

Acts of 1875 and 1899. These included 82 samples of milk, 3 of whiskey, 2 each of ginger, Epsom salts and dripping, and 1 each of lard, cheese, chocolate, beer, camphorated oil and sausages. In 12 cases the results differed from those reported by the public analyst. Five samples of fertilisers and 6 of feeding-stuffs were submitted under the Fertilisers and Feeding-Stuffs Act. The fertilisers consisted of superphosphate, basic slag, and ammonium sulphate; the feeding-stuffs comprised feeding meals and cakes, milling by-products and poultry foods. Several of the meals contained substances unsuitable for feeding purposes.

## REVIEWS.

### COLLOID CHEMISTRY.

1. **THE CHEMISTRY OF COLLOIDS. PART I., KOLLOID-CHEMIE,** by RICHARD ZSIGMONDY. *Translated by E. B. SPEAR, Associate Professor of Inorganic Chemistry, Massachusetts Institute of Technology.* **PART II. INDUSTRIAL COLLOIDAL CHEMISTRY,** by E. B. SPEAR. **A CHAPTER ON COLLOIDAL CHEMISTRY AND SANITATION,** by J. F. NORTON, *Assistant Professor of Chemistry of Sanitation, Massachusetts Institute of Technology.* (New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 1917.) Price: 13s. 6d. net.
2. **AN INTRODUCTION TO THEORETICAL AND APPLIED COLLOID CHEMISTRY: "THE WORLD OF NEGLECTED DIMENSIONS."** By DR. WOLFGANG OSTWALD, *Privatdozent in the University of Leipzig.* *Authorised translation from the German by DR. M. H. FISCHER, Eichberg Professor of Physiology in the University of Cincinnati.* (New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 1917.) Price: 11s. 6d. net.

The publication of these two books, both translations of German works, while illustrating the continued and growing interest in the chemistry of colloids among English-speaking students, emphasises the lack of an adequate and satisfactory indigenous English literature of this important branch of chemistry. As the number of British workers in this domain increases, we may, however, hope that the gap in our English chemical literature will be made good.

The former of the two books mentioned above is a composite production, consisting, for the most part, of a translation of Zsigmondy's "Kolloidchemie," first published in 1912 and well known to students of colloid chemistry. To this, however, the translator has added a section of some thirty pages in length on Industrial Colloid Chemistry, and J. F. Norton a short chapter of some five pages on Colloids in Sanitation.

The work of Zsigmondy certainly deserved to be brought more fully to the notice of English-reading students on account not only of the authority with which the writer can deal with the subject of colloids, but also of the independent and characteristic outlook of the author. It is, however, unfortunate that the English translation should have been so long delayed as to appear just before a second and enlarged edition of the German work, and to be, in consequence, somewhat out of date already.

The work before us will probably not be found by students so useful as certain others for giving a general introduction to the properties of colloids. The work reads too fragmentarily and disconnectedly, and for this the classification adopted is, of course, mainly to blame. As no sharply-defined classification of colloids can be given, the author has adopted one depending on a chemical grouping of substances forming the dispersed phase of a col-

loidal system. After a chapter on "General Considerations" and one on Classification, the "Properties of Colloids" are dealt with in a chapter of less than forty pages, while another chapter of about fifteen pages is headed "Theory." After the more general treatment given in these four opening chapters the author discusses inorganic colloids—metals and non-metals, colloidal oxides, colloidal sulphides, colloidal salts—and organic colloids (especially soaps), dyestuffs, and protein bodies. These later chapters of the book are especially valuable from the practical point of view. Moreover, in his selection of material the author has confined himself for the most part to substances with which he has become familiar in his own investigations. If, thereby, restrictions have been introduced which make the book less valuable for the general student, the increased authoritativeness of the discussion enhances its value for the more specialist reader. Of special interest are the sections dealing with colloidal metals, particularly colloidal gold, in the investigation of which the author has taken an active part. With regard to the medical applications of colloidal metals, especially colloidal silver, the information is not very definite, and the review by Voigt of the state of knowledge in this department, although published some years ago, is not referred to here, as it did not see the light until after the appearance of the first German edition. This is only one of many cases illustrating the fact that the English translation as it stands is already rather out of date, and it is a pity that some attempt was not made to remedy this defect.

