

gamete-formation again. It is a mistake to suppose that nutrition determines sexuality, but it sometimes determines the opportunity for the expression of sexuality. Similarly, the nutritive supply is not necessarily related to differentiation of sex or size. The male gametophyte of *Equisetum* is small because it is a male, and not male because it is small.

The general theory suggested in this interesting essay is that decline of vegetative vigour favours the production of gametes with characteristic chemical substances. The zygotes that result from the pairing of gametes tend to lie dormant until environmental conditions improve—a useful and probably primary protective adaptation. The peculiarity of gametes is not to be found in their motility, or in their minuteness, or even in pairing (as is shown by nuclear fusions in endosperm-formation); what, then, is their essential feature? In the reduction division their nuclei become peculiar, so that a new individual can only be produced after the nuclei have fused. And the advantage of this is probably in securing individuality or variation. Thus sexual reproduction makes, on the one hand, for protection, and, on the other, for variability.

CASE-HARDENING.

(1) *La Cémentation de L'Acier*. By Prof. F. Giolitti. Traduction française revue par M. A. Portevin. Pp. 548. (Paris: A. Hermann et Fils, 1914.) Price 16 francs.

(2) *The Case-hardening of Steel*. By H. Brearley. Pp. xv + 164. (London: Iliffe and Sons, Ltd., 1914.) Price 7s. 6d.

(1) **P**ROF. GIOLITTI is probably the greatest living authority on the cementation of steel, and in the above-mentioned publication will be found by far the most comprehensive and lucid presentation of this subject that has ever appeared. During recent years many important original researches in this domain have been published by him and his co-workers at Turin, and no one is better qualified than he to summarise present-day knowledge with regard to it. M. Portevin, in rendering as he has done an admirable French translation of the Italian text, has considerably enlarged the circle of students to whom the book will be available.

As Prof. Giolitti remarks in his preface, there is probably no branch of present-day steel technology in which empiricism is so supreme as cementation or case-hardening. Such a condition of things, justifiable no doubt at one time, can no longer be defended. Scientific knowledge is now available which permits this highly important

process to be carried out under simple and easily controlled conditions with inexpensive materials, in such a way as to secure definite results with remarkable certitude. In spite of this, many works are content to go on buying at fancy prices mixtures of a very ordinary character, the nature of which is entirely disguised by the trade names under which they are sold.

Part i. of the book deals with cementation processes from a chemical point of view, and consists of five chapters, which trace the sequence of researches that laid the foundation of scientific case-hardening, and gradually lead up to the final chapter on present-day knowledge of the subject. The author has been exceedingly careful in mastering and summarising the literature available, and in spite of his own large share of the experimental field he seems to have missed little or nothing that anybody else has done. It seems now to be well established that while pure carbon can and does under suitable conditions of heating carburise solid iron in the complete absence of any gas, yet such carburisation proceeds so slowly as to be useless from the technical point of view. All industrial case-hardening processes require the presence of gas, and to the question "What are the respective parts played by the carbon and the gas in such processes?" it is impossible to return an answer that will hold for all cases. It is necessary to examine for every type of cementing material the specific action of the gas which may be formed, and then to study how this action is modified by the presence either of free carbon pre-existing in the cement or of carbon formed during cementation.

Part ii. deals with the technical applications of cementation, and of particular interest are the chapters relating to liquid and gaseous cementing agents. It is unfortunate that the table of contents is very meagre, and that the book is without an index. It is to be hoped that the latter defect will be remedied when a second edition appears, for it detracts considerably from the usefulness of the book in its present form.

(2) Mr. Brearley's book has been written mainly for those who are engaged in the commercial production of case-hardened objects. Nothing could indicate its point of view better than the following quotation from his preface: "An explanation based on the mechanical structure of an object is intelligible, because most minds can appreciate the elements of design and pass judgment on the composite properties of materials. All kinds of steel have a mechanical structure which, when suitably magnified, is as obvious as that of reinforced concrete. It is in terms of such structures that the properties of case-hardened steels

must be explained." Chapters i.-vii. are concerned with various aspects of case-hardening processes, and these are followed by others dealing with methods of testing, automobile steels, hardening and tempering, and finally surface hardening without cementation. No attempt is made to separate the subject into practical and theoretical divisions, and the author's treatment presupposes an elementary knowledge of metallography on the part of his readers.

