Book Reviews


Twenty years ago Dr A. R. Rees launched the book ‘The growth of bulbs’. Since then it has been a standard reference in many studies and publications dealing with bulb physiology and development. During the past decades, however, there has been a considerable increase in the knowledge and understanding of these items and there was a need for a review of the information that had become available. The present book: ‘Ornamental bulbs, corms and tubers’ is an attempt to meet this demand. In condensed formulations the essential phenomena are described succinctly.

The introduction presents a clear definition of the various types of storage organs: bulbs, corms, tubers, rhizomes, and rootstocks. The drawings clearly illustrate the differences; the drawings tell more than photographs usually do in such cases. The wide variation in types of storage tissues and the geophytic habit of plants leads the author to a consideration of evolutionary aspects of bulbous plants and the various solutions in the plant kingdom for survival.

Chapter two deals with horticultural uses. The diversity of the various bulbous and cormous plants offers many possibilities for the use of these plants as ornamentals. They can be used for flowering in spring and summer as well as in autumn and winter. The variation in climatic conditions and the different degrees of plant hardness determine the time and place of planting. The use of frames, conservatories and cool greenhouses extends the possibilities for horticultural uses considerably, which makes trade in ‘bulbs’ international. Data are presented to illustrate the efforts in different countries.

The additional chapters deal with: origins, breeding and selection; morphology; physiology; propagation; bulb, corm and tuber production; flower production; pests, diseases and disorders; and future prospects. Within these various disciplines descriptions are presented of daffodils, tulips, hyacinths, bulbous irises, lilies, anemones, Hippeastrum and ‘minor bulbs’. The latter group contains a number of very attractive plants, but they are called ‘minor’ because of the relatively small part of the market they take up. Another discrimination is made between plants with or without cold requirements: an important factor concerning the programming of flowering. This programming is possible through thermomorphogenesis (‘seasonal thermoperiodicity’), including alternating high and low temperatures for definite time periods at the appropriate developmental stages of the plants. Altogether, it becomes clear, that the book found its origin in the UK because the treatise is modelled on narcissi, the main bulbous crop in the UK; Dutch authors would have used the tulip as a model.

Growing bulbs requires careful control of diseases and pests and there are many of them. The main problem is inherent to the nature of the storage organs, containing various carbohydrates which are very attractive to almost all organisms. Diseases can be caused by insects, mites, bacteria, fungi and viruses or improper treatments followed by physiological aberrations. Symptoms of the diseases are described and photographs illustrate some of them. In fact, a good photographic illustration requires many colour plates, but this is not within the scope of the book. Other sources are recommended for detailed information.

In the final chapter of the book future prospects are mentioned, being: the development of new products, the introduction of improved techniques, marketing problems, crop protection and fertilization in connection with environmental affairs and industrial back-up. The main challenge for the ‘bulb industry’ will be the development of systems for disease control with a minimum of acceptable chemicals and without the development of resistance by the pathogens. Research and cooperation between the workers in the bulb industry are the tools to tackle the actual and future problems.

The increase in scientific papers on bulbous, cormous and tuberous plants has been tremendous in the past twenty years. It is almost impossible to refer to them all (this would require possibly another 220 pages), and the author had to make a choice. The strongest selection of references resulted in an easily readable handy-sized book. Those who are looking for detailed information on the various subjects are advised to find their way via ‘The physiology of flower bulbs’ edited by De Hertogh and Le Nard, another attempt to satisfy the need for an up-dated review, which has also been issued in winter 1992. Looking to the reference list it is remarkable that proportionally so many papers were issued from the UK and it also demonstrates the authority of the composer of the book in the midst of other well known scientists in the field of flower-bulb research, which have been honoured by a quotation.

The book will be an important contribution for the understanding of the various aspects of bulb growing, marketing and forcing. I will recommend this book to students in horticulture and researchers in the field of geophytes and it will also be of much help to workers in the ‘bulb industry’ who like to know about the fundamental characters of the products they are dealing with.

W. J. de Munk


It was with interest and hope that I opened Peter Bell’s latest edition of his long established book: interest in the subject material, and hope that here was a text that would grab the
attention of the increased numbers of first and second year students, of different backgrounds, motivation and interests, taking courses on plant and microbial diversity as part of their degree in biology, biochemistry or environmental science at my university.

