

Some Unpublished Correspondence of the Rev. W.B. Clarke

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Abstract: Four previously unpublished letters, with memoranda of Rev. W.B. Clarke to W.S. Macleay, written between 1842 and 1845 clarify the ideas of both about the mode of formation of coal and the age of the stratigraphical succession in the Sydney Basin. Clarke makes the first mention of his discovery of the Lake Macquarie fossil forest, the first identification of the zeolite stilbite in New South Wales and gives details of his study of the volcanic rocks of the Upper Hunter Valley.

Keywords: Clarke, Macleay, coal formation, Sydney Basin, stilbite

INTRODUCTION

When Dr Thomas G. Vallance died in 1993 a considerable amount of his historical jottings and memorabilia on the history of Australian science, and particularly geology, was passed on to me (David Branagan) through his wife, Hilary Vallance. For various reasons, only now have I been able to delve, even tentatively, into this treasure house. The present note concerns four letters of the Reverend W.B. Clarke (1798–1878), together with several additional related memoranda, which Vallance somehow acquired, written to William Sharp MacLeay (1792–1864), Clarke's great friend, and sternest critic, of Elizabeth Bay, Sydney. He transcribed the letters in part, and researched some of the historical and scientific problems which had emerged on reading the letters. I have continued the process.

The four letters were written as follows: Letter 1: 1 July 1842 (with additional memoranda 5 July 1842); Letter 2: 16 July 1842 (Figure 1); Letter 3: 28 May 1843, and Letter 4: 24 January 1845. Letters one and three were written from 'Paramatta' [sic], then Clarke's place of residence, the second from Petty's Hotel, Sydney, where Clarke often stayed when visiting Sydney in that period. The fourth letter was written at Muswellbrook in the upper Hunter Valley. The letters, in Clarke's hand, are here transcribed, but are presented and discussed, not in order of date of writing. The reason for this change of order is that the three later letters are relatively straight-forward, and

essentially self-contained, although, of course, almost no letter can stand alone, but depends on the correspondents. Each letter has some importance in dealing with aspects of Clarke's geological work, as will be noted.

The first and longest letter, which is accompanied by a long series of memoranda and a labelled sketch fits between two letters from MacLeay (28 June & 4 July 1842) to Clarke. Both these MacLeay letters have been reproduced in Moyal (2003), as letters Nos. 30 & 31 (Moyal 2003, vol. 1, pp. 112–120). Part of the earlier MacLeay letter was also quoted by Jervis (1944, pp. 428–429), in which there are slight variations in the transcription from that by Moyal. The two MacLeay letters have been re-transcribed by us herein as there are a few significant, as well as less important, differences from Moyal's transcription, based on our interpretation of the handwriting, the addition of a few lines of postscript (with a sketch), and the advantages of the internet in identifying some doubtful names and historical events. Moyal (2003) in her vol. 1, page 115 footnote 1, reported 'Clarke's reply to MacLeay's previous letter has not survived.' This is the letter which has now turned up, with the previously unreported memoranda and sketch.

While some written words of both Clarke and MacLeay are difficult or impossible to decipher, and a few words are lost through tears, blots etc. the general gist of the letters and memoranda can be readily determined. We have based our interpretation of some words (mainly geological) on the geological literature

which was familiar to both writers, and to which they allude quite freely. In addition to mentions of the work of e.g. Lyell (we use a readily accessible work of later date), Murchison, Sedgwick, De la Beche, Adolphe Brongniart we have given attention to other French and German authors, such as Bonnard, Dufrénoy, Thirria and Humboldt, who were involved in sorting out the stratigraphy and palaeontology of both the Palaeozoic and Mesozoic successions in Europe in the 1820s–1830s.

Some allusions in the texts are now less readily understood than they would have been in Clarke's time, and are briefly discussed in footnotes, with leads to more details in references, such as to those researchers mentioned above. For New South Wales locations mentioned in the letters see Figure 2.

The letters deal with aspects of Clarke's studies during his early attempts to sort out the stratigraphy of the Palaeozoic and Mesozoic rocks of New South Wales. They show to a considerable extent how his European (and particularly English) geological background influenced his Australian work, with his attempts to fit the Australian stratigraphy into the 'known'

European framework, based largely on supposed palaeontological evidence, which to Clarke's mind, at the time, indicated that the New South Wales coals were considerably younger than the coal deposits of Europe. Thus Clarke's firmly-held attitude at this time was that the Australian (essentially the New South Wales) coals were of Oolitic (i.e. Jurassic) age, whereas MacLeay, perhaps acting in part as 'devil's advocate', kept pushing the coal age back down, although not necessarily to the Carboniferous, the period of the major deposition of coal in the northern hemisphere.

J.D. Dana (1813–1895), during his visit on the Wilkes' Expedition in 1839–40 had agreed with Clarke that the NSW coals did not fit the European system, but he thought them not much younger than Carboniferous, probably Permian, although he was prepared to have them as young as Triassic. However Clarke did not agree at the time. Dana's thoughts, although available in his notes and correspondence, did not become publicly available until the publication of his work on the Geology of the Expedition (Dana 1849).

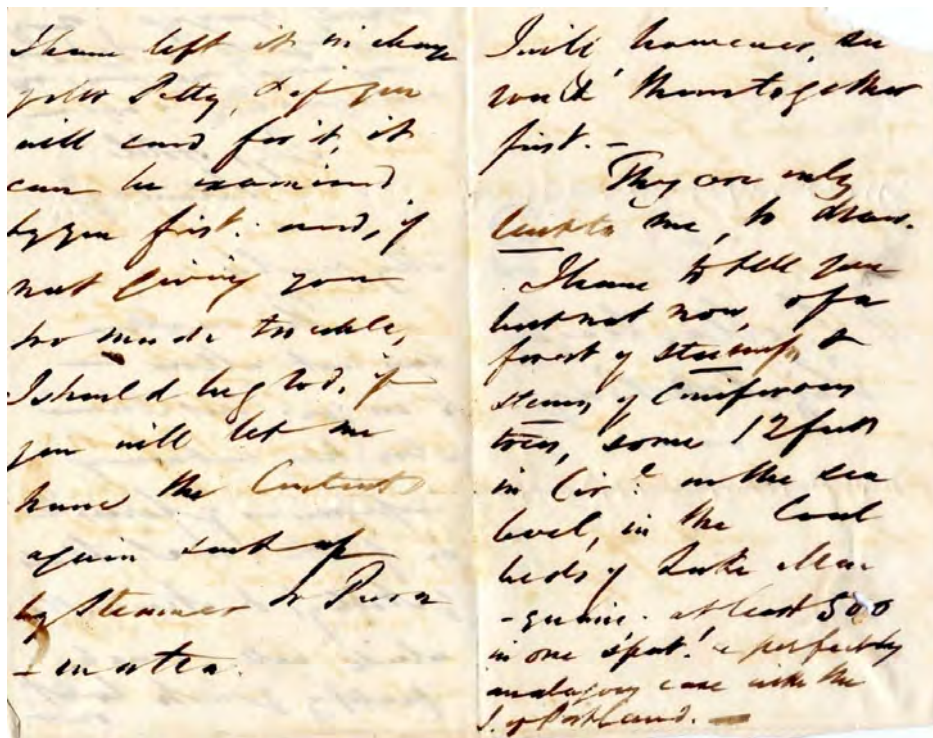


Figure 1. Clarke letter to MacLeay, 16 July 1842

The Australian coal argument, which was very important in the history of the development of Australian geology has been thrashed out by previous authors, particularly Vallance (1981), but see also Organ (1990) and

Moyal (2003).

The Clarke Letters 2, 3 & 4 are now transcribed, followed, if appropriate, by a brief comment. Necessary clarifications and additional comments are placed in the footnotes.



Figure 2. Map of localities in New South Wales mentioned in the Letters

CLARKE LETTER 2 – TO W.S. MACLEAY

See Figure 1

[Addressed to] *W.S. Macleay Esq. Elizabeth Bay*
 [Postmarked] *General Post Office Sydney, July 18 1842*

[Written at] *Petty's Hotel*¹
Saturday [July 16, 1842]

My dear Sir,

The weather does not allow me to see you: but I have a box here, containing impressions of ferns etc. etc. from the Coal Shales of Nobby's² and Newcastle which will much gratify you to look over. [end of first page] I have left it in charge of Mr. Petty, & if you will send for it, it can be examined by you first: and, if not giving you too much trouble, I should be glad, if you will let me have the contents again sent up by Steamer to Paramatta. [end of second page]

I will, however, see [? damaged] ... them together first. —

They are only lent to me, to draw. I have to tell you but not now, of a forest of stumps & stems of Coniferous trees, some 12 feet in Circ^e on the sea level, in the Coal beds of Lake Macquarie; at least 500! [hole in page] in one spot! A perfectly analogous case with the I. of Portland³ [end of third page]

I have also 2 new shells from the Sandstone (above the Coal) of the Broken Back Range⁴.

In haste, faithfully

W.B. Clarke

Comment

This letter is apparently the first mention of Clarke's discovery of the famous Kurrur Kurran Fossil forest, (See Figures 3 and 4), referred to in the letter from Clarke to Adam Sedgwick 29 August 1842, which enclosed Clarke's paper on the topic, for the Geological Society of London.⁵ Several specimens were sent separately to Sedgwick.

Although Kurrur Kurran is a designated Geological Heritage site (Percival 1985, pp. 2–3; 88–89), sadly it is only a 'shell' of its condition as first observed by Clarke. Many of the stumps were souvenired over the years, some being used to built fences (still preserved) in the district (Ray 1993, p. 1 and photo) (Figure 5).

¹ This hotel, owned by Thomas Petty, was at No. 1 York Street, Church Hill. It was earlier the house of the Rev. John Dunmore Lang (1799–1878). It functioned as a hotel into the mid twentieth century.

² At that time a small island with a steep cliff marking the entrance to the Hunter River at Newcastle. A project was in progress to link the island with the mainland to the south and prevent ships attempting to enter harbour through the shallow water south of the island.

³ Clarke is referring to the occurrence of an 'ancient forest' exposed on the so-called Isle of Portland (a peninsula), Dorset, first described by W. Buckland and H. De la Beche (1835), and illustrated by C. Lyell (1878, p. 317).

⁴ A range on the southern side of the Hunter Valley near Wollombi Brook. Mitchell (Foster 1985, p. 203), refers to 'Broken Back Mountain' as one of a series of trig points he established in marking the 'Great North Road from Wiseman's Ferry north to the Hunter'. Wells (1848, p. 94) lists it (Brokenback) as 'a mountain of N.S.W., situated in the county of Northumberland, S.W. of Maitland.' We are sure that the bed from which the fossils were collected was stratigraphically below the coal beds.

⁵ For this Clarke letter to Sedgwick (August 1842) see Moyal 2003, vol. 1, 121–124. For a follow-up letter, Clarke to Sedgwick (2 February 1843) see Moyal 2003, vol. 1, pp. 130–133. See also J. Jervis 1944, p. 384.

