Book review

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Book review

Frey W. (ed.): Syllabus of Plant Families. Adolf Engler's Syllabus der Pflanzenfamilien. Ed. 13. Part 2/1. Photoautotrophic eukaryotic Algae. *Glaucocystophyta*, *Cryptophyta*, *Dinophyta/Dinozoa*, *Haptophyta*, *Heterokontophyta/Ochrophyta*, *Chlorarachniophyta/Cercozoa*, *Euglenophyta/Euglenozoa*, *Chlorophyta*, *Streptophyta* p.p. – Stuttgart: Borntraeger Science Publishers, 2015. – ISBN 978-3-443-01083-6. – x + 324 pp., 67 figures, 17 × 25 cm, 930 g, hardback. – Price: EUR 89. – Available from: https://www.schweizerbart.de

The first edition of Adolf Engler's *Syllabus der Pflanzenfamilien*, with the rather cumbersome title of *Syllabus der Vorlesungen über specielle und medicinisch-pharmaceutische Botanik*, was published in 1892 and consisted of just under 200 pages. Its purpose was to document all the organisms recognized as part of the botanical kingdom, as defined in Engler's *Die natürlichen Pflanzenfamilien*. Synoptic descriptions of all taxa were included, down to genus level. Its primary aim was to be authoritative. The layout was based on Engler's classification, or "Engler's System", as outlined in *Die natürlichen Pflanzenfamilien*, which did indeed become influential. To some extent based on an earlier approach known as "Eichler's System" (after August Eichler, 1839–1887), often considered to be the first attempt at representing phylogenetic relationships in a classification, it attempted to replace what was referred to as the "natural systems" of classification offered by a previous generation of botanists, in the hope of reflecting a post-Darwinian approach to systematics.

Naturally revisions of plant groups continued apace and further editions of the *Syllabus* were periodically issued. With roughly five years between subsequent editions until the 9th/10th edition of 1924 (published as a single issue), after Engler died, in 1930, the gaps became more pronounced: the 11th edition appeared in 1936, the 12th in 1954, the latter being printed as two volumes separated by a decade, with volume 1 issued in 1954 and volume 2 in 1964. It would be safe to assume that as time passed the authoritative power of the *Syllabus* diminished.

Nearly half a century later, in 2009, the first part of the 13th edition was published: part 3, dealing with "Bryophytes and seedless Vascular Plants". The completed 13th edition, now written in English and with the English title of *Syllabus of Plant Families* ("A. Engler's *Syllabus der Pflanzenfamilien*" as its sub-title) will have five parts. Excluding the "blue-green algae" (which make up two sections of part 1; a third for *Basiodiomycota* is planned), taxa recognized at some point as belonging to an "algal" group are included in the two sections of part 2, with part 2/1 including "Photoautotrophic eukaryotic Algae. *Glaucocystophyta*, *Cryptophyta*, *Dinophyta*, *Haptophyta*, *Heterokontophyta*, *Chlorarachniophyta*, *Euglenophyta*, *Chlorophyta*, *Streptophyta* p.p." and part 2/2, devoted entirely to the *Rhodophyta*, to be published later this year. Part 2/1, dealing with the "Photoautotrophic eukaryotic Algae" other than the *Rhodophyta*, is the subject of the book under review. In short, part 2/1 includes all those "algal" groups that would have been included in the old categories of "green algae" and "brown algae" (as noted in this book, "a polyphyletic assemblage of six distinct phylogenetic lineages", p. 2).

This book has 11 chapters of varying size: an introduction, a brief definition of what "Phototrophic eukaryote Algae" are, with the remaining chapters dealing with a particular algal taxon as reflected in the book's subtitle. Some brief unnumbered parts are included: a section on "*Heterokontobionta* p.p. (Autotrophic *Heterokontobionta*)", which includes a synopsis of the classification to follow (pp. 11–21, of which more later); a single page on "Organisation type 'Green Algae'" (p. 177), a single page on "*Chlorobionta* ('*Viridiplantae*')" (p. 190), and a single page on "*Chlorophyta* incertae sedis" (p. 281). Presumably, the first two above are unnumbered as they serve as short introductions to the chapter that follows – the latter two are simply idiosyncratic asides.

