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Book review: The four dimensions of terrestrial plants: reproduction, structure, evolution and ecology

Michael Schwerdtfeger¹

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Book details: Dörken V. M., Edwards D., Ladd P. G. & Parsons R. F., The four dimensions of terrestrial plants: reproduction, structure, evolution and ecology. – Remagen: Kessel Publishing House, 2021. – ISBN: 978-3-945941-80-5. – 17 × 22 cm, 344 pages, 135 coloured plates, softback. – Price: EUR 45. – Available at: <https://www.forstbuch.de/>

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The book gives an overview of how plants colonized land, which structural adaptations they had to achieve, which evolutionary processes they underwent, from the first humble liverwort-like pioneers in the Devonian Rhynie chert some 400 million years ago until today, where angiosperms rule most terrestrial habitats where plant life is possible.

The evolution of terrestrial plants via mosses and liverworts, ferns, clubmosses, horsetails and gymnosperms to flowering plants is a classic topic of teaching biology/biodiversity and to a greater or lesser scale part of the curricula of most universities. The modifications in life cycle, from the zygotic life cycle of green algae to a heterophasic life cycle with subsequent reduction of the haploid generation (the gametophyte), are crucial in the evolution of the different plant groups. The book does not provide much new or unexpected information or revolutionary scientific upheavals to the body of botanical knowledge (which is sort of reassuring for us senior lecturers), but it is nevertheless very valuable by underpinning the classical facts by a broad base of new, well-researched literature.

Reproduction and structure, with almost 200 pages a core chapter of the book, introduces bryophytes, pteridophytes, gymnosperms and angiosperms. By clear full-page illustrations the reader is made familiar with details of the life cycles of *Marchantiophyta*, *Bryophyta*, *Anthocerotophyta*, *Lycopodiopsida*, various subclasses of *Polypodiopsida*, gymnosperms with spermatozoid fertilization and gymnosperms with pollen tube fertilization, and angiosperms. Special emphasis (46 pages) is laid on gymnosperms, which, compared to a mere nine pages for angiosperms, seems ill-balanced. At a closer look, however, owing to the very different reproduc-

tive structures and heterogenous life cycles of the gymnospermous *Cycadales*, *Ginkgoales*, *Coniferales* and *Gnetales*, which are much more diversified than the angiosperms, such a thorough treatment seems reasonable and appropriate.

The most visible expression for the user value of the book lies in its vast number of good to marvellous illustrations in 135 coloured plates of photographs and line drawings. Starting with microscope photo details of the early tiny Devonian Rhynie plants, which are of a stunning clarity and quality, the book illustrates the details of the life cycles of all groups of land plants. Most photographs are brilliant and of high quality; the line drawings, to my taste, are sometimes too schematic (and may be misleading as in the case of fig. 13, where the gametangio-phores of *Marchantia* are “planted” on the upper part of the thallus by the botanical illustrator).

The next essential chapter, Ecology of terrestrial plants, comprises 77 pages. It provides brief overviews on the ecology of the bryophytes, pteridophytes, gymnosperms and angiosperms, with information, among others, on distribution, life forms, dispersal, leaf structures and economic uses of the respective plant groups. Numerous splendid photographs visualize terrestrial plant life on earth, ranging from *Pinus mugo* at the timberline of the European Alps, through clumps of epiphytic ferns in Indonesia, stands of *Araucaria* and *Fitzroya* in Chile, *Agathis* in New Caledonia to fire-adapted savanna vegetation in central Australia.

The cover claims “it is the first book to provide detailed photo plates and descriptions of all structures and life cycle stages of the main groups of terrestrial plants ...”. And the term the main groups of terrestrial plants contains more than one may perceive at first glance: classic bota-

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ny textbooks have often had a European perspective with emphasis on mosses, ferns and conifers and only marginal mention of groups such as, e.g., *Anthocerotophyta*, *Isoetales* and *Gnetales*, which are rare or even lacking in the northern hemisphere, and therefore did often not fully reflect global plant life. This book, being written by a German, a British and two Australian scientists, gives a more balanced view, and we “palearctic botanists” enjoy

the descriptions and aesthetic pictures of plant groups of the tropics and the southern hemisphere, which are commonly underrepresented in teaching, yet so important in global evolutionary view.

Altogether, it is a book to confirm, update and sharpen the knowledge of botany teachers and lecturers, but it is also recommendable for advanced undergraduates and at € 45 reasonably priced.

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