

different constitutions. Were we to remove the whole flora and fauna of a country to a distant region, or, what comes to the same thing, change the external conditions of that flora and fauna, as to climate, physical influences, natural enemies, or other causes of destruction, means of protection, &c., we should now be taught to expect that some of the individual races would at once perish; others, more or less affected, might continue through several generations, but with decreasing vigour, and, in the course of years or ages, gradually die out, to be replaced by more vigorous neighbours or invaders; others again might see amongst their numerous and ever-varying offspring some few slightly modified, so as to be better suited for the new order of things; and experience has repeatedly shown that the change once begun may go on increasing through successive generations and a permanent representative species is formed, and some few races may find themselves quite as happy and vigorous under their new circumstances as under the old, and may go on as before, unchanged and unchanging.

Taking into consideration the new lights that have been thrown upon these subjects by the above investigations and by the numerous observations called forth by the development of the great Darwinian theories, amongst which I may include a few points adverted to in a paper on *Cassia* which I laid before you last year, it appears to me that in plants, at least, we may almost watch, as it were, the process of specific change actually going on, or at least we may observe different races now living in different stages of progress, from the slight local variation to the distinct species and genus. As a first step we may take, for instance, those races which are regarded by the majority of botanists as very variable species, such as *Rubus fruticosus*, *Rosa canina*, *Zornia diphylla*, *Cassia mimosoides*, &c.: we shall find in each some one form, which we call typical, generally prevalent over the greater part of the area of the race, whilst others more or less aberrant are more or less restricted to particular localities, the same varieties not occurring in disconnected stations with precisely the same combinations of character; and in the same proportions local and representative varieties and sub-species are being formed, but have not yet obtained sufficient advantages to prevent their being kept in check by their inter-communication (and probable cross-breeding) with their more robust type. The British rubologist or rhodologist transported to the south of France or to Hungary will still find one, or perhaps two or three, forms of bramble and dog-rose with which he is familiar; but if he wishes to discriminate the thirty or forty varieties or sub-species upon which he had spent so much labour and acuteness at home, he will find that he must recommence with a series of forms and combinations of characters quite new to him. The species is still the same; the varieties are changed. As examples of what we may call a second stage in the formation of species, we may adduce such plants as *Pelargonium australe* or *grosularioides* and *Nicotiana suaveolens* or *angustifolia*, to which I alluded in the above-mentioned paper on *Cassia*. Here we have one race, of no higher than specific grade in the ordinary acceptance of the term, inhabiting two countries which have long been widely discovered (in the one case South Africa and Australia, in the other Chili and Australia), which, if originally introduced by accident from one country to the other, have been so at a time so remote as thoroughly to have acquired an indigenous character in both; in both are they widely spread and highly diversified, but amongst all their varieties one form only is identical in the two countries (*Pelargonium australe*, var. *erodioides*, and *P. grosularioides*, var. *anceps*; *Nicotiana suaveolens*, var. *angustifolia*, and *N. angustifolia*, var. *acuminata*), and that so comparatively a rare one that it may be regarded as being in the course of extinction; whilst all other varieties, some of them very numerous in individuals over extended areas, and all connected by nice gradations, diverge nevertheless in the two countries in different directions and with different combinations of characters, no two of them growing in the two countries being at all connected but through the medium of that one which is still common to both. When that shall have expired the distinct species may be considered as established. A still further advance in specific change is exemplified in *Cassia* itself, in which I have shown that no less than eight or nine different modifications of type, sectional and sub-sectional, are common to South America, tropical Africa, and Australia, but without any specific or, at least, sub-specific identity, except perhaps in a few cases where a more modern interchange may be presumed. The original common specific types are extinct, the species have risen into sections. Common types of a still higher order have disappeared in the case of Proteaceæ,

an order so perfectly natural and so clearly defined that we cannot refrain from speculating on the community of origin of the African and of the Australian races, both exceedingly numerous and reducible to definite groups—large and small well-marked genera in both countries, and yet not a single genus common to the two; not only the species, but the genera themselves, have become geographical. As in the varieties of *Pelargonium* and *Nicotiana*, so in that of the species of *Cassia* and of the genera of Proteaceæ, it is not to be denied that precisely similar modifications of character are observed in the two countries; but these modifications are differently combined, the changes in the organs are differently correlated. In Asiatico-African *Chamaecristis* a tendency to a particular change in the venation of the leaflet is accompanied by a certain change in the petiolar gland; in America the same change in the gland is correlated with a different alteration in the venation. In Australian Proteaceæ the glands of the torus are constantly deficient, with a certain inflorescence (cones with imbricate scales), which is always accompanied by them in Africa.

In selecting the above instances for illustration of what we may, without much strain upon the imagination, suppose to be cases of progressive change in races, it is not that they are isolated cases or exceptionally appropriate; for innumerable similar ones might be adduced. In the course of the detailed examination I have had successively to make of the floras of Europe, N.W. America, tropical America, tropical Africa, China, and Australia, I have everywhere observed that community of general type, in regions now dis severed, is, when once varied, accompanied by more or less of divergence in more special characters in different directions in the different countries.

G. BENTHAM

#### SURFACE-OCEANIC LIFE

IN the waiting-room at the Admiralty is a drawing 12 feet by 8 feet, which is attracting the attention of numerous scientific and naval men, who thoroughly appreciate the novel and complete manner in which the several groups of interesting marine life have been arranged, and the system and regularity upon which the arrangement has been carried out, and we may also add, for the benefit of the curious, that the beauty and colour of these grotesque forms would exceed the imagination of Gustave Doré. The work was entirely executed in H.M.S. *Rodney*, on her passage from China to England during the last six months, and extends over the China Sea, Indian and Atlantic Oceans. The subject of surface-oceanic life is particularly acceptable at the present time, as Dr. Carpenter, Mr. Gwyn Jeffreys, and Professor Wyville Thomson were last season engaged in examining the deep-sea life of the neighbouring ocean, and are likely to extend their investigations into the Bay of Biscay and Mediterranean Sea during the summer. These deep sea explorations should be energetically pursued, and we may earnestly hope that it will not be long before an honest rivalry is maintained in the Atlantic and European seas, and that other oceans and parts of the world may be dipped into by voyagers, for contributions to this useful branch of science.

Those who only know the sea under the aspect which it usually presents round our own coasts will hardly be acquainted with the fact that the surface of the ocean forms a world in itself, inhabited by myriads of strange and delicate creatures, as distinct in its conditions from the shore world as from the inhabitants of the dark mysterious depths whose oozy plain, shut off from the day by three miles' thickness of water, is tenanted by the lingering and stunted refugees of a world of animals now for the most part extinct. The creatures which inhabit the surface of the ocean are very many of them born and bred there; others, on the contrary, have left their parents at a very early age, being carried away from the shore by surface currents and drifted out to sea, there to pass through ever-changing forms, until the time comes for their return to shallower places and a life of grovelling on the ground. Although this picture contains more than six hundred drawings of marine animals, it does not represent much more than one-third of the actual labour incurred, duplicate and fac-simile drawings of all the creatures having been originally made. The author of this picture, Mr. Francis Ingram Palmer, has been employed surveying the coasts of Japan and China, and it was on his passage home that he devoted his attention to this subject.