

vidual workers with one another and with the results attained in the most exact researches. This leads up to a consideration of the conclusions that can be drawn from the work, or of the additional experiments that must be made before any conclusions can be drawn.

It is to be feared that those teachers who most need the stimulus and the criticisms of this book will be the last to read it; but many younger teachers, who have already tasted of the tree of knowledge, will find in the book fresh inspiration for the study of chemical discovery, and guidance as to its application in the daily routine of the school.

T. M. L.

Cocoa and Chocolate.

Cocoa and Chocolate: Their History from Plantation to Consumer, by Arthur W. Knapp. Pp. xii+210. (London: Chapman and Hall, Ltd., 1920.) 12s. 6d. net.

MR. A. B. WALKLEY has recently explained in his inimitable fashion how the whole future of the drama and dramatic art in England depends on the withdrawal of the rule that chocolates must not be sold in theatres after 8 p.m. A commodity which has such a profound, if indirect, influence on an important phase of English culture merits serious treatment, and it was clearly time that the history of cocoa and chocolate should be written, and written in a popular fashion.

When, about 1735, Linnæus coined for the cacao tree the picturesque name of *Theobroma cacao*, the English chocolate-making industry had been in existence about seven years. It made slow progress in its early days, and 100 years after its inception the imports of cacao beans amounted to only 450 tons per annum. Since then, and especially in the last ten years, the rise has been remarkable, the imports of the raw material for home consumption in 1919 being over 64,000 tons. In addition, there are considerable imports of foreign-made cocoa and chocolate. The chocolate-maker has, therefore, no reason to complain of the descent of chocolate from its lofty estate as a food of the "gods" to the more humble condition of the flapper's confection.

Mr. Knapp is connected with an enterprise which not only makes everything that can be made from cacao beans, but also owns plantations of cacao trees. He has had, therefore, unique opportunities of making himself acquainted with every branch of the industry, and he has clearly not only utilised these opportunities to the full, but also has thought to some purpose about the

numerous unsolved problems connected with cacao-planting and the preparation of the beans for the market. There must be few planters whose ideas on the shading of cacao trees, the fermentation of the beans and the characteristics of a good cacao will not be clarified by a perusal of Mr. Knapp's pages.

Though chocolate is regarded by the ordinary person as a luxury, it has always had a band of devotees, who regard it as an important food-stuff. Mr. Knapp is one of these enthusiasts, and he provides the inevitable table, comparing the "fuel value" of chocolate with those of some ordinary foods. He omits, however, all reference to price per calorie, which would bring out the interesting fact that even plain chocolate is an expensive food, and that when consumed in the form of those super-confections which, if one may judge from the contents of chocolate-shop windows, constitute the bulk of the chocolate consumed to-day, it is a very expensive food—in fact, as the plain man believes, a luxury. The author of so interesting a book as this may, however, be forgiven a trifling obsession of this kind. It is a book which should be in the hands of all officials of tropical agricultural departments (for whose experimental work Mr. Knapp expresses much admiration) and of all cacao planters, and it is so simply and clearly written that it might even be read by the chocolate consumer if there were in this country any adequate machinery for making the existence of interesting technical literature known to the general public. The illustrations are numerous, good and well selected.

T. A. H.

Our Bookshelf.

An Introduction to Combinatory Analysis. By Major P. A. MacMahon. Pp. viii+71. (Cambridge: At the University Press, 1920.) 7s. 6d. net.

In this little book Major P. A. MacMahon has given a short introduction to his two volumes on combinatory analysis which were published in 1915-16. The theories of combination, permutation, arrangement, order, and distribution which are dealt with in those volumes present technical difficulties; it is, therefore, a great advantage that such an introduction should exist, for the gradual development of the subject by easy stages will prove interesting to the reader and whet his appetite for the larger tomes which await him.

In the first chapter the elementary theory of symmetric functions is introduced, and on it the theory of distributions is afterwards based. The author treats in turn the simplest problems of the distribution of objects into boxes, one object

only being placed in each box, then the various complicated problems which result when the restrictions are removed, and finally the general problem of distributing s different sets of similar objects of which there exist p_1 of one kind, p_2 of a second kind . . . and p_s of another kind, into boxes of which there are m_1 of one kind, m_2 of a second kind . . . and m_t of another kind, the whole number of the boxes being any number not greater than the whole number of the objects.

