That the character of our alpine climate (of a continental nature on the eastern side of the central chain) disappears as soon as changes in the orographical configuration are met with, is instructively seen in the valleys of the River Makarora (Lake Wanaka) and the River Hunter (Lake Hawea), both of the same breadth, altitude, and direction, and for at least fifteen miles above the lakes, with an equal gradient. Whilst in the former, over the low pass across the Central Alps which bears my name, the moist winds from the west coast can advance nearly to Lake Wanaka before all their moisture is extracted or condensed, the latter valley has a high mountain-range at its head covered with perpetual snow, and is therefore not exposed to the same amount of warm moisture. Consequently the valley of the Hunter has all the characteristic vegetation of a true alpine valley, abounding in *Aciphyllæ*, *Celmisia*, and coniferous subalpine and alpine shrubs and trees, whilst in the Makarora Valley they are missing, exhibiting a flora more similar to that of the west coast, or the lower regions of the east coast.

I have made this observation in order to show that the least change in the orographical conditions of this island gives at once to the flora an entirely different character, which, taking the preceding remarks into account, may offer a still stronger argument in aid of the hypothesis started in this note.

Thus the existence of the Moa bones found amongst the Pleistocene terminal and lateral moraines induces us, more than any other reason, to adopt the conclusion that nearly the same meteorological conditions existed then as now; offering at the same time a further reason for accepting the theory of large plateau-like ranges rising above the line of perpetual snow, as a principal cause for the greater glaciation of New Zealand during the Pleistocene epoch.

DECEMBER 21, 1864.

Henry Bowman Brady, Esq., F.L.S., Newcastle-on-Tyne; Richard Brown, Esq.; Major William Howley Goodenough, R.A.; John Jones, Esq., The Trindle, Dudley; and John Reginald Yorke, Esq., M.P., Tewkesbury, were elected Fellows.

M. Jules Desnoyers, of the Jardin des Plantes, Paris, was elected a Foreign Member.

The following communications were read:—

1. *On the COAL-MEASURES of NEW SOUTH WALES, with SPIRIFER, GLOSSOPTERIS, and LEPIDODENDRON.* By WILLIAM KEENE, Esq., Examiner of Coal-fields and Keeper of Mining Records, New South Wales.

(In a letter to the Assistant-Secretary.)

THE main feature in the geology of New South Wales is the "Sydney Sandstone," and in no case has any younger rock come under

my observation. From reports which can be depended upon, there is, however, no lack of more recent deposits in South-western Australia, and I possess specimens, given to me by an explorer, from the River Belliands (Queensland), very near the place of my own examinations in the North-east, containing fine Belemnites and Shells of the Cretaceous period.

In the southern part of New South Wales, near the head-waters of the Lachlan River, I found some remarkable blocks, containing large leaves in high relief, which would, at first sight, be pronounced Tertiary; but, from their position, I cannot separate them from the siliceous beds intercalated with the auriferous shales, far older than the Coal-measures. These leaves are accompanied by very distinct impressions of Ferns; and I beg to direct the special attention of phytologists to the specimens from these beds which will be found in the collection sent by me to the International Exhibition of 1862, and presented by the New South Wales Exhibition Commissioners to the Bath Philosophical Society.

The upper beds of the "Sydney Sandstone" contain shales which I have called "the false coal-measures" (the "Wyanamatta shales" of the Rev. W. B. Clarke). These shales are invariably mistaken by even intelligent miners for the Coal-measures, and I have been frequently called upon to examine them for coal; but their position is 800 feet above the upper coal-seam; and the name I have given them is justified by the fact that, although in places they present a thickness of 150 feet, only a few thin coal-pipes have been found in them.

On approaching the coal-seams (from the false coal-measures), the *Vertebraria australis* makes its appearance; and this, with the *Glossopteris*, accompanies the entire series of the Coal-measures from the topmost to the lowest seam.

Reckoning the workable seams to be eleven in number (and I know from observation in many natural sections that this is not far wrong), we find, on approaching the two lower seams, abundance of fossils—*Pachydomus* and *Bellerophon*. *Spirifer* is rare, until we approach the lowest seam; and here, as well as below, the *Spirifer* abounds in great variety, as also *Fenestella* and *Orthoceras*; but I must repeat that the *Glossopteris* and the *Vertebraria* never cease, but are constant through the whole series.

Marine remains other than those indicated above are rare; but a fish with heterocercal tail, in a very distinct impression, was found in the Australian Agricultural Company's B. Pit at Newcastle, in the shales above the "Yard Seam."

Conglomerates indicative of strong drift-currents are found between nearly every seam of coal; and immediately below the Coal-measures coarse siliceous grits and porphyritic clays envelope a considerable amount of the Carboniferous flora. Very well-defined specimens of the *Lepidodendron* are occasionally to be met with in these siliceous deposits.

