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On the Meaning of the term "SILURIAN SYSTEM" as adopted by Geologists in various countries during the last ten years. By Sir RODERICK IMPEY MURCHISON, F.R.S., G.S., Member of the Academies of St. Petersburg, Berlin, and Copenhagen; and Corr. M. Inst. France.

[Read June 16, 1852.]

Introduction.—As in the last memoir printed in the preceding number of this Journal* my old friend Professor Sedgwick has animadverted upon some of my proceedings in establishing the Silurian System and in afterwards extending its application to British tracts beyond those in which it was originally formed,—I now offer, with the permission of the Council, a reply, which shall be very brief, and which, in vindicating my scientific credit, will be little more than a reference to documents published in successive years on this subject. Being perfectly sure that, whatever may have been the strength and pungency of his expressions, Professor Sedgwick had no intention to hurt my feelings, I am also certain, that he will be pleased that I thus have an opportunity of explaining what I consider to be the history of the origin and final establishment of my own Silurian classification.

* *Vide supra*, pp. 136 *et seq.*

Historical Retrospect.—(1831.) In the year 1831 Professor Sedgwick and myself commenced, but without any concert, our respective surveys, he in North Wales, and myself along the Welsh and English borders. In that year he published no notice of his observations; but on my part, being then President of the Geological Society, I laid before the first meeting of the British Association at York (Sept. 1831) a coloured geological map representing the succession of what I then termed the “Transition Rocks, Old Red Sandstone, and Carboniferous Limestone on the borders of Wales*.” My contemporaries (Mr. Greenough, Professor Phillips, and others) who were present will recollect, that I then explained the discovery of an infraposition of certain beds of fossiliferous greywacke to the lowest member of the Old Red Sandstone, and described their general range from the banks of the Wye to those of the Teme near Ludlow, or to that tract where the Rev. T. T. Lewis afterwards rendered me signal assistance. The discovery was made in consequence of a resolution of my own to endeavour to work out, if possible, a descending order beneath that geological horizon to which previous researches had carried it. This was the origin of a series of labours, the results of which were in successive years communicated to the Geological Society and registered in its Proceedings, and which ended, in the year 1835, in my proposal of the “Silurian System.”

(1832.) Professor Sedgwick’s first communication to the public on the structure of North Wales was made to the British Association at its second Meeting in 1832, and is entitled “A Verbal Account of the Geology of Caernarvonshire,” which is reported in a few lines of type, in which no allusion is made to an order of succession in relation to any known stratum, nor to rocks characterized by any organic remains.

(1833.) In the years 1833 and 1834 Professor Sedgwick published nothing, as far as I know, on the subject of Wales, whilst in that period I produced before the Geological Society several memoirs, detailed sections, many sheets of the Ordnance Survey coloured by myself in the field, and copious organic remains, by which in February 1833 a first general view was adopted of *four fossiliferous formations*, underlaid by a great mass of unfossiliferous greywacke†.

(1834.) In January 1834 the previous view was sustained, improved, enlarged, and corrected in some details, the formations beneath the Old Red Sandstone being termed in descending order Ludlow Rocks, Wenlock and Dudley Rocks, Horderley and May Hill Rocks (afterwards named Caradoc), Builth and Llandeilo Flags, the whole underlaid by the unfossiliferous greywacke of the Longmynd‡.

Let me here remark, that this my earliest corrected classification, and before the word “Silurian” was applied to it, is what has been eventually sustained as the true order of nature in many parts of the world as well as in Britain.

(1835.) Having extended my researches from the counties of

* Report of the British Association, vol. i. p. 91.

† Proceed. Geol. Soc. vol. i. p. 470 *et seq.*

‡ Proceed. Geol. Soc. vol. ii. p. 11.

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Oral communications made by Sir Roderick Murchison and Professor Sedgwick at the third meeting of the British Association (Cambridge, 1833) have, through inadvertence, not been referred to. These communications are, however, merely reported in a few lines of type, and simply state that the authors explained the leading features of their respective regions; Professor Sedgwick pointing out the relations of his tract to that described by Sir R. Murchison, of which the latter exhibited coloured maps and sections. (See Reports, Brit. Assoc. Adv. Sc. vol. iii. Proceedings, p. xxxiii.)

Quart. Journ. Geol. Soc. vol. viii. Part I.

Salop (Shropshire), Montgomery, and Hereford, through those of Radnor, Brecon, and Caermarthen, and having recognized an outcrop of all the fossiliferous strata above-mentioned, as surmounted by the Old Red Sandstone, I was urged by geologists at home and abroad to give a distinct name to this whole series of fossiliferous beds. Hence the word "Silurian," as propounded early in the year 1835; the *System*, as I then termed it, being divided into Upper and Lower groups*.

