formed fish which passes into a beak at *e*; but this fish forms the body of a cock (there is also a fish in the body of each cock in Fig. 1); *f* is its beak with an oval in front of it, behind it is an eye which touches the crest, or cockscomb, which itself terminates in a fish's tail *g*. Between this and the corresponding figure are two degenerate cocks rampant, their feet are united, the long falciform beaks directed upward and the tails downward, the latter being connected by a pair of small ellipsoids. Decorated fish-skin garments, worn only by women, illustrate nearly all the forms of cock and fish ornaments, and numerous hybrids besides. The body of a cock is often shaped like a fish, and frequently has another fish enclosed within it; there are also numerous, rather complicated, ornamental arrangements, which are built up of spirals, trigrams, leaves, conventionalised fishes, and elements of the cock ornaments. Those who take the trouble to study Mr. Laufer's memoir with the care it deserves will satisfy themselves that the figures will bear these interpretations, which, after all, it must be remembered, are the explanations that the natives gave to him.

According to our author, no other explanation of the predominance of the cock and fish in the decorative art of the Amur tribes can be found than that these

FIGS. 3 and 4.—Decoration in red and light green on the rim of the cover of a lacquered tobacco box.

particular animals have an extremely ornamental character because of the great permutations of their graceful motions, and they thus lend themselves admirably to the spirit which strives after beauty of form. There is no chronological sequence in the stages of development; the single phases of development are merely various forms of different kinds of adaptation to certain spaces or to given geometrical forms, mostly spiral. The spiral, in his opinion, is not the final result of the gradual conventionalisation of realistic images, but is employed for the symbolic expression of the most varied things, since its forms are so convenient for this particular purpose. The same applies to the triskele; an entire cock is never represented by a purely geometrical triskele; the triskele plays an active *rôle* in indicating single parts of the body, but not for the whole creature. As an independent element, having a definite meaning, the triskele never occurs.

Mr. Laufer insists it should not be imagined that the representations of animal life continued to lose more and more of their original forms, and gradually shrunk into geometrical devices. On the contrary, the multifarious kinds of conventionalisation have their final cause, last but not least, in a faithful observation of nature, especially in that ability to watch motions which is so highly developed in the East Asiatic mind. The conception of a fish in the form of a spiral is based, he contends, on a true observation of that animal in its natural state; it would never have been drawn in spiral form, never have clung to a spiral, without a foundation of fact. This very capacity of the fish for motion, together with the highly cultivated power of the people to observe its motions, formed the reason for its adoption in ornamentation. The same remark holds good for the cock. It is doubtful whether this view of the author's will appeal to all of his readers; the idea that the bulk of the ornamentation of a group of people is based mainly upon conceptions of motion is certainly new. Whatever diversity of opinion there may be on minor points, there can be none as to the value and excellence of Mr. Laufer's work. It is no exaggeration to say that this is the most minute and thorough study we possess of the decorative art of an uncivilised people.

ALFRED C. HADDON.

FLORA OF THE GALAPAGOS ISLANDS.[1]

IT is now more than half a century since Sir Joseph Hooker published his famous essay on the flora of this archipelago, founded mainly on the collections made by Charles Darwin. Since then, until within the last decade, little had been done towards a more complete investigation of this highly interesting flora and fauna. It is to various American expeditions that we are indebted for a more complete knowledge. The late Dr. G. Baur was foremost in this work, and his collections and theories were briefly discussed in NATURE (lii., 1895, p. 623). Baur boldly promulgated the theory of subsidence, in opposition to upheaval, in accounting for the origin of the islands, basing it upon biological evidence. Dr. Robinson, the author of the essay under consideration, and Mr. J. M. Greenman, his collaborator, in working out Baur's botanical collections were almost converted to Baur's theory. In the present work Dr. Robinson practically recants, and attempts to demonstrate that the composition of the flora favours the assumption that it is derived rather than original. I will first give some particulars of the general composition of the flora, limiting them, however, to the vascular plants.

Unfortunately for purposes of comparison, Robinson's enumeration and tabulation of the plants include all that were found growing in the islands, amongst them *Brassica campestris, B. Sinapistrum, Raphanus*

[1] "Flora of the Galapagos Islands." By B. L. Robinson. *Proceedings* of the American Academy of Arts and Sciences, xxxviii. (1902). Pp. 77-270 with three plates.

sativus, and a number of others which might have been eliminated as certainly introduced, and placed in a separate list. As it is, without considerable labour, one can only distinguish two elements, namely, the endemic and the non-endemic, the latter comprising both indigenous and certainly introduced species. It is further complicated by the fact that "undetermined species," "varieties," and "forms" are all tabulated equally, and the percentages of the constituents of the flora are calculated from mixed totals.

