



TRANSACTIONS

AND

PROCEEDINGS

OF THE

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~~PART I.~~—VOL. VIII.

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BY

THE HONORARY SECRETARY, THOS. H. RAWLINGS, Esq.

THE AUTHORS OF THE SEVERAL PAPERS ARE SOLELY RESPONSIBLE FOR THE SOUNDNESS OF THE
OPINIONS GIVEN AND OF THE ACCURACY OF THE STATEMENTS MADE THEREIN.

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AGENTS TO THE SOCIETY.
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To whom communications for transmission to the Royal Society of Victoria from all
parts of Europe should be sent.

M'Coy to establish the existence in Australia of the cretaceous formation. The present collection enabled Professor M'Coy on this occasion not only to confirm his previous determination of the geological age of the rocks of the district, but to make the very important announcement of the occurrence of *Enaliosaurian* fossil reptiles of the genera *Ichthyosaurus* and *Plesiosaurus*, as well as the characteristic molluscos genus *Ancyloceras* and a *Belemnite*, and a second species *Ammonites* allied to European cretaceous forms. These were exhibited and described under the following names :—

Ichthyosaurus Australis (M'Coy).

Numerous deeply bi-concave vertebræ, the bodies 4 inches wide, 3 inches deep, and $1\frac{1}{2}$ inches long.

Plesiosaurus Sutherlandi (M'Coy).

Length of centrum $2\frac{1}{4}$ inches, width $3\frac{3}{4}$ inches, depth $2\frac{1}{2}$ inches. This differs in its proportions from the New Zealand *Plesiosaurus*, described by Professor Owen, to which it is most nearly allied.

Plesiosaurus macrospondylus (M'Coy).

Having the bodies of the vertebræ much longer in proportion to their width than any known species. Length 3 inches, width 3 inches, depth $2\frac{1}{2}$ inches. The anterior and posterior margins are longitudinally wrinkled as in the *P. rugosus*.

Ancyloceras Flindersi (M'Coy).

A gigantic species equalling the *A. gigas* of the Lower Greensand in size, but more nearly resembling the *A. Tabarelli* of the French Lower Greensand in marking.

Ammonites Sutherlandi (M'Coy).

A new small species like the French *Am. Paraudieri* of the Gault.

Belemnitella diptycha (M'Coy).

A species with two dorsal inflected folds or sulci on the dorsal face; broadly hastate guard, eight lines wide; agreeing in size and shape almost exactly with the English and French lower cretaceous *B. plena*.

ART. X.—*A Contribution to Meteorology.*

[Read 11th February, 1867.]

Mr. G. W. Groves read a paper with the above title, in which he sought to prove the correctness of his weather prophecies, and ascribed to the "Science of Terrestrial Magnetism" certain principles upon which his calculations were based.

ART. XI.—*On the Glacial Period in Australia.* By the REV. J. E. TENISON WOODS, F.L.S., F.G.S., &c.

[Read at the Annual Conversazione of the Royal Society, March 4, 1867.]

I owe some apology to the Society for the brief and scattered notes on this subject, which I bring before their notice this evening; but I trust they will see that it contains the germs of what is of the utmost importance to science, not only in Australia, but the scientific conclusions of many eminent men of Europe. It is well known that what is termed the glacial period has occupied a very prominent position in the researches of geologists at home. I need not particularize now what is ordinarily understood by the term, for most of my hearers will be familiar with the facts to which I refer. It appears that during the close of the tertiary period Europe, and indeed we may say the whole of the northern hemisphere, has been visited with a climate which is only now equalled by what is seen in Greenland and the Arctic regions. What that is will be best understood by Dr. Rink's paper in vol. xxiii. of the Royal Geographical Society's journal, p. 143. Not only have such snowy regions as the Alps been the sources of glaciers, which have extended far beyond their present limits, but such temperate regions as the south of England have been visited by floating icebergs. Large masses of drift and boulder till have been strewn all over Great Britain; projecting rocks have been grooved, striated, and ground down; and in Scotland the evidence is such that nothing short of an immense system of glaciers will explain the evidence presented by that country. I need not go into the details of all this. They are so well known now as to be found in every popular manual of science. They have caused quite a revolution in our received explanations of terrestrial phenomena, and have in turn themselves become the subject of various theories.