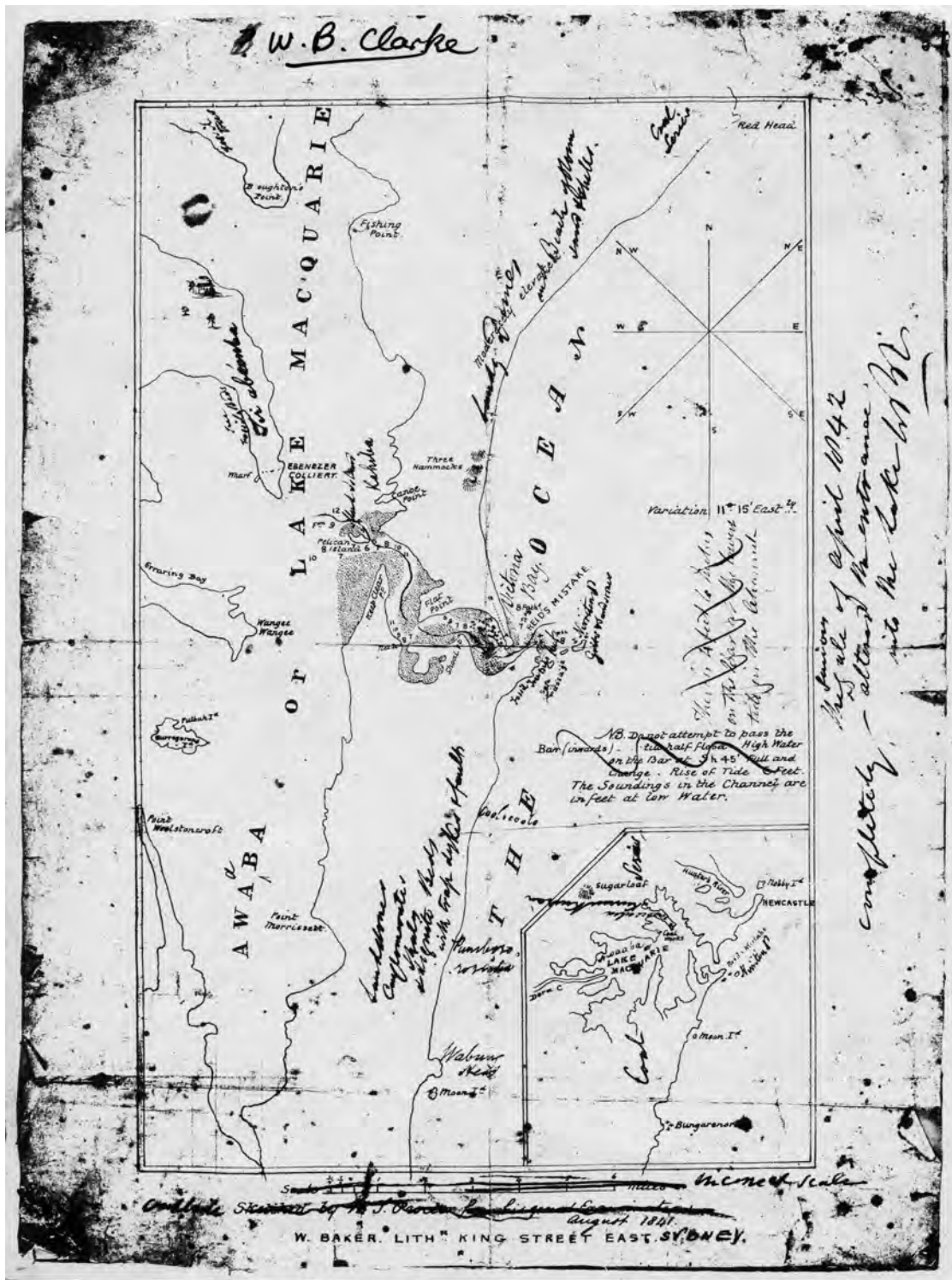


Figure 3. Map of Lake Macquarie annotated by Clarke, probably 1842



Figure 4. Sketch of the Kurrur-Kurran Fossil forest by Clarke

CLARKE LETTER 3 – TO W.S. MACLEAY

Paramatta, 28 May 1843

My dear Sir,

I have just received from Liverpool Plains a small box containing various Bones dug up in making a well, from a depth of 94 feet. They appear to me to belong to some Marsupial animal — but they do not think all belong to the same individual. I have a part of a jaw — two incisors — a tibia somewhat broken — two metatarsal bones — and several fragments of tibia. It is somewhat curious, that the flat regions west of the Dividing Range appear to abound in these relics, whilst none have been discovered east of it.

I have long been [end of first page of manuscript] anticipating the pleasure of a call from you, and as I shall be obliged to pack up specimens in a very short time, I should like to shew you them here, if some day this week would suit you. By favoring me with a post to mention, what day you could come up I would take care to be within.

With compliments to your family, I remain,

My dear Sir,
Very faithfully Yrs.
W.B. Clarke

Comment

We have not located the exact source of the specimens, but see *Sydney Morning Herald* October 1842 – 2 January 1843 (listed in Organ 1994, items 172–178). This letter was not Clarke's first encounter with Australian vertebrate fossils. Clarke had received specimens from J.C. Burnett (1815–1854) in June 1842, which might have been vertebrate fossils. Moyal

(2003, vol. 1, p. 112 fn. 2), notes that Clarke wrote 'Mr. Jamison⁶ has sent to Mr Macleay a fossil Saurian bone from his station, N.W. of the Liverpool Range far into the interior, – found 35 feet below the surface in mud. Will Mr. B enquire after such things in the wells of New England etc. etc? '.

⁶ This is very probably Sir John Jamison (1776–1844) who acquired land on the Namoi River in the 1830s. He was a non-resident member of the Wernerian Natural History Society of Edinburgh (Walsh 1967).

MacLeay had already informed Clarke (16 July 1842)⁷ about another supposed saurian bone from the Liverpool Plains obtained from a depth of 35 feet by his friend Alfred Deni-

son. Clarke took up the matter of Australian vertebrate palaeontology with Richard Owen as early as 1847⁸, and continued in touch by correspondence until his death.

Lake's secret heritage a rare geological phenomenon



Figure 5. Fossil tree stumps used as a fence.

⁷ MacLeay to Clarke 16 July 1842. see Moyal (2003, vol. 1, p. 121).

⁸ Clarke to Owen, 30 November 1847 (in Moyal 2003, vol. 1, p. 217). The tone of the letter indicates that the two were already on familiar terms, particularly regarding the topic of fossil vertebrates.

CLARKE LETTER 4 – TO W.S. MACLEAY


Muswellbrook⁹

24 Jany 1845

My dear Sir,

When I sent you those four wretched little specimens, I was anxious to have your determination of the *Trilobite*¹⁰, with a view to fixing the place of the deposit in which it is found. — Perhaps, if you have not mislaid the paper on which the specimens were fixed, you will kindly look at it & tell me — what genus you put [it] in etc. etc. [end of first page]

I have done some capital work since I have been here. I have examined carefully all the ranges from the Hunter at this place up Dart Brook, Middle Brook & Kingdon Ponds to their junction with the Liverpool Ranges, — I have also explored the ranges on the Page, Hunter & Rouchel to the Isis¹¹ — have made out the order of succession of all — and the cause of the disruptions to the limestone mountain on the Page I have passed through, in a gorge which I found dividing it¹². [end of second page]

Trap – trap – trap! everywhere: it has cooked, burned and stewed the lower beds, and cleared out the fossils in such a way as to leave only thin coatings [? castings] of iron. I have seen no more trilobites, but *atrypae*, *leptenae* & small delicate *spirifers*¹³, with abundance of *crinoidea* — much of the marble is composed of small globules — with a nucleus in the heart of radiating fibres. There are myriads of [? another] of this size.  [sketch inserted in letter] I cannot understand, what they can be: they are quite spherical.¹⁴

I have found Coal beds in [end of third page] all places — always, when that is present, under the *spirifer-conglomerate* which I now know, or rather believe, to pass into the Sydney Sandstone¹⁵. But in many places, as here, the coal beds have been burnt into brick by basalt, full of stilbite (like the

⁹ From the period of first settlement the town was known as Muscle Brook, because of the abundant shell-fish resembling mussels found in a local creek. This name was formalised in 1833. In 1838 the term Muswellbrook was introduced, and remains, although the original name was never officially altered (Chisholm, 1962, *The Australian Encyclopedia*, vol. 6, pp. 232–233).

¹⁰ Clarke was the first to find and describe Australian trilobites. He defended this claim quite vigorously in the *Tasmanian Journal of Natural Science* in 1846 (Clarke 1849) referring to the specific date, 2 December 1842, when he found specimens at Burrigood on the Paterson River. The claim seems to be valid.

¹¹ These streams are all tributaries of the Hunter River, north of Muswellbrook, see Figure 2.

¹² For the Carboniferous succession in the Glenbawn region, and the faulting see Osborne 1950, Branagan et al. 1970, Oversby & Roberts 1973, Mory 1978.

¹³ For identification of the fossils referred to in the letters see some of the standard volumes on palaeontology of the period, e.g. Zittel (1913 et seq.). We have not italicised the fossils species names used in the letters, but left them as written.

¹⁴ These are very probably descriptions of the oolites in the local limestone which occur in the Carboniferous succession in the Glenbawn region. ‘Oolite’ is not an age term here.

¹⁵ This is perhaps an example of Clarke’s rather hurried attempts to correlate the rocks of what later became known as the Sydney Basin. Clarke was already aware (see later, letter of MacLeay) that the Sydney Sandstone (in later years, continuing to the present it became known as the Hawkesbury Sandstone) was essentially un-fossiliferous, in stark contrast with the sandstone he studied in the upper Hunter region, which contained abundant marine fossils. The successions he was studying there, both volcanic and sedimentary, later proved to be of Carboniferous and early Permian age.

Dumbarton rock)¹⁶ — *I have traced these brick beds to Ravensworth — and between that & this occurs a singular case where the volcanic rock is a true lava entangling the burnt glossopteris shales. — My Compts to Mr [&] Mrs Macleay & your Sister*¹⁷

Yrs. Very faithfully
W.B. Clarke

P.S. Will Mr. Macleay pardon my asking him to send on the enclosed under cover!

Comment

At this time Clarke was apparently thinking only in terms of a *single* coal succession (see Figure 6). Clarke later (before 1867) recognised two separate successions: the lower or older (Anvil Creek or Greta) and the younger (Newcastle coal measures and equivalents). There are in fact three coal successions. The intermediate ‘Tomago’ Coal measures were not separately identified in Clarke’s time (see David 1907). For a general summary of Hunter Valley coal stratigraphy see Branagan & Packham (Branagan & Packham 2000, Table 4, p. 40).

CLARKE LETTER 1 AND THE TWO MACLEAY LETTERS

Introductory Note

Ann Moyal, in her massive two volume collection of Clarke’s correspondence to and from (Moyal 2003) has published a number of letters

by William Sharp MacLeay to Clarke. Two that are relevant to the Clarke letter of 1 July 1842 are dated 26 June 1842 (Moyal, vol. 1, pp. 112–115) and 4 July 1842 (Moyal, vol. 1, pp. 115–120). It is clear from these letters that there is a massive argument going on about the mode of formation of coal, various stratigraphic matters and even the relation between geology and theology (or at least aspects of Biblical interpretation).

