

List of Publications

Alfred R. Holzwarth

Invited Review articles

1. Holzwarth, A.R. 2005. Ultrafast Primary Reactions in the Photosystems of Oxygen-Evolving Organisms. In: Ultrafast Spectroscopy of Biological Molecules. W. Zinth, editor. Springer-Verlag, Berlin.
2. Balaban, T. S., H. Tamiaki, and A. R. Holzwarth. 2005. Chlorins programmed for self-assembly. In: Topics in Current Chemistry. Springer-Verlag, Berlin. 1-38.
3. Renger, G., and A. R. Holzwarth. 2005. Primary Electron Transfer. In: Photosystem II: The Water/Plastoquinone Oxido-Reductase in Photosynthesis. T. Wydrzynski, and K. Satoh, editors. Springer-Verlag, Berlin.
4. Holzwarth, A. R. 2004. Light Absorption and Harvesting. In: Molecular to Global Photosynthesis. M. D. Archer, and J. Barber, editors. Imperial College Press, London. 43-115.
5. Holzwarth, A. R., M. G. Müller, J. Niklas, H. Witt, and W. Lubitz. 2004. A new model for the energy transfer and early electron transfer processes in photosystem I. In: Photosynthesis: Fundamental Aspects to Global Perspectives. A. van der Est, and D. Bruce, editors. Montreal. 52-54.
6. Holzwarth, A. R. 1999. Die primären Prozesse der Photosynthese. In: Photosynthese. D.-P. Häder, editor. Georg Thieme Verlag, Viernheim. 1-20.
7. Karapetyan, N. V., A. R. Holzwarth, and M. Rögner. 1999. The photosystem I trimer of cyanobacteria: Molecular organisation, excitation dynamics and physiological significance. FEBS Lett. 460:395-400.
8. Holzwarth, A. R., D. Dorra, M. G. Müller, and N. V. Karapetyan. 1998. Structure-function relationships and excitation dynamics in photosystem I. In: Photosynthesis: Mechanism and Effects. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 497-502.
9. Schaffner, K., and A. R. Holzwarth. 1997. Selbstorganisation von Biomolekülen am Beispiel von Bacteriochlorophyllen in natürlichen Antennensystemen - ein Weg für die Entwicklung photoaktiver supramolekularer Funktionssysteme. Leopoldina 42:205-220.
10. Schaffner, K., S. E. Braslavsky, W. Gärtner, P. Hildebrandt, and A. R. Holzwarth. 1996. The mechanism of the P(r) -> P(fr) Photocycle of Phytochrome. Recent advances on phA and phB. Newslett. 58:125-129.

11. Holzwarth, A. R. 1995. Ultrafast spectroscopy of the light-harvesting complex and the isolated reaction center from photosystem II. In: *Photosynthesis: From Light to Biosphere*. Vol.I. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 35-40.
12. Holzwarth, A. R. 1995. Time-resolved fluorescence spectroscopy. In: *Methods in Enzymology*. Vol.246, *Biochemical Spectroscopy*. K. Sauer, editor. Academic Press, San Diego. 334-362.
13. Holzwarth, A. R. 1992. Exciton dynamics in antennae and reaction centers of photosystem I and II. In: *Research in Photosynthesis*. I. N. Murata, editor. Kluwer Academic Publishers, Dordrecht. 187-194.
14. Holzwarth, A. R., and T. A. Roelofs. 1992. Recent advances in the understanding of chlorophyll excited state dynamics in thylakoid membranes and isolated reaction centre complexes. *J. Photochem. Photobiol. B* 15:45-62.
15. Holzwarth, A. R. 1991. Excited-state kinetics in chlorophyll systems and its relationship to the functional organization of the photosystems. In *Chlorophylls*. H. Scheer, editor. CRC Press, Boca Raton. 1125-1151.
16. Holzwarth, A. R. 1991. Structure-function relationships and energy transfer in phycobiliprotein antennae. *Physiol. Plant.* 83:518-528.
17. Schaffner, K., S. E. Braslavsky, and A. R. Holzwarth. 1991. Protein environment and photophysics and photochemistry of the prosthetic chromophores of biliproteins. In: *Frontiers in Supramolecular Organic Chemistry and Photochemistry*. H.-J. Schneider, and H. Durr, editors. VCH Verlagsgesellschaft, Weinheim. 421-452.
18. Holzwarth, A. R. 1990. The functional organization of the antenna systems in higher plants and green algae as studied by time-resolved fluorescence techniques. In: *Current Research in Photosynthesis*. II. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 223-230.
19. Schaffner, K., S. E. Braslavsky, and A. R. Holzwarth. 1990. Photophysics and photochemistry of phytochrome, a chromoprotein in plants. *Pure Appl. Chem.* 62:1421-1426.
20. Schaffner, K., S. E. Braslavsky, and A. R. Holzwarth. 1990. Photophysics and photochemistry of phytochrome. In: *Advances in Photochemistry*. 15. D. H. Volman, G. S. Hammond, and K. Gollnick, editors. Wiley, New York, 229-277.
21. Holzwarth, A. R. 1989. Applications of ultrafast laser spectroscopy for the study of biological systems. *Quart. Rev. Biophys.* 22:239-326.
22. Holzwarth, A. R. 1988. Time resolved chlorophyll fluorescence. What kind of information on photosynthetic systems does it provide? In: *Applications of Chlorophyll Fluorescence*. H. K. Lichtenthaler, editor. Kluwer Academic, Dordrecht. 21-31.

23. Holzwarth, A. R. 1987. Picosecond fluorescence spectroscopy and energy transfer in photosynthetic antenna pigments. In: The Light Reactions. Topics in Photosynthesis, Vol.8. J. Barber, editor. Elsevier, Amsterdam. 95-157.
24. Holzwarth, A. R. 1987. A model for the functional antenna organization and energy distribution in the photosynthetic apparatus of higher plants and green algae. In: Progress in Photosynthesis Research. 1. J. Biggins, editor. Nijhoff, Dordrecht. 53-60.
25. Holzwarth, A. R. 1986. Excited state kinetics of chlorophyll antenna pigments. In: Encyclopedia of Plant Physiology: Photosynthesis III New Series. 19. L. A. Staehelin, and C. J. Arntzen, editors. Springer, Berlin. 299-309.
26. Holzwarth, A. R. 1986. Fluorescence lifetimes in photosynthetic systems. Photochem. Photobiol. 43:707-725.
27. Holzwarth, A. R. 1985. Energy transfer kinetics in phycobilisomes. In: Antennas and Reaction Centers of Photosynthetic Bacteria. M. E. Michel-Beyerle, editor. Springer, Berlin. 45-52.
28. Schaffner, K., S. E. Braslavsky, and A. R. Holzwarth. 1985. Recent advances in the photophysics and photochemistry of small, large, and native oat phytochromes. In: Optical Properties and Structure of Tetrapyrroles. G. Blauer, and H. Sund, editors. de Gruyter, Berlin. 367-382.
29. Holzwarth, A. R. 1982. Synchronously pumped dye lasers for picosecond kinetics: Measuring techniques and applications. Laser Optoelektronik 14:39-46.
30. Naqvi, K. R., A. R. Holzwarth, and U. P. Wild. 1976. Recent advances in instrumentation for the study of electronic emission spectra. Appl. Spectrosc. Rev. 12:131-158.

Original reviewed Publications

31. Holzwarth, A. R., M. G. Müller, J. Niklas, and W. Lubitz. 2005. Ultrafast transient absorption studies on photosystem I reaction centers from *Chlamydomonas reinhardtii*.
2. Mutations around the P700 reaction center chlorophylls provide a new view on the nature of the primary electron donor. Biophys. J. **in print (published on the Web)**.
32. Holzwarth, A. R., M. G. Müller, M. Reus, M. Nowaczyk, J. Sander, and M. Rögner. 2005. Mechanism of electron transfer in intact photosystem II and in isolated reaction centers. Pheophytin is the primary electron acceptor. Proc. Natl. Acad. Sci. USA in print.