Some have wished to account for them by supposing a cap of ice to have formed in the Arctic regions sufficient to reduce the whole temperature of Northern Europe. Others have proposed various modifications of the land of South Europe to account for the facts. One very eminent geologist, Professor Ramsay, considers the change in climate to have been so vast and general that it can only be explained by supposing the earth to have revolved upon a different axis at that time; for observe, the appearances are not confined to Europe. Even as far as the tropical latitudes, such as the West Indies, the effects of extreme cold are perceived in the later tertiary geology. It is not my business now to specify these theories, but I wish to call your attention to the fact that the universality of a period of cold seems to be questioned by none; and even Australia is supposed not to have been exempted from it. Indeed, Dr. Joseph Hooker accounts for the antarctic flora, or more properly our alpine flora, in this manner; and the prevalence of the glacial period, even in Australia, forms a prominent feature in the graceful theory of Dr. Darwin, and the speculations of his numerous supporters. Now, this is the question to which I wish to call your attention this evening—Has this theory of a glacial period for all the world been borne out by observations in Australia? Of course we do not expect such evidence as the groovings and striations of icebergs, drift, and "till" or *roches moutonnées*. These signs do not extend in the northern hemisphere below the 40th parallel of latitude. But do we find evidence of extreme cold? On the contrary, we find evidence of extreme heat, or at least a heat almost tropical in South Australia, and as a consequence a sub-tropical fauna. I do not propose to specify the instances upon which these conclusions are based, but I will mention a few of the most striking. In the first place, every geologist on becoming acquainted with our tertiary fauna is struck with its climacteristic resemblance to the fauna now existing in the Philippine seas and Indian archipelago. It is not that the shells and corals are similar, but the genera are such as are found principally in tropical or subtropical regions. I refer now to the extinct fauna and to our earlier tertiary beds, where any species, if they exist now, do so in very different localities. I may mention as instances of this *Limopsis Belcheri*, which is very common in the miocene beds. Professor McCoy, in the "Annals of Natural History," states that only a few specimens have ever been found, and

these were dredged up from a depth of 90 fathoms off the Cape of Good Hope; but a few shells, which after careful comparison with the specimens in the Museum, I pronounce to be the same species of *L. Belcheri*, were lately cast ashore on the south coast of South Australia. They are much smaller in size than the fossil specimens, and their extreme rarity shows the different conditions under which they now exist. *Pectunculus laticostatus* is another of the survivors, but now never found in Australia. A coral (*Flabellum*) another, but existing only in the Chinese seas. These and is other instances which might be alleged prove that whatever changes have taken place are from a warmer to a colder climate, since the earlier tertiary periods in S. Australia. But when we come to those deposits which correspond in point of time with the glacial period of Europe, we find the contrast still more marked. As a general rule in the glacial deposits, it is said that shells of existing species exist only in extreme Arctic latitudes, and when found in tropical latitude of tropical species are always stunted in their growth in such a manner as must be attributed alone to cold influences. Not only also were Arctic species able to live in the temperate seas of Britain, but species belonging to temperate species were able, owing to the severity of the climate, to find a congenial home in tropical seas. Now, in Australia, we find the exact contrary. Though we do not find actual tropical species in our quaternary beds of Australia, still we find a great many species which only live now in much warmer parts of Australia. A fine instance of this was lately furnished to me by Mr. Lefroy, the superintendent of the Convict Department of W. Australia. He sent to me from Perth two very large specimens of *Fusus colossus*, some which had been dug out from the quarries close to the prison. I need not remind you of the fine specimen of this shell which is in our National Museum, and was brought from Port Essington. One of my fossils is as large, and weighs about 10 lbs. As far as I am aware *F. colossus* has never been found outside the tropics, and yet it appears that it was able to live and grow to a large size at Perth, W. A., during what was a period of extreme cold in Europe. But this is not a solitary instance. The whole quaternary fauna of Perth is of an actually tropical character. In beds of the same age, in South Australia, we have the same phenomena repeated. All the shells found are of much larger size than those which exist upon the coast at present,