These MacLeay letters make much more sense if the intervening letter by Clarke is also read. The Clarke letter stands alone to some extent, but it is more easily understood if read with the two MacLeay letters.

Clarke indeed pondered over many of the points raised by MacLeay in his first letter, and there is an interesting set of notes (the accompanying memoranda) he wrote about particular aspects of the correspondence. He summarised, to some extent, his thoughts on the local stratigraphy with his figure (Figure 6). The three letters are now reproduced below in order.

¹⁶ A reference to the then well-known occurrence of stilbite at Kirkaldy, in Dumbartonshire, N.W. of Glasgow (see, e.g. Dana 1932). Chalmers (1979) suggested that the first recognition of stilbite in Australia was made by Samuel Stutchbury at Garrawilla, north of the Liverpool Ranges in 1852 (see also Branagan 1992). The identification by Clarke clearly predates the Stutchbury find.

¹⁷ Clarke is referring to W.S. MacLeay’s parents, Alexander (1767–1848) and his wife Elizabeth (née Barclay) (d. 1847), who had completed Elizabeth Bay House (still extant) in 1837. W.S., a bachelor, lived with them from his arrival in Sydney in 1839, together with at least one unmarried sister. W.S. Macleay inherited the mansion on his father’s death (MacMillan 1967). Moyal (2003, vol. 1 p. 106) notes that the various MacLeay’s chose different spellings of the surname.

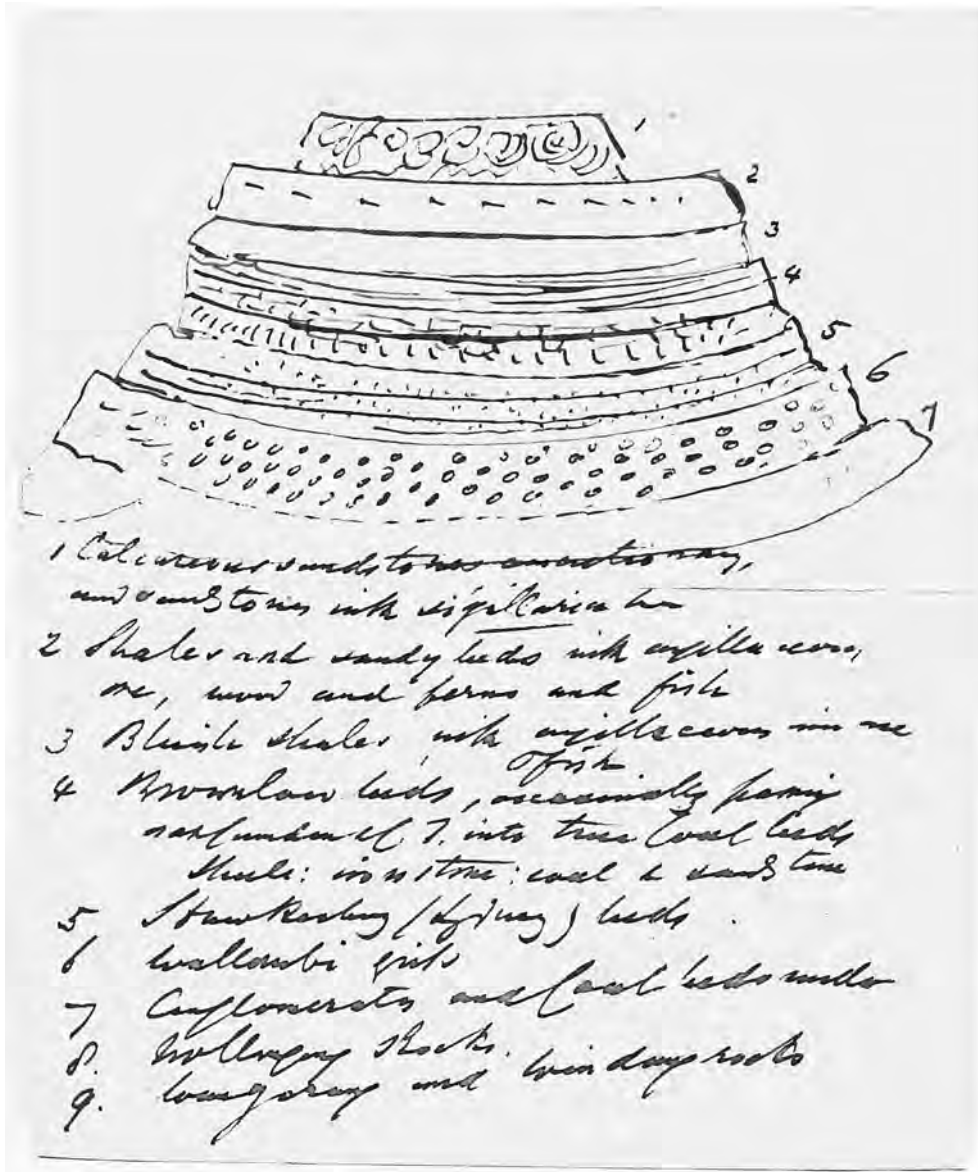


Figure 6. Labelled Sketch by Clarke, July 5 1842, showing the Sydney region stratigraphy as he understood it at the time (see Figure 2 for the named localities).

1. Calcareous sands to [crossed out 'non concretionary'] and sandstones with sigillaria etc.
2. Shales and sandy beds with argillaceous, [?ore, ?...] and ferns and fish.
3. Bluish shales, with argillaceous [?iron ?ore] & fish.
4. Brownlow beds, occasionally passing, as at Camden [?etc] into true Coal beds
Shale: ironstone: coal & sandstone.
5. Hawkesbury (Sydney) beds.
6. Wollombi grits.
7. Conglomerates and Coal beds [?under].
8. Wollongong Rocks.
9. Burrigorang and Windang rocks.

WILLIAM SHARP MACLEAY TO CLARKE

ML MSS 139/42, pp. 381–386

Written from Elizabeth Bay, 26 June 1842

My Dear Sir,

I have considered the subject of your last kind note and I have this evng [evening] read in the *Herald* a hint which I suspect comes from a friend whom you are acquainted with intimately¹⁸; and as both of you seem to think that those persons are rather “obstinate” who do not adopt the opinion that the Coal Measures of N.S. Wales belong to the Oolitic age,¹⁹ I shall now give you my reasons for thinking your theory is to say the least *coram iudice*²⁰. Not that I pretend to be the judge myself of this important Geological question, but that I would thank you or any other professed geologist to shew me who am but a dabbler in the Science how far the following crude notions are wrong before I consider the question as absolutely decided in your favour. —

When the Earth first became habitable by Organized beings it would appear according to geological experience that the Plants and Animals were aquatic and of the lower organizations. When dry land first made its appearance [... in Silurian’ inserted on side]²¹ which was probably about the Old Red Sandstone epoch, whether this land appeared out of the deep by reason of its own elevation or of the Subsidence of the waters it was apparently in districts comparatively confined on which neither Animal nor plant existed — life being as yet confined to the Sea. These limited portions of land appear in process of time to have become covered by a dense vegetation so dark and vicious that in these days we can form no idea of it except by viewing the enormous thickness of certain Coal beds. To account for this extraordinary large accumulation of vegetable life when the Coal Measures present no trace of terrestrial Animals, Brongniart²² is of opinion, in which by the way he is supported by Phillips²³ and other Geologists, that the Atmosphere was at that early epoch charged with an extraordinary dose of Carbonic acid gas which made vegetation flourish while it prevented terrestrial animals from existing. Aquatic animals, Mollusca and Fishes however abounded during this Carboniferous period as well as during the previous Old Red Sandstone and Silurian epochs. Shall we say that the tremendous [end of original page] combustion under pressure that converted these ancient uninhabited forests into Coal destroyed nearly all Animal and Vegetable²⁴ life and made the lower new red Sandstone so remarkable for its paucity²⁵ of

¹⁸ Macleay’s comment was possibly a reference to Ludwig Leichhardt, whom Clarke had befriended. However Arousseau (1968, vol. 2, p. 495) mentions Leichhardt writing to Gaetano Durando, 23 June 1842, commenting on the poor character of the *Sydney Morning Herald* and the other colonial papers. Using Arousseau’s information it seems unlikely that Leichhardt would have written to the *Herald*, suggesting that MacLeay’s idea was probably incorrect, and Clarke’s reply indicates the same. Leichhardt had some ideas about correlation of the Newcastle coal measures with the Sydney [i.e. Hawkesbury] Sandstone — an important early example of the idea of horizontal facies change (Branagan 1976, 1994).

¹⁹ Moyal 2003 fn. 1, p. 115 reads ‘The position initially advanced by Clarke’.

²⁰ *Coram iudice* in Latin means ‘set out before a judge’

²¹ It is not clear whether the insert was made by Macleay or as a comment by Clarke.

²² Sometimes the name appears written as Brogniart (this miss-spelling also occurred in early writings of Charles Lyell). MacLeay is almost certainly referring to Adolphe Brongniart (1801–1876), although Adolphe’s father Alexandre (1778–1847) was also an important geologist. See Moyal 2003 vol. 1, p. 115, fn. 2 for more details.

²³ Possibly William Phillips (1775–1828), whose *Outlines of Mineralogy and Geology*, second edition 1816, remained popular, but more likely John Phillips (1800–1874), William Smith’s nephew, whose *Treatise on Geology* (1837) was widely read. John Phillips is later specifically mentioned by MacLeay. See Moyal 2003 vol. 1, p. 115, fn. 3 for more details.

²⁴ In the right hand margin is an inclined line / crossed out.

²⁵ In the right hand margin are two vertical long and short lines crossed by a short horizontal line.

Organic remains? At all events an immense quantity of Carbonic acid gas must have been evolved. So we find no trace of true terrestrial Animals in the Poikilitic group of Buckland & Conybeare²⁶ the *Chirotherium* being now understood²⁷ to have been an immense toad or at least a *Batrachian*²⁸ which we know to be of all the classes of animals the most independent of a pure state of the Atmosphere. Then comes the *Grès bigarré*²⁹ and the Lias in which other reptiles of a higher order were formed. These reptiles however be it observed were still Amphibious, or even aquatic. Then comes the oolitic and the first appearance of a Mammiferous quadruped in the Stonesfield Marsupial³⁰. So that we may argue that the formation of Coal from the beginning of the forest to its combustion under pressure poisoned the air for terrestrial animals during a long series of ages; for would not the growth of such a ?dense mass of vegetation as form a Coal bed have required a vast supply of Carbon, and would not the quantity of carbonic acid gas evolved by the combustion of such a mass have rendered the existence of Birds and Mammalia impossible? A Reptile and more particularly a toad or any other batrachian might endure such a state of the air, but nothing higher in the scale of land Animals.

