

with, and how far they contradict, the main facts of the distribution of plants. It seems evident that the various modes of glacial action have produced much more effect on the migrations of plants than on those of animals, and also that plants have, on the whole, more varied and more effectual means of dispersal. Still, if the views here advocated are true, the flora of each region should exhibit a characteristic substratum of indigenous forms, though often much modified, and sometimes nearly overwhelmed by successive streams of foreign invasion.

My object in calling attention to the subject by this very partial review of it, is to induce those Naturalists, who are working at particular groups, to give more special attention to geographical distribution than has hitherto been done. By carefully working out the distribution of allied genera and closely connected groups of species, they could give the amount of agreement or discrepancy with other groups the geography of which is best known, and furnish us with such information on the habits of the species, as might help to explain the anomalies which are found to occur. We should thus soon accumulate a sufficiency of detailed facts to enable us to determine whether these are the best primary divisions of the earth into terrestrial Zoological and Botanical regions, or whether such general divisions are altogether impracticable. Some such simple classification of regions is wanted to enable us readily to exhibit broad results, and to show at a glance the external relations of local faunas and floras. And if we go more into detail and adopt a larger number of primary divisions, we shall not only lose many of these advantages, but shall probably find insuperable difficulties in harmonizing the conflicting distribution of the different groups of organized beings.

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XX.—NOTE ON THE REPLACEMENT OF SPECIES IN THE COLONIES AND ELSEWHERE. By J. D. Hooker, M.D., F.R.S., &c.

AMONG the most interesting phenomena connected with the distribution of plants, are those that concern the rapidity with which some species of one country will, when introduced into another, rapidly displace the aborigines and replace them. The Cardoon in the Argentine provinces is one conspicuous example, the *Anacharis* in our own

rivers is another, but neither of these cases is more remarkable than some that our Colonies present. In Australia and New Zealand, for instance, the noisy train of English emigration is not more surely doing its work, than the stealthy tide of English weeds, which are creeping over the surface of the waste, cultivated and virgin soil, in annually increasing numbers of genera, species and individuals. Apropos of this subject, a correspondent, W. T. Locke Travers, Esq., F.L.S., a most active New Zealand botanist, writing from Canterbury, says, "You would be surprised at the rapid spread of European and other foreign plants in this country. All along the sides of the main lines of road through the plains, a *Polygonum (aviculare)*, called "Cow Grass," grows most luxuriantly, the roots sometimes two feet in depth, and the plants spreading over an area from four to five feet in diameter. The dock (*Rumex obtusifolius* or *R. crispus*) is to be found in every river bed, extending into the valleys of the mountain rivers, until these become mere torrents. The Sow-thistle\* is spread all over the country, growing luxuriantly nearly up to 6000 feet. The water-cress increases in our still rivers to such an extent, as to threaten to choke them altogether: in fact, in the Avon, a still deep stream running through Christ-Church, the annual cost of keeping the river free for boat navigation and for purposes of drainage, exceeds £300. I have measured stems twelve feet long and three-quarters of an inch in diameter. In some of the mountain districts, where the soil is loose, the white clover is completely displacing the native grasses, forming a close sward. Foreign trees are also very luxuriant in growth. The gum-trees of Australia, the poplars and willows, particularly, grow most rapidly. In fact, the young native vegetation appears to shrink from competition with these more vigorous intruders."

I have urged upon various Colonial correspondents the great importance of systematically collecting and recording facts upon this curious subject, but hitherto without success. The same spirit which prompts us to subscribe more for the heathen of Africa than of St. Giles, seems to animate the collectors in our Colonies, and yet this department of botany is most interesting and important. Directly, every problem of the geographical distribution of plants is interfered with by these intruders, and, indirectly, the zoology of the Colonies

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\* *Sonchus arvensis* is wild in New Zealand, and was eaten by the aborigines; but the cultivated form is far more abundant than the aboriginal.

