

GOVINDJEE, BEATTY J.T., GEST, H., ALLEN J.F. (eds), *Discoveries in Photosynthesis* (Advances in Photosynthesis and Respiration, 20), Dordrecht: Springer, 2005, xxxviii + 1304 pp., illus., \$350.00.

There is no field in plant biology, especially in plant physiology, where the history of ideas, concepts and techniques has been so firmly and ambitiously investigated and documented within the last decades than in photosynthesis research. Here the past and the present scientific work are understood as an inseparable unity whereas in other experimental branches modern research often seems to be an ahistorical venture. The general recognition and dissemination of historical perspectives on photosynthesis is undoubtedly the merit of Govindjee, Professor Emeritus of Biochemistry, Biophysics and Plant Biology of the University of Illinois at Urbana (USA), long-standing Editor of 'Photosynthesis Research' (PR) and Series Editor of 'Advances in Photosynthesis and Respiration'. As Historical Corner Editor of PR, he has seen to it that historical articles, personal perspectives and obituaries became a regular part of the program.

The beginning of the new millennium after 2000 was a striking occasion to remember 'historical highlights of photosynthesis research' from the early roots into modern times. 'Celebrating the millennium', Govindjee together with J. Thomas Beatty (University of British Columbia, Vancouver, Canada), Howard Gest (Indiana University, Bloomington, USA), and John F. Allen (Queen Mary, University of London, UK) edited three special historical numbers of PR (vols. 73/2002, 76/2003, and 80/2004) on the long and winding road to our science of photosynthesis. These issues are now combined and completed in the book 'Discoveries in Photosynthesis' published in the esteemed Advances in Photosynthesis and Respiration series.

Well-knowing that today the amount of information is too vast for any one person to give a comprehensive view of the real state of our knowledge - to say nothing of its emergence -, Govindjee and his co-editors enlisted pioneers and experts for summarizing the genesis of their areas. 111 papers, written by 132 authors from 19 countries, have been compiled to a real encyclopedia of photosynthesis research with a clear arrangement. Starting with editorials, special tributes to prominent 'architects' of the 'cathedral of photosynthesis' (namely Martin Kamen, Robert Emerson, Cornelis B. van Niel, Louis N. M. Duysens, Eugene Rabinowitch, Roger Stanier, Germaine Cohen-Bazire, William Arnold, Robin Hill, James Franck, Hans Gaffron, Samuel Ruben and Henrik Lundegårdh) and some general overviews (including a history of the word 'photosynthesis') and timelines (of discoveries in anoxygenic and oxygenic photosynthesis), the book is arranged along the following research areas: (i) Excitation energy transfer; (ii) Reaction centers; (iii) Oxygen evolution; (iv) Light-harvesting and pigment-protein complexes; (v) Electron transport and ATP synthesis; (vi) Techniques and application; (vii) Biogenesis and membrane architecture; (viii) Reductive and assimilatory processes; (ix) Transport, regulation and adaptation; (x) Genetics; and (xi) Evolution. The volume ends with documentary chapters on (xii) Laboratories and national perspectives, and (xiii) Retrospectives with lists of conferences, symposia, awardees, important books and journals, historical sources and more or less known contributors to our understanding of photosynthesis ('In memoriam'). A complete list of contents and further information are provided on the website for the title (<http://www.life.uiuc.edu/govindjee/newbook/Vol%2020.html>).

A remarkable feature of the book is its rich illustration. All chapters include informal and formal photographs of the scientists. The photos, subjects, names and authors are listed in separate indices.

It is impossible to go into detail, and so I give here a more general impression. The history of investigations into plant gas exchange started more than 250 years ago, but most of the minireviews deal with research during the past 50 years. That's understandable and acceptable since the 1950s saw indeed astounding and unprecedented progress, marking truly a turning point; and the fundamental results before were well considered in the best monograph on photosynthesis of that time by Eugene Rabinowitch (1945, 1951, 1956). Photosynthetic studies have always been advanced by new approaches and technological refinements, which the last decades convincingly confirm. We consequently learn a lot about the innovative techniques and the 'artisans' who provided the experimental data. Referring to the well-known metaphor of 'science' as a 'cathedral, built by the efforts of a few architects and of many workers' by Gilbert N. Lewis and Merle Randall (1923), the editors deliberately appreciate, besides the 'architects', the host of highly skilled 'workers' who witnessed their results firsthand. The history of the science on photosynthesis is told through the careers of its practitioners ensuring a high authenticity of the stories. Apart from its empirical side, photosynthesis research is furthermore a borderless business; its international and interdisciplinary character are one of the field's attractions and strengths. Thus, understanding the mechanisms of light regulation in cyanobacteria and improvements in DNA and protein sequencing brought unbelievable insights and new research areas that have blossomed over the last 20 years, but also new problems with an increasing imbalance of sequence data relative to a real understanding of cell physiological properties.

The national perspectives taken into consideration can only be a first round and should be completed in coming volumes of PR. Institutions and developments in China, France, Greece, India, the USA and Russia are represented, whereas leading groups and influential research lines, for instance in Germany, Japan, the Netherlands, Scandinavia or the UK, are missing. Nevertheless, the book evolved into a wonderful encyclopedic saga involving all of the essential sides of photosynthesis - with the substance of an unique 'bible' of photosynthesis research, a 'must' for all who are dealing with photosynthesis. The book is meant not only for researchers and graduate students, but also for advanced undergraduates in plant biology, microbiology, cell biology, biochemistry, biophysics and, not to forget, history of science. Scientists can use it as an instructive textbook about photosynthesis on a historical basis; and historians of science will learn a lot about how science is working and developing. They will find no recipe or unique method how a scientific field makes progress, but countless concrete examples.

'Life is bottled sunshine.' This inspired phrase by Wynwood Reade in his 'Martyrdom of Man' (1924), quoted on the book's back cover, is indeed the shortest summary of the significance of photosynthesis for life on earth. All who would like to understand life on earth should know the story of photosynthesis by reading 'Discoveries in Photosynthesis'. There is nothing to compare!

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