I have studied carefully the fossil you have returned to my father; and find it to be a new Species of *Ulodendron* answering to Lindley's³¹ definition of the genus namely "Stem not furrowed but covered with rhomboidal marks the vertical diameter of which is nearly equal to the horizontal". Now *Ulodendron* is a genus peculiar to the ancient Coal formation. At least I cannot find in Thirria's list³² of the fossils of the "Terrain Jurassique"³³ (which is synonymous with what we call the Oolite Series) any mention of those singular Coal genera *Sigillaria*, *Favularia*, *Megaphyton*, *Bothrodendron* and *Ulodendron* which Buckland makes so much noise about in his *Bridgewater Treatise*.³⁴

Again the cycadeous family of plants abound in the Oolitic Series but never have been found in the true Coal Measures; and I would ask if any Cycadeous³⁵ or other family of plants peculiarly characterising the Oolitic has been found in N.S. Wales? I am aware of your specimen which you consider

²⁶ 'and Conybeare' has been inserted. The term 'Poikilitic' (with its variant 'poecilitic') was introduced about 1836 to refer to the Permian and Triassic rock systems, 'as being composed of variegated rocks' (The *Shorter Oxford Dictionary* Third Edition, revised 1956, p. 1532). The *AGI Glossary of Geology and Related Sciences* (1962, p. 226) attributes the term to Conybeare alone in 1832, who applied it first to the group of rocks – the Magnesian limestone (dolomitic limestone) of middle Permian age, the New Red conglomerates together with the Bunter Sandstone (Triassic) of England. Adolphe Brongniart applied it to the Bunter only, and Buckland to the combined Permian and Triassic systems (Zittel 1901, p. 458). See also Lyell 1865 p. 430.

²⁷ In the right hand margin are two inclined lines containing 'Br... '?

²⁸ For this discussion see Lyell 1878, pp. 360, 361.

²⁹ The French equivalent of the Bunter Sandstone, the oldest of the three units comprising the Triassic of Germany (see Lyell 1878, p. 364). The French term is literally translated as 'multicoloured sandstone'.

³⁰ See Buckland 1824, *Transactions of the Geological Society* 2nd series 1 (part 2), 390–6. In the right-hand margin are five vertical ink strokes cut by a single horizontal stroke

³¹ For information on John Lindley (1799–1865) see Moyal 2003, p. 115 fn. 5.

³² Although MacLeay's writing is not clear for this word we believe this hard to decipher word is meant to be 'Thirria' for Charles Edouard Thirria (1796–1868), who with Peter Merian (1795–1883), studied the French Jurassic succession in some detail. Thirria published on the geology of the Jurassic ('Terrain Jurassique') of the Haute Saone. (Thirria 1830; see also Zittel 1901, pp. 429, 499), and, using fossils identified by Philippe Louis Voltz (1785–1840), compared this succession with the English sub-divisions (Zittel 1901, p. 458). We have not identified a Knot, the name suggested by Moyal 2003, vol. 1, p. 113

³³ Term given by Brongniart (1829).

³⁴ Buckland (1836) *Geology and Mineralogy considered in relation to Natural Theology*.

³⁵ Strictly speaking 'cycadaceous'

to be Cycadeous but may it not have been a voltznamian³⁶ or other coal measure plant which had its folioles on the same plane, the only fact by which we deemed it possible that it might be Cycadeous? Have any Marsupial or reptile fossils been found in the Sandstone of New South Wales?³⁷ No. The fossils that have occurred as yet of a higher order than fish have been found in caves and indicate a very recent existence from their identity with existing³⁸ Genera and Species. Again have any Sauroid fishes such as characterize the Coal formations of Gt. Britain and as has been found at Newcastle N.S. Wales³⁹ been ever found in the Oolitic series?⁴⁰ Thirria's list tells me No.

You express a wish that I would see what John Phillips says on the Subject of Coal beds in the Oolitic Series. I have consulted him carefully and I find that after alluding to the fact that the Belemnites of the Lias are found both above and below a great number of plants analogous to those of the Ancient Coal Measures, he says "These plants may be viewed as a remainder of the Vegetation of the Era of the Coal deposits transferred to a sea of organic beings of the earliest Oolitic Age"⁴¹. By which I understand him to mean that such forests as formed the Coal beds occurring in the Oolitic Series did not grow in the Oolitic [end of original page] epoch, but were transferred by some convulsion and accidental cause to the Oolitic Seas. An hypothesis by the way that receives confirmation from the thinness of the seams of Oolitic coal as well as from the rarity of these occurrences and the quantity of fossils that occur immediately above this kind of coal. May not a thin bed of Charcoal formed in the true Carboniferous era but not yet from particular causes heavier than water have been floating about in the early Oolitic waters? By whatever accident or convulsion it got free may not this bed of charcoal have become gradually of greater Specific weight and at last have sunk and taken its anomalous place among the true Oolitic Strata? But however this may be and putting all wild hypotheses aside I must say that I still retain my suspicion that the sandstone of Elizabeth Bay corresponds with the lower New Red Sandstone of England. The *Glossopteris Browniana* is a fern that singularly characterises the Coal Measures of New South Wales, and no species of the genus so far as I know has ever ['ever' inserted] been found in the Oolitic Series.⁴² Yet it is a curious fact that the same species *Glossopteris Browniana* occurs in the Coal measures of India. Are the Indian Coal Measures Oolitic? At the same time I beg of you to observe that I do not by this mode['mode' inserted.] of reasoning consider myself absolutely to say that the Coal here is of the same Age as the British true Coal measures; for on the one hand it may be stated that the same cause might produce the same effect in different places at different epochs, and again in answer to this it may be urged that Coal, notwithstanding if we believe in Brongniart's hypothesis of a Carbonic Atmosphere⁴³, [end of original page] must have been contemporaneously formed in all places since it is difficult to understand how the atmosphere of the globe should have been impregnated in one place⁴⁴ with such a strong store of Carbonic acid gas and not in another. — I shall be happy to learn from you how these my difficulties as to the theory of New South Wales Coal being oolitic can be got over. And in the meantime believe me

My dear Sir,

Yours most faithfully,

W.S. MacLeay

³⁶ The word is doubtful but could refer to some of the voltz-like fossils described from the 'old' coal measures of Europe, and the Triassic (see Lyell 1878, p. 370).

³⁷ In the left-hand margin are two small vertical lines crossed by two small horizontal lines

³⁸ the word 'the' inked out.

³⁹ Dana (1848) illustrated the fossil fish he was given when visiting the Newcastle Coal mines in 1839–40. Few such have been found in the Australian Permian coal measures, but numerous fossil fish have since been recorded from the Australian Triassic successions.

⁴⁰ The word 'again' inked out

⁴¹ John Phillips *Treatise on Geology* 1837.

⁴² Moyal (2003, vol. 1, p. 115 fn. 7) indicates that this underlining has been done by Clarke, but we are not sure.

⁴³ Possibly Alexandre Brongniart (1778–1847).

⁴⁴ word after 'been' crossed out, 'impregnated in one place' inserted.

CLARKE'S REPLY – CLARKE LETTER 1

On the cover of the letter, addressed in Clarke's hand.

W.S. Macleay Esq. etc. etc.

Elizabeth Bay

Sydney

[Post Office Stamps]: Parramatta Jy 2 1842

General Post Office Sydney Jy 2 1842

Paramatta 1 July 1842

My dear Sir,

At the present moment I have scarcely time to reply as I would wish to your very interesting & instructive letter of 26 June⁴⁵, having only returned a few hours from an inspection of the country about Jervis Bay & the Coal Cliffs of Bulli etc. [Figure 2] & finding some arrears of correspondence on business matters, with a multiplicity of notes to digest & arrange. I do not like however, to put off to another date my acknowledgment of the favor you have conferred on me in writing so explicitly on the subject of your views, as to the age of the Coal in Australia.

I must however, beg to say, that you must not hold me responsible for all you read in the Herald – or think me like the Barber in the play *Figaro ci Figaro la*⁴⁶ – because there may be expressions in the article to which, in consequence of your remark, I have referred, which are perhaps so worded, as to convey more than they mean in strict interpretation: there may be more than one poker in the editorial fire.

Whether the real Simon Pure⁴⁷ be before you or not, [end of first handwritten page] or whether any other *Naturforscher*⁴⁸ – (Nature Poker) is engaged in stirring up the coals is little to the purpose. But so far as I read the article to express a doubt, & no more, as to the non-proof of the identity of Australian & Northumberland Coal [goes! scratched out], the case seems to me to run neck & neck with your assertion, which is most true, that there is no proof yet that the A.[ustralian] Coal is identical with that of the Oolite.

Your view of the earth's geological progress is one which appears philosophical & true, one which (so to speak of myself in your ear) I have always held, with the exception, that if Combustion under pressure applies to Forests standing, I do not see how the Coal could be, in your plan, produced, & with the addition, that if, as I see no reason to doubt, Carbonic Acid gas was then as common as Soda Water now, it was necessary to be swallowed if there were throats for it to pass through, the wondrous abundance of vegetation, nourished by that gas, was wisely provided, not to [?] prevent animal existence, but to prepare the earth for it by the invention of oxygen. And it may be said, in reference to this topic, that whilst Lindley's experiments⁴⁹ shew, that there was probably other veget [end of second manuscript page of first folded section] ation than the present Coal plants exhibit, so Moses in Gen. 1.10.11 declares, vegetation followed upon the earth's appearance above the primaeval waters, & preceded even the appearance of the Sun & the creation of the water-creatures.

Admitting this, & further your idea of the Coal of the Oolitic age being merely emigrant charcoal of a former period (though I confess this is not so clear to me as many of the Q.E.D. in Euclid) though I always have thought all the rocks since the primary ones, save [perhaps] limestone & some sandstones,

⁴⁵ Moyal (2003, 1, pp. 112–115), reproduced above, but modified by us. In her footnote 1, page 115 Moyal notes 'Clarke's reply to MacLeay's previous letter has not survived.' It has survived and is presented here.

⁴⁶ *The Barber of Seville* by P.A. Beaumarchais (1732 – 1799).

⁴⁷ A term made popular in 1815 for the name of a Quaker in a play 'A bold stroke for a wife', impersonated by another actor, meaning a real, genuine or authentic person. See Shorter Oxford Dictionary, Third edition revised 1955, p. 1896

⁴⁸ See fn. 18 above re Leichhardt.

⁴⁹ Lindley carried out a number of experiments on the behaviour of plants under varying conditions.

derivative by destructive agency – such as the Old Red from Slates & Granites etc & the New Red from ?; the old – the Plastic Clay Sands from the Hastings & Green Sands etc⁵⁰ & lastly the concretion-invested spirifers & corallines of the Australian, (perhaps) from rocks older than those now entombing them — I cannot see why we are to exclude Vegetation altogether from the Oolitic age, for there must have been trees & plants sufficient to make the small accumulations of oolitic Coal & Lignite: seeing Bush beasts existed, [end of third manuscript page].

Take the case, however, as it is here – Sandstone & Shales, containing occasionally fossils of the sea land and marshes, & Coal of some sort, with abundance of evidence of fireworks & water frolics in trap dykes & [?] abraded imbedded fragments – the [letters crossed out] problem appears to me to be solved not by the fact, that some of the organic remains abound in the Old Coal Beds of Europe, but by the preponderance of the evidence as to the other fact, that the greater part of these remains are generically oolitic rather than the other way⁵¹

Now it was upon this ground, admitting all that can be said as to the presumption in favor of Mountain Limestone⁵² fossils, fish, plants etc that I ventured to surmise, that though in, these things are not of the formations in which they are found of necessity because they are in: your very argument as to Coal Beds.

