clear in this case why the addition of zinc was not detrimental. Even if manganese availability in alfalfa is initially adequate, or if it becomes so after early increases in acidity through fermentation, it seems peculiar that the almost complete inhibition of lactic fermentation due to zinc antagonism was not apparent. Analyses indicate that the zinc content of alfalfa may be high enough to cause difficulty, but in that case magnesium has been helpful. Since the first critical stage of fermentation are not due to lactic acid bacteria, it may be that stimulation of such bacteria, particularly significant factor in the fermentation

—S. T. Dexter, Professor of Farm Crops, University.

**Book Reviews**

SOIL-PLANT RELATIONSHIPS
By C. A. Black, John Wiley & Sons, Inc. 440—4th Avenue, New York. 332 pages illus. 1957, $7.00.

It is a prominent sign of the expanding knowledge of soils when a professor moves our thinking about such a mundane matter into more mathematical accuracy of how that functions as the basis of agricultural production. Progress in soil science is indicated by the advent of this volume of over three hundred pages on soil-plant relationships from the pen of a professor of soils.

Dr. Black, of Iowa, approaches the subject of the relationship between soils and plant (or vice versa) in the logical procedure which we characterize as "problem analysis". In that method he lists the factors, i.e., the items contributing to a particular result, and then evaluates the importance of each in bringing it about.

The sciences of geology, mineralogy, inorganic chemistry, colloid chemistry, microbiology, and many others have given us what are more or less anatomical approaches to the study of the soil body with many basic contributions. Professor Black has taken these characterizations of the soil body and used the mathematico-analytical approaches to elucidate their roles in the soil's functions in the physiology of plants that gives crop production.

He has taken the soil as it is a combination of water, air, temperature, and root environment in terms of acidity, alkalinity, and the commonly considered fertility elements, namely, nitrogen, phosphorus, and potassium in supply, transformations, losses, gains and additions. He treats these mathematically, and otherwise, as the factors operating (via the soil) in their more accurately measured relations to the resulting quantities and qualities of the different crops.

The characterizations of the crop performances are also quantitative treatments of the separate plant factors which—in summation—give the final harvest results. Those in his considered relationships of plant to soil include balanced plant nutrition, fertility removal and return, its losses and gains, functions of the separate nutrient elements, deficiency symptoms of the plants, carbohydrate-protein modifications, root-top mass ratios, plant diseases, schedule of maturity, seed production and the plant's final preservation of bacterial cultures.

The book is conveniently organized into three parts, each consisting of several chapters. Forty-five high quality photographs of organic and inorganic chemical compositions. These are shown in their dependence on the soil factors in every possible case. In this treatment, not only concise tables but also pertinent graphical illustrations are used to let the more accurately measured soil factors reflect their relations to the correspondingly carefully measured activities of the plant.

By using the literature reviews of others in conjunction with his own extensive knowledge in that area, the author has brought the bio-chemodynamics, as energy concepts, of the soil into closer connection with the production of plants used as agricultural crops. He has added much to our comprehension of soil-crop relationships so easily and often too superficially thrown together when we speak in generalities and not specificities about agronomy. Dr. Black has emphasized the latter. His book will be profitable reading and careful study to strengthen all that concerns agronomy—the common concern of all farmers and producers in crops everywhere.

**PLANT VIRUS SEROLOGY**

By R. E. F. Matthews, Cambridge University Press. 195 pp. 1957. $5.00.

Plant Virus Serology is a concise presentation of refinements in serological techniques. The book is of use to those who are unfamiliar with virus serology to employ serological techniques in their research familiar with the subject, the book is an excellent reference.

Illustrations. Twenty-one maps showing the world distribution of individual bacterial pathogens are appended and constitute a useful reference.

Part I of this book consists of four chapters dealing with general characters of bacteria, their classification, the symptoms of diseases, and the principles and methods of their investigation. This section is well written in a readable manner and provides the reader with adequate information in bacteriology for the remaining sections.

Part II of the book is made up of three chapters on methods and media used in bacteriology. It deals with the biochemical activities of bacteria, pH adjustment, the use of indicators and staining methods. The section has been more accurately designated as "METHODS" rather than bear the more restricted title of "MEDIA". The final chapter on preservation, culture methods might also have included in bacteriological methods.

Part III entitled, "Diseases" is the largest section in the book. Four chapters are devoted largely to some 97 bacterial pathogens classified in the genera Pseudomonas, Xanthomonas, Erwinia, and Bacillus. An additional chapter deals with miscellaneous bacteria classified in the genera. The biochemical reactions of all the species are included at the end of each respective chapter.

Dr. Dowson is not entirely in agreement with bacterial pathologists in the use of taxonomic names. He prefers the epithet Peritobacteria for many peritrichous bacilli commonly designated as Erwinia species. He also uses the generic name (Erwinia) for species of crown-gall bacteria, although it was formerly called Agrobacterium. By so doing, the organism causing wilt of sweet corn, is designated as *Erwinia* stewartii. The author pointed out, however, that this name was necessitated by the decision of the International Committee on Nomenclature in 1955 to invalidate the genus *Agrobacterium*. It should be emphasized that Dr. Dowson has authority on the taxonomy of bacterial plant pathogens.

Finally, this book offers enjoyable reading and a British flavor. The author points out that a common cleaning agent for washing glass slides is available in "mongers"; and again he describes plant galls with "an eye of a pea to a "polo ball". —Philip M. Halisky.