The lower fossiliferous limestone, the chlorite-schists, and the auriferous quartzites were, in many places, upheaved to a high angle

before the deposition of the Coal-measures, as I have shown in the section; and, as there indicated, I have found the quartz and limestone beds in unmistakable succession and juxtaposition, and have taken from their site a specimen of gold rooted, as it were, in the limestone passing into the quartz. The limestone itself is frequently so penetrated by siliceous matter as to be wholly unaffected by acids. It is sometimes found deposited on a floor of granite, and I believe it to be the most ancient of our fossiliferous rocks.

The Peak Downs range appears to me to be an upthrow, long posterior in date to the deposition of the Coal-measures, and from which those rocks have been denuded, except in a few isolated ranges, in which coal may still be found. The débris of the lower seams are to be met with over many miles of country, containing always the same plants (*Glossopteris* and *Vertebraria*). Near to the Peak Downs, amongst the silicified wood which strewns the plains, I found a few fossil fruits of large size. One is depressed, or flattened, at both head and stalk, as though the juice had been squeezed out, and left an opening right through it; so that the seed-cases are very plainly to be seen from either side.

The fine black and fertile soil of the Downs is connected with the Peak ranges, which were discovered and attentively examined by Leichardt, who compared them to the igneous rocks of the Puy-de-Dôme. In my opinion, also, they are like those which have burst out in the same country along the northern side of the Pyrenees, described by Charpentier as consisting of ophite, weathering in large dome-like masses. These, too, are comparatively recent, and, as is well known to geologists, have upheaved the Nummulitic and later Tertiary rocks along nearly the whole line of the Pyrenæan range.

That the outburst of the Peak range is posterior to the deposition of the Coal-measures I had ample evidence at the crossing of the Mackenzie, where the igneous matter covers the coal-shales containing plant-remains; and, on close examination, I found in the lava a very perfect cast of a large mussel-shell, the same which now abounds in the river.

The long range of serpentine extending from Rockhampton nearly to the Peak Downs appears also to be a comparatively modern upheaval, and to have been erupted with such sudden force as to have cut through the lower fossiliferous and auriferous rocks. For this reason but little gold has been found along the serpentine range of Canoona.

I also divide the quartz as belonging to different epochs. That is to say, there is a quartz at the base of the Coal-measures, in many cases of great purity, in which I have in vain sought for any sign of gold; whilst the auriferous quartz is in upheaved beds, with which the Coal-measures are unconformable, and contains the old fossiliferous limestone; and drift-gold is to be found where this limestone and the accompanying quartzites and shales have presented their edges to destructive influences.

Vertical Section of the Coal-measures of New South Wales.

The numbered letters refer to the specimens accompanying the paper, and now in the Society's Museum.

Beyond (that is, when the fertile soil of the Peak Downs has been passed over), the edges of the quartzites and shales show themselves over a very extensive country, and here beds of iron- and copper-ore crop out, and are invested on either side by gold-bearing rocks.

These deposits are at this moment exciting the attention of diggers from all parts of Australia, and drawing them to their exploration; and wealthy merchants are investing largely in costly works and apparatus for bringing the copper-ore into a marketable state.

I have no doubt that this part of Eastern Australia will bear comparison with, and even rival, our richest metalliferous districts; whilst New South Wales, by her wealth in coal, facilitates communication from port to port, and contributes thus, unostentatiously, but not the less certainly, to the general prosperity.

At the same time that I recommend reference to my collection now in the Bath Philosophical Institute, I send herewith specimens which I am of opinion will prove satisfactorily that the coal-seams of New South Wales belong to as old a geological series as those of Europe; and I can affirm, from examination over a very extensive area, that they are equally inexhaustible.

2. *On the DRIFT of the EAST of ENGLAND and its DIVISIONS.*

By S. V. WOOD, jun., Esq., F.G.S.

[This paper was withdrawn by permission of the Council.]

(Abstract.)

IN this paper the author divides the Drift of the country extending from Flamborough Head to the Thames, and from the Sea on the east to Bedford and Watford on the west, as follows:—*a*, the Upper Drift, having a thickness of at least 160 feet still remaining in places. *b* and *c*, the Lower Drift, consisting of an Upper series (*b*), having a thickness of from 40 to 70 feet, and a Lower series (*c*), with a thickness, on the coast near Cromer, of from 200 to 250 feet, but rapidly attenuating inland. *c* comprises the Boulder-till and the overlying contorted Drift of the Cromer coast, which along that line crop out from below *b* a few miles inland. In an attenuated form, *c* also ranges inland as far south as Thetford, and probably to the centre of Suffolk, cropping out from below *b* by Dalling, Walsingham, and Weasenham, and appearing at the bottom of the valleys of central Norfolk. *b* consists of sands, which on the east coast overlie the Fluvio-marine and Red Crag, but change west and south into gravels, which pass under *a* and crop out again on the north, south, and centre of Norfolk, and west of Suffolk and Essex, extending (but capped in many places by *a*) over most of Herts. The Upper Drift (*a*) consists of the widespread Boulder-clay, which over-