If we take mineral character of the rocks here, I am sure all the Books go with me in the supposition. If we take mineral contents, there is as much proof of the one side as the other, e.g. Salt. Salt abounds in the Saliferous deposits of the N. Red.⁵³ Be it so. Salt abounds in the [end of fourth manuscript page, being last page of first folded section] Alpine oolites; in the Spanish tertiaries, in the Wielickza tertiaries⁵⁴ & elsewhere in rocks of a later age than the New Red. Again Hydrate of iron & pisolitic Iron etc is abundant in the Oolitic series; they also abound in the rocks of Australia. Alum is another distinguishing mineral, both here & at Alum Bay & Whitby⁵⁵ & elsewhere.

Next as to geological structure: Where shall we find so close a parallel to the deep gulleys & abrupt vertical walls of rock so noticeable in the N.S.W. sandstone as in the Jurassic rocks of the Pyrenees?

But to come closer to your objections let us look at the acknowledged fossils – leaving the doubtful ones out of the question. In the Oolitic Period, including the Wealden Rocks, I think we may find nearly all the disputed evidence: & had I taken examples of the features above named, the Wealden Group would supply me with hundreds.

It is only fair to state here, that Mr Bowerbank writing to his friend Kirk⁵⁶ says ‘The fossils from Wollongong are the equivalents of the Mountain Limestone’⁵⁷, & that [end of fifth page, labelled 2, being

⁵⁰ In the 1840s the Cretaceous rocks were often subdivided into two, the Upper (Younger) Cretaceous consisting largely of ‘Chalk’ (white earthy limestone and marl), the Lower (older) of greensand. Although Lyell suggested the green colour was caused by the presence of chlorite, the greensands are usually rich in glauconite (hydrous potassium iron silicate, closely related to the micas). However, when examined in detail the rock succession was more varied than this. The Hastings Sands comprised the lower division of the Wealden Formation of Lower Cretaceous age.

⁵¹ The last few words fitted in to the margin.

⁵² Limestone of Carboniferous age, underlying the British coal measures.

⁵³ New Red Sandstone.

⁵⁴ This locality, south east of Krakow, Poland, is famous for its salt mines. Stanislaw Staszic (1755–1826) summarised the geology which is now shown at one of the localities in the present tourist mine system.

⁵⁵ Alum Bay, at the west end of the Isle of Wight; Whitby in Yorkshire.

⁵⁶ Probably James Scott Bowerbank (1797–1877), palaeontologist. Kirk is not identified; he is possibly William King (1809–1886) who studied English Permian fossils (Lyell 1865, p. 456 and Sarjeant 1980, vol. 2, p. 1452). Quote not identified.

⁵⁷ Placing the Wollongong fossils in the Mountain Limestone made them stratigraphically well under Clarke’s proposed ‘Oolitic’ coals, rather than over them.

first page of second folded section] they and the sandstone from Woodford⁵⁸ lead to the deduction, that there ought to be Coal very near the surface between these localities. Sedgwick also, writing to me⁵⁹ says that those fossils look like, not are, those of the M. L.⁶⁰ but that the vegetable remains differ.

Silicified coniferous plants have been found abundantly in the Portland Oolitic beds⁶¹. Almost identical plants, colour character etc agreeing occur not only on the surface in the Hunter District, but in the Illawarra rocks. Equisetums occur not only in our Austral Shale but at Brora⁶² & in the Yorkshire oolites. Entrochi occur in the inferior oolite of the Haute Saone⁶³: they occur, at least the branching species, in the fossiliferous rocks of Ja[r] inserted]vis Bay [Fig. 2]. Spirifers (distinguishing the Coal beds also) are met with in the Lias of Yorkshire, Bath, Lyme, Normandy, South of France, & the Hebrides. Mytili occur in the oolites of the same country. One, if not two, species, occurs in N.S.W. Ammonites occur in the Lias etc. etc. one at least is found here. Your Gryphaea & true oysters shew a great resemblance of [?] etc between the oolites & [End of sixth page, being second page of second folded section] Australian rocks: one species of oyster I saw at Black Head⁶⁴, & I hope ere long, to shew, that they are abundant, as it is, in the sandstone on the range near Jere Wonglo Gap between Jarvis Bay & Argyle⁶⁵. I am promised specimens. It may be incorrect, but I believe not.

You lay much stress on the Glossopteris — Now Alex. Brongniart cites Glossopt. Nilssoniana⁶⁶ from the Gres du Lias of Hör in Scania⁶⁷. As to the G. Browniana occurring in India, till recently the Coal beds there were supposed to have been of the Oolitic age: but I have seen somewhere of late an attempt to shew, that they belong to your coal beds.

Two other plants Pecopteris alata & Phyllothea australis (“de classe douteux” A.[lex] B.[rongniart]) occur in New Holland⁶⁸. Six species of Pecopteris also occur in the oolites. [several lines inked out here.]

Now, I think, without going further, & not taking into account the Belemnites! & Orthoceratites, species of which latter [‘latter’ inserted] occur in the oolitic rocks of Italy, the balance thus [end of seventh page, being third page of second folded section] far, setting aside all that is common to the Terrain Houiller⁶⁹ & the Jurassic formations is in favor of the latter.

But you ask whether any thing like the Newcastle Fish⁷⁰ occurs in [? . . . not decipherable] series? I say, I think so: for Mantell says a Lepidosteus (Lacepede) of the Pike Kind, is met with in the Wealden⁷¹.

There is one other point to which I would allude. Most of the fossils in N.S.W. occur in nodules. Is this the case in the Coal Beds of Northumberland or their congeners? It is the case with some of the Oolitic beds. For the Lias of Lyme contains similar nodules of argillo-calcareous substance, spheroidal &

⁵⁸ In the lower Blue Mountains, west of Sydney (Figure 2). A drill hole was sunk there seeking coal in 1888 (see Branagan 2005, p. 47).

⁵⁹ Probably the letter of Sedgwick (1785–1873) to Clarke, 10 December 1838 (Letter 4 in Moyal 2003, vol. 1, pp. 72–73).

⁶⁰ The Mountain Limestone (Lower Carboniferous) of Britain overlies Old Red Sandstone, and underlies the Coal Measures.

⁶¹ See Lyell 1878, pp. 321–322.

⁶² See later, fns. 96–98.

⁶³ the eastern French province bordering Switzerland west of Basel.

⁶⁴ Headland, 40 km south from Wollongong, the furthest point south reached by J.D. Dana on his expedition with Clarke in 1840 (Dana 1849, p. 491).

⁶⁵ Jerrawongala, see Figure 2.

⁶⁶ Nilssoniana

⁶⁷ Hör is a small village north of Lund in Scania (part of Sweden), the site of a rich bed of plant fossils in Lias (Cretaceous) sandstones, described first by Sven Nilsson (1787–1883).

⁶⁸ New Holland, the earlier term for Australia, surprisingly still being used by MacLeay.

⁶⁹ ‘Terrain Houillier’, French term for the main European coal-bearing sequence. Adolphe Brongniart set up the broad classification of ‘Terrains’.

⁷⁰ see fn. 39.

⁷¹ Gideon Mantell (1790–1852) in his *Wonders of Geology* 1838, see also Lyell (1878 p. 301) for this fish, named by Bernard, Comte de Lacépède, (1756–1825).

fracturing in the centre. Again junks of wood occur there: so also much of the fossil wood of N.S.W. is in junks which have been cemented together after having been violently broken. [end of eighth page, being fourth page of second folded section] I have not touched on a variety of points open to comparison. There are enough for the present, to shew you the grounds on which I have conceived the idea of the possible age of this country's coal.

Lastly, however, which is the "unkindest cut of all" – I have in my late excursion satisfied myself, of what I before had suspicion, that the Wollongong fossiliferous beds are over, or in, not under the Coal⁷²: and in looking to my notes, I find the same conclusion almost indubitably proved respecting the Harpur's Hill beds⁷³ If this be so, what then becomes of the question?

My solution would be, that the fossils, even if M.L. fossils, have been intermingled in one common medley with others belonging to a later era, & thus drift fossils are sometimes found in the Crag⁷⁴ beds as well [end of ninth page, being the first page of the third folded section, and headed 3] as in the Diluvium⁷⁵ surmounting it; just as in Bornholm⁷⁶ Coal occurs with marine beds of all ages from the Silurian to the Chalk.

When we behold the proofs of great denudating & destructive agencies about us here, and remember, that the original condition of this Continent was most likely an Archipelago, & consider further that the now deep ocean may occupy the place of older sedimentary rocks, such as M.L. Old Red etc it is not wild to suggest, that some of our fossils may be drifted from tracts now buried or submerged, & at a vast distance from us.

In fact, I believe, that it is actually necessary to take in to the account physical as well as fossilif – [end of tenth page, being second page of third folded section] erous geology before we can come at the truth of the latter.

These are my notions, wild, crude, & undigested they may be: but I place them before you, without hesitation, believing that though I am in your hands as a fly in that of a giant, you have gentleness of nature enough about you to use the giant's strength with delicacy & to crush my theory as Walton says of the frog on the hook⁷⁷, as "if you loved" me.

I have seen a good deal in my late excursions, & know more than I did about the succession of beds.

⁷² This is incorrect and is a somewhat surprising statement by Clarke, as while the coal measures are exposed at sea-level a few kilometres north of Wollongong the seams had risen towards the south, and at Wollongong were exposed below the cliff line of Mounts Keira and Kembla, west from Wollongong. The marine fossils were both topographically and stratigraphically lower than the coal measures (see also Dana 1849, p. 491). Clarke's statement seems to be contradicted by his Table (Figure 6), in which the Wollongong beds are shown below coal.

⁷³ A fossiliferous succession exposed on the road to Muswellbrook (near Singleton) in the Hunter Valley, the hill being apparently named for Charles Harpur (1813–1868), poet. It is sometimes written as 'Harper'. The fossil occurrences were commented upon by various authors, such as the Rev. Richard Taylor 1838, p. 282; Dana 1849, p. 493, and his Appendix 1 pp. 681–720.

⁷⁴ Beds of shelly sand occurring in the Pliocene (Mid to Late Tertiary) beds of Eastern England (Lyell, 1878, p. 172).

⁷⁵ What is now known as glacial drift. The term was originally used to explain the extensive occurrences of unconsolidated material thought to have been left by the withdrawal of Noah's Flood. This idea lingered with some 'biblical' geologists, when evidence of continental glaciation became generally accepted from the 1840s. However the word continued as a useful term for these deposits.

⁷⁶ Bornholm, Danish island in the Baltic Sea, SE of Denmark.

⁷⁷ Isaac Walton's *The Compleat Angler*, chapter eight in the 1932 edition.

When I can spare time I am going to Lake Macquarie. Threlkeld has sent me a box of specimens⁷⁸
 The Maughan⁷⁹ fossil I had marked down before I had your letter as *Ulodendron* or [?] *Favularia*. I [?]
 I was not far out. That remember was not in situ – but drifted – black fellow carried!
 Pardon the length & cacography⁸⁰ of this scrawl & believe me

Faithfully yours
 W.B. Clarke

I beg my compliments to the family

MANUSCRIPT MEMORANDA

This relates to the discussion in Letter 1 (Clarke to Macleay, 1 July 1842)

Dated at the end: Midnight 5 July 1842.

