BOOK REVIEWS, continued

history of nitrogen fixation processes and production of synthetic ammonia are interesting and well done. The treatment of recent ammonium nitrate production work is good, especially that of its development and the engineering aspects of present processes. Synthesis gas preparation is described quite well, but synthesis gas purification is disposed of with only one page. In view of the importance of this step, a more complete treatment would be desirable.

- Chapters on nitric acid manufacture and ammonium sulfate production are quite adequate, but there are only 5 pages on ammonium nitrate and ammonium nitrate-limestone (nitrochalk). In comparison, there are 28 pages on ammonium sulfate production and 18 pages on ureaform. Since ammonium nitrate is one of the most important nitrogen fertilizers, this treatment is scarcely satisfactory.

The chapter on soil nitrogen is informative and interesting. However, we are puzzled by the statement that the annual fixation of nitrogen by legumes in the United States, which is estimated at 1.8 million tons, is two to three times the amount sold as chemical fertilizer. Nearly 4 million tons of nitrogen was supplied by chemical fertilizer in the year ending June 30, 1963.

Chapters on ammonium phosphates, ammoniated phosphate fertilizer, and chemistry and utilization of ammonium solutions in fertilizer manufacture do not add much to the literature since this subject has been treated in other books including American Chemical Society Monograph 331, "The Chemistry and Technology of Fertilizers." Two of these chapters deal with the chemistry of ammoniation of superphosphate by presenting the same data which are drawn from a 1930 publication, in such detail as has been learned since 1930 on this subject, and it is regrettable that more recent information was not included.

The discussion of factors affecting ammonia absorption is somewhat confusing. It is drawn mainly from papers that describe laboratory scale experiments. The conclusions are presented without qualification though they are actually applicable only to the conditions of the experiments.

A chapter on comparing efficiency of nitrogen fertilizers presents a thoughtful analysis of the problem. Readers who are not agronomists (including the reviewer) are likely to find it heavy going.

"Safety Precautions in Fertilizer Plants" is an important subject. Its treatment is good as applied to mixed fertilizer plants, but it does not deal specifically with the problems and hazards in ammonia, nitric acid, urea, and ammonium nitrate plants.

One chapter (14 pp.) deals with one specific urea production process which is not the most widely used process. It is quite well written. Eight other urea processes are described in a part of another chapter (10 pp.). This disproportionate treatment seems inappropriate.

The two chapters on sodium nitrate: one on the natural (Chilean) material and one on the synthetic product. Since sodium nitrate occupies a comparatively minor place in modern agriculture, this treatment is more than adequate. Nothing is said about other nitrate products other than mention of it as a byproduct from Chilean sodium nitrate production.

In summary, the book should be quite useful to those who are interested in the production and use of nitrogen fertilizers. Its shortcomings are far outweighed by its excellent contributions.—TRAVIS P. HIGNETT, Director, Div. of Chem. Development, National Fertilizer Development Center, Tennessee Valley Authority, Wilson Dam, Ala.

Reclamation of Salt Affected Soils in Iraq

This monograph is the result of the work of the four contributing authors on the reclamation of salt-affected soils of the Mesopotamian Plain of Central Iraq during the period 1953-1959. It has been compiled from progress reports written during the interval and is composed of nine chapters, seven annexes, and a summary in four languages. Although the chapters are variously authored and co-authored, the monograph suffers none of the disjointedness which usually characterizes the work of this type and the three of overlap is minor.

So far as the reviewer is aware, this study is one of the most comprehensive ever undertaken of the reclamation of a salt-

affected soil in the Middle East. It touches upon virtually every aspect of salinity, irrigation, drainage, crop yield, soil fertility, and economics which may be of interest.

The first chapter is a general introduction and provides information on geography and crops of Iraq. A description of previous reclamation efforts is given and the present-day salt distribution is described. The second chapter presents detailed information on soil properties of the Dujailah Experimental Area, the principal reclamation site. Salinity was measured by finding the conductivity of 1:1 extracts and using a conversion factor to obtain the conductivity of the saturation extract. While this procedure may be valid for this soil, it obviously could not be extended to many soils. Chapter three deals with the effect of leaching on the soil conductivity and describes the use of leaching curves. Seasonal salinity fluctuations are also described. Chapter four describes the effects of leaching on exchangeable sodium and the relationship between exchangeable sodium, pH and salinity. The authors conclude that when the soils are leached with Tigris River water, exchangeable quality, exchangeable sodium is readily reduced as the salinity is lowered even in the absence of soil amendments.

Chapter five discusses the effect of salinity and fertilizer on yield, particularly barley and develops a crop rotation scheme to be employed during reclamation. In chapter six, three methods of estimating consumption water use (Blaney-Criddle, Penman, and pan-evaporation methods) are compared with field results. The chapter ends with a discussion of conditions and the conclusion is reached that the Blaney-Criddle method, with modified coefficients, is to be preferred since it is the simplest. In chapter seven, some principles governing the drainage and irrigation of saline land are discussed. Water and salt balance equations are developed as well as a leaching efficiency formula.

In chapter eight, some applications of these equations are made, with due respect to the fact that the underlying the equations may not be met in the field. Examples are given of calculating drain spacings and depths making use of a monograph included in an appendix. The authors state, "It is realized that many local conditions and practical, technical or economic considerations are involved in the final solution. It is therefore expressly stated that the calculation techniques should never be used as purely routine methods: one should always adopt a critical attitude and be aware of the extent to which assumptions made correspond to local conditions and experiences." Finally, chapter nine discusses some economic aspects of reclamation projects. There is evidently little solid information available, but it is estimated, for example, that the increase in marketing value of the crop may pay for a whole drainage system in approximately 7 years.

The research reported in this monograph represents a broad attack on the problem of salt-affected soils in Iraq. It is an excellent example of the results which can be secured when the fields of agronomy, soil science, agricultural engineering, irrigation, and economics are all brought to bear on reclamation. Only a sociological point will be raised in mentioning the work, however, large scale reclamation are relatively untouched. The authors are also well aware that the significance of the results may be restricted to Iraq. In the preface the editor states, "The main object of rewriting the reports is to give the reader a clear picture of the interrelationship of salinity, irrigation, drainage and crops under conditions prevailing in the Mesopotamian Plain of Central Iraq. By stating in full (as far as possible) the conditions and data of influence on the salt and water balance, an attempt has been made to facilitate the drawing of a parallel with the reader's own problems." The attempt is successful.—K. L. BARCOCK, Nuclear Research Center, Demiros, Aigina, Atiki, Greece.

Azotobacter and Its Use in Agriculture

It is seldom that a book devoted exclusively to Azotobacter appears. In fact, there is but one other book of this sort known to the reviewer and this is the early Russian volume published