This chapter did highlight, for me at least, one of the problems in reviewing the literature on nutraceuticals. These compounds can be purchased from health food stores as supplements, typically in tablet form, but are also in the diet normally. Evaluating the literature on their benefits is, therefore, very complex and imprecise, as the source and amount of the nutraceutical can vary significantly between individuals, depending on their diet. Is such a compound more effective when ingested in a food or as a supplement? Is one route more bioavailable than the other? What about the potential interactions of nutraceuticals between each other? In most cases we do not know, nor do we understand enough about the amounts needed for health benefits. Much needs to be done before such questions can be answered.

In summary, the authors have made a good effort to cover a selected range of nutraceuticals. The book will be of interest to those in the field, although the general public may be hesitant to purchase it at £29.95 and hope that the public library will stock it.

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Pectins and their Manipulation
G.B. Seymour and J.P. Knox (Eds.); Blackwell Publishing, Oxford, 2002, 262 pages, ISBN 1-841-27228-0, £79.00.

This is a valuable, eclectic collection of essays on diverse aspects of pectins and, to a more limited extent, their manipulation. In most chapters, useful methodological tips are provided, drawn from the authors' extensive experience. The articles are, without exception, packed with useful facts, figures and references, yet they are not merely telegraphic txt msgs but thoughtful discussions in which points of view are expounded. It is very helpful to have these authors' pectic philosophies assembled in one concise volume.

Pectins, major components of the primary cell wall in all land plants and charophytes, are not simply—as sometimes portrayed—α-(1→4)-linked, partially methylesterified polymers of galacturonic acid. They are now known to be a continuum of inter-linked domains whose chemical structures are summarised by Schols and Voragen in Chapter 1, including homogalacturonan (HG), rhamnogalacturonans (RGs) I and II, xylogalacturonan and type-I arabinogalactans (AGs). Mohnen's chapter on biosynthesis also starts, refreshingly, from the premise that HG, RG-I and RG-II are linked together during synthesis. More controversially, Schols and Voragen suggest that type-II AGs, better known as the carbohydrate moieties of arabinogalactan-proteins, are also pectic.

Mort takes an appropriately critical look at the evidence for cell wall models, and especially the putative covalent cross-links between cell wall polymers, including pectins. His scepticism is welcome, and should serve to highlight the current paucity of unambiguous evidence. Curiously, however, he concludes that there is a clear-cut example of a covalent cross-link between polysaccharides in the cell wall—provided by Ishii's tantalising isolation, after Driselase-digestion of bamboo cell walls, of a pair of xylan-derived trisaccharide molecules cross-linked by a diferuloyl group. Mort's scepticism lapsed here: such a fragment could equally have been isolated from a looped xylan chain in which the diferulate bridge was intra-polysaccharide rather than inter-polysaccharide. 'Xylans are rigid; they wouldn't easily form loops', I hear you say. True, but newly synthesised xylan chains are in the order of 10^6 Da (roughly 2–3 μm long) and fit into Golgi vesicles that are roughly 0.1 μm in diameter, so intra-polysaccharide looping seems highly plausible.

Mohnen updates a compendium of data on pectin biosynthesis (sub-cellular localisation, synthesis and transport of sugar nucleotides, and the properties of polysaccharide synthases) based on her other recent reviews in *Comprehensive Natural Products Chemistry* vol. 3, and in *Phytochemistry*.

Jarvis gives a customarily thoughtful essay on the biophysical properties of pectins. His account goes well beyond your money's worth for a review article: indeed it presents a helpful and original analysis of what happens when non-covalent pectic junction zones are *mechanically* stretched, as must occur in a growing plant cell wall. 'Pectic gels under stress' is a recurrent theme in this chapter, drawing further attention to the importance of defining the covalent linkages between pectins and other wall polymers—the latter possibly acting as handles for pulling at pectic chains.

Knox provides a summary of immunological methods, many of them emanating from his laboratory, for localising and possibly quantifying particular pectic domains at the microscopical level. Their distribution varies in parallel with changes in cell proliferation, expansion, maturation, differentiation, and separation. Several micrographs illustrate examples, though unfortunately not in colour.

Tucker and Seymour (Chapter 6) and Benen et al. (Chapter 7) discuss pectin-degrading enzymes, the two chapters emphasising those of plant and microbial origin respectively. Unfortunately, both these chapters refer to pectic enzymes (even the lyases) collectively as 'pectinases', despite the fact that 'pectinase' is used by the Enzyme Commission as a synonym of one specific hydrolase, endopolygalacturonase (EC 3.2.1.15). In Chapter 6, even peroxidase is all but elevated to honorary pectinase status because of its proposed role in generating active oxygen species that can cause non-enzymic scission of pectins. Notwithstanding this nomenclatural transgression, Tucker and Seymour provide a helpful and up-to-date account of pectic enzymes and their proposed roles in ripening, abscission and growth—including a consideration of the application of gene silencing and mutation.

Benen et al. discuss pectic enzymes of microbial origin, the emphasis being on the enzymes' mode of action and, where data permit, on their structure. Helpful information is provided on the preparation and purification of model substrates for many of the enzymes discussed. This article is thorough and quite lengthy, while remaining concise.

The final article (by Rolin) is very different from the others, and will be valuable remedial reading for those of us who see pectin principally as a physiologically important component of the living plant cell rather than as a product of commerce. Rolin explains the origin of commercial pectin preparations, including those we routinely buy for laboratory use from biochemical supply companies. He provides a collection of useful do's and don'ts to be heeded when handling pectin in the laboratory, or indeed when making jam, including heat-resistant jams for use in pastries and glazes for cheesecakes. You will enjoy this chapter.

There is a little, inevitable, repetition between chapters, for example as each author sets out his or her stall of pectic domains. This, however, is not detrimental; in fact, the little differences of usage which emerge as the authors clear their throats during the introductory paragraphs will be helpful to readers new to the subject who may be about to embark on the primary literature. In summary, this is a very valuable and readable book.

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