Mem:

Combustion. No proof such was the case. Charcoal, I believe, may be produced without combustion — & wood may be bituminised without fire — though perhaps not without heat whether derived from pressure or otherwise. *Quere!*⁸¹

Moses. The word “appeared” was marked [?]. I admitted the existence of the Sun before that time: his appearance could not take place till the fog & the darkness over the great deep was cleared off. I allow all that is said about the introduction of Scriptural Geology. & I have finished some forty or fifty pages against it⁸². My allusion to the subject was merely to point out a curious coincidence. I believe the days of Genesis to have been 24 hours long, & all fossiliferous rocks older than the history of the preparation, for the use of man, of the Earth after having been flooded & so to speak destroyed. Created in the indefinite Beginning (When ? – who knows. See *Joh.1.1* – [?])⁸³ it had been peopled — was destroyed & was again to be peopled. [‘granted’ written along left-hand edge of this text] — [End of page 1 of Memorandum, the next page is headed ‘2’]

Carbonic Acid Gas.

Is not the argument for this idea derived from the Limestones of the Silurian & Carboniferous eras? No⁸⁴ Where are these limestones in Australia? All I have seen are plutonic⁸⁵, & for ought I know more recent than the Coal. I believe some are. *Quere*

Preponderance of Species. By this I meant not that more or as many species of any one Genus were found in the oolites rather than in the M.L. & Coal beds: but that there were of species found in Australia more that could be referred, of all genera to the O. rather than to the M.L. & C. This is not the case

Conglomerates. The oolitic series contains such “Quartzose Conglomerates” in the Vallorsine, Trient, etc etc & are not confined to Savoy & the French Alps, but in the shores of Como & La Spezia abound (see *De la Beche*)⁸⁶. *Quere*

⁷⁸ Lancelot Threlkeld (1788–1859), Congregational minister who opened a coal mine at Coal Point on the west side of Lake Macquarie in 1840 in opposition to the Australian Agricultural Company’s supposed monopoly (Branagan 1972, pp. 65–66; see also Champion 1939).

⁷⁹ Not identified. It is apparent that both writers were familiar with the specimen and its origin. We have not identified either a place or person, and there are no Clarke or MacLeay letters of earlier date presently extant. We may have misread the word.

⁸⁰ ‘bad writing’ or ‘incorrect spelling’ (*Shorter Oxford Dictionary*, p. 245).

⁸¹ Words such as ‘Quere’ etc at the end of each section are in pencil and apparently indicate MacLeay’s reaction to the section.

⁸² Clarke apparently never published these notes on Scriptural Geology.

⁸³ Probably referring to The Gospel according to John.

⁸⁴ See fn. 83.

⁸⁵ possibly meaning metamorphic, i.e. marble.

⁸⁶ De la Beche 1836.

The latter conglomerates separate the gneiss and mica slate of the higher Alps from the calcareous beds: they are composed of “rounded pieces of quartz [End of page 2 of Memorandum] and porphyry & other rocks associated [partly torn] with beds of sandstone.” –

This is identically the case in the Blue Mountains (Hassan’s Walls) & in Argyle (Gibraltar Rocks)⁸⁷ may be so

Rocks behind Eliz. Bay

They appear to me as much like the P. clay beds⁸⁸ of Dorsetshire, or older: but I admit if for Shale with lignite we read ‘Marl with gypsum’ they might pass for a yellow variety of New Red. If the Sydney Sandstone be New Red, where are the red & green marls — & the gypsum? not necessary abrupt character of gulleys etc

Take the case of Normandy, where the oolitic series rests on the old rocks & the rivers have been cut down to the latter. not to the point

Grès des Vosges M. Bonnard⁸⁹ says that what he calls ‘Arkose’, represent [‘ing’ crossed out] the ar[‘a’ crossed out] enaceous beds of the lowest part of this ?unit of the Vosges; & Dufrenoy⁹⁰ says this arkose exists in S.W. France. This arkose (a sandstone – baked?) made up of felspar, quartz grains & cemented by siliceous or marly matter [End of page 3 of Memorandum] separates the [damaged] & oolites f [inserted ‘r’]om each other near Chatre [sic]. farfetched

“This arkose seems to pass into lias limestone.” Now if I interpret all this aright such arkose exists in the lower beds of the sandstone of N.S.W. a specimen of it, or rather a variety, goes to you with this.

Mica. I admit, generally, want of mica distinguishes the Oolitic rocks. Yet micaceous marls rest on lias in S.W. France: & micaceous brown sandstone [underwritten ‘like greywacke’] occurs in the Gulf of Spezia in ool. Series. (Salt encore. Mines of Halle in Austria⁹¹ — oolitic. —) Silicified wood. If this lies in beds of sandstone above the Coal: it bears on the argument, presuming that of the Illawarra etc to be of same era as the Portland. Now such does lie in beds above Australian Coal. valeat consequentur⁹² Gryphites. Two species occur in the great arenaceous formation of [the] Western Islands⁹³. Six others in Lias. [End of page 4 of Memorandum]. Murchison & Sedgwick class the great sand & sandstone formation above the Brora Coal as the equivalents of the Great & Inferior Oolites. — the upper part sand & sandstone, the lower carboniferous shales & sandstones⁹⁴. These are Murchison’s words “with respect to Brora Coal, the purer part of it differs in no respect from the coal of the carboniferous series when subjected to chemical analysis: but it offers a mineralogical distinction upon being pulverised, assuming like all⁹⁵ lignites a red

⁸⁷ See Figure 2 for locations. Clarke is apparently referring to the Gibraltar Rocks, on the northside of the Wollondilly River, County Argyle, GR745651 in the far southeast corner of Chatsbury 8828-I-N 1:25 000 topographic Map, rather than the better-known ‘The Gib’ (Mt. Gibraltar) at Mittagong (Wells 1848, p. 179), which is in the adjacent county, Camden, close to the boundary with Argyle, and which consists of igneous rock, while the Gibraltar Rocks are of Permian conglomerate.

⁸⁸ Plastic Clay sands.

⁸⁹ Augustin Henri de Bonnard (1781–1857), a Freiberg graduate, author of Aperçu géognostique des Terrains, *Annales de Minéralogie*, 1819.

⁹⁰ Pierre Armand Dufrenoy (1792–1857), who carried out stratigraphical work in the Pyrenees (Zittel 1901, p. 501).

⁹¹ NW of Leipzig, now Germany.

⁹² ‘It is a logical consequence’.

⁹³ Of Scotland.

⁹⁴ Murchison & Sedgwick first worked together in Scotland in 1827 (Geikie, 1875, vol. 1. pp. 139–145). Zittel (1901, p. 432 incorrectly says 1826).

⁹⁵ There is no underline in the original (Murchison 1829A, p. 301)

ferruginous tinge, and thus differing from the true coal which works into a black powder.⁹⁶ In my idea the Brora coal is the best type of the Australian: if it is not⁹⁷ rather to be found in the Brown Coal of the Rhine.⁹⁸ — [End of page 5 of Memorandum] [New page: top right hand corner '6'] Unkind Cut. Not to Mr M^cLeay, but to old Dawson⁹⁹ and the Mountain Limestone folks. And how. If as Mr M^cLeay says — the beds containing the fossils be Recent — and they are all the “old Coal” people rely on — eadit questio¹⁰⁰ But since these beds are part of the Coal & Sydney sandstone series, for all are one, (I can prove it,) — if they in the middle be recent, what are the upper. — (recent i.e. comparatively so). —

Limestone. 1. What is the age of the Aust^a. Limestone of Wellington etc Pentland says that of the Cave limestone of Yorkshire i.e. — Kirkdale ?etc i.e. Jurassic — or Oolitic¹⁰¹ —

2. Where is there any, of the equivalents of any M.L.¹⁰² in N.S.W.? —

Fullers' Earth. abundant near Newcastle, where I have seen a bed of it. Sulphate of Lime. in small portions, in the [shape crossed out] form of fibrous gypsum, Bullai [sic] “Coal” Cliffs. [End of page 6 of Memorandum]

Porphyry of P. Stephens [Port Stephens, Figure 2] [inserted ‘Some’, then several words lost as page is torn] it is decidedly older than the sandstone [inserted ‘& grit’] which overlies it, & which are composed of pebbles & grains of porphyry — yet contain impressions of Newcastle Coal plants & casts of the Harpur’s Hill fossils. The P. of P.S. is not all of one age — dykes of a later kind — later than the grit etc pass through the older, & tilt up the sandstone thus in one of the little islands.¹⁰³



⁹⁶ The quote is from Murchison *Transactions of the Geological Society of London* 1829, 2nd series II, pp. 293–353. Brora Coal refers to an ‘anomalous patch of coal-bearing strata in the Brora district’ in the eastern Highlands of Scotland, near where Roderick Murchison was born. Murchison carried out some of his earliest fieldwork on these rocks trying to see where they fitted into the stratigraphic column. Murchison thought the fossil evidence fitted with Oolitic rocks he had been shown in Yorkshire by William Smith and his nephew John Phillips, so that the Brora Coal did not belong to the ‘true’ British coals measures, of Carboniferous age. (Rudwick 1985, p. 68; Murchison 1829a; 1829b; Oldroyd 1990, p. 32 note 28; p. 47 note 64).

⁹⁷ Here the text is interrupted by two ‘blots’ separated by a rough near-vertical line. The blot on the left is identified as: ‘1 ?wet powder of Illawarra ‘Coal’ with an additional note stating ‘there are redder varieties than this’. The blot on the right: ‘2 Cake of best Cologne Earth from Paint Box’ (Figure 7)

⁹⁸ The German brown coals are about the equivalent of the Tertiary brown coals of the Latrobe Valley, Victoria. Their existence was virtually unknown in Clarke’s day.

⁹⁹ The comment possibly refers to Robert Dawson (1782–1866), first ‘Superintendent’ of the Australian Agricultural Company (A.A.Co.), between 1825 and 1829, who exhibited (Friday Sept 15, 1837), a collection of fossils from New South Wales at the 7th meeting of the British Association for the Advancement of Science (Liverpool).

¹⁰⁰ ‘likewise this is questioned’.

¹⁰¹ Joseph Barclay Pentland (1797 – 1873), Baron Georges Cuvier’s assistant, described the Wellington fossils following Cuvier’s death. He is shown in the titles of these papers on the fossils (Pentland, 1832, 1833) as W. Pentland, possibly a misidentification of M. (for Monsieur). The Kirkdale occurrence was made famous by Buckland’s exploration of ‘a hyena’s den’ (Buckland *Reliquae Diluvianae* 1823). The Wellington limestones are Silurian.

¹⁰² Mountain Limestone, essentially Early Carboniferous, underlying the European Coal Measures.

¹⁰³ The tilting has not been caused by the dyke intrusions, but is the result of regional folding, which Clarke might not, at that time, have seen in the region.

It also forms true prismatic columns on One Hill No. 1, 500 feet high, behind Tahlee House¹⁰⁴ — This second porphyry is decidedly trappean & changes into, or ?intercalates with the Basaltic & Trappean rocks of Stroud. The “Coal” beds of Booral¹⁰⁵ also lie highly inclined in consequence — some also fossiliferous having casts in them of Spirifers: which I discovered when there in April.

