The writer has during the past few years propagated several thousand apple trees of many different varieties on their own roots by means of the common whip graft, but cutting off the seedling nurse root after two seasons' growth and replanting those trees which had thrown out roots from the scion, thus establishing the variety on its own roots. Many of these trees have been more or less troubled with the crown gall and hairy root. It has been observed that there is a tendency for a given variety to have only a single form of the disease. Thus the Jewett apple shows usually if not always the hard form of the gall, the Red Astrachan the simple form of the hairy root and the Oldenburg the woolly knot form with many soft fleshy root growths. Other varieties show the broom root form and still others often the aerial form.

In the ordinary method of propagation of apple trees the root systems are of seedling origin and from a pomological viewpoint the root system of every tree is a different variety. May not this be the reason for the various forms of crown gall and hairy root?

Some varieties on their own roots seem to be largely if not entirely immune to this disease. If this proves to be really the case, here may lie the solution of the problem of the prevention of crown gall. If a resistant variety is selected as the root variety, and the variety desired propagated on it, trees immune to the disease may presumably be secured. Probably the economic advantage would warrant the extra effort necessary to propagate such trees, only under conditions where the crown gall was especially troublesome.

There are other root diseases which are injurious, especially through the southern part of the apple belt, that might possibly be avoided in a similar fashion.

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WHEN A FORCE IS A FORCE

Referring to the perennial discussion of the meaning of force and of the law of action and reaction, lately revived in the pages of Science,[1] I venture to suggest that the essential point of the alleged difficulties which have been raised is covered by the following simple propositions:

1. A force is a *push* or a *pull* exerted upon a body (portion of matter) by another body.

2. Whenever a body A pushes or pulls a body B, then at the same time B pushes or pulls A equally in the opposite direction. Such a pair of forces is an "action and reaction." *An action-reaction pair concerns two bodies and only two.*

3. The two forces of an action-reaction pair never balance each other; a force acting on A can not balance a force acting on B.

4. To balance a force acting on B, another force must be applied to B.

One who keeps these simple facts in mind will, I believe, find it easy to decide whether an alleged force is really a force in the meaning of the Newtonian laws. He will also see that there is no contradiction between the statement that forces always occur in action-reaction pairs and the statement that forces are often unbalanced.

L. M. Hoskins
Stanford University,
March 22, 1917

[1] See articles by Gordon S. Fulcher (November 24, 1916), and Andrew H. Patterson (March 16, 1917). Mr. Fulcher's discussion seems to me to be entirely sound.

SCIENTIFIC BOOKS

The Potato. By Arthur W. Gilbert, assisted by Mortier F. Barrus and Daniel Dean. New York, The Macmillan Co., 1917. Pp. i–xii and 1–318, Pl. XVI.

The author states in his preface that the book is intended to give brief and practical suggestions on the growing, breeding and marketing of potatoes, and the subject-matter amply substantiates the statement. This publication, in addition to being up-to-date in its cultural directions, devotes considerably more attention to the subject of potato breeding than any of our preceding American treatises on the potato. Conveniently arranged statistical data are presented in Chapter I. under the caption of Acreage, Distribution, Production and Valuation. Chapter III. em-

bodies the various classification systems which have been advocated by American writers, and, in addition, presents a very conveniently arranged list of varietal names and so far as identified places them in the various classification systems under their group names. This should prove of no little convenience to those interested in the subject.

The three chapters devoted to "Climate, Soils and Rotations," "Manures and Fertilizers," and "Planting," are excellently treated, the suggestions being clear, concise and practical. In the opinion of the writer, the value of the subject-matter in these chapters would have been enhanced by a few well-selected illustrations of potato implements and cultural methods. The discussion of potato diseases and their control is clear and convincing and should prove very helpful to both the farmer and the student. A chapter on "Markets, Marketing and Storage" is both suggestive and helpful, as is also that on the cost of growing potatoes.

As a whole, the book is unique, in that it is strikingly devoid of illustrations, as compared with most of the recently published agricultural text-books. It is a welcome addition to our present text-books on the potato, and should find a place in the classroom of agricultural schools and colleges.

WM. STUART

Health and Disease: Their Determining Factors. By ROGER L. LEE. Little Brown, Co., 1917. $1.75.

This book gives a very pleasing presentation of the factors of health and disease in strictly non-technical language. The author has successfully and very commendably avoided a consideration of the treatment of ailments, and has emphasized throughout the preventive measures which may be performed, or encouraged by the cooperation of the layman. The most reprehensible thing in the book, from the reviewer's view-point, is the title of Chapter XII., "The Air-borne Diseases!" After the struggle that has been, and is being made to disillusion the popular mind of the idea that air is an important conveyor of disease, it is a misfortune to use this phrase in any sense. The author goes to some pains to explain that he includes under this term chiefly "droplet" or mouth-spray infection, but the use of "air-borne" throughout the book is bound to nourish the age-old fallacy.

The first nine chapters consider chiefly matters of personal hygiene, the next nine, communicable diseases, and the last six, matters of general sanitation. The sequence and point-of-view throughout are good. Specially to be commended are the chapters on Alcohol, Tobacco and the Habit-forming Drugs and on the Venereal Diseases and Sex Hygiene.

There are a good many minor criticisms which might be made, as, for example, the loose use of the term antitoxin on page 173, speaking of the "*Spirochæta pallida*" instead of *Treponema pallida,* the sentence "'Red flap' is caused by a ringworm which is really a vegetable bacterium" (p. 243), and the statement that "tubercle bacilli are only present in milk when there is tuberculous disease of the udder" (p. 306).

The book contains 378 pages, is printed on rough paper in good print and is amply indexed. There are no cuts or diagrams in the book and no specific references are given. It is to be most cordially recommended to the lay reader and might find a useful place as a text in a general elementary college course in hygiene and sanitation, and should certainly be on the desk of every teacher of biology and hygiene.

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SPECIAL ARTICLES

A NOTE ON THE EFFECT OF ASPHYXIA AND AFFERENT STIMULATION ON ADRENAL SECRETION

RECENT observers have expressed some doubt as to the effect of asphyxia and afferent stimulation on the secretion of the adrenal glands. Under the circumstances it is desirable to have simple methods which any one may use to demonstrate the effect. During the past few months, with the aid of Mr. H. F. Pierce, I have devised such methods.

If both carotid arteries, both subclavian arteries and the aorta just anterior to the inferior mesenteric artery are tied, and the