Had I never published a single document beyond the memoirs already mentioned, no one could have disputed my right in the world of science to sustain a nomenclature and classification which was entirely my own. I had, in short, propounded a natural system, which, composed of four formations, each characterized by fossils and connected by a general or common facies, had in many tracts a clear top, and in one tract of my own region an unfossiliferous bottom (the Longmynd). The same formations were subsequently (1836) shown to exist in the sea cliffs of Pembrokeshire, and to be there also surmounted by the Old Red Sandstone†. Unluckily, there lay to the west of my Silurian country a vast slaty region terminating in the highest mountains of North Wales, and of which I never attempted to obtain an acquaintance, because it was entirely under the supervision of Professor Sedgwick, my colleague in former years. I took it for granted on his showing, that all these harder slaty rocks were really inferior to my softer schists and sandstones, or to quote his own words, "it appeared to me absolutely certain that the greatest portion of the undulating series of North Wales was inferior to the lowest rocks of Siluria‡." This was from the first his own view, and I relied on it.

In short, at the Dublin Meeting of the British Association, or some months after I had published the first Silurian Tables, with lists of their fossils, Professor Sedgwick and myself communicated respectively our views. I gave a general sketch of the "Silurian" rocks, and he for the first time used the word "Cambrian" in a geological sense, and as defining a great group of slaty rocks lying beneath the Silurian, but referring to no fossils§.

On one occasion (in 1834) I crossed the assumed limit in the Berwyn Chain, travelling by the high-road, in his company, to look for a moment at the Bala limestone, which I then believed to plunge under those true Llandeilo flags with *Asaphus Buchii* which I had recognized on the east flank of that chain. This idea of the order of infraposition has proved to be entirely erroneous, and if I "lost my way" in going downwards into the region of my friend, it was under his own guidance. I am answerable only for Silurian and Cambrian rocks described and drawn as such *within* my own region.

Not seeing in that hurried visit any of the characteristic Llandeilo Trilobites in the Bala limestone, I did not then (1834) identify that

* See Philosophical Magazine, New Ser. vol. vii. p. 46 *et seq.*

† Proceed. Geol. Soc. vol. ii. p. 226.

‡ Quart. Journ. Geol. Soc. vol. iii. p. 161.

§ Report of the British Association, August 1835, Trans. Sections, p. 59.

rock with the Llandeilo flags, as has since been done by the Government Surveyors; nor does it ever appear to have occurred to Professor Sedgwick that these were beds of about the same age as those which we had seen together on the east flank of the Berwyns, on the banks of the Twrch, where they were recognized by me as "Llandeilo Flags." But having afterwards ascertained that several species of *Orthidæ* which occur in the Bala rock were common both to the Caradoc and Llandeilo formations, I specially stated, four years afterwards, in publishing the 'Silurian System' (1838), "As these shells abound also in the Lower Silurian rocks, it would seem that as yet no defined line of zoological division can be drawn between the Lower Silurian and Upper Cambrian groups, and that, as our knowledge extends, we may probably fix the lowest limit of the Silurian System beneath the line of demarcation which has for the present been assumed*."

In reference to the argument about a "base-line," as employed by Professor Sedgwick, I must state that in the whole 'Silurian System' the term "base-line" is never once applied to these rocks. I had quite labour enough within my own region, without being made responsible for the accuracy of the western boundary of my original map of 1830, that separated Siluria from Cambria; but which ten years ago I abrogated, as being wholly inaccurate. That line was, I maintain, a boundary merely between one region whose contents had been worked out and published, and another whose fossil contents were unpublished and therefore unknown.

The simple question, then, which every practical geologist has long ago answered in the negative, is this, Was the Cambrian system ever so defined, that a competent observer going into an uninvestigated country could determine whether it existed there? That it was never so characterized is demonstrated by the successive publications of Professor Sedgwick himself, to say nothing of the inferences of every one of our contemporaries who have examined countries at home or abroad in which such rocks occur. For wherever well-known Lower Silurian fossils occurred in such countries, the tracts so typified have necessarily been called Silurian.

(1836-38.) I have already stated, that during the establishment of the Silurian System and up to the period when it was so named, Professor Sedgwick published nothing on the subject; and, although he refers to a Cambridge Syllabus of Lectures drawn up in 1836, and issued early in 1837, wherein he uses the word "Cambrian" (I have referred above also to the communication made at the Dublin Meeting of the British Association), it is only in 1838 that we meet with the first published abstract of a real memoir, his "Synopsis of the English Series of Stratified Rocks inferior to the Old Red Sandstone"†; followed in 1841 by the "Supplement to a Synopsis of the English Series of Stratified Rocks inferior to the Old Red Sandstone‡." For the indistinctness of the author's views on those occasions respecting the fossil contents of his Cambrian rocks (two or

* 'Silurian System,' p. 308.