This book contains nine chapters, the first of which deals with general features of the plant kingdom including a brief outline of autotrophic and heterotrophic nutrition, life cycles and reproduction and finally a classification of chlorophyllous phototrophs into sub-kingdoms. The algae are considered as a sub-kingdom of the Plantae and Chapter 2, after a brief introduction, deals with algae containing wholly or predominantly chlorophyll a (as opposed to possessing other forms of chlorophyll) that is, the cyanobacteria and the red algae. Chapter 3 is devoted to groups having chlorophylls a and b, covering the recently discovered prokaryotic forms and the better known chlorophytes and euglenophytes. Chapter 4 considers the algal divisions containing chlorophylls a and c including the brown algae, diatoms and dinoflagellates and concludes with a brief discussion of evolutionary trends within the algae. The sub-kingdom Bryophyta is dealt with in Chapter 5 and this has major sections on the liverworts and mosses with a shorter section on the hornworts and a final discussion on the origins of, and the evolutionary relationships within, the bryophytes. The remaining four chapters are concerned with the vascular plants, which are considered to fall in the sub-kingdom Tracheophyta; this ranges from a general introduction to tracheophytes in Chapter 6 with an account of those groups represented only by fossils and the ‘fern allies’ with both living or fossil members to Chapter 9 which gives an account of the flowering plants and ends with a consideration of their origins and the main evolutionary trends within the group. As might be expected, sandwiched in between these chapters there are accounts of the ferns in Chapter 7 and the primitive ovulate plants and their precursors in Chapter 8. After the general text there is an essential glossary of the many technical terms liberally employed throughout the book. This is followed by a chapter by chapter list of suggested reading matter to further amplify the topics covered.

My criticisms of this book are based to a lesser degree on content, even though this is largely concerned with morphological diversity, but more with the language and style in relation to the reader in ‘high school and college classrooms’ as well as amateur botanists at whom this book is apparently aimed. In the present era, as a consequence of GCSE-associated changes in the science syllabus and the knock-on effects of this on ‘A’ level teaching, the majority of students have had a minimal exposure to the plant kingdom whilst at school and are usually taught with a minimum of jargon and technical terms. Placed in this context the style of Bell’s account is sometimes too verbose and too heavily laced with specialist botanical vocabulary to be attractive to the present generation of university students. It is written for the student of twenty years ago. Bell does attempt to integrate ultrastructural and physiological features into the book, but with only three transmission electron micrographs (TEM), five scanning electron micrographs and eight line diagrams based on TEMs in the book, it does not compare well with alternative texts available in illustrating the ultrastructural differences in the various groups. The line diagrams are generally excellent but the reproduction of the micrographs of all types is somewhat variable and not well served by being printed on matt rather than on glossy paper—a consequence of economics in relation to the market! This text is not as well illustrated with micrographs as either of two of its rather more aged competitors that I have on my bookshelf Bold et al. (1980), Scagel et al. (1984). The diversity of green plants can also be considered at the biochemical, physiological and ecological levels. Brief and generally up to date notes on these topics are included throughout the book but are mostly descriptive and anecdotal in nature. They are however more simply and clearly written than some of the descriptions of morphology. A more accurate title would have been Green Plants, Their Origin and Morphological Diversity.

Bell’s account creates a strangely dated impression by considering the algae as a sub-kingdom of the Plantae, with no mention of Protista or Monera and by the downplaying of the prokaryote-eukaryote divide (Bell, in the preface, considers the sharp division of organisms into prokaryotes and eukaryotes to be an error on the premise that this is based on one character only! Surely most modern biologists recognize a whole range of characters that fundamentally delimit these groups). Many would now regard the algae as a series of distinct Divisions of polyphyletic origin and there is a general consensus that the chlorophyte line, with the exception of the Euglenophytes, is monophyletic (Marshall Darley, 1982; South and Whitlock, 1987). The parallels of morphology exhibited by algae in different divisions arises as a consequence of a similar response of the ancestral forms and their descendants to the evolutionary pressures of life in an aqueous environment. The word ‘Algae’ has thus been abandoned as a collective Taxonomic term by many, but not all, modern Phycologists. Bell does not agree with this, but does recognize their lack of uniformity by arranging them into three groups based on their chlorophyll pigment types. He also confuses the picture by including the statement in Chapter 1 that the envelope of the plastid consists of two unit membranes. A true statement about most plant groups but not of the series of algae that he recognizes as the ones possessing chlorophyll a and c or the Euglenophytes. The a + c group, except for the Dinoflagellates, contain an extra pair of membranes surrounding the plastid, referred to as the ‘chloroplast endoplasmic reticulum’. The arrangement of thylakoids in groups of three is also characteristic of the plastids of these algae and may serve as a useful taxonomic character. In contrast, the Dinoflagellates and the Euglenophytes each possesses a third membrane in their plastid envelope. These features are referred to in the appropriate chapter so it is surprising that some qualification was not made to the misleading generalization in Chapter 1. Such membranes have lead to speculation about the possibly different endosymbiotic origins of the organelle in these groups of algae. However, all biologists still use ‘algae’ as part of their everyday vocabulary, even if its taxonomic status may be questioned, and this is unlikely to change because of its practical utility.

