breadth of subjects covered is such that the book can serve as an introduction to this increasingly important field of microbiology.

Given the importance of many antibiotics, particularly those inhibiting wall biosynthesis, it is not surprising that several chapters deal with the interactions between antibiotics and bacteria. Detailed attention is given to the role of the envelope, especially the outer membrane of Gram-negative organisms, as a permeability barrier to antibiotics. In addition, two interesting chapters discuss the influence of antibiotics on adhesion of bacteria to cell surfaces and the role of bacterial exopolysaccharides, the glycocalyx, in resistance to antimicrobial agents. This latter area is of increasing importance, for it is recognized that adhesion of microorganisms to prostheses introduced into the human body represents a route of colonization of normally sterile areas. Moreover, it is apparent that bacteria growing in this way are more resistant to attack by either antibiotics or the host defenses.

In other circumstances, death of the invader as a conseqence of attack by this two-edged sword can be avoided and bacteria (and other microorganisms) have been ready to exploit the various ways possible. Thus, survival can result from adopting a form of intracellular rather than extracellular growth or by presenting a surface "resistant" to host defenses. The former mechanism is covered in this book in a chapter that almost alone among those in the book deals with a variety of microorganisms in addition to bacteria. Interactions with humoral defenses and phagocytes are discussed separately in two chapters which serve to emphasize the multiple nature of bacterial virulence factors and of the host defence mechanisms. It is at this point that the reader will realize how little is really known about the role of the envelope in the survival of bacteria in infection. So much of the information available is concerned with laboratory rather than with in-vivo cultures, and this situation is only gradually being changed. However, the importance of the environment, particularly iron, to the ability of invading pathogens to survive and multiply in the host receives detailed attention. The book concludes with two chapters describing the rational design of antibacterial agents and vaccines directed against components of the bacterial envelope.

On the whole this book is well written and well illustrated and has only a few typographical errors. The editors are to be congratulated on bringing together a good overview of this fascinating area which is of undoubted and increasing interest to academic and applied microbiologists alike.

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BOTANICAL SCIENCES

PLANT VARIATION AND EVOLUTION. *Second Edition. By D. Briggs and S. M. Walters. Cambridge University Press, Cambridge and New York.* $59.50 (hardcover); $17.95 (paper). xv + 412 p.; ill.; index. 1984.

Included in the undergraduate curriculum of many plant biology departments are courses in plant evolution, biosystematics and ecological genetics. Instructors in such courses face the difficulty of finding an appropriate textbook. General treatments of evolution are frequently "animal-biased" and despite the recent spate of books covering various aspects of plant population biology, most are either too specialized in scope or contain little evolutionary material. A solution that I have adopted is to use Briggs and Walters's "little book," *Plant Variation and Evolution*, first published in 1969. The appearance of the second edition is therefore of some interest, particularly since it has been thoroughly revised and expanded from 256 to 412 pages. The new version retains the highly readable and unpretentious style and is full of illustrated examples and useful references (over 850). The new work probably represents the best book currently available for an introductory level course in plant microevolution. It does, however, have a number of shortcomings if viewed as a comprehensive textbook on the subject.

The book contains sixteen chapters. The first five focus on an historical review of studies of plant variation, its measurement and statistical analysis, genetic basis, and taxonomic treatment. The next six chapters deal with reproductive systems, ecotypes and clines, speciation mechanisms, and hybridization. The remainder of the book covers species concepts, an extended treatment of genecology, a glimpse of macroevolution and a final potpourri of topics, including nature conservation and the role of the amateur in botany. At times, because of the broad coverage, the book takes on an almost encyclopedic quality, as in Chapter 15 where, in quick succession, we are treated to such diverse topics as the fossil record, adaptive radiation, environmental conditioning, Gould and Lewontin's sermon on *Baupläne*, polyploid evolution and apomixis and, finally, the domestication of crops and weeds. The book has a strongly traditional flavor throughout, with taxonomic and genecological thinking at times almost constraining the treatment of topics. Some major growth areas in plant evolutionary biology are dealt with superficially, such as the impact of electrophoretic techniques on our knowledge of mating systems, gene flow and population structure, and the quantitative analysis of plant life histories. Despite these concerns, I believe Briggs and Walters and the publishers are to be congratulated; the book is well produced and is good value for the money (particularly in paperback); I anticipate its widespread adoption as a course textbook in plant evolution.

