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BOOK REVIEW

Alexander V. Ruban: The photosynthetic membrane: Molecular mechanisms and biophysics of light harvesting

John Wiley, UK, 2012, ISBN nos. 978-1119-96054-6 and -96053-9.

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A nice little timely book **"**The Photosynthetic Membrane**",** by Alexander Ruban, was published in 2012 by John Wiley, A John Wiley & Sons, Ltd. Publication, Chichester, West Sussex, UK (ISBN 978-1119-96054-6 (cloth); 978-119-96053-9 (paperback); DOI: 10.1002/9781118447628). The book was set by SPi Publisher Services, Pondicherry, India; and was printed and bound in Singapore by Markono Print Media Pte Ltd. (see:http://www.wiley.com/WileyCDA/WileyTitle/productCd-1119960533.html). The e-book is available for $52, paperback for $65, and the hardcover for $165; these are very reasonable prices. The book has indeed a beautiful cover (see Fig. 1).

This book has 267 pages and eleven chapters, with bibliography and references. The content of the book can be easily gleaned from the titles of these 11 chapters: Light, Energy and Light (Chapter 1); The Space of the Cell (Chapter 2); The Photosynthetic Membrane: Outlook (Chapter 3); Popular Methods and Approaches to Study Composition, Structure and Functions of the Photosynthetic Membrane (Chapter 4); Primary Processes of the Light Phase of Photosynthesis: Principles of Light Harvesting in Antennae (Chapter 5); Towards the Atomic Resolution Structure of Light Antenna: On the Path of Discoveries (Chapter 6); Structural Integration of Antennae with Photosystems (Chapter 7); Dynamics of Light Harvesting Antenna: Spectroscopic Insights (Chapter 8); Adaptation of Photosynthetic Membrane to Light (Chapter 9); What is in it for Plant, Biosphere and Mankind (Chapter 10); and Conclusions (Chapter 11). It ends with 6 ½ pages of Index.

This book by Alexander (for me Sasha) Ruban (see his photo in Fig. 2) is a fascinating story in a beautiful language on a topic that must be fully understood as we begin to manipulate the antenna size to increase productivity of plants, algae and cyanobacteria. Among others, research groups of Donald (Don) R. Ort, Anastasios (Tasso) Melis, and Richard (Dick) Sayre are already making progress in the direction of manipulating antenna size to get better photosynthesis, and thus, increased biomass.

Ruban's book is indeed a great book to read and re-read. I recommend that it be put on "Reading lists" for students in biology, biochemistry, biophysics as well as in biotechnology. It is indeed a refreshing book to read, and it has great quotes. What I enjoyed most was that it includes lots of basic dictums. It is unusual for me to write a book review by citing passages and things that I like. What follows is just a glimpse of a few random observations, but only from Chapter 1.

On page 2, it has seven very interesting and unique definition(s) of Life. I quote the 6th one:" *Life is a form of "revolt" against the second law of thermodynamics achieved by very unstable "vulnerable" (soft matter) systems, a fragile lip of matter towards order and high organization on the way to the thermodynamic equilibrium and energy drain in the expanding Universe.*"

On page 3: (1) Speaking of electromagnetic radiation (light), Ruban writes" *This is the best wireless and custom-addressed (not all matter stuff can get it) form of energy ever known to man. Quanta of electromagnetic radiation are spanning our Universe*." (2) Speaking of the energy from the Sun, Ruban writes "*It is actually enough to boil 100 thousands of billions* (10^{14}) *of kettles, roughly 10 thousands per capita of the planet's population. For*

