

**Manganese in Soils and Plants:** edited by R. D. GRAHAM, R. J. HANNAM and N. C. UREN, Kluwer Academic Publishers, Dordrecht, xvii + 344 pp. £47.00.

Published in the series entitled "Developments in Plant and Soil Sciences" this book reports the proceedings of an International Symposium on manganese held in Adelaide in August 1988. Twenty-two papers are presented starting with a lively unnumbered chapter, based on the opening address to the symposium by J. P. Quirk, which gives a history of work on manganese and indicates how the remaining chapters fit into this perspective. As the senior editor co-authored the paper, it is a pity that he did not insist on the full citing of references as adopted in the rest of the book.

The biological chemistry of manganese is covered in two chapters. Burnell describes the role that manganese plays in the water-splitting reaction in photosystem II and as a cofactor for a variety of enzyme reactions. He identifies manganese-containing superoxide dismutase as one of a group of metalloenzymes widely distributed in biological systems where more research is necessary to decide if its activity is valuable as an indicator of nutritional status. The importance of the relative stabilities of Mn(II), Mn(III) and Mn(IV) is emphasized in explaining similarities and contrasts with iron, copper and molybdenum in a thoughtful paper by Hughes and Williams who also stress the importance of compartmentalization for the efficacy of the ions in different enzyme systems. Transfer of ions into and between compartments are also seen by other authors as important topics for further research.

The physiological roles of manganese in general metabolism and in disease resistance are covered largely from the perspective of manganese deficiency although a chapter is devoted to the physiology of manganese toxicity. Throughout these chapters and others devoted to uptake

and redistribution surprisingly little attention is given to the interaction of manganese with other ions such as iron, calcium and magnesium. This aspect is however considered briefly in the paper on genetic differences in plant tolerance to manganese toxicity by Foy, Scott and Fisher. Nonetheless, it is evident that there is still a need to clarify primary and secondary effects of inadequate or excess supplies of manganese, not least so as to provide better diagnostics and prognoses for deficiency and toxicity.

The important role played by the microbial population in governing the uptake of manganese from soils is considered in several chapters and is well summarized by Marschner who also considers mobilization and immobilization in the rhizosphere. However, the relative importance of biologically induced transformations in soil compared with other processes remains uncertain and new sampling and analytical procedures are required if the plant-available manganese is to be predicted accurately.

The editors rightly claim the book to be a unique review of manganese in soils and plants. It certainly covers all aspects of the importance of the element. The inclusion of an index is particularly helpful though more comprehensive cross-referencing would have been fully justified. Authors, editors and publishers can be congratulated on the speed at which this well-presented volume has been produced. I am certain that for many years the book will be the standard reference for those interested in the biological chemistry of manganese, in its availability as a nutrient and other aspects of soil-plant relations, as well as in its transformations in soil processes.

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**Plant Response to Stress. Functional Analysis in Mediterranean Ecosystems**—edited by J. D. TENHUNEN, F. M. CATARINO, O. L. LANGE and W. C. OECHSEL, Vol. 15 in the NATO ASI Series G: Ecological Sciences, Springer, Berlin, 1987. 668 pp. DM 278.

The five disjunctive regions of the world with Mediterranean-type ecosystems exhibit striking similarity in the physiognomy of their vegetation. This convergence has provided a large amount of significant material for a number of studies into the adaptation of plants and the functioning of ecosystems. This particular volume is a record of a NATO Advanced Research Workshop held in Sesimbra, Portugal, in 1985. It is especially concerned with the morphological and physiological responses to stress imposed by the climate, the soil, fire and the disturbances associated with man.

Recent ecophysiological studies have been greatly advanced by technical developments; therefore, it is fitting that the opening section deals with current methodology

and experimental strategies. Of particular interest are the advances in photosynthetic measurements using portable infra-red gas analysers and chlorophyll fluorescence. Similarly the use of radioactive tracers for root-function studies and image-processing for community dynamics are highlighted. The second section draws attention to water relations and water stress, appropriately enough as drought is such a characteristic phenomenon in these ecosystems. I found particularly interesting, in different ways, the reports on water use by *Quercus ilex* in Spanish woodlands and that on stomatal mechanics of shrubs found in the chaparral-desert ecotone in the U.S.A. Such wide studies fit neatly together in the context of this workshop, and when taken together lead to a deeper understanding of the workings of adaptation, emphasising that the obvious convergent morphology is a reflection of convergent physiology.

The emphasis then turns to primary production, gas-exchange and canopy structure, which are covered by nine papers in the third section. These are mainly author-