is even more materially affected. Hitherto, but one author has had the boldness to inquire into the rationale of this "replacement;" to grapple with the startling fact that plants are thus proved to be located by nature, not necessarily under the conditions best suited to their development; and this is Mr. Darwin. This great naturalist informs me that he believes that the facts hitherto observed favour the supposition, that in the struggle for life between the denizens of the Old continents and the New, the former are prepotent; and he attributes this to the longer period they have been engaged in strife, and consequent vigour they have acquired. European weeds have established themselves abundantly in America and Australia, but comparatively very few plants of these countries have become weeds in England. We may hence infer why it is that the indigenous vegetations of St. Helena and Madeira show no tendency to increase, whilst European and African trees, shrubs and herbs are rapidly covering those islands.

On the other hand, there are many reasons why a whole population of Old World plants should become established in the New World and in the Colonies, before any symptoms of a return emigration can be detected. The export of garden and field-crop seeds, as well as of European animals and merchandise, favours the rapid introduction of emigrant plants into the Colonies, but there is no such import of materials to Europe; it is also to be observed, that the processes of agriculture, conducted through many centuries, have resulted in a European population of sturdy weeds (the tramps of our Flora), and that there can be nothing of the kind in the Colonies, till these are as long cultivated by ourselves or others. It is therefore conceivable that, had New Zealand been cultivated for a thousand years, there might have resulted races of its native Dock, Speedwells, *Polygona*, &c., &c., which would, on being introduced into England, displace some of those very Docks and *Polygona* now establishing themselves in New Zealand; and that something of this sort is going on may be argued from the rapidity with which the *Impatiens fulva*, *Galinsoga*, *Erigeron Canadense*, *Claytonia perfoliata* and other American plants are spreading in Europe, of which some are *bona-fide* weeds with us, and may perhaps at a future period be re-introduced into America as more intrusive forms of the species than that continent now possesses. So too, I am given to understand, various Australian *Acaciæ*, *Eucalypti* and other *Myrtaceæ* are established and spreading spontaneously in the peninsula of India;

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slowly, so that settlers, knowing its utility, have carried it in boxes and bottles to their new inland stations."

It must be long before facts enough to theorize upon can be collected. Meanwhile, the inquiry appears to be perhaps the most interesting and important in all Biology, and as such it is most earnestly to be desired that all who are favourably circumstanced to pursue it, will do so both systematically and very carefully.

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XXI.—ON THE DEVELOPMENT OF THE CRANIUM IN THE VERTEBRATA. By Prof. H. Rathke.\*

[Concluded from Vol. III. p. 251.]

IN my 'Development of *Blennius viviparus*' (Abh. z. Bildungs-und Entwickelungs-geschichte § 22) I have stated that the sheath of the cephalic part of the notochord (or, to speak more correctly, the investing mass thereof) divides itself into three successive portions. This error probably arose from the circumstance that so minute an object, if it be not kept sufficiently moist under the microscope, dries rapidly, and that its central part breaks up into two or three portions, so as to give rise to the appearance of articulation.

Perhaps in no fish does the bony plate referred to above, which I regard as the representative of the presphenoid of higher animals, attain so large a relative size as in the Sturgeons. In these it extends far back, so as to cover, not merely the chondrified investing mass of the notochord, but also the bodies of the four or five anterior vertebræ. If we consider this bone (which arises, not by the modification and higher development of a portion of the chondrified investing mass of the cephalic part of the notochord, but independently of it) in different animals we observe that it is but little governed by the investing mass and the bones which arise therefrom, for it extends sometimes for a greater, sometimes for a less distance backwards, and assumes, in comparison to the investing mass, a very various breadth and form. It may be added that, in the Sturgeon, the bodies of the most anterior vertebræ are not, as Joh. Müller states, divided below, and their lateral halves separated, by the bony plate in question; but it is the ribs of the anterior vertebræ, together with a corresponding number of small pieces of cartilage to which they are attached,

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\* Translated from the original Memoir published at Königsberg, in 1839. See Nat. Hist. Rev. 1863, p. 234.