33. Holzwarth, A. R., M. G. Müller, J. Niklas, and W. Lubitz. 2005. Charge recombination fluorescence in photosystem I reaction centers from *Chlamydomonas reinhardtii*. *J. Phys. Chem. B* 109:5903-5911.
34. de Boer, I., J. Matysik, K. Erkelens, S. Sasaki, T. Miyatake, S. Yagai, H. Tamiaki, A. R. Holzwarth, and H. J. M. de Groot. 2004. MAS NMR structures of aggregated cadmium chlorins reveal molecular control of self-assembly of chlorosomal bacteriochlorophylls. *J. Phys. Chem. B* 108:16556-16566.
35. Schuster, D. I., P. Cheng, P. D. Jarowski, D. M. Guldi, C. Luo, L. Echegoyen, S. Pyo, A. R. Holzwarth, S. E. Braslavsky, R. M. Williams, and G. Klichm. 2004. Design, synthesis, and photophysical studies of a porphyrin-fullerene dyad with parachute topology; Charge recombination in the Marcus inverted region. *J. Am. Chem. Soc.* 126:7257-7270.
36. Christophorov, L. N., A. R. Holzwarth, and V. N. Kharkyanen. 2003. Conformational regulation in single molecule reactions. *Ukr. J. Phys.* 48:672-680.
37. Croce, R., M. G. Müller, R. Bassi, and A. R. Holzwarth. 2003. Chlorophyll *b* to Chlorophyll *a* energy transfer kinetics in the CP29 antenna complex: A comparative femtosecond absorption study between native and reconstituted proteins. *Biophys. J.* 84:2508-2516.
38. Croce, R., M. G. Müller, S. Caffarri, R. Bassi, and A. R. Holzwarth. 2003. Energy transfer pathways in the minor antenna complex CP29 of photosystem II: A femtosecond study of carotenoid to chlorophyll transfer on mutant and WT complexes. *Biophys. J.* 84:2517-2532.
39. de Boer, I., J. Matysik, M. Amakawa, S. Yagai, H. Tamiaki, A. R. Holzwarth, and H. J. M. de Groot. 2003. MAS NMR structure of a microcrystalline Cd-bacteriochlorophyll *d* analog. *J. Am. Chem. Soc.* 125:13374-13375.
40. Losi, A., I. Yruela, M. Reus, A. R. Holzwarth, and S. E. Braslavsky. 2003. Structural changes in D1-D2-cyt *b*₅₅₉ photosystem II reaction centers depend on the β -carotene content. *Photochem. Photobiol. Sci.* 2:722-729.
41. Müller, M. G., J. Niklas, W. Lubitz, and A. R. Holzwarth. 2003. Ultrafast transient absorption studies on photosystem I reaction centers from *Chlamydomonas reinhardtii*.
1. A new interpretation of the energy trapping and early electron transfer steps in photosystem I. *Biophys. J.* 85:3899-3922.
42. Prokhorenko, V. I., D. B. Steensgaard, and A. R. Holzwarth. 2003. Exciton theory for supramolecular chlorosomal aggregates. 1. Aggregate size dependence of the linear spectra. *Biophys. J.* 85:3173-3186.

43. Balaban, T. S., P. Fromme, A. R. Holzwarth, N. Krauß, and V. I. Prokhorenko. 2002. Relevance of the diastereotopic ligation of magnesium atoms of chlorophylls in photosystem I. *Biochim. Biophys. Acta* 1556:197-207.
44. Möltgen, H., K. Kleinermanns, A. Jesorka, K. Schaffner, and A. R. Holzwarth. 2002. Self-assembly of [Et,Et]-Bacteriochlorophyll c_F on highly oriented pyrolytic graphite revealed by scanning tunneling microscopy. *Photochem. Photobiol.* 75:619-626.
45. Prokhorenko, V. I., A. R. Holzwarth, M. G. Müller, K. Schaffner, T. Miyatake, and H. Tamiaki. 2002. Energy transfer in supramolecular artificial antennae units of synthetic zinc chlorins and Co-aggregated energy traps. A Time-resolved fluorescence study. *J. Phys. Chem. B* 106:5761-5768.
46. Prokhorenko, V. I., A. R. Holzwarth, F. R. Nowak, and T. J. Aartsma. 2002. Growing-in optical coherence in the FMO antenna complexes. *J. Phys. Chem. B* 106:9923-9933.
47. Psencik, J., Y.-Z. Ma, J. B. Arellano, J. Garcia-Gil, A. R. Holzwarth, and T. Gillbro. 2002. Excitation energy transfer in chlorosomes of *Chlorobium phaeobacteroides* strain CL 1401: the role of carotenoids. *Photosynth. Res.* 71:5-18.
48. Tamiaki, H., M. Amakawa, A. R. Holzwarth, and K. Schaffner. 2002. Aggregation of synthetic metallochlorins in hexane. A model of chlorosomal bacteriochlorophyll self-assemblies in green bacteria. *Photosynth. Res.* 71:59-67.
49. Crimi, M., D. Dorra, C. S. Böisinger, E. Giuffra, A. R. Holzwarth, and R. Bassi. 2001. Time-resolved fluorescence analysis of the recombinant photosystem II antenna complex CP29. Effects of zeaxanthin, pH and phosphorylation. *Eur. J. Biochem.* 268:260-267.
50. Croce, R., M. G. Müller, R. Bassi, and A. R. Holzwarth. 2001. Carotenoid-to-chlorophyll energy transfer in recombinant major light-harvesting complex (LHC II) of higher plants. I. Femtosecond transient absorption measurements. *Biophys. J.* 80:901-915.
51. Gich, F. B., C. M. Borrego, A. Martinez-Planells, D. B. Steensgaard, J. Garcia-Gil, and A. R. Holzwarth. 2001. Variability of the photosynthetic antenna of a *Pelodictyon clathratiforme* population from freshwater holomictic pond. *FEMS Microbiol. Ecol.* 37:11-19.
52. Holzwarth, A. R., M. Katterle, M. G. Müller, Y.-Z. Ma, and V. I. Prokhorenko. 2001. Electron-transfer dyads suitable for novel self-assembled light-harvesting antenna/electron-transfer devices. *Pure Appl. Chem.* 73:469-474.
53. van Mourik, F., M. Reus, and A. R. Holzwarth. 2001. Long-lived charge-separated states in bacterial reaction centers isolated from *Rhodobacter sphaeroides*. *Biochim. Biophys. Acta* 1504:311-318.

54. van Rossum, B.-J., D. B. Steensgaard, F. M. Mulder, G.-J. Boender, K. Schaffner, A. R. Holzwarth, and H. J. M. de Groot. 2001. A refined model of chlorosomal antennae of *Chlorobium tepidum* from proton chemical shift constraints obtained with High-Field 2-D and 3-D MAS NMR dipolar correlation spectroscopy. *Biochemistry* 40:1587-1595.
55. Balaban, T. S., J. Leitich, A. R. Holzwarth, and K. Schaffner. 2000. Autocatalyzed Self-assembly of (3¹R)-[Et,Et]Bacteriochlorophyll c_F in Nonpolar Solvents. Analysis of the Kinetics. *J. Phys. Chem. B* 104:1362-1372.
56. Christophorov, L. N., A. R. Holzwarth, V. N. Kharkyanen, and F. van Mourik. 2000. Structure-function self-organization in nonequilibrium macromolecular systems. *Chem. Phys.* 256:45-60.
57. Cinque, G., R. Croce, A. R. Holzwarth, and R. Bassi. 2000. Energy transfer among CP29 chlorophylls: Calculated Förster rates and experimental transient absorption at room temperature. *Biophys. J.* 79:1706-1717.
58. Croce, R., G. Cinque, A. R. Holzwarth, and R. Bassi. 2000. The soret absorption properties of carotenoids and chlorophylls in antenna complexes of higher plants. *Photosynth. Res.* 64:221-231.
59. Croce, R., D. Dorra, A. R. Holzwarth, and R. C. Jennings. 2000. Fluorescence decay and spectral evolution in intact photosystem I of higher plants. *Biochemistry* 39:6341-6348.
60. Goushcha, A. O., V. N. Kharkyanen, G. W. Scott, and A. R. Holzwarth. 2000. Self-regulation phenomena in bacterial reaction centers. I. General theory. *Biophys. J.* 79:1237-1252.
61. Prokhorenko, V. I., D. B. Steensgaard, and A. R. Holzwarth. 2000. Exciton dynamics in the chlorosomal antennae of the green bacteria *Chloroflexus aurantiacus* and *Chlorobium tepidum*. *Biophys. J.* 79:2105-2120.
62. Prokhorenko, V. I., and A. R. Holzwarth. 2000. Primary processes and structure of the photosystem II reaction center: A photon echo study. *J. Phys. Chem. B* 104:11563-11578.
63. Steensgaard, D. B., C. A. van Walree, H. Permentier, L. Baneras, C. M. Borrego, J. Garcia-Gil, T. J. Aartsma, J. Amesz, and A. R. Holzwarth. 2000. Fast energy transfer between BChl *d* and BChl *c* in chlorosomes of the green sulfur bacterium *Chlorobium limicola*. *Biochim. Biophys. Acta* 1457:71-80.
64. Steensgaard, D. B., H. Wackerbarth, P. Hildebrandt, and A. R. Holzwarth. 2000. Diastereoselective control of bacteriochlorophyll *e* aggregation. ³S-BChl *e* is essential for the formation of chlorosome-like aggregates. *J. Phys. Chem. B* 104:10379-10386.