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PLANT CHEMOSYSTEMATICS.

By J. B. Harborne and B. L. Turner. Academic Press, London and Orlando (Florida). $95.00. x + 562 p.; ill.; plant genera/species and subject indexes. 1984.

Somehow we have been waiting for this book for a long time. After all, it is 22 years since Alston and Turner's classic *Biochemical Systematics* was published. Since then we have had a number of notable multiauthor works covering the general subject and an introductory textbook by P. M. Smith (*The Chemotaxonomy of Plants*, 1976) outlining the distribution of low-molecular-weight chemical constituents of plants in relation to taxonomy (or systematics). In addition, Robert Hegnauer has published his marvelous comprehensive six-volume survey, *Chemotaxonomie der Pflanzen* (1962-1973), and Darnley Gibbs, his four-volume contrapuntal *Chemotaxonomy of Flowering Plants* (1974). But over the last ten years there has been a real drop off in interest.

The application of protein sequencing to plant taxonomic problems, in spite of conscientious research, has led to a confusion rather than to an enlightenment. Even isozyme and serological analyses have thrown little light on problems above the generic level.

This relative reduction in activity is to a large extent the result of several trends. First, there are fewer organic chemists interested in natural products. Those who are, want to exploit the power of their newer instruments (e.g., Fourier transformed mass spectroscopy, infrared and nuclear magnetic resonance spectroscopy) and separatory methods (e.g., high pressure liquid chromatography, drop counter-current chromatography) for the isolation of new compounds rather than to survey the occurrence and distribution of those already known. Second, many phytochemists, originally drawn towards chemotaxonomy, have moved into the more exciting fields of biochemical ecology, evolution, and medicine where they hope to explore the rationale behind the occurrence of natural products. Third, molecular biology has continued to move in its fast and furious way and is now concentrating on aspects of the structure and function of DNA and RNA, rather than examining proteins. Fourth, classical systematics have not shown the remotest interest in taking up chemosystematics with any vigor. Indeed, they appear to eschew true systematics *sensu* Simpson and thus in their Hennigian cladistical way ignore almost all chemical data.

The authors of this book have gone overboard trying to refute (or should it be ingratiate themselves with?) some of these developments. I am sorry to say that, in my opinion, they do not succeed. Indeed, they play far too much to the classical taxonomic audience than need be. After all, classification is in the eye of the beholder. If it were otherwise, there would be no such petty arguments as whether to name the Leguminosae the Fabales, and so on.

What is important from the point of view of plant chemosystematics is not just the kinds of but the diversity of organisms, and of any and all relationships among them. These problems are hardly addressed here. Where inconsistencies arise between classical, morphologically based classification and biochemical criteria, the data from the latter are generally excused as being too scarce and hence not capable of proper assessment. Here the authors may be right. But it does not give one much confidence that chemosystematics will ever be accepted as a proper means of determining the systematic and evolutionary meaning of biochemical diversity, as I believe one day it will.

I fully expect that future research will reveal important differences in non-structural DNA in plants that will point to true evolutionary advance. Although I am prepared to believe that the amino acid sequences in the vital proteins of primary metabolism may change regularly with time, I do not concur with the idea that true biochemical evolution is neutral. Changes in phenotypic sparkle obviously require changes in DNA and proteins involved in secondary pathways leading to the complex and increasingly varied behavioral and chemical patterns that we find in higher animals and plants. To try to detect such changes via the common flavonoids or cytochrome c, therefore, is hardly likely to be successful. Hence, it seems unlikely that we will find useful chemosystematic clues by sticking to the biochemically obvious. Such aspects are not addressed by the authors. Similarly, we can agree with the postulates of punctuated evolution. Biochemical changes are necessarily rapid and when their sum totals "click" at the embryonic level (where evolution is likely to be most inventive—even if not usually successful) they could be expected to have quite dramatic morphological or other consequences on the phenotype. Surely, the example of thalidomide shows this! But the result in the end must be a harmonious whole. Populations of animals with poorer metabolism or reduced means for obtaining food or successfully reproducing cannot be expected to survive for long in a hostile world. Similarly, no plant populations can escape the folly of