

second gives the simple theory of the deflection of kathode rays, for the benefit of those not entirely unacquainted with mathematics; while the third describes the chemical processes involved in the extraction of the radio-active products from pitchblende residues.

The general arrangement is good, but there appears to be more than the usual allowance of uncorrected errors in spelling and composition. We hope that a second edition will give the author an opportunity of correcting these.

On the whole the book may be thoroughly recommended to the general reader as an accurate and attractive account of the latest aspect of scientific thought on the structure of matter; whilst the specialist will find numerous passages which are suggestive and stimulating.

O. W. RICHARDSON.

#### LABORATORY EXERCISES IN BREWING.

*Laboratory Studies for Brewing Students.* By A. J. Brown, M.Sc., &c. Pp. xviii + 193. (London: Longmans, Green and Co.) Price 7s. 6d. net.

THE brewing school at Birmingham is fortunate in possessing Prof. Brown as its head, and we hail the appearance of his book as extending its advantages to students of brewing generally.

These Laboratory Studies describe a systematic series of experiments illustrating the scientific principles underlying brewing. The author is careful to point out that he does not aim at dispensing with a teacher. Assuming a knowledge of chemical manipulation, he gives the detail necessary for the successful performance of each experiment, and draws the appropriate conclusion. He frequently connects the conclusions with others from allied experiments, and even to some extent with brewing practice, but at each step more and more scope is left for the teacher to discuss the bearing of the results on one another and on large scale work. If the author published his own lectures we should doubtless find them an exceedingly valuable complement to the work before us.

The book is divided into four sections:—(1) barley and malting; (2) principles of the mashing process; (3) fermentation; (4) hops. These sections are further subdivided into parts and paragraphs, the latter corresponding to each experiment.

The first section follows the changes in outward appearance from the flowering stage to the ripe barley corn, and thence passes on to the anatomy of the corn and to its conversion into malt.

Under the heading dealing with the varieties, we find one of the many instances of the way in which the author equips his men for taking their part in the controversies of present day brewing but avoids all dogmatising on points still *sub judice*. The experiments are planned so that the student will know all the characteristics of, e.g., Chevallier (we adopt Mr. Beaven's spelling of the rev. gentleman's name) and Goldthorpe, but he is left with an

open mind as to the vexed question of their rival merits.

Dealing with the technical examination of malt (and, indeed, also of barley and hops), we are glad to find due recognition given to expert knowledge—the student being specially commended to the teacher for instruction in it. For we are apt nowadays to underrate the knowledge accumulated by the practical man—what corresponds to the “farmer's eye” is still of immense value to the brewer.

Section i., part v., devoted to the chemical examination of malt, is as good as any in the book. Heron's method of determining the yield of extract is very fairly criticised, and we leave the subject with a full appreciation of its value and difficulties. The footnote of p. 46, that “a thoroughly satisfactory malt mill is yet to be introduced,” should appeal to all interested in brewing.

Section ii., the principles of the mashing process, deals with the changes which take place when malt and water are brought together at various temperatures and sketches the analysis of wort as far as the carbohydrates (much the largest constituents) are concerned. We were sorry that, in giving the experiment showing that the influence of heat in restricting starch transformation is due to modification of the diastase, no reference is given to Kjeldahl's “Recherches sur les ferments producteurs de sucre” (*Résumé du Compte rendu des Travaux du Laboratoire de Carlsberg*, i, 109), but this is perhaps on account of its being in a foreign language and so unsuitable for students.

Section iii. is devoted to fermentation, but, as there are already books, chiefly by the Hansen school, dealing with this important subject, this section is a good deal curtailed. We are, however, glad to see (even if they are in small print) experiments on the author's important discovery that the maximum number to which yeast cells multiply in a nutritive solution depends, not on the number of cells with which the solution is seeded, but on the volume of the solution, granted, of course, a sufficiency of food.

Section iv., on hops, concludes the volume. We wish an experiment had been included to show the restrictive action of hops on the acid-forming bacteria, but such an experiment is not a very easy one for students.

It will have been noticed that the book adheres to the usual plan of beginning with barley and ending with beer. This seems inconsistent with the custom of passing from the well known to the less well known, and we should like to see tried the opposite plan of starting with beer and tracing it back into its constituents.

In training men for technical work the course should be; first, a general grounding in science; secondly, practical experience of the art in question; thirdly, a study of the scientific principles involved. If this be so the work before us should not only be of service to students but also to those brewers who desire to look into the experiments on which the principles of their art are founded.