65. Cheng, P., S. R. Wilson, D. I. Schuster, S. Pyo, L. Echevoyen, R. Williams, G. Klihm, S. E. Braslavsky, and A. R. Holzwarth. 1999. Synthesis and photophysical properties of a novel parachute-shaped C₆₀-Porphyrin dyad. *Electrochem. Soc. Proc.* 99-12:225-230.
66. Goushcha, A. O., A. R. Holzwarth, and V. N. Kharkyanen. 1999. Self-regulation phenomenon of electron-conformational transitions in biological electron transfer under nonequilibrium conditions. *Phys. Rev. E* 59:3444-3452.
67. Karapetyan, N. V., U. Windhövel, A. R. Holzwarth, and P. Böger. 1999. Physiological significance of overproduced carotenoids in transformants of the cyanobacterium *Synechococcus* PCC7942. *Z. Naturforsch. C* 54:191-198.
68. Miyatake, T., H. Tamiaki, A. R. Holzwarth, and K. Schaffner. 1999. Self-assembly of synthetic zinc chlorins in aqueous microheterogeneous media to an artificial light-harvesting device. *Helv. Chim. Acta* 82:797-810.
69. Miyatake, T., H. Tamiaki, A. R. Holzwarth, and K. Schaffner. 1999. Artificial light-harvesting antennae: Singlet excitation energy transfer from zinc chlorin aggregate to Bacteriochlorin in homogeneous hexane solution. *Photochem. Photobiol.* 69:448-456.
70. Richter, M., R. Goss, B. Wagner, and A. R. Holzwarth. 1999. Characterization of the slow and fast reversible components of non-photochemical quenching in isolated pea thylakoids by picosecond time resolved chlorophyll fluorescence analysis. *Biochemistry* 38:12718-12726.
71. Schuster, D. I., P. Cheng, S. R. Wilson, V. I. Prokhorenko, M. Katterle, A. R. Holzwarth, S. E. Braslavsky, G. Klihm, R. Williams, and C. Luo. 1999. Photodynamic behavior of a constrained parachute-shaped fullerene - Porphyrin dyad. *J. Am. Chem. Soc.* 121:11599-11600.
72. Steensgaard, D. B., C. A. van Walree, L. Baneras, C. M. Borrego, J. Garcia-Gil, and A. R. Holzwarth. 1999. Evidence for spatially separate bacteriochlorophyll c and bacteriochlorophyll d pools within the chlorosomal aggregate of the green sulfur bacterium *Chlorobium limicola*. *Photosynth. Res.* 59:231-241.
73. Valkunas, L., V. Cervinskis, G. Trinkunas, M. G. Müller, and A. R. Holzwarth. 1999. Effects of excited state mixing on transient absorption spectra in dimers. Application to photosynthetic light-harvesting complex II. *J. Chem. Phys.* 111:3121-3132.
74. van Walree, C. A., Y. Sakuragi, D. B. Steensgaard, C. S. Böisinger, N.-U. Frigaard, R. P. Cox, A. R. Holzwarth, and M. Miller. 1999. Effect of alkaline treatment on Bacteriochlorophyll a, quinones, and energy transfer in chlorosomes from *Chlorobium tepidum* and *Chlorobium phaeobacteroides*. *Photochem. Photobiol.* 69:322-328.
75. Abgaryan, G. A., L. N. Christophorov, A. O. Goushcha, A. R. Holzwarth, V. N. Kharkyanen, P. P. Knox, and E. A. Lukashev. 1998. Effects of mutual influence of

- photoinduced electron transitions and slow structural rearrangements in bacterial photosynthetic reaction centers. *J. Biol. Phys.* 24:1-17.
76. van Rossum, B.-J., G. J. Boender, F. M. Mulder, J. Raap, T. S. Balaban, A. R. Holzwarth, K. Schaffner, S. Prytulla, H. Oschkinat, and H. J. M. de Groot. 1998. Multidimensional CP-MAS ^{13}C NMR of uniformly enriched chlorophyll. *Spectrochim. Acta A* 54:1167-1176.
 77. Balaban, T. S., H. Tamiaki, A. R. Holzwarth, and K. Schaffner. 1997. Self-assembly of Methyl zinc (^{31}R)- and (^{31}S)- bacteriopheophorbides *d*. *J. Phys. Chem. B* 101:3424-3431.
 78. Connelly, J. P., M. G. Müller, R. Bassi, R. Croce, and A. R. Holzwarth. 1997. Femtosecond transient absorption study of carotenoid to chlorophyll energy transfer in the light harvesting complex II of photosystem II. *Biochemistry* 36:281-287.
 79. Connelly, J. P., M. G. Müller, M. Hucke, G. Gatzten, C. W. Mullineaux, A. V. Ruban, P. Horton, and A. R. Holzwarth. 1997. Ultrafast Spectroscopy of Trimeric Light Harvesting Complex II from Higher Plants. *J. Phys. Chem. B* 101:1902-1909.
 80. Goushcha, A. O., V. N. Kharkyanen, and A. R. Holzwarth. 1997. Nonlinear Light-Induced properties of Photosynthetic reaction centers under low intensity irradiation. *J. Phys. Chem. B* 101:259-265.
 81. Goushcha, A. O., M. T. Kapoustina, V. N. Kharkyanen, and A. R. Holzwarth. 1997. Nonlinear Dynamic Processes in an Ensemble of Photosynthetic Reaction Centers. Theory and Experiment. *J. Phys. Chem. B* 101:7612-7619.
 82. Karapetyan, N. V., D. Dorra, G. Schweitzer, I. N. Bezmertnaya, and A. R. Holzwarth. 1997. Fluorescence spectroscopy of the longwave chlorophylls in trimeric and monomeric photosystem I core complexes from the cyanobacterium *Spirulina platensis*. *Biochemistry* 36:13830-13837.
 83. Konermann, L., G. Gatzten, and A. R. Holzwarth. 1997. Primary processes and structure of the photosystem II reaction center. V. Modeling of the fluorescence kinetics of the D1-D2-Cyt-b559 complex at 77K. *J. Phys. Chem. B* 101:2933-2944.
 84. Konermann, L., I. Yruela, and A. R. Holzwarth. 1997. Pigment assignment in the absorption spectrum of the photosystem II reaction center by site selection fluorescence spectroscopy. *Biochemistry* 36:7498-7502.
 85. Trinkunas, G., J. P. Connelly, M. G. Müller, L. Valkunas, and A. R. Holzwarth. 1997. Model for the excitation dynamics in the Light-Harvesting complex II from higher plants. *J. Phys. Chem. B* 101:7313-7320.
 86. Trinkunas, G., and A. R. Holzwarth. 1997. On the rate-limiting process of energy transfer in the light harvesting antenna. *J. Luminesc.* 72-74:615-617.

87. Trinkunas, G., and A. R. Holzwarth. 1997. A Model for Dynamic Protein Control of Energy Transfer to Photosynthetic Reaction Centers. *J. Phys. Chem. B* 101:7271-7274.
88. Cherepy, N. J., M. Du, A. R. Holzwarth, and R. A. Mathies. 1996. Near-infrared resonance raman spectra of chlorosomes: Probing nuclear coupling in electronic energy transfer. *J. Phys. Chem.* 100:4662-4671.
89. Gatzen, G., M. G. Müller, K. Griebenow, and A. R. Holzwarth. 1996. Primary processes and structure of the photosystem II reaction center: III. Kinetic analysis of picosecond energy transfer and charge separation processes in the D1-D2-cyt-b559 complex measured by time-resolved fluorescence. *J. Phys. Chem.* 100:7269-7278.
90. Holzwarth, A. R. 1996. Data analysis of time-resolved measurements. In *Biophysical Techniques in Photosynthesis. Advances in Photosynthesis Research*. J. Amesz, and A. J. Hoff, editors. Kluwer Academic Publishers, Dordrecht. 75-92.
91. Holzwarth, A. R., and M. G. Müller. 1996. Energetics and kinetics of radical pairs in reaction centers from *Rhodobacter sphaeroides*. A femtosecond transient absorption study. *Biochemistry* 35:11820-11831.
92. Jesorka, A., T. S. Balaban, A. R. Holzwarth, and K. Schaffner. 1996. Aggregation of modified zinc chlorins in nonpolar solvents. Mimicking bacteriochlorophyll c with interchanged hydroxy and carbonyl functions. *Angew. Chem. Int. Ed.* 35:2861-2863.
93. Kamlowski, A., L. Frankemöller, A. J. van der Est, D. Stehlik, and A. R. Holzwarth. 1996. Evidence for delocalization of the triplet state $^3P_{680}$ in the D1D2cytb559-complex of photosystem II. *Ber. Bunsenges. Phys. Chem.* 100:2045-2051.
94. Konermann, L., and A. R. Holzwarth. 1996. Analysis of the absorption spectrum of photosystem II reaction centers: Temperature dependence, pigment assignment and inhomogeneous broadening. *Biochemistry* 35:829-842.
95. Müller, M. G., M. Hücke, M. Reus, and A. R. Holzwarth. 1996. Annihilation processes in the isolated D1-D2-cyt-b559 reaction center complex of photosystem II. An intensity dependence study of femtosecond transient absorption. *J. Phys. Chem.* 100:9537-9544.
96. Müller, M. G., M. Hücke, M. Reus, and A. R. Holzwarth. 1996. Primary processes and structure of the photosystem II reaction center: IV. Low intensity femtosecond transient absorption spectra of D1-D2 reaction centers. *J. Phys. Chem.* 100:9527-9536.
97. Müller, M. G., G. Drews, and A. R. Holzwarth. 1996. Primary charge separation processes in reaction centers of an antenna-free mutant of *Rhodobacter capsulatus*. *Chem. Phys. Lett.* 258:194-202.
98. Tamiaki, H., M. Amakawa, Y. Shimono, R. Tanikaga, A. R. Holzwarth, and K. Schaffner. 1996. Synthetic zinc and magnesium chlorin aggregates as models for

