Prokaryotic nitrogen fixation

I purchased a copy of this book at its pre-publication price of £104, but decided to accept a review copy as well because the volume covers a range of topics of interest to several colleagues. This review draws on their comments, but I accept responsibility for the final copy.

Dr. Triplett has assembled an impressive list of experts and persuaded them to produce manuscripts quickly, so that the material in this volume is generally very up-to-date. It has a comprehensive coverage of all prokaryotic nitrogen fixing organisms, the only current volume to my knowledge to do this. The work is divided into seven sections, beginning with one on the nitrogen cycle. The first of the two papers in this section gives a brief overview of the nitrogen cycle and is useful for putting nitrogen fixation into context. The second chapter is solely on the marine organism Trichodesmium. This is a very interesting summary of nitrogen fixation in the oceans, but I was sorry that there were not other chapters on the global significance of biological nitrogen fixation, however difficult this may be to assess. Readers may care to know of a paper in press (Vitousek et al., 2000) attempting to do this.

Section 2 consists of six chapters and covers the structure and function of nitrogenase. It is an excellent source of readable material, especially for those of us that are not specialists in this field. The three chapters in the next section covers regulation of nitrogen fixation at the genetic and molecular level. This is appropriate for a book with an emphasis on the prokaryotes, but persons interested in symbiotic systems may be disappointed in the coverage.

The reason that I purchased a pre-publication copy of this book was the flyer which extolled the coverage of evolution. I have to say that I was disappointed in this section. The four chapters are well written, but do not come to grips with some of the more interesting aspects, particularly of co-evolution in symbiotic systems. Only Benson and Clawson (actinorhizal plants) put a geological time scale in their chapter. The inclusion of a chapter on termite symbionts, though very interesting in itself, was more ecological than evolutionary.

The largest section, the fifth, has 20 chapters on legumes and is divided into three sections, covering infection, nodule development and metabolism, and model legumes systems respectively. Much, but not all, of the material is covered in more depth in the volume edited by Spaink et al. (1998). However the chapters in the present book (not only in this section) are characterised by a very good coverage of the literature and there are some excellent photographic and other illustrations.

Genomics are the topic of the four chapters in Section 6. I found the account of methanogens by Leigh of particular interest as it summarised the current state of knowledge on these Archaea. The chapter could have been equally at home in the evolution section.

The final section has five chapters on bacterial–grass associations, a topic which has been very controversial for many years. As with much of this volume, most of the data summarised have been published elsewhere. However, Boddey et al., in their consideration of how to assess nitrogen fixation in grasses have suggested a new way (using ELISA techniques) to count the number of bacteria present. This essential piece of information has been badly neglected in attempts to
quantify nitrogen fixation in grasses and similar systems. The paper of Sevilla and Kennedy gives useful \( \text{^{15}N}_2 \) data for sugar cane plantlets, although I am not fully persuaded that this represents a ‘new type of symbiosis’.

Whilst I fully sympathise with the emphasis on legumes, I think the cyanobacteria might have had more coverage, especially the symbiotic systems which are scarcely mentioned. Fortunately these have been the subject of a recent review (Rai et al., 2000).

The main positive features of this book are the up-to-date literature coverage and (with the exception of cyanobacterial symbioses and to a lesser extent actinorhizal systems) the wide coverage of prokaryotes. The book is well edited and there are few errors. Unfortunately, these advantages are offset by the very high price of the volume.

References


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