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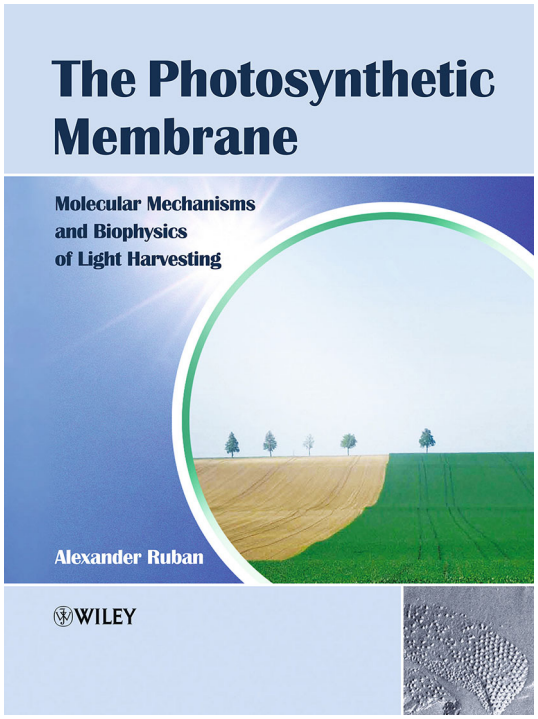

Fig. 1 A photograph of the cover of the book "The Photosynthetic Membrane" by Alexander Ruban

Fig. 2 Alexander Ruban (on the *right*) with a biochemistry student at the Queen Mary University of London graduation reception in Central Hall of Westminster, London, UK

someone preferring a Bugatti-Veyron to tea, this is enough to run 20 Bugattis per person; mind you, it has got to be a car driving on a 'green' fuel." (3) He writes: "*The point is that the Sun was, is and will be for sometime, a very charitable body in the sky: it gives us all this energy for free, unlike the energy supplying companies.*"

On Page 5, Ruban writes: "*As Confucius said: 'The hardest thing of all is to find a black cat in a dark room, especially if there is no cat.' Photosynthesis by living organisms seems to be well equipped to deal effectively with such an elusive form of matter as light.*"…

It is hard to write anything negative about this book. However, I cannot help mention that I have a personal distaste for words like"antennae"; and "granae; they sound awful to me. For my taste, just antenna (or at best antennas) is enough; and certainly "grana". Almost all books have typographical errors. I will mention just a few: "surprizing" (for surprising); "wondering" (for wandering); "insight" (for inside); "plastocyanine" (for plastocyanin); "precize" (for precice); "taking" (for taken); and "leave" (for live).

I would include in the bibliography of Chapter 1: E. Rabinowitch and Govindjee (1969) Photosynthesis, also published by John Wiley; it is available free on my web site at: http://www.life.illinois.edu/govindjee/g/Books.html and at http://www.life.illinois.edu/govindjee/photosynBook.html. Further, I would include in the bibliography of Chapter 5: G. C. Papageorgiou and Govindjee (Eds.) (2004) Chlorophyll Fluorescence: A Signature of Photosynthesis, which is Volume 19, in Advances in Photosynthesis and Respiration Springer, Dordrecht. For research students working on the topic of this book, I recommend that they read chapters in several other books in the same series (http://www.springer.com/series/5599) on: Light-Harvesting Antennas (B. Green and W. Parson, eds., Vol. 13, 2003); Photosystem II (T. Wydrzynski and K. Satoh, eds., Vol. 22, 2006); Photosystem I (J. H. Golbeck, ed., Vol. 24, 2006); Chlorophylls and Bacteriochlorophylls (B. Grimm et al., eds., Vol. 25, 2006); Biophysical Techniques (T. Aartsma and J. Matysek, eds., Vol. 26, 2008); Lipids in Photosynthesis (H. Wada and N. Murata, eds., Vol. 30, 2010); Photosynthesis (covering many topics) (J. Eaton-Rye et al., Vol.34, 2012); and Non-Photochemical Quenching (and Energy Dissipation) (B. Demmig-Adams et al., eds., 2014). Happy hunting!

I strongly recommend **"**The Photosynthetic Membrane**",** by Alexander Ruban, to all the advanced undergraduate and graduate students and even researchers of Plant Biology, Plant Sciences, Biochemistry, Biophysics, Molecular Biology, Biotechnology and Bioengineering. Further, all libraries around the World must acquire a copy of this book for their students and teaching faculty. It is indeed a beautiful and refreshing book at a time when we are just too busy with only technical aspects of a problem.