- supramolecular antenna complexes in chlorosomes of green photosynthetic bacteria. *Photochem. Photobiol.* 63:92-99.
99. Tamiaki, H., T. Miyatake, R. Tanikaga, A. R. Holzwarth, and K. Schaffner. 1996. Self-assembly of an artificial antenna system: Energy transfer from zinc chlorin to pheophytin in a supramolecular aggregate. *Angew. Chem. Int. Ed.* 35:772-774.
 100. Trinkunas, G., and A. R. Holzwarth. 1996. Kinetic modeling of exciton migration in photosynthetic systems: 3. Application of genetic algorithms to simulations of excitation dynamics in three-dimensional photosystem I core antenna/reaction center complexes. *Biophys. J.* 71:351-364.
 101. Turconi, S., J. Kruij, G. Schweitzer, M. Rögner, and A. R. Holzwarth. 1996. A comparative fluorescence kinetics study of photosystem I monomers and trimers from *Synechocystis* PCC 6803. *Photosynth. Res.* 49:263-268.
 102. Wagner, B., R. Goss, M. Richter, A. Wild, and A. R. Holzwarth. 1996. Picosecond time-resolved study on the nature of high-energy- state quenching (qE) in isolated pea thylakoids. Different localization of zeaxanthin dependent and independent quenching mechanisms. *J. Photochem. Photobiol.* 36:339-350.
 103. Yruela, I., G. Gatzert, R. Picorel, and A. R. Holzwarth. 1996. Cu(II)-inhibitory effect on photosystem II from higher plants. A picosecond time-resolved fluorescence study. *Biochemistry* 35:9469-9474.
 104. Balaban, T. S., A. R. Holzwarth, K. Schaffner, G. J. Boender, and H. J. M. de Groot. 1995. CP-MAS ¹³C-NMR Dipolar correlation spectroscopy of ¹³C enriched chlorosomes and isolated bacteriochlorophyll *c* aggregates of *Chlorobium tepidum*: The self-organization of pigments is the main structural feature of chlorosomes. *Biochemistry* 34:15259-15266.
 105. Balaban, T. S., A. R. Holzwarth, and K. Schaffner. 1995. Circular dichroism study on the diastereoselective self-assembly of bacteriochlorophyll *c* s. *J. Mol. Struct.* 349:183-186.
 106. Cherepy, N. J., A. R. Holzwarth, and R. A. Mathies. 1995. Near-infrared resonance raman spectra of *Chloroflexus aurantiacus* photosynthetic reaction centers. *Biochemistry* 34:5288-5293.
 107. Chiefari, J., K. Griebenow, F. Fages, N. Griebenow, T. S. Balaban, A. R. Holzwarth, and K. Schaffner. 1995. Models for the pigment organization in the chlorosomes of photosynthetic bacteria: Diastereoselective control of *in-vitro* Bacteriochlorophyll *c*_s aggregation. *J. Phys. Chem.* 99:1357-1365.
 108. Hildebrandt, P., H. Tamiaki, A. R. Holzwarth, and K. Schaffner. 1994. Resonance raman spectroscopic study of metallochlorin aggregates. Implications for the supramolecular structure of chlorosomal BChl *c* antennae of green bacteria. *J. Phys. Chem.* 98:2192-2197.

109. Holzwarth, A. R., M. G. Müller, G. Gatzert, M. Hucks, and K. Griebenow. 1994. Ultrafast spectroscopy of the primary electron and energy transfer processes in the reaction center of photosystem II. *J. Luminesc.* 60&61:497-502.
110. Holzwarth, A. R., and K. Schaffner. 1994. On the structure of bacteriochlorophyll molecular aggregates in the chlorosomes of green bacteria. A molecular modelling study. *Photosynth. Res.* 41:225-233.
111. Hucks, M., A. R. Holzwarth, W. Reuter, and W. Wehrmeyer. 1994. Ultrafast transient absorption study on allophycocyanin complexes of *Mastigocladus laminosus*. *Liet. Fiz. Zurn.* 34:313-319.
112. Tamiaki, H., A. R. Holzwarth, and K. Schaffner. 1994. Dimerization of synthetic zinc aminochlorins in non-polar organic solvents. *Photosynth. Res.* 41:245-251.
113. Tamiaki, H., S. Takeuchi, R. Tanikaga, T. S. Balaban, A. R. Holzwarth, and K. Schaffner. 1994. Diastereoselective control of aggregation of 3 1-Epimeric zinc methyl bacteriopheophorbides-d in apolar solvents. *Chem. Lett.* 401-402.
114. Trinkunas, G., and A. R. Holzwarth. 1994. Kinetic modeling of exciton migration in photosynthetic systems. 2. Simulations of excitation dynamics in two-dimensional photosystem I core antenna/reaction center complexes. *Biophys. J.* 66:415-429.
115. Trinkunas, G., and A. R. Holzwarth. 1994. Modelling of energy transfer in photosystem I using genetic algorithm. *Liet. Fiz. Zurn.* 34:287-292.
116. Turconi, S., N. Weber, G. Schweitzer, H. Strotmann, and A. R. Holzwarth. 1994. Energy transfer and charge separation kinetics in photosystem I. 2. Picosecond fluorescence study of various PSI particles and light-harvesting complex isolated from higher plants. *Biochim. Biophys. Acta* 1187:324-334.
117. Yruela, I., P. J. M. van Kan, M. G. Müller, and A. R. Holzwarth. 1994. Characterization of a D1-D2-cyt b-559 complex containing 4 chlorophyll a/2 pheophytin a isolated with the use of MgSO₄. *FEBS Lett.* 339:25-30.
118. Yruela, I., M. S. Churio, T. Gensch, S. E. Braslavsky, and A. R. Holzwarth. 1994. Optoacoustic and singlet oxygen near-IR emission study of the isolated D1-D2-cyt b-559 reaction center complex of photosystem II. Protein movement associated with charge separation. *J. Phys. Chem.* 98:12789-12795.
119. Holzwarth, A. R. 1993. Is it time to throw away your apparatus for chlorophyll fluorescence induction? *Biophys. J.* 64:1280-1281.
120. Holzwarth, A. R., G. H. Schatz, H. Brock, and E. Bittersmann. 1993. Energy transfer and charge separation kinetics in photosystem I: 1. Picosecond transient absorption and fluorescence study of cyanobacterial photosystem I particles. *Biophys. J.* 64:1813-1826.

121. Hücke, M., G. Schweitzer, A. R. Holzwarth, W. Sidler, and H. Zuber. 1993. Studies on chromophore coupling in isolated phycobiliproteins. IV. Femtosecond transient absorption study of ultrafast excited state dynamics in trimeric phycoerythrocyanin complexes. *Photochem. Photobiol.* 57:76-80.
122. Mullineaux, C. W., A. A. Pascal, P. Horton, and A. R. Holzwarth. 1993. Excitation energy quenching in aggregates of the LHC II chlorophyll-protein complex: A time-resolved fluorescence study. *Biochim. Biophys. Acta* 1141:23-28.
123. Mullineaux, C. W., and A. R. Holzwarth. 1993. Effect of photosystem II reaction centre closure on fluorescence decay kinetics in a cyanobacterium. *Biochim. Biophys. Acta* 1183:345-351.
124. Müller, M. G., G. Drews, and A. R. Holzwarth. 1993. Excitation transfer and charge separation kinetics in purple bacteria: 1. Picosecond fluorescence of chromatophores from *Rhodobacter capsulatus* wild type. *Biochim. Biophys. Acta* 1142:49-58.
125. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1993. Picosecond energy transfer and trapping kinetics in living cells of the green bacterium *Chloroflexus aurantiacus*. *Biochim. Biophys. Acta* 1144:161-169.
126. Roelofs, T. A., S. L. S. Kwa, R. van Grondelle, J. P. Dekker, and A. R. Holzwarth. 1993. Primary processes and structure of the photosystem II reaction center: II. Low-temperature picosecond fluorescence kinetics of a D1-D2-cyt-b-559 reaction center complex isolated by short Triton exposure. *Biochim. Biophys. Acta* 1143:147-157.
127. Trinkunas, G., and A. R. Holzwarth. 1993. Genetic algorithm of simulation of energy transfer in pigment- protein complexes. *Annual Report Vilnius 1993*.
128. Turconi, S., G. Schweitzer, and A. R. Holzwarth. 1993. Temperature dependence of picosecond fluorescence kinetics of a cyanobacterial photosystem I particle. *Photochem. Photobiol.* 57:113-119.
129. Vass, I., G. Gatzert, and A. R. Holzwarth. 1993. Picosecond time-resolved fluorescence studies on photoinhibition and double reduction of Q A in photosystem II. *Biochim. Biophys. Acta* 1183:388-396.
130. Holzwarth, A. R., E. Venuti, S. E. Braslavsky, and K. Schaffner. 1992. The phototransformation process in phytochrome. I. Ultrafast fluorescence component and kinetic models for the initial Pr⁻→Pfr transformation steps in native phytochrome. *Biochim. Biophys. Acta* 1140:59-68.
131. Holzwarth, A. R., M. G. Müller, and K. Griebenow. 1992. Model calculations on the fluorescence kinetics of isolated bacterial reaction centers from *Rhodobacter sphaeroides*. In *The Photosynthetic Bacterial Reaction Center II: Structure, Spectroscopy and Dynamics*. J. Breton, and A. Vermeglio, editors. Plenum Press, New York. 219-225.