Thus this book is a general catalogue of plant diversity.
considered mainly in relation to structure and reproduction. The present generation of students seeking a more obviously process oriented and general biological approach would probably find their needs and interests better served elsewhere, perhaps in texts relating to the biology of each of the groups. However if present trends in GCSE continue, with their impact on what can be taught at ‘A’ level and on the alternative routes to higher education, and subsequently higher education itself; then much thought will have to be given to books aimed at this latter market about both content and style of presentation.

LITERATURE CITED


The idea that different parts of a landscape may be the equivalent of different temporal stages in its development is central to our understanding of ecological succession, for the simple reason that vegetational and landscape change takes place over a timescale of decades, centuries and millennia, and so cannot be observed directly. H. C. Cowles used this approach almost a century ago to infer ecological succession from a series of dunes on the emerging shoreline of Lake Michigan, writing that “it is only by studying the horizontal succession that one can get any idea of the vertical, since all fossil traces of preceding plant societies have passed away” (Cowles, 1901: p. 79). This concept of space as a substitute for time is more precisely but less elegantly termed a chronosequence, of which the most widely known examples are the landscapes in front of retreating glaciers. The most famous must surely be that at Glacier Bay in Alaska, first examined by W. S. Cooper in 1923. Storbreen glacier foreland, in the Jotunheimen of southwest Norway, is rapidly becoming almost equally well known through the publications of John Matthews and his co-workers. This book, the one hundredth of those publications, is a great deal more than a mere summary of the Storbreen work; it is a very comprehensive, authoritative, and critical review of the whole corpus of literature on pro-glacial primary succession and soil development, culminating in a geocological model of succession. In contrast to earlier models, which over-emphasize biological processes in Matthew’s view, his geocological model includes both biological and physical processes as agents of succession.

A brief introductory chapter outlines the history and current status of glacier foreland ecology, and introduces the concepts of chronosequence and geocology, also termed landscape ecology. The emphasis on landscape, and the argument that physical factors may be as important as biological factors in determining succession, justify the following chapters on geomorphic and pedogenic processes, which are examined in considerably more depth and detail than might otherwise be expected in an ecological treatise. A variety of dating methods are available to determine terrain age, because the relationship between distance from the glacier front and age of the terrain surface is not a direct one: minor glacial readvances may have caused discontinuities, and the developing pro-glacial terrain is subject to erosion and disturbance, effectively causing localized rejuvenation. Soil development is considered at length, drawing especially on the work at Glacier Bay. Here the assumptions of the chronosequence approach have been directly tested by re-analysis of soils 30 years after they were first examined; the changes are consistent with those inferred from the chronosequence.

The fifth and longest chapter is a detailed review of pro-glacial plant successional patterns and their environmental controls. It begins with the work at Glacier Bay, and again describes direct tests of inferred vegetational change, which are almost as rare as they are for soils. Matthews concludes that although the dominant changes are as predicted from the chronosequence, microclimatic change and disturbances cause some retrogressive change. General trends in the patterns of primary succession are examined, including trends of cover, spatial organization, physiognomy, biomass, diversity and population parameters. The extensive data from Storbreen, where species abundances have been mapped in greater detail than elsewhere, provide the grist for a very comprehensive multivariate analytical mill. The analyses show that successional pathways are determined by environmental severity, and that the pathways diverge into more heterogenous vegetation types in the later stages. Divergence is favoured by strong physical controls, whereas convergent but complex series with many short stages are characteristic of less severe environments, where biological controls are dominant.

