

and villages at intervals of a few miles all round the coast. As these gentlemen are strangers to us, I should be very glad to hear from any persons living near the coast who would be willing to receive from us a copy of the schedule and a statement of our preliminary needs. The services which we ask of observers round the coast do not involve any serious trouble, and, of course, no expenses will fall upon those who are willing to assist us.

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### POPULAR NATURAL HISTORY.<sup>1</sup>

(1) MR. SWANTON'S work on plant galls will be welcomed by a wide circle of readers, since it appeals to both the botanist and entomologist. In it the former will find a ready

cover the whole ground the author has included growths which can scarcely be regarded as galls in the accepted sense. Thus the "Reed Mace" fungus (*Epichloe typhina*) is a mere mass of mycelium outside the plant, there being no hypertrophy of the tissues. It should also be noted that the galls on alder roots are caused, not by *Frankiella alni*, but, as Miss Pratt has shown, by the bacterium *Pseudomonas radicola*, though the growths may afterwards become infested by the hyphomycete. Bottomley has shown that the similar "galls" on the roots of bog myrtle are produced by the same bacterium.

The work is illustrated by thirty-two plates, of which sixteen are reproductions of excellent colour drawings by Miss M. K. Spittal, and there are also more than thirty text figures.



A male spider near the edge of a web in which the female is at the centre. From "Spiderland."

means of identifying the gall-producers which claim his attention, whilst the latter will value the interesting details of insect life-histories. Descriptions are arranged under the headings of gall-producing insects, and chapters are also devoted to growths produced by mites, nematodes, and fungi. The remaining half of the work is occupied by a very complete catalogue of British plant galls, botanically arranged. In the endeavour to

The author is to be congratulated on a work of great utility and general excellence.

(2) To the majority of the human race spiders are repulsive creatures. They are for the most part devoid of that beauty of form and colour which often ensures a favourable reception to other members of the so-called lower creation. He would, however, be a soulless person who, after reading Mr. Ellis's work, did not regard spiders with respect if not with admiration. As shedding an interesting light on the struggle for existence it is worthy of note that some spiders which resemble ants lay but three or four eggs, whilst less defended orb weavers may lay twelve hundred.

We hesitate to cast a doubt on the wonderful reasoning powers, and especially on the great maternal affection, which the author sees so con-

<sup>1</sup> (1) "British Plant-galls." A Classified Text-book of Cecidology. By E. W. Swanton. With Introduction by Sir Jonathan Hutchinson, F.R.S., and sixteen coloured plates by Mary K. Spittal. Pp. xv+287. (London: Methuen and Co., Ltd., n.d.) Price 7s. 6d. net.

(2) "Spiderland." By R. A. Ellis. With Photographs and Drawings by the Author. Pp. xxii+193. (London: Cassell and Co., Ltd., 1912.) Price 3s. 6d. net.

(3) "Elementary Entomology." By E. Dwight Sanderson and Prof. C. F. Jackson. Pp. vii+372. (Boston and London: Ginn and Co., n.d.) Price 8s. 6d.

(4) "Butterflies and Moths at Home and Abroad." By H. Rowland Brown. Pp. 271+21 full-page plates. (London: T. Fisher Unwin, 1912.) Price 7s. 6d. net.

stantly exhibited by his subjects, but we confess that our faith in these attributes is of the weakest. The female Lycosid may carry her own young, but she will also carry any other young family indiscriminately, and the author refrains from telling us that *Atypus affinis* will devour her own brood should they unduly delay their departure from the parental abode. The elaborate nest once begun by *Agelena* will be carefully completed and guarded, whether the eggs are removed or not. Mr. Ellis tells us that his book is primarily intended for young folk, but it will undoubtedly be of interest both to the naturalist and the general reader.