132. Holzwarth, A. R., K. Griebenow, and K. Schaffner. 1992. Chlorosomes, photosynthetic antennae with novel selforganized pigment structures. *J. Photochem. Photobiol. A* 65:61-71.
133. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1992. Primary processes in isolated bacterial reaction centers from *Rhodobacter sphaeroides* studied by picosecond fluorescence kinetics. *Chem. Phys. Lett.* 199:465-469.
134. Roelofs, T. A., C.-H. Lee, and A. R. Holzwarth. 1992. Global target analysis of picosecond chlorophyll fluorescence kinetics from pea chloroplasts. A new approach to the characterization of the primary processes in photosystem II alfa- and beta-units. *Biophys. J.* 61:1147-1163.
135. Rohr, M., W. Gärtner, G. Schweitzer, A. R. Holzwarth, and S. E. Braslavsky. 1992. Quantum yields of the photochromic equilibrium between bacteriorhodopsin (BR) and its bathointermediate K. Femto- and nano-second optoacoustic spectroscopy. *J. Phys. Chem.* 96:6055-6061.
136. Schweitzer, G., M. Hucke, K. Griebenow, M. G. Müller, and A. R. Holzwarth. 1992. Charge separation kinetics in isolated photosynthetic reaction centers of *Chloroflexus aurantiacus* (with QA reduced) at low temperatures. *Chem. Phys. Lett.* 190:149-154.
137. Tamiaki, H., A. R. Holzwarth, and K. Schaffner. 1992. A synthetic zinc chlorin aggregate as a model for the supramolecular antenna complexes in the chlorosomes of green bacteria. *J. Photochem. Photobiol. B* 15:355-360.
138. Beauregard, M., I. Martin, and A. R. Holzwarth. 1991. Kinetic modelling of exciton migration in photosynthetic systems. (1) Effects of pigment heterogeneity and antenna topography on exciton kinetics and charge separation yields. *Biochim. Biophys. Acta* 1060:271-283.
139. Griebenow, K., M. G. Müller, and A. R. Holzwarth. 1991. Pigment organization and energy transfer in green bacteria. 3. Picosecond energy transfer kinetics within the B806-866 bacteriochlorophyll a antenna complex isolated from *Chloroflexus aurantiacus*. *Biochim. Biophys. Acta* 1059:226-232.
140. Griebenow, K., A. R. Holzwarth, F. van Mourik, and R. van Grondelle. 1991. Pigment organization and energy transfer in green bacteria. 2. Circular and linear dichroism spectra of protein-containing and protein-free chlorosomes isolated from *Chloroflexus aurantiacus* strain OK-70-fl*. *Biochim. Biophys. Acta* 1058:194-202.
141. Hildebrandt, P., K. Griebenow, A. R. Holzwarth, and K. Schaffner. 1991. Resonance Raman spectroscopic evidence for the identity of the bacteriochlorophyll c organization in protein-free and protein-containing chlorosomes from *Chloroflexus aurantiacus*. *Z. Naturforsch.* 46C:228-232.

142. Mullineaux, C. W., and A. R. Holzwarth. 1991. Kinetics of excitation energy transfer in the cyanobacterial phycobilisome-photosystem II complex. *Biochim. Biophys. Acta* 1098:68-78.
143. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1991. Primary processes in isolated photosynthetic bacterial reaction centers from *Chloroflexus aurantiacus* studied by picosecond fluorescence spectroscopy. *Biochim. Biophys. Acta* 1098:1-12.
144. Roelofs, T. A., M. Gilbert, V. A. Shuvalov, and A. R. Holzwarth. 1991. Picosecond fluorescence kinetics of the D1-D2-cyt-b559 photosystem II reaction center complex. Energy transfer and primary charge separation processes. *Biochim. Biophys. Acta* 1060:237-244.
145. Colombano, C. G., S. E. Braslavsky, A. R. Holzwarth, and K. Schaffner. 1990. Fluorescence quantum yields of 124-kDa phytochrome from oat upon excitation within different absorption bands. *Photochem. Photobiol.* 52:19-22.
146. Fages, F., N. Griebenow, K. Griebenow, A. R. Holzwarth, and K. Schaffner. 1990. Characterization of light-harvesting pigments of *Chloroflexus aurantiacus*. Two new chlorophylls: Oleyl (octadec-9-enyl) and cetyl (hexadecanyl) bacteriochlorophyllides-c. *J. Chem. Soc. Perkin Trans. I* 1990:2791-2797.
147. Griebenow, K., A. R. Holzwarth, and K. Schaffner. 1990. The 5.6-kilodalton protein in isolated chlorosomes of *Chloroflexus aurantiacus* strain OK-70-fl is a degradation product. *Z. Naturforsch.* 45C:823-828.
148. Holzwarth, A. R., M. G. Müller, and K. Griebenow. 1990. Picosecond energy transfer kinetics between pigment pools in different preparations of Chlorosomes from the green bacterium *Chloroflexus aurantiacus* Ok 70-fl. *J. Photochem. Photobiol. B* 5:457-465.
149. Holzwarth, A. R., K. Griebenow, and K. Schaffner. 1990. A photosynthetic antenna system which contains a protein-free chromophore aggregate. *Z. Naturforsch.* 45C:203-206.
150. Holzwarth, A. R., E. Bittersmann, W. Reuter, and W. Wehrmeyer. 1990. Studies on chromophore coupling in isolated phycobiliproteins. III. Picosecond excited state kinetics and time-resolved fluorescence spectra of different allophycocyanins from *Mastigocladus laminosus*. *Biophys. J.* 57:133-145.
151. Mullineaux, C. W., E. Bittersmann, J. F. Allen, and A. R. Holzwarth. 1990. Picosecond time-resolved fluorescence emission spectra indicate decreased transfer from the Phycobilisome to photosystem II in light-state 2 in the cyanobacterium *Synechococcus* 6301. *Biochim. Biophys. Acta* 1015:231-242.
152. Mullineaux, C. W., and A. R. Holzwarth. 1990. A proportion of photosystem II core complexes are decoupled from the phycobilisome in light-state 2 in the cyanobacterium *Synechococcus* 6301. *FEBS Lett.* 260:245-248.

153. Nultsch, W., E. Bittersmann, A. R. Holzwarth, and G. Agel. 1990. Effects of strong light irradiation on antennae and reaction centers of the cyanobacterium *Anabaena variabilis*: A time-resolved fluorescence study. *J. Photochem. Photobiol. B* 5:481-494.
154. Roelofs, T. A., and A. R. Holzwarth. 1990. In search of a putative long-lived relaxed radical pair state in closed photosystem II. Kinetic modeling of picosecond fluorescence data. *Biophys. J.* 57:1141-1153.
155. Griebenow, K., and A. R. Holzwarth. 1989. Pigment organization and energy transfer in green bacteria. 1. Isolation of native chlorosomes free of bound bacteriochlorophyll a from *Chloroflexus aurantiacus* by gel-electrophoretic filtration (GEF). *Biochim. Biophys. Acta* 973:235-240.
156. McCauley, S. W., E. Bittersmann, and A. R. Holzwarth. 1989. Time-resolved ultrafast blue-shifted fluorescence from pea chloroplasts. *FEBS Lett.* 249:285-288.
157. Bittersmann, E., A. R. Holzwarth, G. Agel, and W. Nultsch. 1988. Picosecond time-resolved emission spectra of photoinhibited and photobleached *Anabaena variabilis*. *Photochem. Photobiol.* 47:101-105.
158. Louis, T., G. H. Schatz, P. Klein-Boelting, A. R. Holzwarth, S. Cova, and G. Ripamonti. 1988. Performance comparison of a single-photon avalanche diode with a microchannel-plate photomultiplier in time-correlated single-photon counting. *Rev. Sci. Instrum.* 59:1148-1152.
159. Meister, E. C., U. P. Wild, P. Klein-Boelting, and A. R. Holzwarth. 1988. Time response of small side on photomultiplier tubes in time-correlated single-photon counting measurements. *Rev. Sci. Instrum.* 59:499-501.
160. Sandström, A., T. Gillbro, V. Sundström, J. Wendler, and A. R. Holzwarth. 1988. Picosecond study of energy transfer within 18-S particles of AN 112 (a mutant of *Synechococcus* 6301) phycobilisomes. *Biochim. Biophys. Acta* 933:54-64.
161. Schatz, G. H., H. Brock, and A. R. Holzwarth. 1988. A kinetic and energetic model for the primary processes in photosystem II. *Biophys. J.* 54:397-405.
162. Bittersmann, E., H. Senger, and A. R. Holzwarth. 1987. Synchronous cultures of the green alga *Scenedesmus obliquus*: Comparison of picosecond decay associated emission spectra and fluorescence induction kinetics. *J. Photochem. Photobiol.* 1:247-260.
163. Brock, H., B. P. Ruzsicska, T. Arai, W. Schlamann, A. R. Holzwarth, S. E. Braslavsky, and K. Schaffner. 1987. Fluorescence lifetimes and relative quantum yields of 124-Kilodalton oat phytochrome in H₂O and D₂O solutions. *Biochemistry* 26:1412-1417.
164. Gust, D., T. A. Moore, R. V. Bensasson, M. Rougee, F. C. De Schryver, M. Van der Auweraer, A. R. Holzwarth, and J. S. Connolly. 1987. Charge separation in