It is a great achievement to expound a difficult subject in a simple manner, and for that reason alone Major MacMahon is to be congratulated. For some reason which is not at present clear, the theory of the combination of different sets of similar possibilities (which can conveniently be represented as the distributions of balls in boxes) is of the utmost importance in many different branches of science. For example, it is clear that this theory must enter into such a question as the formation of a muddy liquid from molecules which occur in groups of one, two . . . n . The theory will also be relevant in a serious consideration of error in relation to causal laws. The subject is, therefore, of great importance in applied as well as in pure mathematics, and might very well prove another example of the extraordinary way in which abstract mathematics leads the way in applied science.

DOROTHY WRINCH.

Il Regime delle Acque nel Diritto Pubblico e Privato Italiano. By Avv. Antonino Vitale. Pp. x+480. (Milano: Ulrico Hoepli, 1921.) 25 lire.

THE rapidly increasing development of the water-power resources of Italy since the commencement of the war, and the probability of still further extensions in its use in the future, have led many writers in Italy to attempt a clear exposition of the legal aspect of the question, which is an extremely wide one, covering, as it does, the interests of the State, communities, and individuals. The author of the present work, Advocate Vitale, who is attached to the Ministry of Public Works, brings to his study a special competence. After a reasoned consideration of the question whether there exist private waters in contradistinction to public waters, or whether there is a private title to certain waterfalls as compared with the public title, he deals at length with the legal aspects of private title. The question of administrative control is treated in three large sections, the first of these bearing on the harnessing of water-power and the protective measures involved; the second on the actual utilisation and control of falls, rivers, and streams; and the last on contentious points of law and administration. In this survey all possible applications of water-power, including hydro-electric stations, irrigation plants, river diversions for water supply, transport, etc., have received consideration. The volume contains copious references to existing legislation on the subject and to the works of other authors. The main

interest of the book is naturally to Italians, although, of course, existing and subsequent enactments would affect corporations and syndicates anywhere which might anticipate obtaining concessions for the development of water-power in Italy.

E. S. H.

A Text-book of Physics. By Dr. W. Watson. Seventh edition. Revised by Herbert Moss. Pp. xxvi+976. (London: Longmans, Green and Co., 1920.) 21s. net.

THE new edition of this well-known text-book is substantially a reprint of that of 1919. The additions made include the spherometer, Young's extensometer, the McLeod gauge for measuring low pressures, and the travelling microscope. The discussion of Young's modulus, Poisson's ratio, and rigidity has also been considerably amplified, while descriptions of the pyrheliometer, the Callendar continuous-flow method of mixtures, and the Beckman and clinical thermometers now find a place. Further additions include a proof of Gauss's theorem with illustrations, likewise illustrations of the applications of Kirchhoff's laws, and in electron theory a concise account of "canal" or positive rays. The explanation of diffraction through a slit has been extended, and "resolving power" is also treated.

The values of physical constants have been revised, and under "Terrestrial Magnetism" the majority of the maps and diagrams replaced by recent plottings. It is interesting to note therefrom that the east line of zero declination, or agonic line (1917), now consists of a nodal curve with intersecting branches, in place of the former simple curve and Siberian oval, as in 1907.

In its present form Watson's "Physics" is the most comprehensive single-volume text-book of physics in the English language. It contains little that may now be adversely criticised, and the compilers have improved the index by increasing it to nearly twelve pages.

A. W. BAIN.

La Colloïdothérapie: Résultats Cliniques. By Dr. J. Laumonier. (Collection Médicale.) Pp. ii+283. (Paris: Félix Alcan, 1920.) 5.50 francs.

THIS book, as its title suggests, has been written by one who has no doubts as to the answer to a question which gives pause to many—namely, whether any special therapeutic value can be assigned to preparations of metal and other substances in the colloidal state which can be attributed to their state.

The theoretical section is commendably brief, the main body of the work being devoted to a systematic account of the method of preparation, uses, and physiological action of colloidal solutions of silver, gold, platinum, arsenic, etc.

The author's reading is limited, and his references are confined practically solely to the work of his compatriots; but the work of the French school affords ample material for the object in view—namely, the production of a book of reference for the practitioner.