

Book reviews

C. VAN DEN HOEK, D. G. MANN and H. M. JAHNS. *Algae. An Introduction to Phycology*. Cambridge University Press, Cambridge. 1995, pp. xiv + 623. ISBN: 0 521 30419 9 (hardback); 0 051 31687 1 (paperback). Price: £70.00 (hard); £24.95 (soft).

This is a completely revised English version of Christiaan van den Hoek's *Algen Einführung in die Phykologie* published by Georg Thieme Verlag in 1978 (a second, unrevised edition appeared in 1984). The German edition was particularly popular as it came in a handy size, was well organized and copiously illustrated, and dealt in a concise and precise manner with the morphology and cytology of the algae. The present text, although it has the same title, benefits from being in a larger format (in two columns) and, for many, from being in English.

According to the authors (p. xiii), 'there has been an enormous increase in our knowledge of the cytoskeleton, especially in relation to the flagellar apparatus and the processes of mitosis and cytokinesis' since the appearance of the German editions. A complete revision of the Chlorophyta and major changes in the organization of other divisions (phyla) has been adopted. In some ways, the subtitle of both this and the German editions is misleading as this is an evolutionary treatise that is organized along classical taxonomic lines: physiology, ecology and applied phycology take second place throughout. Nevertheless, a huge amount of information has been included, particularly from ultrastructural, cytological and molecular sources, making this a wonderful text for an advanced undergraduate class and as a reference book for postgraduates. It also serves, as the authors claim (p. xiv), as 'a modern overview of the algae and their classification'. I would have preferred the subtitle 'Algae. An Introduction to their Evolution' as this is exactly what this book treats in such a fascinating and comprehensive manner. In a review of another, similar text (Christensen's *Algae. Phycologia* 34: 252–253, 1995), I wondered whether anyone would in future be able to provide such an overview given the enormity of the task and the multitude of languages and publications involved. My wonder has, if anything, increased that the present authors have been able to deal with the explosive growth in algal literature recently. This leads me to reflect that the supposed lack of pure phycological appointments does not seem to have affected the steady increase in quality phycological research. This is probably because many workers are not regarded in their departments or institutes as doing what is essentially phycological re-

search but are seen as molecular biologists or even as microbiologists.

The range of morphological diversity in the algae as described here is truly extraordinary. Eleven divisions that include 29 classes are listed. The so-called higher plants and Fungi together manage only 8 divisions with 18 classes. All extant animals are squeezed into 14 divisions (phyla). These simple figures are a testimony to the extraordinary diversity of the algae and the resultant difficulty in trying to cover them in short courses. One can be absolutely certain, too, that we have not yet seen the end of the description of new divisions and classes of algae. Anyone who may think that phycologists have overstated the case for such a diversity of divisions and phyla has only got to look at the molecular evidence that is accruing.

There is an excellent introduction using the daisy (*Bellis perennis* L.) to illuminate the concept – surprisingly difficult for some students – of a hierarchy of systematic relationships. In the introduction there is also a particularly clear account of the endosymbiosis, evolution and the place of algae in relation to other organisms. A very useful summary of the characteristics of algal phyla is given in tabular form. The remainder of the book then treats the algae (including the Cyanophyta and Prochlorophyta, which may end up being merged) in a classical taxonomic sequence starting with the Blue-green algae and ending with the Chlorophyta. Some placements are still not entirely satisfactory. The Rhodophyta, as is usual, is placed near to the Cyanophyta whereas all the molecular evidence now suggests (figs 32.1, 32.2, 32.3) that the red algae are very far removed from the blue-greens, and may have evolved from ancestors similar to the present-day glaucophytes and which possessed flagella.

A particular problem in respect of the origin of the Rhodophyta (p. 96) stems from the early use of what are now considered unreliable 5S rRNA sequences. In these, the Rhodophyta, in agreement with conventional wisdom, appeared to have arisen *before* the evolution of 9+2 flagella. More recent 28S sequences do not support such a primitive origin, instead suggesting that the Rhodophyta evolved *after* the development of 9+2 flagella. The authors conclude that the Glaucophyta (p. 97) 'could perhaps be the only living descendants of the primeval, flagellate ancestors of the red algae, apart from the red algae themselves'. With the benefit of such potential hindsight, one can only smile wryly at the designation of some very early fossils as red algae merely because nothing else could have been around at that time! Indeed, some glaucophytan and other flagellates may soon be

reclassified with the red algae. May I also dare to suggest that there may even be some brown-coloured flagellates that will ultimately be placed in the Phaeophyceae (Fucophyceae). On the other hand, the Chlorarachniophyta, even though it includes but two flagellates, seems not to be aligned with any other group.

The Chlorophyta is thought to include 11 classes, although the Prasiolales is considered *incertae sedis*. Chapter 31 includes a discussion of the traditional classification of the green algae and the evidence for the new classification, including fossil, macromolecular, chloroplast genome and single-copy-DNA-DNA hybridization evidence. The weight of evidence in favour of such a classification is now overwhelming and, although some tinkering is still necessary, I am firmly of the opinion that such a classification is fully justified.