The organization of this book is somewhat frustrating, as there is no guide as to how to use it or what one might expect to gain from each account. For example, one has to keep turning back to the introductory pages to find out who the authors are for any particular section – and it is still not clear who the authors are for the section on "Other Heterokontophytes" (pp. 103–139), which, as it happens, is one of the better accounts.

Nevertheless, each account more or less follows the same format: a brief introduction, followed by a summary of the characters for each inclusive taxon, a few images (some colour photographs, some electron micrographs, a few drawings), a few accounts include a diagram of relationships, each account has a list of included genera, with authorities but lacking any description or diagnosis, and each finishes with references and some further reading suggestions (although these are lumped together so one doesn't know which are references and which are intended as "Further Reading" items). It was merely guesswork

on my part that when a genus name appears the number in brackets that follows is the estimated number of species recognized (only later did I happen to notice this convention in the abbreviations list) – in nearly all cases the authors suggest this number is provisional so it is a virtually useless addition. When checking a few of these numbers for genera that I know a little about, I could not even begin to tell how the numbers were established.

Naturally, some accounts are better than others, with the *Phaeophyceae* (pp. 139–177) and the *Ulvophyceae* (pp. 247–281) being the most informative.

Two general questions emerge when considering the *Syllabus of Plant Families*, perhaps questions that might eventually relate to all five parts: Why publish a 13th edition? And, who is it actually intended for?

With respect to the first question, the series editor provides some thoughts. In the Preface we read:

"… numerous molecular analyses led to new insights and a better understanding of the evolution and systematics of the lowermost groups. On the other hand, 'classical' morphological and taxonomical expertise is in decline, especially for less showy groups of organisms. As also noted in part 3, 'we are convinced that in the 'molecular times' there is an indispensable need to preserve the knowledge of the whole diversity and biology of organisms for the next generations. Otherwise, we will not be able to educate experts in the future who will maintain our knowledge of the full range of the earth's biodiversity'" (p. v).

This highlights key issues as to why this book, and maybe the series, ultimately fails. There are two parts to the justification given above. The first is with respect to discovering relationships among taxa ("new insights and a better understanding of the evolution and systematics of the lowermost groups"); the second is how to identify specimens ("there is an indispensable need to preserve the knowledge of the whole diversity and biology of organisms").

It was Linnaeus who first provided insight into the differences between artificial and natural classification, and Candolle who later elaborated upon them. In brief, artificial classifications are primarily designed for identification, to allow those of us who do not know the name of the specimen in front of us, to find it. These are keys, guides, or hand-books, which lead us to what is already known. With hindsight, it is a pity that the word "artificial" was used as it implies something "false" or "not natural" and therefore of limited value, perhaps even of no value. But as Candolle noted when he first discussed these matters in 1813, it is to do with stated purpose:

"For their unique purpose and their unique result, artificial systems [classifications] have, as we have seen, to make it possible to learn with more or less ease, the names of the species to which the system are applied" (Candolle 1813: 44, translated).

It is not possible to use this book for identification, as in most cases the descriptions are too sparse to be of any help in that endeavour and do not include characters for genera, a fairly reasonable starting point for any identification guide.

Natural classification differs in that it is concerned with discovery, about learning something new of the world we live in. Implicitly, although never stated as such, this book assumes that phylogenetic results will be the basis of our natural classifications and that phylogenetic conclusions are arrived at by analysing some quantity of DNA sequence data. As the introduction states:

"The new molecular results allow now a new understanding of the relationships between the different phylogenetic lineages in algae. The relationships were dramatically revised and we have now a better understanding of the systematics of this phylogenetic assemblage …" (p. 1).