† *Proceed. Geol. Soc.* vol. ii. p. 675 *et seq.*

‡ *Proceed. Geol. Soc.* vol. iii. p. 541 *et seq.*

three species of which only are mentioned, not one being figured), I refer to his own words*.

At the same time there came out (for the work was really issued in 1838, though 1839 is on the title-page) my 'Silurian System' with its detailed evidences and figures, by which, both at home and abroad, so many regions have been assimilated to the Lower as well as to the Upper Silurian tracts therein described. So far for the priority of our respective publications and for the nature of them.

I had, in a word, completed in 1838 the illustration of a natural system which had been worked out by fossil evidences in 1833, 1834, and 1835, whilst in the same years Professor Sedgwick had neither shown the real physical relations of his rocks to my already well-known types, nor had he published any descriptions of fossils by which his so-called "Cambrian System" could be recognized as entitled to a separate name.

(1840-43.) Unwilling to encroach upon the Cambrian region, and believing, from the delay of my friend (his fossils were even then unexamined), that much time must elapse before the rocks of so complicated, contorted, and difficult a country as North Wales could be properly classified, I resolved to test the value of my own labours by an extensive appeal to foreign countries, and in consequence visited Russia accompanied by M. de Verneuil in 1840 and 1841, where Count Keyserling joined us. The results were so palpable, that, being again President of this Society, I put forth, in the most prominent and public manner in the first pages of the Discourses of 1842 and 1843, as printed in the Proceedings†, the expression of my conviction, that the Lower Silurian rocks were the oldest fossil-bearing group; adding my belief that the same rocks ranged over nearly all North Wales.

I specially refer every student in geology, who may not have followed the process of induction by which the Silurian classification was thus applied generally, to the pages of my Discourse of 1842 which commence under the heading of 'Palæozoic Geology,' and in which the Silurian, as surmounted by the Devonian and Carboniferous, is shown to be the oldest fossiliferous system‡. My general view was founded on what I saw in the north of Europe and in Bohemia, and my distinct and final application of it to North Wales was made in 1843 in consequence of a traverse across that region with Count Keyserling, when we found the Lower Silurian fossils in and around Snowdon. Hence the publication of my small general Map of England, executed at the request of the Society of Useful Knowledge, in which the erroneous line of demarcation between Siluria and Cambria was obliterated.

In these proceedings, which, in a British geographical sense, so vastly extended the application of the Silurian system, and which showed why the provisional cartographical boundary between Siluria and Cambria was expunged, I simply but courteously explained, that a broad appeal to nature in foreign countries, followed by a traverse

* *Op. cit.* p. 554.

† Vols. iii. and iv.

‡ *Proceed. Geol. Soc.* vol. iii. p. 640.

of North Wales, had led me by a process of induction, and not by any "rash generalization," to adopt these views. In my Discourse of 1843 I used these words in reference to the last publication of Professor Sedgwick himself:—"The hope, however, which was entertained by my friend, of finding these vastly expanded lower members characterized by peculiar groups of fossils has been frustrated, and, whatever may be the thickness of the lowest palæozoic division, he now fully admits, that zoologically it is from top to bottom a Lower Silurian Series*."

(1845.) Having ascertained that there was a true fossiliferous base in Scandinavia, Bohemia, and other countries, I then wrote (1845) those earlier chapters in 'The Geology of Russia and the Ural Mountains,' to which my friend makes no allusion, though in them the general order from true "base-lines" was first given, from an unfossiliferous bottom, through the Lower and Upper Silurian and overlying palæozoic deposits, to the Permian (then so named by myself) inclusive. This was no "downward development," but an original and clear exposition of a true, natural ascending order from a fossiliferous base-line.

This being done, and the North American geologists having adopted the same views, it still remained a desideratum in our own country to ascertain, by physical and geological proofs, if the Cambria of Sedgwick was what I had suggested, *i. e.* essentially nothing but Lower Silurian.

In North Wales Mr. Davis made the first approach to the ascertainment of a base of what he termed "Silurian Rocks," by the discovery (November 1845) of the now well-known *Lingula*-beds of Tremadoc†, the true physical position of which, in reference to the underlying unfossiliferous grits of Barmouth and to the overlying series replete with common Lower Silurian fossils, was subsequently carried out by Professor Sedgwick and the Government Geological surveyors.