Porphyry of Oolitic ?age Humboldt says: “Dans la partie meridionale du Tyrol des masses de granite & et de porphyre syénitic qui (i.e. spec. Australas [?]) semblent même déborder du grés rouge dans le [End of page 7 of Memorandum] calcaire alpin, et ces phénomènes curieux d’alternance, liés à tant d’autres plus anciennement connues, semblent condamner à la fois et la séparation du grès houiller des porphyres du terrain intermédiaire et la denomination historique et trop exclusive de terrains pyrogènes.” (Gisements des Roches p. 190)¹⁰⁶

He also mentions a porphyry in the Southern Hemisphere in the Andes cov’d by a “calcaire (alpin?)” with fossils etc He further names the porp^{v107} associated with rocks younger than the “calcaire alpin” in another part of the country. But so far as Australia is cond¹⁰⁸, the question is solved — Mount Hay & Mount George in the Blue Mountains are crested with overflowing masses of porphyry which have passed up from below¹⁰⁹

WBC

Midnight 5 July 1842

¹⁰⁴ The main site of the Australian Agricultural Co. on the north side of Port Stephens, occupied by the Australian managers of the company, including P.P. King, and later his son P.G. King. The building is still extant. The nearest hill to the house is some 130 m high.

¹⁰⁵ The coal beds of Booral are in the later-named ‘Stroud-Gloucester Trough’, and were first described in any detail by Ferdinand Odernheimer (1808–1885) a consultant brought (with his assistant Ernest Herborn, (?1827–1909)) to New South Wales to advise the A.A. Co.

¹⁰⁶ ‘In the central region of the Tyrol are masses of granite and syenitic porphyry which seem even to extend beyond the red sandstone onto the alpine limestone, and these curious alternating phenomena linking up with many others, known to be much older, seems to assign [them] to the period of the separation of the sandstones of the coal succession from the porphyries of the intermediate succession, and to the historic and unique episode of the [formation of] the pyrogene [i.e. igneous] terrains.’ Translation by Branagan 2008.

¹⁰⁷ Porphyry.


¹⁰⁸ Possibly abbreviation of ‘concerned’.

¹⁰⁹ These two mounts are capped by basalt of Tertiary age (mid-Miocene), between 14.6 and 17.7 million years old (Pickett & Alder, 1997). The name Mount [King] George has been replaced by Mt. Banks.

5


Michigan Hedgwick class the great
 sandstone formation above the
 Brona coal ~~is~~ the equivalent of
 the Great Superior & others - the
 the best sand & sandstone, the
 lower carboniferous shaly & sandstone.

There are Michigan in words
 with respect to Brona coal, I have
 just got differ in no respect from
 from the coal of the carboniferous
 series when subjected to chemical
 analysis: but it offers a mineral-
 -ogical distinction upon being
 pulverised & appearing like all
 lignites and ferruginous tuffs,
 others differing from from the true
 coal which breaks into a black
 powder. - In my idea, the
 Brona coal is the best type
 of the Australian if it is not



1

Best powder of
"Slow coal"



2

Best
Coke of Colocua Lake.
from Paint Box

cakes to be found in the Brona coal
 of the Ohio. -

Figure 7. Page from Clarke's memoranda (5 July 1842) showing his comparison of the two colours of powdered coal specimens.

MACLEAY'S REPLY

Eliz. Bay 4 July 1842

My dear Sir,

Mille choses! by which magic words I hope, a thousand thanks, Compliments etc are safely got over and perfectly understood by you. Our grand business is the Search after Geological truth, and therefore let us proceed to work not like two rustic bruisers in order to ascertain which is "the better man" nor yet roaring out like MacBeth "c—d be he who first cries hold enough" Rather like two peaceable warriors on a melodramatic stage let us be content with eliciting a few sparks of light from the collision of our respective weapons.

1. You begin by questioning the accuracy of my expression "combustion under pressure" as applied to the Great Coal Bed. Perhaps the expression may be loose, but my idea of the formation of coal is this. Vast quantities of wood were carried down by the ancient torrents and deposited [*'on deltas or otherwise' inserted*] at the mouths of rivers whether these were clothed with standing trees or not. Here piled up, these masses of vegetation were covered by a Sea which seems gradually and quietly to have deposited its sediments around and over them whether the trees were standing or prostrate. Then again all was covered by a Sea which deposited beds of Sand over the mud. Then followed that tremendous fire which I think must have acted from without, burning the beds of sand that lay on the Coal, cementing them with iron and the carbonic acid of the shells they contained so as to form the lower New Red Sandstone while the mass of vegetables in the mud bed below was converted into Coal. My reason for supposing the fire that made the coal to have come from without is that the fossils of the several lower limestone formations would have been all melted down into marble and have disappeared had this great Conflagration proceeded from the centre of the earth. By combustion under pressure therefore, I merely meant the conversion by heat of the wood into coal under the pressure of the superincumbent Mud and Sand.¹¹⁰
2. As to what Moses says in Genesis of the Creation I have long thought the safest way for me would be to consider that if this lawgiver had adapted his lessons to the discoveries made by modern Philosophy instead of adapting [*end of original page*] to the state of knowledge of those he governed he would not have been understood by the Israelites. It is possible that as a clergyman you think you have a right to a more distinct exposition of my belief than this, and I am not the person to shrink from giving it. Thus I believe that terrestrial vegetation (for fucoids existed before in the waters) followed upon the earth's appearance out of the *primaeval deep*; but I doubt (nay I will go further) I do not believe that vegetation preceded the appearance of the Sun and of every kind of Aquatic Animal. I must disbelieve my senses or put faith in the Geological evidence [*several words inked out*] against such an antiquity of grass, herbs and trees. Nevertheless, I do not think I am placed in the sad predicament of conceiving the statements of Moses inconsistent with the truth.¹¹¹ On "the first day" the Creator said "let there be light" and he called this light day and the darkness he called night and he then divided that light that is day from the darkness i.e. night. It was on this "first day" then that the Sun was created; for on "the fourth day" if the Almighty said "let there be lights in the heaven to divide the day from the night" these clearly [*'were' crossed out*] had been already divided on the first day, and I therefore understand that by this apparently second division of the day and night is meant the division into the Seasons, day and year nearly as these periods of time at present exist. Nor do I imagine that there is any improbability in some great Astronomical Change of this kind having taken place long prior to the existence of Man. In short my interpretation of the Bible is that the Sun existed before the fourth day, but the Creator at that epoch [*end of original page*] made it to regulate the day and year as they at

¹¹⁰ MacLeay's hypothesis on the formation of coal by fire is no longer accepted. Pressure and heat, together with chemical changes, caused largely by the pressure of cover of overlying sedimentary layers, interaction with underground water, intrusions and tectonic movements are known to be sufficient. See for example Dulhunty (1954).

¹¹¹ See Moyal (2003, vol. 1, p. 120 fn. 2), where she discusses Clarke's earlier comments and work on Biblical geology.

present exist. There is every reason to believe that there was no dry land until after the Silurian age; and yet during the Silurian age and consequently before terrestrial vegetation Fishes and trilobites lived in possession of eyes having a structure such as to show us that they were formed to meet light of much the same kind as fishes and Crustacea enjoy at present.

3. As to the time of creation of the Aquatic Animals, I believe Infusoria to have been almost contemporaneous with the precipitation of water; that is, with the formation of the earliest primitive Strata. Reade discovered them in mica Slate¹¹² and Ehrenberg¹¹³ has discovered infusoria living in hot springs and has shewn that the ancient fossil species are almost identical with those now existing. Indeed Infusoria must have lived to supply food to the Annelida of the Cambrian System and to the Polyps Mollusca and trilobites of the Silurian System. All these animals with the Crinoidea and Fishes of the same epoch must according to Geological evidence have existed before dry land. Do I then dare to contradict, – you will ask – the 20th verse of Gen. [Genesis] c.1. No, I believe that on the fifth day (which may have been for all that I know the Oolitic epoch) “moving creatures were created abundantly in the waters” although many Species existed in the deep during the previous epochs. That was the time when Ichthyosauri Plesiosauri and other Leviathans made their appearance. The word “whales” in our translation, is said to signify [inserted ‘in the original’] any kind of large Aquatic Animals, and this to me is the more probable as I am not aware that there is any well authenticated fossil of Cetaceae prior to the Miocene tertiary formation. – So much for Mosaic Geology – But to say the truth I am no Hutchinsonian nor Granville-Pennite nor Dean Cockburnite¹¹⁴. I cannot [end of original page] consider the Bible as a Scientific book according to the vulgar meaning of the word Scientific; and although I do not conceive that Moses wrote anything inconsistent with the truth, I confess I have as much confidence in his opinion of the binomial theorem as I have in his dictum on Geology. If therefore you as a Hebrew scholar tell me that my interpretation of the Mosaic Cosmogony is not borne out by the original, however it may square with the translation, I shall not much care, as on this head at least my Conscience is void of offence. I say this however with all the respect which is due to such a subject and to the profession of the person I am addressing.
4. I surely made a gross mistake if by any expression in my letter I seem to you to exclude vegetation from the Oolitic age. The Cycadea and other plants of the Oolitic and the Herbivorous Iguanodon of the Wealden¹¹⁵ would contradict me at once if I had been so absurd. But I never meant this whatever I may have written. All I said or at least all I meant to say was that in the Oolitic epoch there were no such enormous masses of vegetation as to require the extraordinary dose of Carbonic acid gas which Brogniart [sic] deems to have been necessary for the Great Coal bed vegetation.
5. The Problem as to the age of the Australian Coal appears to you to be solved not so much by the fact that some of the organic remain(s) abound in the Old Coal Beds of Europe as by the predominance of the evidence [end of original page] in support of the other fact namely that the greater part of these remains are oolitic rather than otherwise. [see Figure 8] For the “sake of peace and quietness”, I shall grant that the problem is to be thus solved; and now I ask does the evidence so preponderate? I shall venture to discuss seriatim¹¹⁶ the evidence which you give as to this point. In the first place you acknowledge yourself that as to mineral contents there is as much proof on the one side as on the other; but [inserted ‘you’] refer to the mineral characters. I am not sure that I rightly comprehend your reference, but my notion as to “the Mineral Character” of these rocks is, that the Sandstone and Quartzose Conglomerate which characterizes the neighbourhood of Sydney agrees with the character of the Millstone Grit that lies under the old Coal Measures and also with the character of the Grès

¹¹² Reverend Joseph Bancroft Reade (1801–1870) microscopist and photographer (Serjeant 1982).

¹¹³ Christian Gottfried Ehrenberg (1795–1876), microscopist (Serjeant 1980, pp. 948–950).

¹¹⁴ See Moyal 2003, vol. 1, p. 120, fn. 3, for further on Hutchinson, Granville Penn and Cockburn, defenders of the Mosaic story.

¹¹⁵ Moyal (2003, vol. 1, p. 117) notes here several words blurred. We read them as ‘of the Wealden’.