and those which are not found in the same places are to be looked for in warmer localities. The contrast in some cases is most marked. *Venus strigosa* (Sow) is a tolerably common shell at Guichen Bay. It is also very common but of much larger size in the quaternary deposits. Shells of a size equal to that of the fossils are only to be found at Port Lincoln, which is in very much warmer seas. *Venus aphrodina* is the common shell at Robe now; a variety representing, as I believe, Lamarck's *V. aphrodinoides* (not the shell so named in the National Museum, which is a Philippine species). This shell is abundant also at the head of Spencer's Gulf. The fossils at Robe are of a kind only found in the warmer climate. One more instance out of thousands which I could cite:—A peculiar variety of *Bulla Australis* (called by some naturalists *B. striata*) is only found now in Western Australia. It is only found as a fossil in Robe, and the existing species at Port Adelaide does not belong to the same variety. I need not detain you with more particulars, but I may sum up the whole in this announcement—that after carefully considering the subject for a period of more than two years, during which thousands of fossils and shells have passed through my hands, I am convinced that during the glacial period of Europe our continent and seas have passed through a subtropical climate, or one at least very much warmer than what we experience now. This conclusion is formed upon evidence of the same nature as that from which they conclude a period of extreme cold at home; and most of the arguments used there apply here, but in an inverse order. I believe that the same conclusions are forced upon us by the fossil flora, though none of the species discovered here and in Australia have been identified. Yet I am sure my botanical friends will agree with me in saying that they offer evidence confirmatory of a warmer climate prevailing during the time in which they grew. In Tasmania this is especially remarkable where palms and a sub-tropical flora are found well preserved in extensive deposits. The importance of the conclusion to be drawn from these facts is obvious. If we had no period of extreme cold in the southern hemisphere, then the arguments or the theories which account for the glacial epoch, on the hypothesis of changes which affected the whole earth, must be abandoned. The extent to which such theories have been relied upon can hardly be credited by those who have not paid attention to the later developments of

Darwin's hypothesis. I do not pretend to say how far received theories may be modified by the facts to which I have drawn attention, but I am convinced that the glacial period must be confined to the northern hemisphere, and some other explanation must be sought for our Alpine flora. I may remind the Society, however, that I do not wish to extend my observations further than Australia proper. In New Zealand, Julius Haast has found extensive evidence of glacial action, but the observations are rather too limited for us to conclude anything directly therefrom. A true glacial period in New Zealand would be a puzzling fact, and very difficult to reconcile with what we observe in Australia; but we may find hereafter that even in Europe climatic changes may depend upon physical conditions to which New Zealand has been especially and exceptionally subjected. At any rate there has been no glacial period in Australia—in fact, the continent is now passing through a colder period than any of which we can find evidence in its previous geological history.

ART. XII.—*The Manufacture of Paper from Native Plants.*
By J. COSMO NEWBERRY, B. Sc., Analyst of the Geological Survey of Victoria.

[Read 8th April, 1867.]

The subject of paper-making from raw materials has been for many years occupying the special attention of manufacturers in Europe and America, in reference to the supposed deficiency for meeting the increased demand for paper, consequent upon the progress of education, and the use of this material in various branches of industry. Hitherto rags have been the great staple upon which paper-makers have depended, and for many reasons they are the best adapted for the manufacture of the finer varieties of paper, they have passed through a thorough cleansing from refuse during their conversion from raw vegetable fibres into woven fabrics, and even the wear and tear to which they have been subjected, renders them particularly well adapted for the purpose. When, however, the manufacturer has to resort to raw material, the whole cost of this cleansing and preparing has to be defrayed by the paper produced. I am of course speaking of the best white rags; when those of an