- carotenoporphyrin-quinone triads: Synthetic, conformational, and fluorescence lifetime-studies. *J. Am. Chem. Soc.* 109:846-856.
165. Holzwarth, A. R. 1987. Pikosekundenstudien zum Energietransfer in photosynthetischen Antennenpigmenten. *Habil. -Schrift Univ. Marburg* 1-208.
 166. Holzwarth, A. R., J. Wendler, and G. W. Suter. 1987. Studies on chromophore coupling in isolated phycobiliproteins. II. Picosecond energy transfer kinetics and time-resolved fluorescence spectra of C-phycoyanin from *Synechococcus* 6301 as a function of the aggregation state. *Biophys. J.* 51:1-12.
 167. Schatz, G. H., H. Brock, and A. R. Holzwarth. 1987. Picosecond kinetics of fluorescence and absorbance changes in photosystem II particles excited at low photon density. *Proc. Natl. Acad. Sci. USA* 84:8414-8418.
 168. Suter, G. W., and A. R. Holzwarth. 1987. A kinetic model for the energy transfer in phycobilisomes. *Biophys. J.* 52:673-683.
 169. Wendler, J., and A. R. Holzwarth. 1987. State transitions in the green alga *Scenedesmus obliquus* probed by time-resolved chlorophyll fluorescence spectroscopy and global data analysis. *Biophys. J.* 52:717-728.
 170. Al-Ekabi, H., I. Tegmo-Larsson, S. E. Braslavsky, A. R. Holzwarth, and K. Schaffner. 1986. Phytochrome models: Part 10. Concentration, sonication and temperature affecting the population of the ground-state conformers of biliverdin dimethyl ester in solution. *Photochem. Photobiol.* 44:433-440.
 171. Schatz, G. H., and A. R. Holzwarth. 1986. Mechanisms of chlorophyll fluorescence revisited: Prompt or delayed emission from photosystem II with closed reaction centers? *Photosynth. Res.* 10:309-318.
 172. Suter, G. W., U. P. Wild, and A. R. Holzwarth. 1986. Phosphorescence line narrowing of 1-indanones upon S₁--S₀ excitation. *Chem. Phys.* 102:205-214.
 173. Wendler, J., W. John, H. Scheer, and A. R. Holzwarth. 1986. Energy transfer kinetics in trimeric C-phycoyanin studied by picosecond fluorescence kinetics. *Photochem. Photobiol.* 44:79-85.
 174. Gillbro, T., A. Sandström, V. Sundström, J. Wendler, and A. R. Holzwarth. 1985. Picosecond study of energy transfer kinetics in phycobilisomes of *Synechococcus* 6301 and the mutant AN 112. *Biochim. Biophys. Acta* 808:52-65.
 175. Holzwarth, A. R., J. Wendler, and W. Haehnel. 1985. Time-resolved picosecond fluorescence spectra of the antenna chlorophylls in *Chlorella vulgaris*. Resolution of photosystem I fluorescence. *Biochim. Biophys. Acta* 807:155-167.

176. Köhler, G., S. Solar, N. Getoff, A. R. Holzwarth, and K. Schaffner. 1985. Relationship between the quantum yields of electron photoejection and fluorescence of aromatic carboxylate anions in aqueous solution. *J. Photochem.* 28:383-391.
177. Wehrmeyer, W., J. Wendler, and A. R. Holzwarth. 1985. Biochemical and functional characterization of a peripheral unit of the phycobilisomes from *Porphyridium cruentum*. Measurement of picosecond energy transfer kinetics. *Eur. J. Cell Biol.* 36:17-23.
178. Holzwarth, A. R., J. Wendler, B. P. Ruzsicska, S. E. Braslavsky, and K. Schaffner. 1984. Picosecond time-resolved and stationary fluorescence of oat phytochrome highly enriched in the native 124 kDa protein. *Biochim. Biophys. Acta* 791:265-273.
179. Suter, G. W., P. Mazzola, J. Wendler, and A. R. Holzwarth. 1984. Fluorescence decay kinetics in phycobilisomes from the blue-green alga *Synechococcus* 6301. *Biochim. Biophys. Acta* 766:269-276.
180. Wendler, J., A. R. Holzwarth, and W. Wehrmeyer. 1984. Picosecond time-resolved energy transfer in phycobilisomes isolated from the red alga *Porphyridium cruentum*. *Biochim. Biophys. Acta* 765:58-67.
181. Wendler, J., A. R. Holzwarth, S. E. Braslavsky, and K. Schaffner. 1984. Wavelength-resolved fluorescence decay and fluorescence quantum yield of large phytochrome from oat shoots. *Biochim. Biophys. Acta* 786:213-221.
182. Gillbro, T., A. Sandström, V. Sundström, and A. R. Holzwarth. 1983. Polarized absorption picosecond kinetics as a probe of energy transfer in phycobilisomes of *Synechococcus* 6301. *FEBS Lett.* 162:64-68.
183. Haehnel, W., A. R. Holzwarth, and J. Wendler. 1983. Picosecond fluorescence kinetics and energy transfer in the antenna chlorophylls of green algae. *Photochem. Photobiol.* 37:435-443.
184. Holzwarth, A. R., J. Wendler, and W. Wehrmeyer. 1983. Studies on chromophore coupling in isolated phycobiliproteins. I. Picosecond fluorescence kinetics of energy transfer in phycocyanin 645 from *Chroomonas* sp. *Biochim. Biophys. Acta* 724:388-395.
185. Holzwarth, A. R., J. Wendler, K. Schaffner, V. Sundström, A. Sandström, and T. Gillbro. 1983. Picosecond kinetics of excited state relaxation in biliverdin dimethyl ester. *Isr. J. Chem.* 23:223-231.
186. Kufer, W., H. Scheer, and A. R. Holzwarth. 1983. Isophorcarubin - A conformationally restricted and highly fluorescent bilirubin. *Isr. J. Chem.* 23:233-240.
187. Holzwarth, A. R., S. E. Braslavsky, S. Culshaw, and K. Schaffner. 1982. The blue anomalous emission of large and small phytochrome. *Photochem. Photobiol.* 36:581-584.

188. Holzwarth, A. R., J. Wendler, and W. Wehrmeyer. 1982. Picosecond time resolved energy transfer in isolated phycobilisomes from *Rhodella violacea* (Rhodophyceae). *Photochem. Photobiol.* 36:479-487.
189. Braslavsky, S. E., H. Herbert, A. R. Holzwarth, and K. Schaffner. 1981. Chromatographic detection of solvent adducts of bilinoid pigments. *J. Chromatogr.* 205:85-94.
190. Holzwarth, A. R., and K. Schaffner. 1981. Wavelength dependence of quantum yields and product distribution in the anaerobic photochemistry of bilirubin dimethyl ester. *Photochem. Photobiol.* 33:635-639.
191. Braslavsky, S. E., A. R. Holzwarth, E. Langer, H. Lehner, J. I. Matthews, and K. Schaffner. 1980. Phytochrome models. IV. Conformational heterogeneity and photochemical changes of biliverdin dimethylesters in solution. *Isr. J. Chem.* 20:196-202.
192. Holzwarth, A. R., E. Langer, H. Lehner, and K. Schaffner. 1980. Luminescence and solvent-induced circular dichroism of bilirubin dimethyl ester: Evidence for heterogenous composition of the solute. *J. Mol. Struct.* 60:367-371.
193. Holzwarth, A. R., E. Langer, H. Lehner, and K. Schaffner. 1980. Absorption, luminescence, solvent-induced circular dichroism and H-nmr study of bilirubin dimethyl ester: Observation of different forms in solutions. *Photochem. Photobiol.* 32:17-26.
194. Braslavsky, S. E., A. R. Holzwarth, H. Lehner, and K. Schaffner. 1978. The fluorescence of biliverdin dimethyl ester. *Helv. Chim. Acta* 61:2219-2222.
195. Holzwarth, A. R., H. Lehner, S. E. Braslavsky, and K. Schaffner. 1978. Phytochrome models II: The fluorescence of biliverdin dimethyl ester. *Liebigs Ann. Chem.* 1978:2002-2017.
196. Holzwarth, A. R., K. R. Naqvi, and U. P. Wild. 1977. Slow internal conversion between two close lying singlet states in a large molecule: Azuleno[5,6,7-cd]phenalene. *Chem. Phys. Lett.* 46:473-476.
197. Wild, U. P., A. R. Holzwarth, and H. P. Good. 1977. Measurement and analysis of fluorescence decay curves. *Rev. Sci. Instrum.* 48:1621-1627.

Short Communications and Conference Proceedings

198. de Boer, I., J. Matysik, S. Sasaki, T. Miyatake, S. Yagai, H. Tamiaki, A. R. Holzwarth, and H. J. M. de Groot. 2004. In: *Photosynthesis: Fundamental Aspects to Global Perspectives*. A. van der Est, and D. Bruce, editors. Montreal. 121-122.

