

2nd. When the electrodes are brought into contact, one with the external surface of the spongioles of a plant, and the other with the sap ascending from the root, the sap and the external surface are in opposite electric states. The effects which are here observed with the galvanometer may, in the majority of instances, be due to ordinary electro-chemical actions; but in some instances the effect cannot be referred to these actions, but may be referred to the organic changes which occur in the roots during vegetation.

3rd. That with the petals of flowers slight currents were obtained; and,

4th. In fruits and tubers powerful currents may be occasionally obtained; but these effects are evidently secondary results, due to the reaction of the different vegetable juices upon each other.

4. "Notice of some Additions to the Hepaticæ of the neighbourhood of Edinburgh," by John Lowe, Esq.

5. "Record of Localities for Rare Plants," by Prof. Balfour.

6. "Continuation of Account of some of the Contents of the Museum at the Botanic Garden," by Prof. Balfour.

7. "List of the Fibrous Plants of India," communicated by Prof. Balfour.

MISCELLANEOUS.

On the probable Origin of the Organized Beings now living in the Azores, Madeira, and the Canaries. By M. OSWALD HEER.

In a letter to M. A. DE CANDOLLE.

IN your Geography of Plants you have adopted the opinion of Edward Forbes, that in the miocene period the European continent extended to the Azores and Canaries, and supported it by fresh proofs*. In fact, the predominant European character of these islands, which occurs in their insects as well as in their flora, proves that they were anciently joined to the continent. Nevertheless we must not forget that, as compared with Europe, these islands are very different from those of the Mediterranean. They are distinguished in the first place by a much greater number of peculiar species, which constitute a third or a fifth of the plants; and in the second by some American types, which make their appearance in all these islands. These are not only certain American species which might have reached them accidentally by the agency of the winds and currents, or of man, but American genera which are represented by peculiar species. I will instance the genera *Clethra*, *Bystropogon*, and *Cedronella*, as also the unique pine of the Canaries (*Pinus canariensis*, Sm.), which belongs to the American forms with acicular ternate leaves. The relations of the Laurels is very remarkable in this respect; they form a great part of the forests of Madeira and the Canaries, dividing into four species and playing an important part. Two species (*Oreo-*

* DeCandolle, *Géographie Botanique raisonnée*, p. 1310.

daphne foetens and *Persea indica*) are essentially American types; the third (*Phæbe Barbusana*, Webb) belongs to a genus which occurs in India and America; and the fourth (*Laurus canariensis*, Webb) corresponds with the European species. By the possession of these laurel forests the islands of the Atlantic differ greatly from the African continent, where they are entirely wanting, and approach America rather than Africa, notwithstanding the proximity of the latter.

These facts obtain great importance by the observation that the flora of the Atlantic islands has much resemblance to the Tertiary flora of Europe.

In my 'Flora Tertiaria Helvetiæ,' I have proved that a considerable number of plants of the Tertiary epoch corresponded with species peculiar to Madeira and the Canaries, in such a manner that there must be a relation between the two floras. On the other hand, our Tertiary flora indicates a great resemblance to the flora of the southern United States. Many perfectly characteristic genera, such as *Taxodium*, *Sequoia*, *Liquidambar*, *Sabal*, &c., were distributed over the whole of our tertiary country, and composed partly of species very closely allied to those which now grow in America; other genera belong equally to America and Europe (such as *Quercus*, *Corylus*, *Populus*, *Acer*, &c.), and occur in the European Tertiary epoch, composed of species corresponding with the American forms.

We find similar cases amongst the terrestrial mollusca and insects, although this is not so positive as with regard to plants.