With regard to the section added by the translator on applied colloid chemistry, the reviewer, while recognising the importance of the subject, doubts the wisdom of the decision "to devote several chapters in this book to a side of the question that is particularly interesting to the technical chemist." Owing to the small amount of space allotted to this section, the treatment could not be anything but sketchy, and the author of the section has been compelled to omit considerable portions of the subject. The section, however, incomplete as it is, may in any case direct the attention of the reader to this side of the study of colloids, and will indicate something of the importance of applied colloid chemistry. In the chapter on "Colloids in Sanitation" it is also merely a glimpse that is afforded of this particular aspect of the subject.

The second volume under review is, as the author styles it, "a propaganda sheet for colloid chemistry," and is based on a series of lectures which the author delivered in the United States and in Canada during the winter, 1913-14. The work is a very useful one, more especially for the general reader, and also as an introduction to the fuller and more special study of colloids, because it is an attempt to give a general survey of modern colloid chemistry as a pure and as an applied science in a form readily intelligible to the general reader. It makes its appeal to the individual of general scientific culture, and the appeal is, on the whole, very successful. The subjects of the five lectures forming the basis of the book are: Fundamental properties of the colloid state; Classification of the colloids and the dependence of their properties on the degree of dispersion; Changes in state of colloids; Some scientific applications of colloid chemistry; Some technical applications of colloid chemistry. The field covered is a very wide one, the survey of the subject is very satisfactory and can be recommended to anyone wishing to obtain a general idea of what the colloidal state is and of the importance of this state in pure and applied science. It is, so far as the reviewer is aware, the only work of its kind.

The lectures were illustrated by specimens and experiments, and the author is to be commended for

giving full directions for carrying out the experiments shown. The book thereby acquires a greatly enhanced value for the lecturer and teacher. For such a person this book is to be recommended. It will be found of very great value.

ALEXANDER FINDLAY.

GRUNDLEGENDE OPERATIONEN DER FARBENCHEMIE. By H. E. FIERZ. Pp. ix.+323. (Zürich: Schulthess and Co. 1920 [1919].)

Of the four sections into which this highly practical treatise is divided, two are devoted to the fundamental operations involved in the production of coal tar intermediates and synthetic dyes; the third part furnishes technical details of the manufacture of these materials, and the fourth indicates methods of proximate analysis for the testing of the products. The chapter on sulphonation furnishes typical examples of the technology of this operation and includes also exercises in nitrations reductions and alkali fusions leading to the preparation of such important naphthalene derivatives as the naphthylamine-sulphonic acids and the technically valuable aminonaphtholsulphonic acids. To working descriptions suitable for operations on the laboratory scale the author adds useful memoranda concerning the carrying out of these preparations in the factory.

In the chapter specially devoted to nitrations and reductions one is glad to notice the substitution of cheap works recipes for the expensive academic methods of reducing nitro-compounds with tin and excess of acid or with alcoholic ammonium sulphide. The salting out of aniline from water replaces its extravagant extraction with ether.

Suitable examples of chlorination and oxidation are followed by the section on colouring matters, where a typical selection of azo-dyes is introduced.

A patriotic motive has prompted the author to add an interesting chapter on the synthesis of indigestion by Sandmeyer's method. This Swiss process, although no longer employed commercially, is a classical example of the combination of science and technology. It proceeds in five stages from aniline to indigo, giving an over-all yield of 80 per cent. of the calculated amount.

The section on technical details deals with distillation under diminished pressure, with the construction and employment of autoclaves, with the construction of the dye factory, and with other practical details essential to the successful management of a colour works.