For instance, the percentage of endemic species of flowering plants is obtained from a total which includes fifty "undetermined species," some of which, one would suppose, are also endemic. On the other hand, fifteen "varieties" and nineteen "forms" are included in the calculation, by which the endemic element is made out to be 44·4 per cent. This Dr. Robinson designates an "extraordinary endemic element"; but, as compared with some other islands and continental areas, it is low. In the Hawaiian Islands it has been placed at 81·4, in Juan Fernandez at 68·6, in St. Helena at 61·3, in West Australia at 85, and in Central America, including Mexico, at 70 per cent. This is the specific endemic element. According to the now generally accepted generic limits, there is almost no generic peculiarity in the flora of the Galapagos. Scalesia (Compositæ), which is as well defined as many other genera of this order, is confined to the archipelago, where it is represented by seventeen described species, most of them inhabiting only one island. This peculiarity, specially characteristic of the Galapagos flora, is shared by several other leading genera, amongst them Castela, Euphorbia, Croton, Acalypha, Opuntia and Borreria. On the other hand, there are some species peculiar to the archipelago but represented in nearly all the islands. *Telanthera echinocephala* (Amarantaceæ), *Oxalis Cornelli*, *Maytenus obovata* (Celastraceæ), and *Cordia lutea* (Boraginaceæ) are conspicuous examples.

But I must not attempt to summarise the whole of Dr. Robinson's work. Briefly, he enumerates 500 named species of vascular plants, of which fifty-two are ferns, only three of which are confined to the islands. The 205 endemic species of vascular plants include members of thirty-nine natural orders. The orders most numerously represented by endemic species are Compositæ, 39; Amarantaceæ, 29; Euphorbiaceæ, 25, besides 7 endemic varieties and 7 endemic forms; Rubiaceæ, 16; Gramineæ, 13; and Boraginaceæ, 14, giving a total of 136, or two-thirds of the whole, contributed by six orders. Against this there are seventeen other orders, limited to one endemic species each. But the Cactaceæ, the species of which are still badly defined, are much more prominent and generally dispersed than some of those much more numerous in species. Members of the Cactaceæ are recorded from all of the islands except Gardner, but including the small and remote Tower, Wenman, and Culpepper Islands. The Leguminosæ, counting only six endemic species, are also very prominent in the arboreous element, from the presence of the genera Acacia, Cassia, Mimosa and Parkinsonia. *Astragalus Edmonstonei* is a noteworthy outlier of this genus, not found by any recent collector. The presence of four species of the Loranthaceæ is another interesting fact.

The affinities of the flora of the Galapagos Islands are wholly American, for the very few exceptional species may be accidental introductions. In composition it differs from that of the smaller flora of Juan Fernandez in having almost no generic endemic element, and in the specific endemic element being furnished by relatively numerous natural orders. From the flora of the Hawaiian Islands it also differs in being much less highly specialised. There are no tree-ferns, no gymnosperms, and, with the exception of grasses and sedges, of which there are 52 and 25 species respectively, monocotyledons are very poorly represented. There is one orchid, *Epidendrum spicatum*, one bromeliad, *Tillandsia insularis*, and *Commelina nudiflora*, a very widely dispersed weed in warm regions, and *Hypoxis decumbens* complete the petaloid series. The aquatic genera Potamogeton, Ruppia, Naias, and Lemna rest on single records of American collectors.

Dr. Robinson concludes his essay with an examination of the "botanical evidence regarding the origin of the Galapagos Islands." After a brief examination of the evidence in favour of the opposed theories of submergence and emergence, he says:—"During a re-examination of the whole vascular flora of the islands, I have sought further light upon this question, and now find the peculiar distribution of the plants less difficult to account for on the emergence theory than it seemed when the Baur plants were studied some years ago." I should like to discuss this "new light" briefly in a separate communication, and will merely remark here that all the proved means of dispersal of the seeds of plants to long distances are insufficient, to my mind, to account for certain insular floras generally regarded as derived rather than as residues.

W. BOTTING HEMSLEY.

A NEW NATURAL HISTORY.[1]

THE increased interest in zoology certainly existing at the present time is one of the causes which has induced Prof. Davis to attempt a natural history written on lines totally different from those usually followed in works of this kind. In place of treating the various animal groups in more or less full detail according to their presumed relationship to one another, it is proposed to consider them in relation to their environment, and to lay special stress on the interdependence of animals and plants, and the bearing upon life of chemical and physical conditions. Such a mode of treatment undoubtedly has great possibilities before it, and is one which should do good by drawing attention to our lack of knowledge as to the reason of many of the structural peculiarities of animals. It is, indeed, one of the reproaches that may be legitimately brought against our present methods of zoological study that we attach far too much importance to describing and recording minute differences between closely allied animals to the utter neglect of the study of their life-history. Whether the author will be successful in this mode of treatment we cannot at present even conjecture, for the two sections of the work now before us are devoted to a brief systematic survey of the leading groups of the animal kingdom, which must form a necessary introduction to its proper subject. These two sections may, indeed, be regarded as a kind of "index-museum" to the rest of the work. They are important as serving to show that from no point of view can systematic zoology be neglected, and also that the issue of a work like the present in no wise renders the older type of natural history superfluous. There is ample room for both, and neither poaches on the preserves of its fellow.

As a whole, the author's treatment of the systematic part of his subject may be regarded as fairly successful, and the volume before us is rendered highly attractive to the general reader by the beauty of its coloured plates and other illustrations. Where all are excellent it is difficult to select any for special commendation,

[1] "The Natural History of Animals; the Animal Life of the World in its various Aspects and Relations." By J. R. A. Davis. Half-vols. i. and ii. Pp. xxxii+429; illustrated. (London: Gresham Publishing Co., 1903.)