These remarkable circumstances are explicable, if we suppose that during the Tertiary epoch a terrestrial formation united the continents of Europe and America, and that this surface was extended by some projection to the Atlantic islands. A glance at the map of the depths of the ocean by Maury, shows that the bottom of the Atlantic forms a longitudinal valley, of which the deepest parts are between the twentieth and fortieth degrees of north latitude, nearly at an equal distance from Europe and Africa, but that on the two sides of this deep valley there is a vast *maritime plateau*, which includes the Atlantic islands, as well as the whole space between the European continent, Newfoundland, and Acadia. Beyond this space another long valley, but of less depth, takes its rise, in a direction from south to north-east between Madeira and the Azores; it loses itself close to the coast of Oporto.

If we may attribute any importance to these very general data, we must admit that during the miocene period the maritime plateau above indicated was solid ground.

This country, this ancient Atlantis, would have had the same plants as central miocene Europe, of which the remains are found in the mollasse of Switzerland in such astonishing profusion, that I shall be able to give descriptions and figures of about six hundred species in my 'Flora Tertiaria.' On the coast of this country the marine shells presented a great conformity in America and Europe; and this remarkable phænomenon is still reproduced, that Europe has more littoral than deep-sea species of shells and fishes in common with America; which proves that at one period a band of firm ground must have

united these two parts of the world. The Atlantic islands had already risen towards the south coasts of this continent at the diluvian period. That this country was at the bottom of the sea during the miocene epoch, is shown by the fossil shells of Porto Santo and St. Vincent in Madeira and those of the Azores; but that it had emerged at the diluvian period is proved by the terrestrial mollusca of Caniçal, and the fossil plants of St. Jorge in Madeira*.

The islands formed at this epoch would have received their vegetation from the Atlantis in the diluvian period, and consequently at an epoch when this continent had entered upon a new phase of development. If we suppose, that then, by a subsequent depression of the soil, the connexion with America was destroyed, and subsequently that which existed with Europe, we shall obtain the elements for the explanation of the existing flora of these islands. We there find the remains of the flora of the ancient Atlantis, and in consequence many types of the Tertiary flora are retained there whilst they have disappeared in Europe. These remains, with a certain number of other species, form the peculiar plants of these isles, corresponding in part with the American species because they have issued from the same centre of formation. But it is with Europe that these islands have the most species in common, probably because their connexion with this continent lasted longer.

At the diluvian period the flora of central Europe was displaced by great changes of climate (extension of glaciers, &c.); and as by the depression of the Atlantis the connexion with America was destroyed, the new European vegetation could not extend on that side, but only towards the east. It is thus that the characters of the new vegetation would be explained, particularly that of the lower countries, whilst the Alps and the north have undergone less change. This also is the reason of the great analogies which occur between the north of Europe, Asia, and America. I arrive therefore at the same conclusion with yourself as regards these latter countries, namely that the alpine vegetation is certainly the most ancient in our country, and that subsequently when the climate became warmer, after the glacial epoch, it rose from the low countries to the mountains and Alps.—*Bibliothèque Univ. de Genève*, April 1856, p. 327.

Note on Clausilia plicatula and C. Mortilleti.

By J. GWYN JEFFREYS, Esq.

Mr. Benson, in the last Number of the 'Annals' (p. 75), states that I omitted *Clausilia plicatula* in my "Notes on the Swiss Mollusca," as well as two other so-called species of *Clausilia*; all of which he had found in Switzerland. My reason for omitting *C. plicatula* was explained in the preface to my "Notes," in which I said I was induced to think that a notice of "some *hitherto unrecorded* localities" which occurred to me might be interesting, and that I adopted Charpentier's Catalogue as my text-book. By referring to that catalogue it will be seen that Charpentier mentions *C. plicatula*

* See Heer, "Ueber die fossilen Pflanzen von San Jorge in Madeira." Zurich, 1855.



1856. "On the probable origin of the organized beings now living in the Azores, Madeira, and the Canaries. By M. Oswald Heer. in a letter to M. A. DeCandolle." *The Annals and magazine of natural history; zoology, botany, and geology* 18, 183–185. <https://doi.org/10.1080/00222935608697609>.

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