Chapter six reviews the evidence, or the lack of it, for various biological processes which may control the course of succession. These include the arrival and establishment of propagules, modification of the physical habitat by plants, and interactions between plant populations. Modification of the habitat (reaction) may favour (facilitate) the establishment or persistence of later populations, whereas competition inhibits either the persistence of earlier populations or the successful establishment of later potential colonizers. It is striking how little experimental evidence exists to demonstrate the roles of any of these processes in foreland succession. Nevertheless, the data are sufficient to set the stage for a consideration of the many models of the pattern and process of succession. Climax, relay floristics, and initial floristic composition describe the possible patterns; facilitation, tolerance and inhibition are models of the processes. Matthews carefully examines each in turn for aspects which may be applicable to glacier forelands, but it is clear that no single model provides a satisfactory explanation of even any one foreland sere, and that most are incomplete representations of the complexities of succession.
Process interaction models, predicting the relative importance of a variety of processes at different stages and in different environments, are viewed more favourably by Matthews, except that they still underestimate the importance of physical factors. Matthews' own geoeological model provides that emphasis, by coupling physical and biological processes, equivalent to autogenic and geologic factors, respectively. The former are predicted to be more important in more severe environments, which should also cause lower species diversity, lower biomass, fewer successional stages, and slower rates of change. Cowles was clearly aware of the importance of geomorphic, physical processes in shaping the dune succession, so it seems appropriate that Matthews re-emphasizes them in his geoeological model.

The book has two particular strengths. First, it integrates geomorphological and ecological fields of inquiry, and thus reveals generalizations not apparent from more limited reviews of the topic. One area that would have merited more detailed consideration is the role of hypothesis testing in understanding the causes of vegetation change, and especially the potential value of manipulative experimentation. Most of the models of succession, including the geoeological model, appear to be too generalized to be tested directly, but some may have more value than others in leading to specific, testable hypotheses. There have apparently been no attempts yet to investigate foreland primary succession through simulation modelling. The book's second strength is that it combines detail and depth to form a comprehensive review of the field, rather than a mere introduction. A measure of this is the length of the bibliography: almost 1000 references, more than twice the number in some recent books of the same series. Again unlike some others, the book provides sufficient information, both in the text and as figures, to allow the reader to avoid the need to refer frequently to the original journal articles. It seems churlish, therefore, to point to some relatively minor shortcomings. The introduction fails to point out explicitly the central generalized questions that underlie research into succession, and so fails to set a focused context for much of what follows. Is succession inherently a deterministic, predictable process? Is it controlled dominantly by autogenic, physical processes or by geologic biological ones? Perhaps these questions seem too obvious for the specialist, but they are the sorts of questions that, if set out at the start, would focus the attention of the non-specialist reader. Similarly, the conclusion does not return to and summarize the answers to such broad questions, but fizzes out with justifications of pro-glacial successional studies in a wider context. A second, related, shortcoming is that the author does not often summarize his material in a way that would help the reader to follow the themes and arguments. As a naive reviewer, I was particularly conscious of the need for chapter summaries. Even a more educated reader may find it a little difficult to distill the essential elements of the arguments without some assistance. But these points take little away from an impressively comprehensive monograph, which brings together the extensive, multilingual literature into an accessible form. It is undoubtedly essential reading for ecologists, geomorphologists, pedologists and geographers, and will remain the most authoritative work on primary succession for many years to come.

**LITERATURE CITED**


**H. F. Lamb**


The press release states that "*The Action Plant* is a remarkable account of the work of plant movement, presenting a wealth of research for the first time....Simons looks at plants as sensitive moving creatures, more like primitive animals than vegetables. He shows that movement is not restricted to a few 'weird' species, but that all plants are alive with excitability". Similar statements on the book jacket might be taken as a warning to plant biologists that this book is not really aimed at them and a quick scan through the chapter contents might also disturb the serious academic... Exploding Plants, Flower Power, Hunting and Killing, Bloody Plants, Electric Self-Defense, Seeing the Light, Sunbathing, Sleeping and Rhythms, Plant Muscles, Excitable Chemistry, Good Behaviour, etc. However, if the book is indeed aimed at the non-scientist, the contents are quite challenging and it would need a New Scientist reader rather than a subscriber to *Practical Gardening* to appreciate much of the material. Models of actin--myosin interactions, of ion-channels in nerves and of hormone--receptor interactions are hardly likely to appeal to readers without some interest in cellular and molecular events. Having picked up conflicting signals from the cover and some parts of the text, I was left very uncertain as to exactly who is likely to read and enjoy this book. I suspect the professional plant biologists will find the use of first names and the informal style rather strange or tiresome. Indeed, those familiar with the subject material will often react nearly as dramatically as a *Mimosa* to the sweeping, simplified treatment of some topics. Yet what will the non-specialist make of the 400+ references and the discussion of how actomyosin works? I finally concluded that the author is an enthusiast who wants to pass on his own excitement to any reader and is spreading his net wide, hoping to find others who can be led into the world that he finds so amazing. Who but a real enthusiast would end such a book with instructions on how to grow sensitive plants and encourage the reader to try a range of experiments. The reader is even encouraged to build their own simple amplifier (circuit diagram provided—maybe of great use to those wanting to do electrophysiology in UK universities).