I have my doubts about equating natural classification with phylogenies derived solely from DNA sequence data, neglecting the phylogenetic information found in morphology, but I won't argue that point here (Williams & Ebach 2008). What is of note is that there are only five diagrams of relationships in this book, most are relatively uninformative as to how they were arrived at and most do not translate directly into the accompanying classification. One might ask, why so? What guided the approach to classification? No answer is evident. The diagram for "*Heterokontophyta*/*Ochrophyta*" (p. 63) presents one tree with no details other than it is "unrooted" and based on two previously published studies: Grant & al. (2009) and Yang & al. (2012) – the Grant & al. reference is missing from the reference list but having found it and looked at the trees included in Grant & al. and Yang & al., it is not easy to understand why the one published in this book is "unrooted"; the diagram for diatoms is taken from Theriot & al. (2010) but does not match the classification in the account provided here, as if the tree and classification were to be considered independent of one another (pp. 74–75); the diagrams for *Trebouxiophyceae* and *Chlorophyceae* provide details of both the data and method of analysis (p. 204 and p. 218, respectively), but the "schematic phylogenetic tree of the *Ulvophyceae*" is based on "literature data", which gives no guidance to readers at all (pp. 250–251; one might go back to page 247, which summarizes selected studies). It is hard, then, to see how, exactly, "The new molecular results" illuminate classification – even harder to see how "The new molecular results" were evaluated.

Additionally, and of more significance when dealing with "a new understanding of the relationships between the different phylogenetic lineages in algae", is that many of these included algal groups have non-photosynthetic relatives. For example, diatoms are related via monophyly to the water-moulds as well as many different heterotrophic "protist" groups. This is alluded to in the Introduction to the "*Heterokontobionta* p.p. (Autotrophic *Heterokontobionta*)" (p. 11), but their definition of *Heterokontobionta* is taken from Bresinsky & al. (2008, referred to as "Strasburger 36. Aufl.,

2008", not the most recent edition), which the present authors immediately note that "recent molecular data do not support" (p. 11) but, rather, support the mix of auto- and heterotrophic organisms, relationships now reasonably well established. Perhaps it is time to acknowledge that the term "algae" serves no useful purpose when discussing the relationships of these organisms.

In my view, then, this book fails to be an accurate summary of relationships amongst these "algal" groups as well as failing to serve as a guide to their identification. So, who exactly it is intended for? What is its target audience?

The blurb on the back cover suggests this is a "mandatory reference for students, experts and researchers from all fields of biological sciences, particularly botany". Setting aside the fact that publishers occasionally tend to be over optimistic about potential audiences, I doubt any student would be able to own a copy of this given its price (€ 89) and I suspect that most young people (everyone?) would reach for a search engine to get this kind of information – which brings me to another, rather major, point: Why are books such as this still being printed? Do we really need a 13th edition of the *Syllabus of Plant Families*? These data should now be on dedicated websites (such as the *Tree of Life* and *Encyclopedia of Life*; http://tolweb.org/Life_on_Earth/1 and http://eol.org) so that a broad range of images can be seen, defining characters (synapomorphies) can be outlined in detail, taxon names can be (hyper)linked to nomenclatural sources and, more importantly, the data can be updated *when necessary* via this dynamic version of publishing. The Preface notes:

"Following the tradition of Engler, and incorporating the latest results from molecular phylogenetics and phylogenomics, the editor and the authors hope to have created an up-to-date overview of families and genera that will serve as reference for a long time" (p. v).

Given the number of authors who suggest that their account is merely provisional (and most offer 2014 as the cut-off point), I doubt that very much. Roughly half a century passed between the 12th edition (1954–1963) and the 13th edition (2009–2017) of the *Syllabus der Pflanzenfamilien*, the 12th taking a decade to complete. The 13th is not yet finished, and, who knows, it may take even longer (eight years so far). This is completely unnecessary in this digital age.

Here I should briefly return to what I understand to be the primary aim of the previous versions of the *Syllabus der Pflanzenfamilien* and this new edition, *Syllabus of Plant Families*: It wants to be the voice of authority, as if by merely presenting summaries of taxa by certain persons, it automatically suggests that the accompanying classifications must be the "best" we have, never mind how the word "best" is viewed, and we should all adopt them forthwith.

Suppose for a moment one focuses on developments in systematics *as a discipline in its own right*, then the period between 1963 and 2000 was a time of intense reflection that provided insight into how we once classified organisms, and how we continue to do so today. The core issues were never about any particular kind of data, or any particular kind of analysis, or any particular kind of philosophy for that matter: it was quite simply about the relationship between characters and taxa, systematics as a proper science based on evidence (characters) and conclusions (taxa), not on statements of authority. Science has no need of authoritarian texts. Engler's *Syllabus der Pflanzenfamilien* might have served a purpose once but not anymore.

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