(3) In this work the authors have provided a text-book for beginners undertaking a course of elementary entomology. The book is divided into three sections, the structure and growth of insects, descriptions of species typical of the orders, and a section containing a series of laboratory exercises, together with a key to the orders and information concerning the apparatus and methods employed in collecting and preserving. We have rarely seen a work in which so large an amount of information is compressed into so small a space, and the text is well and profusely illustrated. Such errors as we have found are but few, and detract little from the general usefulness of the work. The statement that the mouth parts of Lepidoptera are so formed as to preclude injury to vegetation is scarcely correct, since at least two African Noctuids do no small damage to peaches by piercing the skin and sucking the juices, whilst the Australian *Ophideres fullonica* attacks oranges, and, as pointed out by Francis Darwin many years ago, has the proboscis specially modified in adaptation to its habits. The statement that all moths are night flyers seems to require some modification.

So long as there is no universally accepted classification of the Insecta we must refrain from too great comment on this portion of the work, though we think it would have been better to point out the sexual differences in the tarsi of the Nymphalidæ and Lycænidæ, and the Erycinidæ should find a place in even a condensed table. Compared with the general utility of the work these are, however, but small matters, and will doubtless be amended in a second edition, which we fully expect will soon be required.

(4) The author of this work has drawn upon his wide and lengthy experience of collecting to provide an extremely pleasant and readable account of a selection of European Lepidoptera. We confess to a feeling of satisfaction that the work tends to lead the young lepidopterist away from the narrow insularity so long and painfully associated with the old-fashioned British collector. The inflated value often placed on British examples of species which may be pests on the Continent is essentially unscientific. For the collector who can extend his field to the Continent Mr. Rowland-Brown's work provides just the information which will awaken and maintain a healthy interest in the subject.

In criticising the coloured plates one must bear in mind the low cost of the volume, and if the figures are not always typical of the best in lithographic art they are at least free from that crudeness of execution which is not always absent from many more costly productions. Whilst we find no fault with the work itself we trust the author's well-known talents, both as a writer and a naturalist, will soon find expression in a volume of a more advanced type.

#### NATURAL AND SYNTHETIC RUBBER.

UNDER the above title an interesting address was delivered by Dr. F. Mollwo Perkin before the Society of Arts on December 11. After briefly reviewing the history of the development of the indiarubber industry and the nature of the processes used in extracting the natural product and in vulcanisation, an account was given of the recent synthetic processes by which the manufacture of artificial rubber on the large scale has become a commercial possibility. In the process of the Synthetic Products Co. isoprene is made from fusel oil, which is fractionated so as to give isoamyl alcohol,  $\text{CH}(\text{CH}_3)_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{OH}$ , which is converted into the chloride,  $\text{CH}(\text{CH}_3)_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{Cl}$  by the action of hydrochloric acid and then into the dichloride  $\text{C}(\text{CH}_3)_2 \text{Cl} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{Cl}$  by the action of chlorine, under specially controlled conditions; the dichloride obtained is passed through a tube heated at  $470^\circ$  and filled with soda-lime, whereby it is converted into isoprene, which can be polymerised to rubber by means of small quantities of sodium.

The only difficulty in the way of this process is the cost of the raw product, amyl alcohol, which is about 140l. per ton. On this account, Prof. W. H. Perkin, with E. H. Strange, F. E. Matthews, and Prof. Fernbach, devised a process for obtaining butyl alcohol cheaply, from which butadiene could be obtained. By the employment of a certain organism, it was found possible to ferment starch, and, more recently, sawdust, so as to obtain butyl alcohol and acetone, the latter being sold, thus cheapening the cost of the butyl alcohol. The butyl alcohol is chlorinated in the same way as the isoamyl alcohol, and by similar treatment with soda lime yields butadiene,  $\text{CH}_2 \cdot \text{CH} \cdot \text{CH} \cdot \text{CH}_2$ , which on polymerisation gives a rubber which, although not chemically identical with the polymerised isoprene, has all the properties of natural rubber in regard to elasticity and behaviour towards sulphur on vulcanisation.

An account was also given in the lecture of the processes devised by the firm of Friedrich Bayer, of Elberfeld, and of the interesting fact discovered by Prof. Harries that the presence of a small quantity of rubber ozonide very much increases the rapidity of polymerisation of isoprene and its derivatives.

In discussing the question of the competition of natural and synthetic rubber, it is pointed out that "at present prices and with the present supply and demand there is no reason, provided synthetic