So can I recommend this book? Yes. Not as a good balanced, critical analysis of modern understanding of plant movements but as a source of many intriguing observations that do deserve the attention of researchers. Too many young plant researchers have a very limited view of anything much beyond the current fashionable model system (however, would they really appreciate a book called *Action*...).
Plant that mentions Arabidopsis only once in passing?). This
book might just inspire one or two such readers to investigate
some of the many interesting phenomena outlined in this
book. They will have to adopt a questioning approach when
reading the book but it is easy to read and has some nice
diagrams and photographs. Of course there are better
treatments elsewhere of many of the topics covered in the
book but few writers on these topics are quite so provocative
or enthusiastic as Paul Simon. The book might also serve as
a source of inspiration to those having to think of cheap
undergraduate research projects. It could even be a useful
text for provoking lively, critical discussions in tutorials or
seminars. Undergraduates might just respond quite favourably
to a text written by a science journalist rather than an
academic scientist.

Richard D. Firn

Mogie M. 1992. The evolution of asexual reproduction in
plants. 276 pp. London: Chapman and Hall. £35
(hardback).

Single author scientific texts come in a range of styles. At
one extreme there is a minimum of synthesis and inter-
pretation, and every statement is profuse with bibli-
ographic citations. This is the textbook as reference
compilation. At another extreme, the views put forward are
very much those of the author, based on his own research or
scholarship and interest in the topic. This format can be the
scientific text equivalent of Luther’s 95 theses posted on the
door of Wittenberg cathedral. It is evident at the outset that
this new book by Michael Mogie favours the latter style.
The author has investigated and thought about asexual
reproduction in plants for some years, and he uses this book
to present his own views on the phenomenon.

Enclosed between a ‘Prologue’ and ‘Reflections’ the
book consists of five chapters whose titles give a fair
indication of the topics covered: ‘Patterns of Reproduction
in Bryophytes and Tracheophytes’; ‘The Costs, Benefits
and Constraints of Asexual Reproduction in Plants’;
‘Cosexuality, Asexuality and the Male Function’; ‘The
Genetic Control of Apomixis’, and ‘At the Court of the
Red Queen’. Essentially, this book covers three main
themes. Firstly, a careful analysis of the distribution and
kind of apomictic phenomena which occur in homosporous
vs. heterosporous terrestrial plants. This section presents
the view that aspects of the evolution of the cell lineages in the
angiosperm embryo-sac have given this group an element of
pre-adaptation for asexual reproduction. Effectively, based
on P. R. Bell’s concept of archegonial homologies, it is
proposed that the polar nucleus (nuclei?) of the embryo-sac
appears to be equivalent to the homosporous egg cell, and
thus needs the stimulus of fertilization to divide, whilst the
angiosperm egg cell is homologous with the ventral canal
cell of the ancestral archegonium, and so retains a mitotic
potential. A second major theme is an interesting re-
assessment of the role of the persistence of the male function
in the evolutionary success of both non-pseudogamous and
pseudogamous apomictic taxa. And thirdly, Mogie con-
structs a case for the view that meiotic mutations can
function as fairly simple ‘apomictic genes’. In this section a
theoretical model is established, which is then tested against
data available for apomixis in triploid Taraxacum species.

This book has the decidedly definitional and didactic style
of the enthusiast seeking to convert. In places this can cause
interest to pall, as in the paragraphs where what most
readers would readily understand as intragametophytic
selfing in ferns is repeatedly referred to, according to
previous definitions, as ‘intragametophytic, non-partheno-
genetic automixis’. And here and there the didactic rigour
falters somewhat, as when members of two distinct Divisions
(i.e. the equivalents of Phyla) of seedless vascular plants, the
Lycophyta and Pterophyta, are lumped in discussion under
‘pteridophytes’ or even ‘ferns’. More frustratingly, a key
term, ‘apogamy’, appears without further explanation in a
table on page 21, and the uninitiated reader either has to wait
until page 38 before the process is defined, or seek help
in the index. In general, however, the refreshingly clear style
of this book, with its regular pauses to summarize points
which have been dealt with, is very welcome. Not every
reader will accept the total Mogie view of apomixis, but
plant biologists will encounter in this carefully constructed
and somewhat idiosyncratic book a series of plausible but
thought-provoking ideas on the evolution of asexual
reproduction in plants.

P. E. Gibbs
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