The fourth and final section, which offers an introduction to the analytical control of coal tar intermediates might with advantage have been expanded so as to give a more detailed explanation of the analytical operations involved.

This treatise is profusely illustrated with plates and diagrams of apparatus and plants. The entire work is so completely up to date that it seems unnecessary to give it an incorrect date of publication ("1920"), a tampering with time which is not justified even by the most recent and advanced views on relativity.

This manual may be recommended with confidence not only to those making a special study of synthetic dye wares, but also to the general student of organic chemistry, to whom it offers a graduated series of laboratory experiments on the preparation of aromatic derivatives.

G. T. MORGAN.

IRON BACTERIA. By D. ELLIS. With 45 illustrations and five plates. Pp. 179. (London: Methuen and Co., Ltd. 1919.) Price 10s. 6d. net.

This book is designed mainly to assist the water engineer and chemist, by giving descriptions of the chief types of "iron bacteria" at present known, and by indicating the manner in which the know-

ledge so far gained may help in dealing with the attacks of these organisms.

From the point of view of the bacteriologist it must be admitted that our knowledge of this physiological group is scarcely sufficient to warrant a treatise, but Dr. Ellis's book reviews the present state of the subject, gives a useful list of the literature, and should serve to draw attention to the need for further research.

In the first portion of the book the author describes the various types of "iron bacteria" commonly met with, and gives diagrams and microphotographs illustrating their morphology. As in the case of many other bacteria, a good deal of uncertainty exists as to the specific distinctness of the various forms. For example, the group of *Leptothrix ochracea* and its allied forms *Gallionella* and *Spirophyllum* differ in the twisting and shape of the threads, and the author inclines to the view that they are variations of a single type. It would seem that further cultural study should enable this point to be settled. A similar example is seen in the case of *Cladothrix dichotoma* and its related forms.

However, the chief interest in connexion with the "iron bacteria" is centred round the physiology of their nutrition. The author devotes a chapter to the consideration of the various theories connected with the deposition of iron oxide by the organisms. General attention was first drawn to the subject by Winogradsky's theory, that they derived energy by the exothermic reaction involved in the oxidation of ferrous to ferric compounds. This theory, supported chiefly from an analogy with the sulphur bacteria, has been largely discredited since the behaviour of *Leptothrix* in pure culture was studied by Molisch, who showed that a ferruginous medium is not essential, but that the organism will grow as a saprophyte in the presence of organic matter, and that the presence of this organic matter is essential to its growth.

Molisch has suggested that the iron bacteria make use of organic matter which is in combination with an iron radical, casting out the iron as hydroxide. However, as the author points out, if we accept this theory, we must assume that the organisms possess an exceptional affinity for organic iron compounds. Until the possession of this power has been demonstrated the question of their metabolism cannot be regarded as settled.

The book contains two chapters dealing with the practical aspect of the subject and the detrimental effects of the organisms in reservoirs and water-pipes is described. The author suggests curative measures chiefly depending on the oxidation of the organic food material in the water and on the formation of an alkalinity unfavourable to growth by the addition of lime. At present, however, it is only possible to indicate the broad lines upon which treatment may be effective, and more research is needed before curative methods can be perfected.

H. G. THORNTON.

## PUBLICATIONS RECEIVED.

THE CHEMICAL ANALYSIS OF ROCKS. By HENRY S. WASHINGTON. Third edition, revised and enlarged. Pp. 271. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall. 1919.) Price 11s. 6d.

THE PREPARATION OF ORGANIC COMPOUNDS. By E. DE BARRY BARNETT. Second edition, with 54 illustrations. Pp. 273. (London: J. and A. Churchill, 1920.) Price 10s.

INDUSTRIAL GASES. By H. O. GREENWOOD. Pp. xvii.+371. (London: Baillière, Tindall and Cox. 1919.) Price 12s. 6d.