, is a passage from the little-known 1946 publication of Förster in which he discusses energy transfer in photosynthesis.

The subtitle of the book is very significant. Rather than merely describing *in vivo* Chla spectra, as the main title might imply, the book does concentrate on the 'signature of photosynthesis' theme. The editors thereby create a highly practical textbook on the optical aspects of photosynthesis itself. Potential readers and buyers should make their evaluation with this in mind.

The book is highly recommended to the libarary of any institution whose laboratories deal with either photochemistry or photobiology.

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