Some 1940 references are included. These are meticulously researched and very clearly presented, but few are post-1990 and none are post-1992. This, I understand, is due to delays at the publishers but may also be a result of the system of numbering references. I find it extraordinary in these days of instant multimedia communications over the Internet via the World-Wide Web that publishers, even when they have access to text on disk and vastly improved printing processes, do not seem to be able to produce books with anything approaching the speed necessary to keep up with the enormous outpouring of scientific literature. Many think that the printed textbook will shortly become a thing of the past. Many suggest that compact discs may be the solution, but much of what I have seen on CD is perfectly dreadful. I doubt very much that the book as a means of communication is doomed, but it would help if publishers could do things a little more rapidly rather than provide ammunition for the multimedia fanatics.

Some errors in a book of this size are inevitable. Figure 6.10 on p. 119 is part of fig. 7.1 on p. 125 and must be replaced in a future edition. Perhaps the correct figure could be distributed with new copies of the book in the interim? (It is now available from CUP. *Ed.*)

The Japanese nori industry is described briefly on pp. 65–66. The numbers are very outdated, although statistics on the Japanese and Chinese seaweed industries are difficult to come by. *Zen-nori* (a Japanese nori industry representative body) *Reports* for 1995 indicate that about 35 000 people are employed in tending some 65 000 ha of farms in Japan, and the total retail worth of the nori output in Japan is about US\$1 billion. It is not true to say that *Mastocarpus* and *Chondrus* (p. 52) are both important sources of carrageenan; only *Chondrus* from the Maritime Provinces of Canada is used in any quantity, and *Eucheuma* and *Kappaphykus* from the Philippines are now the most important sources. *Chondrus* does not form the 'gonimocarps' in papillae (p. 88); only *Mastocarpus* does. In the Rhodymeniales (p. 91) tetrasporangia more commonly have cruciately arranged spores; tetrahedrally arranged spores are found only in species of *Hymenoclonium* (Rhodymeniaceae) and in the relatively

few genera placed in the Lomentariaceae and Champiaceae.

As only two genera are usually ascribed to the Cutleriales (p. 190), *Zanardinia* can hardly be described as 'exceptional' in its possession of gametophytes and sporophytes that are 'macrothalli'. Gametophytes of *Cutleria multifida* are found north of the British Isles, not 'on the south European coast of the Atlantic'.

Superfluous hyphens occur from time to time (e.g. p. 344, legend to fig. 21.10). There are other, similar small printing and factual errors but none of these unduly mar the book.

Finally, I would like to congratulate the authors on a superb textbook that will, like the algae it treats, stand the test of time.

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EILEEN J. COX. *Identification of Freshwater Diatoms from Live Material*. Chapman & Hall, London, 1996, £35, 158 pp.

Effective use of most diatom keys requires cells to be 'cleaned', so that cell wall features can be observed under high power on either light or electron microscopes. Although this is a perfectly valid approach, it has meant that the characteristics of live cells have been largely ignored for taxonomic purposes. So, the publishing of a key based on live material has to be applauded.

The key includes most common freshwater diatoms found in the British Isles, which means that it is probably also suitable for northern Europe. It starts with a general introduction to diatom morphology and ecology (11 pages), followed by a guide on how to use the key and what cell features to look for. Next there is a preliminary key, which helps the beginner to separate an unknown into one of 21 groups of genera (6 pages), which are not necessarily phylogenetically related. This leads on to the major part of the book, which consists of a key that distinguishes between taxa within these groups (83 pages). The most common centric (7 pages) and pennate (76 pages) freshwater diatom genera are included but not the rarer ones (e.g. *Cymbellonitzschia*). Finally, there is a section with generic summaries and ecological notes on species (36 pages). Also, references are supplied to more specialist texts (4 pages) that may be needed to confirm identifications in cases where this is not possible on live material alone. The author is well known for her excellent drawings and this shows in the clear, well laid out illustrations (36 composite figures).

At present, a major limitation to the wider study of diatoms is the lack of a reliable taxonomy. This is reflected in the relatively large number of recent name changes. Most are incorporated here but, if not, use is made of footnotes to highlight unresolved issues. However, it is inevitable with a first attempt that some problems will

remain and the author makes a plea in the introduction for users to communicate their difficulties to her. In going through the key, I found only a few problems in separating cells down to the generic level, which is the main aim of the book. It is at the species level that the problems start, but it would be unfair to be too critical, because identification is often very difficult even on cleaned cells, let alone if only live material is used. This key should be seen as a guide into the more specialized literature. Possible improvements in future editions might include descriptions of the potential varieties of form that can occur in live cells, for example when chloroplasts contract in the resting state. Also, some digitized photographic images (cheap to produce?) would be very helpful alongside the excellent line drawings, so that the different taxonomic features visible in live and cleaned specimens could be compared and contrasted. This particularly applies to the centric diatoms, where form changes between taxa can be relatively subtle.

It is difficult to decide what the specific market is for this key. The publicity notes say 'water industries and environmental protection agencies' and the introduction

says 'aquatic ecologists, expert and beginner', which is a broad spectrum. There is always a danger of pleasing nobody. The expert might find it frustrating to have only a partial coverage of taxa but there is little doubt that the beginner will be helped. I tested the key out on an undergraduate class looking at live benthic samples. They responded well and identified more taxa correctly than is usual with the other keys now available, which gave them confidence and stimulated interest, but I suspect that the book is too expensive and specialized for individual students to buy. However, I would certainly recommend it for teachers, libraries and anyone else needing help to bridge the gap to more advanced monographs and keys. Overall, it is a welcome contribution that is likely to generate considerable feedback from users and, I hope, it will start to redress the balance in favour of viewing diatoms as living cells rather than elegant fossils.

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