In a book of this kind it is gratifying to find the following opinion (p. 77): "The most helpful of all generalisations in metallurgy is the one based on observations made with the pyrometer and confirmed by the microscope, known as the equilibrium diagram." Mr. Brearley is to be congratulated on the production of a book that was well worth writing, and one which should certainly be of use to those for whom it is intended. It will repay studying, moreover, by others than case-hardeners.

H. C. H. CARPENTER.

OUR BOOKSHELF.

The Principles of Fruit-Growing. By L. H. Bailey. Twentieth Edition. Pp. xiv+432. (New York: The Macmillan Co., London: Macmillan and Co., Ltd., 1915.) Price 7s. 6d. net.

THIS book has in its different editions been used for nearly eighteen years as a standard text-book on commercial fruit-growing, in the Agricultural and Horticultural Colleges of the U.S.A., Canada, and England.

For the present edition the work has been largely re-written; it deals with important subjects, such as the choice of locality and site; the setting out of orchards; the principles of vegetable physiology involved in the cultivation, pruning and thinning of the fruit, and so on. The question of manuring of orchards, based on experiments at the American Experiment Stations, gives clear general reasons for the effect or non-effect of the fertiliser. The phenomenon of self-sterility of varieties and the advantage of cross-pollination are discussed. Examples of score cards dealing with the growth and character of the tree as well as the fruit show that this is a valuable method for comparison of varieties; an example of a work sheet of an orchard, together with cost and return, show what may be advantageously learnt from keeping such a record. Cover crops and protection from frost by orchard heating are described; control of insect pests and fungoid diseases, and the choice of pumps and nozzles, are well treated; harvesting, packing, and fruit storage houses, also special points of interest such as the origin of varieties, are discussed.

The book is one to interest any English apple grower (it is the apple that is chiefly dealt with); it presents new aspects of things different from

those we are accustomed to see in current English fruit-growing literature.

The application of principles may need slight modification in this country as the work is in the first case written for North America; the main general principles, however, hold good the world over.

CECIL H. HOOPER.

Infant Mortality. By Dr. H. T. Ashby. Pp. x+229. (Cambridge: At the University Press, 1915.) Price 10s. 6d. net.

THE appearance of Dr. Ashby's book is very well timed, for in these days of human wastage it behoves a nation to conserve its resources. It is true that in recent years there has been a slight drop in infant mortality, but it is still disgracefully high, and is largely counterbalanced by a fall in the birth-rate. The word disgraceful is the correct one, because the vast majority of deaths are due to preventable causes, of which the most important is diarrhoea due to bad feeding and especially to bad and infected milk. Dr. Ashby shows that much may be done by the proper instruction of the mothers, but by far the greatest responsibility falls on public bodies and the Government, for it is only they who can deal with the larger questions of hygienic precautions, such as regulations of cleanliness in food depots, and the prevention of fly-borne disease; the call for proper regulation of the milk traffic is an urgent one; the provision of shells is important, but the provision of a healthy race to make and use them is even more pressing. We trust that useful books such as the one under consideration may bear fruit in the proper quarters.

W. D. H.

St. Bartholomew's Hospital in Peace and War. The Rede Lecture, 1915. By Dr. Norman Moore. Pp. 56 (Cambridge: At the University Press, 1915.) Price 2s. net.

WE welcome the publication of this Rede lecture delivered on May 6, 1915, in the Senate House, Cambridge, by Dr. Norman Moore. Such a charmingly written history of a great hospital will appeal to a wide circle of readers. As Dr. Moore says, the history shows "how in a free country such as ours, where everything is not dominated by Government, an ancient institution like St. Bartholomew's Hospital, whether in peace or war, lives with the nation and is in touch with the national life in every period."

Educative Geography. A Note-book for Teachers. By J. L. Haddon. Pp. 76 (London: G. W. Bacon and Co., Ltd., 1915.) Price 1s. net.

It is to be hoped that this little book may secure a wide circulation among teachers of geography in elementary schools and the junior classes of secondary schools. It should convince all who read it that lessons in geography become both more valuable and interesting when they include simple practical exercises to be worked by the children themselves, and that the provision of such work is neither expensive nor unduly troublesome.