199. Prokhorenko, V. I., M. Katterle, A. R. Holzwarth, K. Schaffner, T. Miyatake, and H. Tamiaki. 2002. Energy transfer from supramolecular assemblies of synthetic zinc chlorins to attached energy traps. In: *Femtochemistry and Femtobiology - Ultrafast Dynamics in Molecular Science*. A. Douhal, and J. Santamaria, editors. World Scientific, New Jersey. 782-788.
200. Prokhorenko, V. I., A. R. Holzwarth, F. R. Nowak, and T. J. Aartsma. 2000. Highly unusual growing-in of coherence and strong oscillations in the bacterial FMO antenna complexes, observed in photon echo kinetics. In: *Ultrafast Phenomena XII Springer Series in Chemical Physics Vol.66*. T. Elsaesser, S. Mukamel, M. M. Murnane, and N. F. Scherer, editors. Springer, Berlin. 656-658.
201. Goushcha, A. O., G. W. Scott, A. R. Holzwarth, and V. N. Kharkyanen. 1999. Self-regulation effects in Q_B -active bacterial reaction centers. *Biological Physics: Third Int. Symposium 487 AIP Conf. Proc.*:201-211.
202. Karapetyan, N. V., V. V. Shubin, I. N. Bezmertnaya, M. G. Rakhimberdieva, L. E. Mazhorova, I. V. Terekhova, D. Dorra, A. R. Holzwarth, J. Kruij, M. Rögner, and R. J. Strasser. 1999. Organization and function of photosystem I trimers and monomers of the cyanobacterium *Spirulina platensis*. In: *Chloroplast: From Molecular Biology to Biotechnology*. J. H. Argyroudi-Akoyunoglou, and H. Senger, editors. Kluwer Academic Publishers, Dordrecht. 27-34.
203. Müller, M. G., I. Martin, W. Schlamann, W. Gärtner, K. Schaffner, and A. R. Holzwarth. 1999. Femtosecond kinetics of the plant photoreceptor phytochrome with native and modified chromophores. In *Proc. ESP Congress Granada: Photobiology is an Ultrafast Science*.
204. Trinkunas, G., M. G. Müller, R. Bassi, L. Valkunas, and A. R. Holzwarth. 1999. Modelling problems of energy transfer in pigment-protein complexes. In: *Int. Conf. on Luminesc. Osaka Aug.23.-27.1999 Japan*.
205. Trinkunas, G., M. G. Müller, R. Bassi, L. Valkunas, and A. R. Holzwarth. 1999. Combined modeling of excitaiton dynamics in LHC II and CP29. In: *Tetrapyrrole Photoreceptors in Photosynthetic Organismus 1999*. University of Verona, Verona.
206. van Rossum, B., C. Soede, D. B. Steensgaard, A. R. Holzwarth, K. Schaffner, J. Raap, J. Lugtenburg, P. Gast, A. Hoff, and H. J. M. de Groot. 1999. Magic angle spinning NMR of photosynthetic components. In: *Proceedings European Conference on Spectroscopy of Biological Molecules*.
207. Böisinger, C. S., K. Meierhoff, P. Westhoff, and A. R. Holzwarth. 1998. Fluorescence kinetics of whole plants of *Arabidopsis thaliana*. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 2147-2150.
208. Crimi, M., D. Dorra, C. S. Böisinger, E. Giuffra, R. Bassi, and A. R. Holzwarth. 1998. Zeaxanthin-induced fluorescence quenching in the minor antenna CP29. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 333-336.

209. Dorra, D., P. Fromme, N. V. Karapetyan, and A. R. Holzwarth. 1998. Fluorescence kinetics of photosystem I: Multiple fluorescence components. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 587-590.
210. Holzwarth, A. R., M. G. Müller, I. Martin, N. V. Karapetyan, and G. Trinkunas. 1998. Characterization of the ultrafast processes in the trimeric photosystem I complex by femtosecond transient absorption. In: *Ultrafast Phenomena XI*. T. Elsaesser, J. G. Fujimoto, D. A. Wiersma, and W. Zinth, editors. Springer, Berlin. 678-680.
211. Jennings, R. C., R. Croce, D. Dorra, F. M. Garlaschi, A. R. Holzwarth, A. Rivadossi, and G. Zucchelli. 1998. Photosystem I red spectral forms: Diffusion limited energy transfer, optical reorganisation energy and absorption cross section. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 271-276.
212. Karapetyan, N. V., D. Dorra, A. R. Holzwarth, J. Kruij, and M. Rögner. 1998. Origin of the extreme longwave chlorophyll form of the photosystem I trimeric complex of *Spirulina*. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 583-586.
213. Miyatake, T., H. Tamiaki, A. R. Holzwarth, and K. Schaffner. 1998. Self-assembly of synthetic zinc chlorins in aqueous microheterogeneous media: Structural and functional models for chlorosomes. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 133-136.
215. Prokhorenko, V. I., and A. R. Holzwarth. 1998. Primary charge separation at low temperatures in D1-D2 reaction centers, studied by photon echo and pump-probe spectroscopy. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 1033-1036.
216. Richter, M., R. Goss, and A. R. Holzwarth. 1998. Picosecond time resolved analysis of the slow and fast reversible non-photochemical chlorophyll fluorescence quenching. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 2273-2276.
217. Sakuragi, Y., C. A. van Walree, D. B. Steensgaard, N.-U. Frigaard, K. Matsuura, R. P. Cox, A. R. Holzwarth, and M. Miller. 1998. Alkali treatment of green bacterial chlorosomes. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 161-164.
218. Steensgaard, D. B., C. A. van Walree, L. Baneras, C. M. Borrego, J. Garcia-Gil, and A. R. Holzwarth. 1998. Structure and function of chlorosomes of *Chlorobium limicola* UdG 6040 containing both BChl *c* and BChl *d*. In: *Photosynthesis: Mechanism and Effects*. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 101-104.
219. Trinkunas, G., M. G. Müller, I. Martin, L. Valkunas, and A. R. Holzwarth. 1998. Functional and spectral assignment of chlorophylls in the light harvesting complex II

- of higher plants. In: Photosynthesis: Mechanism and Effects. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 285-288.
220. Valkunas, L., V. Cervinkas, G. Trinkunas, M. G. Müller, and A. R. Holzwarth. 1998. Excited state mixing effects in transient absorption spectra of photosynthetic light-harvesting complex II. In: Photosynthesis: Mechanism and Effects. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 281-284.
221. van Rossum, B.-J., B. Y. van Duyl, D. B. Steensgaard, T. S. Balaban, A. R. Holzwarth, K. Schaffner, and H. J. M. de Groot. 1998. Evidence from solid state NMR correlation spectroscopy for two interstack arrangements in the chlorosome antenna system. In: Photosynthesis: Mechanism and Effects. G. Garab, editor. Kluwer Academic Publishers, Dordrecht. 117-120.
222. Müller, M. G., and A. R. Holzwarth. 1996. Femtosecond transient absorption spectroscopy on the isolated reaction center from *Rb. sphaeroides* R-26. In: Ultrafast Processes in Spectroscopy. O. Svelto, S. De Silvestri, and G. Denardo, editors. Plenum Press, New York. 503-506.
223. Trinkunas, G., and A. R. Holzwarth. 1996. Determination of spatial distribution of chlorophyll spectral types in photosystem I antennae based on picosecond fluorescence kinetics. In: Ultrafast Processes in Spectroscopy. O. Svelto, S. De Silvestri, and G. Denardo, editors. Plenum Press, New York. 511-514.
224. Boender, G. J., T. S. Balaban, A. R. Holzwarth, K. Schaffner, J. Raap, S. Prytulla, H. Oschkinat, and H. J. M. de Groot. 1995. Comparison of the stacking of chlorophylls in Chlorosomes versus aggregates of Bacteriochlorophyll C and Chlorophyll A using 2-D MAS NMR spectroscopy. In: Photosynthesis: from Light to Biosphere. Vol.I. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 347-350.
225. Goss, R., M. Richter, B. Wagner, and A. R. Holzwarth. 1995. Different localization of zeaxanthin dependent and independent quenching mechanisms. A fluorescence decay study on isolated pea thylakoids at picosecond resolution. In: Photosynthesis: from Light to Biosphere. Vol.IV. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 87-90.
226. Hucke, M., M. G. Müller, A. R. Holzwarth, C. Mullineaux, and P. Horton. 1995. Low intensity femtosecond absorption spectroscopy on the light-harvesting Chl A/B complex LHC II. In: Photosynthesis: from Light to Biosphere. Vol. 1. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 77-80.
227. Konermann, L., G. Gatzert, and A. R. Holzwarth. 1995. Modelling the low temperature fluorescence kinetics of the photosystem II reaction center: Energy transfer and radical pair relaxation. In: Photosynthesis: From Light to Biosphere. Vol.I. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 923-926.
228. Müller, M. G., D. Dorra, A. R. Holzwarth, N. Gad'on, and G. Drews. 1995. Time-dependent radical pair relaxation in chromatophores of an antenna-free mutant from

