

Shōkābo, Nihonbashi, Tokyo, June, 1917, 3.50 yen.

Dr. T. Miyake, of the Imperial Agricultural Experiment Station at Nishigahara, Tokyo, has just brought out an excellent book which will serve as the first part of a handbook of entomology. It is beautifully printed in Japanese, fully illustrated, and handsomely bound. It deals with the morphology, physiology and embryology of insects, a field to which, the author states, Japanese entomologists have hitherto made very few contributions. The book is therefore largely a compilation, though here and there the researches of Japanese entomologists are quoted. The work is a pioneer of its kind, and the most detailed book that has ever appeared in Japan. It covers 347 pages and contains 227 figures. The majority of the figures are borrowed from German, American, English and other writers, and are fully credited. Some of the line drawings are apparently original and are very well done.

Dr. Miyake proposes, in his second volume, to publish a brief history of entomology in Japan. He expects to publish four volumes in all, the entire work to be used as a text-book for colleges and universities. It is a pity that European and American entomologists have such a slight knowledge of the Japanese language, for the book has a very attractive appearance and many would like to consult it.

L. O. HOWARD

HERB-GROWING IN THE BRITISH EMPIRE

The British Medical Journal states that at the meeting of the Royal Society of Arts on May 2nd Mr. J. C. Shenstone, F.L.S., read a paper on herb-growing in the British empire. At the present time, he said, herbal remedies occupied a more important place in the medical and domestic practise in most European countries than they did with us. When the war broke out the discovery was made that we had become dependent upon the Central Empires not only for synthetic chemicals, but for the supply of herbal medicines formerly grown by us. Some of these plants, such as belladonna, henbane, foxglove, colchicum, and per-

haps valerian and male fern, were indispensable, but although they had belonged to our native flora, or at least had been cultivated in this country from very early times, their cultivation had fallen into neglect. The same was true of less valuable plants such as the dandelion, poppy capsules, and camomile flowers. As to belladonna and henbane, it was pretty certain that their alkaloidal value could be raised considerably without increasing the cost of production, but for this purpose the cooperation of the chemist would be required. It has also been stated that the wild foxglove of this country could supply the market for digitalis. A medical friend who collected his own digitalis and prepared his own tincture had told him that he found that foxglove growing on a hot sandy bank protected by a wood gave him the best results. Experiments in producing the most active dandelion juice would be worth consideration. Liquorice, most of which came from Spain and Italy, could be cultivated in Essex and Surry, and was already grown in Yorkshire. Many valuable drugs imported from the American continent were not unsuited to our climate; *Podophyllum peltatum*, Linn., imported from America, had figured in our garden catalogues as a decorative plant. He begged medical men to give some attention, in conjunction with pharmacists and botanists, to investigating likely plants, for there could be no doubt that the varied and numerous flora of the British Empire would yield medicines of even greater value than those imported from foreign countries. Sir Robert Armstrong-Jones, who occupied the chair, said that there were eighty or one hundred medicinal herbs and plants of medicinal value; Mr. Shenstone had referred to about forty of them, but the remainder could also be grown practically within our empire. There were many reasons for the decay in the use of the medicinal herbs, but the chief was the insinuating tablet. If herb-growing were taken in hand, it should be done at once, for belladonna only paid in the second year and aconite in the third. He understood that the shortage of digitalis had now been just

overcome. Sir George Savage referred to the great amount of interest he found in the old herbals in his possession, although some of them were difficult to follow. He had spent four years in a very wide country practise in Cumberland, and he recalled his indebtedness to a man who made a great many of the simpler remedies from dandelions and other plants, and saved a great deal of trouble. British bed-straw was a useful herb; in the *British Medical Journal* of forty years ago he found a note on its efficacy in certain cases. He concluded by quoting a remark of Rousseau to the effect that the field of botany had not been studied by scientists, but had been exploited by medical men who wished the public to have faith in their simples.

SPECIAL ARTICLES

THE CHEMICAL BASIS OF REGENERATION AND GEOTROPISM

1. It is a well-known fact that in many plants after the removal of the apex some restoration of the old form is accomplished by the growth of a hitherto dormant bud near the wound. This process has been called regeneration. It is also well known that in certain fir trees the old form is restored in such a case in an apparently different way, namely by one or more of the horizontal branches next to the apex beginning to grow vertically upwards (negative geotropism). One may wonder how it can happen that the same result, namely the restoration of the old form, is accomplished in the organic world in such different ways; and it is quite natural that occurrences of this kind should suggest to one not a mechanist the conception of mystic forces acting inside or outside the living organism towards a definite purpose, in this case the restoration of the lost apex. The writer pointed out not long ago that both phenomena, the restoration of form of a mutilated organism by geotropic bending as well as by the growing out of hitherto dormant buds may be caused by one and the same agency; namely the collection of certain chemical substances near the wound.¹ New experiments which the writer

has since made seem to prove this idea to be correct.

2. In a previous paper the writer had shown that when an isolated piece of stem of *Bryophyllum calycinum*, from 10 to 15 cm. long, with one leaf attached to its apical end, is put in a horizontal position the stem will gradually bend and assume the shape of a U, with the concave side upwards and that this bending is due to the active growth of a certain layer of cells in the cortex on the lower side of the stem. When the same experiment is made with stems without a leaf attached some geotropic bending of the stem still occurs, but at a much slower rate. From this observation the writer drew the conclusion that the leaf furnishes material to the stem which causes the growth of the cortex of the lower side of the stem, resulting in the subsequent geotropic bending of the stem.² The leaf forces this material into that part of the stem which is situated more basally than the leaf; since the part of the stem situated in front of a leaf does as a rule not show any geotropic bending. The fact that the growth leading to the geotropic curvature takes place in the cells of the lower side of a horizontally placed stem indicates that the material causing the growth collects on the lower side of the stem, which appears quite natural, since this material is a liquid, possibly containing some solid particles in suspension. A slight leakage of sap from the conducting vessels might be sufficient to account for such an accumulation of material on the under side of a horizontally placed stem.

3. Since the publication of these observations on geotropism in *Bryophyllum* the writer has been able to show that the mass of shoots which an isolated leaf can produce from its notches is a function of the mass of the leaf and that sister leaves of equal size when isolated from the stem produce equal masses of shoots under equal conditions and in equal time, even if the number of shoots produced differs considerably in the two leaves. When *sette*, 1917, LXIII., 25; "The Organism as a Whole," New York, 1916, p. 153.

¹ Loeb, J., *SCIENCE*, 1916, XLIV., 210; *Bot. Ga-*

² *Loc. cit.*