¹¹⁶ ‘one by one in succession’.

bigarré of the New Red that lies above them; but where is there any [inserted 'sandstone'] rock bearing the character of a Quartzose Conglomerate in the Oolitic Series? Again I am ignorant of any place in the Oolitic where you will find the layers of sandstone separated by micaceous lamination¹¹⁷ although it is a character common in the sandstone of the Poecilitic Formation¹¹⁸ and in [inserted 'the'] Rock behind this house. With respect to Geological Structure you ask where we shall find so close a parallel to the deep gullies and abrupt vertical walls of rock so noticeable in the NSW Sandstone as in the Jurassic Rocks of the Pyrenees? I answer that I find a much better parallel in the precipices of the Pays des Vosges; for in addition to its like abrupt structure the Grès des Vosges is a micaceous sandstone free from fossils like the Sydney rocks whereas the [end of original page] precipices of Jura are Calcareous and abound with fossils of the genera Pteroceras Nerinaea etc.. In short, it may possibly be my ignorance, but I would say that in general Limestone and Clay are the prevailing constituents of the Oolitic Series, Sandstone being the exception, whereas Dolomite and Marles¹¹⁹ [sic] form the exceptions in the New Red System of Sandstone. [see Figure 8]

6. You say that the Silicified Coniferous plants of the Hunter River district and Illawarra rocks are almost identical with those of the Portland oolitic beds. For my part I have never seen and know nothing of the coniferous plants of the Portland and Illawarra beds; but supposing the silicified plants of the Upper Hunter and Illawarra districts to be of the oolitic epoch I do not see how this can affect my arguments with respect to the [inserted 'age of the'] Sydney Sandstone which lies immediately over our Australian coal. Equisetums you mention as occurring not only at Brora but in the Yorkshire Oolite; and on examining this matter I find that the Equisetum Columnare ie. one solitary species does indeed occur at both these places and is the known [inserted 'Oolitic'] species; whereas twenty species and two different genera of [several words inked out here] Equisetaceae are described from the old Coal measures. By the way the Australian genus appears to be "Calamites" – a genus that has never yet occurred in Europe but in the Old Coal strata where 17 species are known. I confess I respect the whole family of Sauroid fishes so abundant [end of original page] in the Coal measures more than the solitary individual which you mention as having occurred in the location. And as to the Entrochites which you mention from the inferior Oolite of the Haute Saone, I will add to them those that are found in the Oolite of various other parts of France of Germany and Switzerland together with the *Pentacrinites vulgaris*¹²⁰ of the Yorkshire Oolite; but at the same time I must beg attention to this fact namely that *Crinoidea* first made their appearance as early as the Cambrian System, (see note p. 710 of Murchison's Sil^p. System) and are abundant in every System between it and the Oolitic not even excepting the old Coal Measures; therefore valeat quantumide¹²¹. So also *Spirifer* is a genus which you acknowledge in the Carboniferous Series, but they are most abundant in the Silurian system. *Mytilus* is a genus common in the New Red and one species of it occurs in the Old Coal. Six species of ammonites are described from the true coal beds, and according to Thirria's¹²² list the genera *Ostrea* and *Gryphaea* occur in the Silurian System (or what the French call 'Le Terrain Schisteux'), but I confess I have my strong doubts of these two last [?] genera being so old since Murchison makes no mention of them. *Ostrea*, however, is to be found in the lists of the New Red Sandstone, *Gryphaea* is not. And I therefore hold your *Gryphaea* to be a most interesting specimen¹²³. The abundance of this genus is no doubt a marked characteristic of the Oolite, but what is singular, it appears never yet to have been found in Europe in the grès du Lias which I imagine to

¹¹⁷ Laminations.

¹¹⁸ = Poikilitic, as previously (fn. 26).

¹¹⁹ This alternative spelling of 'marl' was apparently widespread at the time. The term, although widely used, was never firmly defined, being applied most often to lime-rich clays

¹²⁰ This species does not appear in the list in De la Beche, 1836.

¹²¹ valeat quantumide means 'cancels out'

¹²² See fn. 31, re Thirria.

¹²³ Moyal (2003, vol. 1, p. 120 fn. 5) suggests this underline is by Clarke. We are not sure if this idea is substantiated.

be the French name for the Oolitic Sandstone. But granting that curious Corinda¹²⁴ bed from which you obtained your Gryphaea [end of original page] to be oolitic – of which by the way there is as yet no proof – even this would not affect the validity of my side of the question which relates merely to the age of the Australian Coal and Sydney Sandstone.

7. As to “the unkindest cut of all” namely your discovery of the Wollongong and Harpur Hill fossiliferous beds being over the Coal, I imagine it would be a still more unkind cut for me than “the unkindest” if you had happened to have ascertained such recent formations to be under the Coal; for I never have imagined these formations to be Mountain Limestone but think them to be an ancient volcanic detritus washed down and forming a Sediment enclosing various ancient and more modern shells, which Sediment has afterwards become a concrete, fossiliferous Rock by means of Carbonic gas or iron, the two great causes of Rock concretion.
8. And now¹²⁵ with respect to the Sandstone fossil in your possession which in consequence of its leaves being in one plane we fancied might be Cycadeous, I have considered the matter and have no doubt of its proving a new Species of Brongniart’s coniferous genus Voltzia which characterizes the Grès bigarré. I have an undescribed coniferous living tree from Moreton Bay allied to this New Red Sandstone genus and like it having its leaves in the same plane. You will find a figure of two species of Voltzia¹²⁶ in Mantell’s “Wonders of Geology”.¹²⁷ This Voltzia may have drifted like the Ulodendron but you will grant that the Old Coal cannot be far off from the place where they were found, more particularly if “drifted by blackfellow”.¹²⁸ So you see my dear Sir that I do not get to say “proven”¹²⁹, and will die hard, not confessing anything more than it is no joke and requires a long wind to contend with you.¹³⁰

For [end of original page] a little time therefore I leave the subject in order to take breath, since he that fights and runs away may live to fight another day,

Believe me

Yours very obediently

But sincerely

W.S. MacLeay

Have you ever heard of the occurrence of Selenite (or some other form of Sulphate of Lime) and also Fullers earth¹³¹ in Australia?

I believe you will find an expression in my last letter by which it would appear that I had forgotten Professor Hitchcock’s discovery of a trace of a phalangeal¹³² Bird [word obscure] in Grès bigarré¹³³ beds of Connecticut N. America. I sit corrected in this respect, but there is nothing of it in the lower Red

¹²⁴ Corinda possibly refers to the property of Archibald Bell (1804 – 1883) near Singleton, on the Hunter River (Wells 1848, p. 135), which he established in the mid 1820s (Heydon 1966, p. 80). The rocks from this area are largely Permian or Carboniferous, but might possibly be as young as Triassic. Clarke (1878, pp. 137, 139) refers to a number of fossils from ‘Korinda’. These beds are Permian, older than the Coal succession.

¹²⁵ word crossed out ‘with respect’ written above those crossed out.

¹²⁶ ‘of Voltzia’ inserted. Named for the palaeontologist M. Voltz of Strasbourg d. ca 1849

¹²⁷ Mantell’s *Wonders of Geology*, published 1838.

¹²⁸ An interesting recognition of the transportation/trade of stone by the Aborigines.

¹²⁹ It is not clearly the word ‘proven’.

¹³⁰ See Moyal (2003, vol. 1, p. 120 fn. 6) for more on the MacLeay/Clarke relationships on these matters.

¹³¹ Clarke mentions it in his memoranda (see above) as occurring at Newcastle.

¹³² This word is uncertain. The word might possibly just be ‘prehistorical’. However MacLeay is referring to the discovery by Edward Hitchcock (1793–1864) of Amherst College, of footprints of what he thought were made by web-footed birds in the Triassic sandstones of Connecticut (Hitchcock 1837). We now recognise them as reptile and dinosaur tracks. For Hitchcock see Sarjeant 1980, 1267–1268.

¹³³ Words inked out, replaced by ‘Grès bigarré’.

Sandstone. Pray remember that I do not say that there is no member of the oolitic series to be found [?] in Australia. I am only arguing for the Antiquity of the Sydney Sandstone and [?] Coal. On reading over your letter I find I have omitted to notice your mention of the species of pectopteris found in the Oolite. On this head all I can say is that no less than 75 species of pectopteris have been described from the the Carboniferous Series !!! The occurrence of the Orthoceratite¹³⁴ at Lyme Regis is doubted. Dechen considers it 'ie alveoloe de Belemnite'.¹³⁵ At all events this is the only existence of an Orthoceratite in Oolite. If indeed you have found a true Belemnite in NSW the matter would be worthy of some attention. I am not yet in a state to answer your question as to the fossiliferous nodules. Another question occurs to me namely does not Porphyry of Port Stephens shew the immediate vicinity of Old Coal instead [of] the vicinity of oolite? When does a Porphyritic dyke traverse Oolite? I suspect the Port Stephens Porphyry to be a Plutonic Rock¹³⁶ older than the oolitic rock. But there is no end to my novissima verba.¹³⁷

[Additional Notes, possibly by Clarke]

Glossopteris Nilsonni Hörn ? Coal was considered oolitic Limestone of Wellington by Pentland and oolitic same as that of the [?] Hersian¹³⁸ cavern



See De la Beche p. 332 Plants of the Pine [?] Tribe identical with those of Pentland.

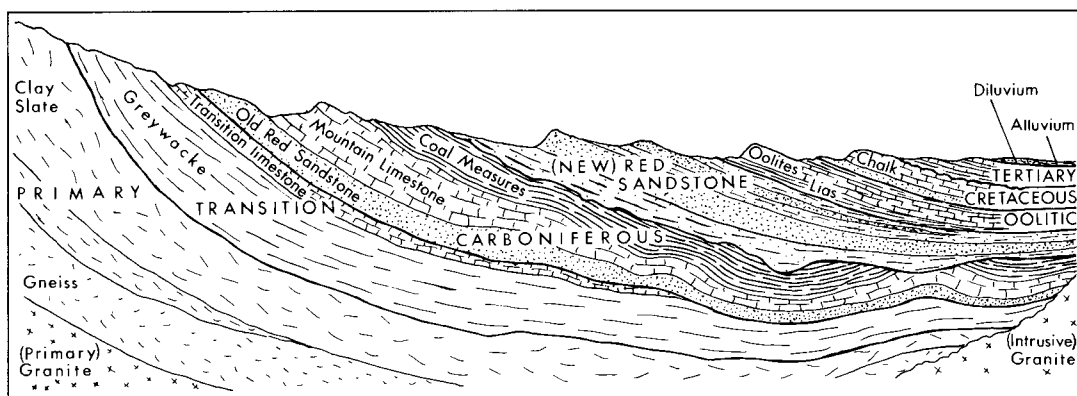


Figure 8. Generally accepted British and comparative Continental European stratigraphic terms of the early 1840s, as used in the letters (Buckland, 1823).

¹³⁴ A cephalopod.

¹³⁵ Heinrich [Ernst Heinrich Karl von] Dechen (1800–1889), geologist and explorer thought the supposed cephalopod was the 'conical chamber of a Belemnite'. Source of the original quotation not located.

¹³⁶ The Port Stephens rocks are not plutonic, but flows or explosive eruptive rocks.

¹³⁷ My last words.

¹³⁸ Not identified

The original Clarke letters have now been deposited in the Mitchell Library, and will presumably be added to the Clarke Papers: ML MSS 139 Collection.

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