

Book Review

Biology of Algae, Lichens and Bryophytes

Edited by Burkhard Budel, Thomas Friedl and Wolfram Beyschlag. 2024. Published by Springer Spektrum, Berlin. Pp 662, numerous photographs and illustrations. 215 × 285 × 32 mm, 2.045 kg. ISBN 978-3-662-65711-9, Hardback (978-3-662-65712-6 eBook). In English. Available from Amazon and Springer Link (Price £119.99 plus postage).

In most universities and secondary education, biology teaching does not include much about ‘cryptogams’, a term that has for some been superseded by ‘lower plants’. This unique book is a major project involving many more people than the editors and is innovative in bringing a modern approach to these organisms. The ‘new cryptogams’ are the oxy-photoautotrophic groups as the title suggests. Their diversity is astounding, with almost 300 000 species in the world, contributing 50–80% of the oxygen released by the biosphere. Their importance to the planet is often not sufficiently promoted.

The chapter headings provide a new way to view these organisms. After the Introduction, there are chapters dealing with Endosymbioses, Cyanobacteria (justifiably included), Algae from Primary Endosymbioses, Algae from Secondary Symbioses, Symbioses and finally Bryophytes.

Symbiosis as a cardinal theme is quite a novel approach. It makes so much more sense when we consider the DNA sequencing evidence upon which the Tree of Life is based. The primary endosymbiotic algae include the red and green algae. The accumulated photosynthetic product is starch. The secondary endosymbiotic algae include the brown algae, *Euglena* and dinoflagellates whose chloroplasts are surrounded by an extra membrane. Their accumulated photosynthate is a β 1–3 glucan rather than starch. Of course, there is much more about these groups of algae but not all may seem relevant to lichenologists.

Lichens come as a section all on their own in the chapter on Symbioses, which also includes algae and cyanobacteria symbiotic in other organisms, from protists to higher plants. The range and number of organisms which have symbiotic algae is amazing. The

section on lichens (excluding references) occupies about 40 pages of the over 600 pages in the book. Whilst this may seem rather limited to some lichenologists, it is very useful to have information, albeit brief, which is up to date and not easily available in such ready form elsewhere.

The more recent classifications of fungi and hence lichens have been rather confusing to traditional lichenologists but it is most interesting to see more clearly how lichens have evolved. The unique features of lichens are described lucidly with excellent images and diagrams. Their origin now appears to be mostly 100 My to 300 My ago depending on the Class. The pervasive convergent evolution (homoplasy) in lichens had misled earlier lichenologists and this is one of their interesting features. The morphology, structure and physiology are similar to other books but updated. The ecology deals with lichens characteristic of the major substrata, with a section on the lichens of old forests. The physiology has an ecological focus, which I like. The elements I notice missing are the growth and development of lichen thalli and of course the secondary metabolites or lichen substances but the author is limited by space and cannot include everything everyone wants.

Universities should have this in their libraries, as of course should anyone teaching the ‘new cryptogams’ or lower plants. Biology departments should embrace the importance of these fascinating and amazing organisms, and make sure their students are aware of their importance to the functioning of the biosphere of planet Earth.

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