- Rhodobacter capsulatus*. In: Photosynthesis: From Light to Biosphere. Vol. 1. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 595-598.
229. Tamiaki, H., M. Amakawa, A. R. Holzwarth, and K. Schaffner. 1995. Synthetic metallochlorin aggregates as models for supramolecular antenna complexes in chlorosomes of green photosynthetic bacteria. In: Photosynthesis: From Light to Biosphere. Vol.I. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 61-64.
230. Trinkunas, G., and A. R. Holzwarth. 1995. On the spatial distribution of chlorophyll spectral types in photosystem I. In: Photosynthesis: From Light to Biosphere. Vol.II. P. Mathis, editor. Kluwer Academic Publishers, Dordrecht. 51-54.
231. Holzwarth, A. R., M. Hucke, G. Gatzen, L. Konermann, and M. G. Müller. 1994. Ultrafast spectroscopy of the electron and energy transfer processes in the reaction center of photosystem II. In: Biol. Chem. Hoppe-Seyler. de Gruyter, Berlin. S9.
232. Fritz, F., K. Griebenow, A. R. Holzwarth, and W. Mäntele. 1993. Electrochemical and spectroscopical characterisation of the multiheme cytochrome subunit of *Chloroflexus aurantiacus*. Proc. 5. European Conf. on the Spectroscopy of Biol. Molecules.
233. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1993. Picosecond fluorescence kinetics of purple bacterial reaction centers. In: Ultrafast Phenomena VIII. J.-L. Martin, A. Migus, G. A. Mourou, and A. H. Zewail, editors. Springer, Berlin. 543-545.
234. Trinkunas, G., and A. R. Holzwarth. 1993. Model of photosystem I core antenna/reaction center complex from simulations of excitaiton decay. Institute of Physics Annual Report 1992 Vilnius.
235. Gatzen, G., K. Griebenow, M. G. Müller, and A. R. Holzwarth. 1992. Energy transfer and primary charge separation processes of the isolated photosystem II reaction center complex D1-D2-Cyt-b559 studied by picosecond fluorescence kinetics. In: Research in Photosynthesis. II. N. Murata, editor. Kluwer Academic Publishers, Dordrecht. 69-72.
236. Holzwarth, A. R., K. Griebenow, and M. G. Müller. 1992. Primary processes in isolated photosynthetic bacterial reaction centers from *Chloroflexus aurantiacus* studied by picosecond fluorescence spectroscopy. In: Ultrafast Processes in Spectroscopy 1991. A. Laubereau, and A. Seilmeier, editors. IOP Publishing Ltd, Bristol. 605-608.
237. Hucke, M., G. Schweitzer, K. Griebenow, M. G. Müller, and A. R. Holzwarth. 1992. Time-resolved fluorescence studies of isolated photosynthetic reaction centers from *chloroflexus aurantiacus* at low temperatures. In: Ultrafast Processes in Spectroscopy 1991. Inst. Phys. Conf. Ser. No. 126: Section VIII. A. Laubereau, and A. Seilmeier, editors. IOP Publishing Ltd, Bristol. 609-612.

238. Griebenow, K., M. G. Müller, and A. R. Holzwarth. 1990. Picosecond energy transfer kinetics between different pigment pools in chlorosomes from the green bacterium *Chloroflexus aurantiacus*. In: *Mol. Biol. of Membrane-Bound Complexes in Phototrophic Bacteria*. G. Drews, and E. A. Dawes, editors. Plenum Press, New York. 383-387.
239. Griebenow, K., and A. R. Holzwarth. 1990. Biochemical evidence for chromophore-chromophore interactions as the main organizational principle in chlorosomes of *Chloroflexus aurantiacus*. In: *Mol. Biol. of Membrane-Bound Complexes in Phototrophic Bacteria*. G. Drews, and E. A. Dawes, editors. Plenum Press, New York. 375-381.
240. Holzwarth, A. R., W. Haehnel, R. Ratajczak, E. Bittersmann, and G. H. Schatz. 1990. Energy transfer kinetics in photosystem I particles isolated from *Synechococcus* sp. and from higher plants. In: *Current Research in Photosynthesis. II*. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 611-614.
241. Lee, C.-H., T. A. Roelofs, and A. R. Holzwarth. 1990. Target analysis of picosecond fluorescence kinetics in green algae: Characterization of primary processes in photosystem II alpha and beta. In: *Current Research in Photosynthesis. I*. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 387-390.
242. McCauley, S. W., E. Bittersmann, M. G. Müller, and A. R. Holzwarth. 1990. Picosecond chlorophyll fluorescence from higher plants. In: *Current Research in Photosynthesis. II*. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 297-300.
243. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1990. Energy transfer and charge separation kinetics in the reaction center of *Chloroflexus aurantiacus* studied by picosecond time-resolved fluorescence spectroscopy. In: *Reaction Centers of Photosynthetic Bacteria*. Springer Series in Biophysics Vol.6. M. E. Michel-Beyerle, editor. Springer, Berlin. 169-180.
244. Müller, M. G., K. Griebenow, and A. R. Holzwarth. 1990. Fluorescence lifetime measurements of energy transfer in chlorosomes and living cells of *Chloroflexus aurantiacus* OK 70-fl. In: *Current Research in Photosynthesis. II*. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 177-180.
245. Roelofs, T. A., and A. R. Holzwarth. 1990. On a presumed long-lived relaxed radical pair state in closed photosystem II. In: *Current Research in Photosynthesis. M*. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 443-446.
246. van Mourik, F., K. Griebenow, B. van Haeringen, A. R. Holzwarth, and R. van Grondelle. 1990. Pigment organization in BChla-free and BChla-containing chlorosomes from *Chloroflexus aurantiacus*, studied by absorption dichroism. In: *Current Research in Photosynthesis. II*. M. Baltscheffsky, editor. Kluwer Academic Publishers, Dordrecht. 141-144.

247. Bittersmann, E., W. Reuter, W. Wehrmeyer, and A. R. Holzwarth. 1988. Picosecond energy transfer kinetics in allophycocyanin aggregates from *Mastigocladus laminosus*. In: *Photosynthetic Light-Harvesting Systems*. H. Scheer, and S. Schneider, editors. de Gruyter, Berlin. 451-455.
248. Holzwarth, A. R., G. H. Schatz, and H. Brock. 1988. Picosecond studies of fluorescence and absorbance changes in photosystem II particles from *Synechococcus* sp. In: *Photosynthetic Light-Harvesting Systems*. H. Scheer, and S. Schneider, editors. de Gruyter, Berlin. 579-587.
249. Holzwarth, A. R., G. H. Schatz, H. Brock, and C. G. Colombano. 1988. Picosecond fluorescence and absorbance study of charge separation and charge stabilization processes in photosystem II particles. In: *Picosecond Phenomena VI*. Springer Series in Chem. Physics Vol. 48. T. Yajima, K. Yoshihara, C. B. Harris, and S. Shionoya, editors. Springer, New York. 602-605.
250. Bittersmann, E., H. Senger, and A. R. Holzwarth. 1987. Picosecond fluorescence spectra of synchronous cultures of the green alga *Scenedesmus obliquus*. In: *Progress in Photosynthesis Research*. 1. J. Biggins, editor. Nijhoff, Dordrecht. 71-74.
251. Holzwarth, A. R., H. Brock, and G. H. Schatz. 1987. Picosecond transient absorbance spectra and fluorescence decay kinetics in photosystem II particles. In: *Progress in Photosynthesis Research*. 1. J. Biggins, editor. Nijhoff, Dordrecht. 61-65.
252. Schatz, G. H., and A. R. Holzwarth. 1987. Picosecond time resolved chlorophyll fluorescence spectra from pea chloroplast thylakoids. In: *Progress in Photosynthesis Research*. Vol. 1. J. Biggins, editor. Nijhoff, Dordrecht. 67-69.
253. Ruzsicska, B. P., A. R. Holzwarth, J. Wendler, S. E. Braslavsky, and K. Schaffner. 1985. Photophysics and photochemistry of degraded and native phytochrome. In: *Primary Photo-Processes in Biology and Medicine*. R. V. Bensasson, G. Jori, E. J. Land, and T. G. Truscott, editors. Plenum, New York. 89-91.
254. Holzwarth, A. R., W. Haehnel, J. Wendler, G. W. Suter, and R. Ratajczak. 1984. Picosecond fluorescence kinetics and energy transfer in antennae chlorophylls of green algae and membrane fractions of thylakoids. In: *Advances in Photosynthesis Research*. C. Sybesma, editor. Nijhoff Publishers, The Hague. 73-76.
255. Holzwarth, A. R., J. Wendler, and W. Wehrmeyer. 1984. Picosecond kinetics of energy transfer in isolated phycobilisomes from *Porphyridium cruentum*. In: *Advances in Photosynthesis Research*. C. Sybesma, editor. Nijhoff Publishers, The Hague. 77-80.
256. Wendler, J., W. Haehnel, and A. R. Holzwarth. 1984. Time-resolved picosecond fluorescence spectra of the antenna chlorophylls in the green alga *Chlorella vulgaris*. In: *Ultrafast Phenomena IV*. 38. D. H. Auston, and K. B. Eisenthal, editors. Springer, Berlin. 503-505.

257. Holzwarth, A. R., J. Wendler, K. Schaffner, V. Sundström, A. Sandström, and T. Gillbro. 1983. Picosecond kinetics of excited state relaxation in a tetrapyrrole pigment. In: *Picoseconds in Chemistry and Biology*. T. Doust, and M. A. West, editors. Science Reviews, Northwood. 82-105.
258. Braslavsky, S. E., A. R. Holzwarth, E. Langer, H. Lehner, and J. I. Matthews. 1980. Conformational heterogeneity and photochemical changes of biliverdin dimethyl esters in solution. In: *Photoreceptors and Plant Development*. Proc. Annual European Symposium on Plant Photomorphogenesis. J. De Greef, editor. University Press, Antwerpen. 89-100.

Last updated 11/2005