(1846.) In all his publications in the Proceedings and the Journal of the Society, up to the early part of 1846, Professor Sedgwick made no objections to the sense which I had so prominently attached to the term "Silurian" in 1841, 1842, and 1843. He had then even himself so applied my nomenclature to the rocks of Cumberland and Wales, that Mr. Horner, as President of the Society, after a full exposition of the extension of the original Siluria, thus spoke in his Anniversary Discourse of 1846‡:—"Since the discovery of the Silurian key, he [Professor Sedgwick] has been enabled to make a clear and intelligible outline of the history of these regions, which, for a long time, geologists seemed to shrink from all attempts to understand."

In truth, Prof. Sedgwick himself had up to that time invariably appealed to my *Lower Silurian* as well as to my Upper Silurian division and their respective fossils as his guides in elaborating the fossil groups of Cumberland and Wales. How, therefore, could I, or

* Proceed. Geol. Soc. vol. iv. p. 74; the same opinion was previously expressed (1842) vol. iii. p. 549.

† Quart. Journ. Geol. Soc. vol. ii. p. 70.

‡ *Ibid.* vol. ii. p. 162.

any one, suppose otherwise than that he had then agreed *ex necessitate rei* to the classification I had proposed, and which all my contemporaries had adopted?

The present controversy, which on my part I now close, began at the end of the year 1846, or eleven years after the promulgation of the Silurian System in England, and four years after it had been extended and generally adopted. In the Supplement to his memoir of 1846, "On the classification of the fossiliferous slates of Cumberland, Westmoreland, and Lancashire," Professor Sedgwick put forth opinions which I was compelled to oppose; because I foresaw, that if a fossiliferous Cambrian group were to be formed by the abstraction of a portion of the Lower Silurian, and the Wenlock shale thrown into the Lower Silurian as a sort of make-weight to enlarge the Caradoc, I might very soon be called upon for a further concession, and be asked to abrogate entirely the lower half of the system: this is literally what has followed.

To that memoir* I therefore replied at the conclusion of a paper on the Silurian rocks of Sweden†. To another and more elaborate memoir‡ by my friend I also replied § in the paper entitled "On the meaning originally attached to the term 'Cambrian System,' and on the evidences since obtained of its being geologically synonymous with the previously established term 'Lower Silurian.'"

To these two memoirs I refer young geologists for all that I could say and which I then thought settled the question at issue. Five years have elapsed during which I have published nothing on this controversy. In the mean time, however, authors who have written on palæozoic geology, in every part of the world, have either gone on with, or adopted my terminology; and, what is most gratifying to me is, that the Government Geological Surveyors have definitively taken the same course, and have in accordance coloured all their maps and sections, and have so named all the fossils of the great Museum presided over by Sir Henry de la Beche. All the fossils of the region of Cambria or North Wales (down to the Lingula-beds inclusive) are now classified as Silurian.

But this band of able men have done much more. They have sustained the value of my chief original *sections*. They, having also used my keys, have decided, after years of hard labour in the field, that the whole of the fossiliferous strata of North Wales are repetitions, by undulation, of certain Lower Silurian strata first described by me in 1834, and of which detailed coloured sections were finally published in 1838. Showing that my original unfossiliferous base, the Longmynd of Shropshire, offers a more copious development of the unfossiliferous rocks to which they now restrict the term "Cambrian," than any of the oldest slaty masses of North Wales, they affirm, that, overlying such unfossiliferous greywacke on the west, and in the order in which I have represented in coloured sections ('Silurian System,' pl. 32. figs. 1, 2, 3), the Lower Silurian schists and quartz-rocks of the Stiper stones and the Llandeilo series of Shelve

* Quart. Journ. Geol. Soc. vol. ii. p. 106 *et seq.* † *Ibid.* vol. iii. p. 1 *et seq.*

‡ *Ibid.* vol. iii. p. 133, Dec. 1846.

§ *Ibid.* vol. iii. p. 165, Jan. 1847.

are precisely represented, after numberless undulations, by the oldest fossil-bearing sandstones and schists of North Wales.

That several of my sections, where they traversed the boundary-line between the Siluria and Cambria of my original map, are erroneous, as my friend states, is necessarily true. Yet even here, the main physical lines are for the most part faithful to nature. Thus, in Montgomeryshire on the east slope of the Berwyns, there are schists which conformably underlie true "Llandeilo flags" as represented by me*; but these, instead of being any longer called Cambrian, have been shown by the Government Surveyors to be part and parcel of the Llandeilo formation. The same authorities have further shown, that the overlying and undulating masses of sandstone, which from many of their fossils I had termed Caradoc sandstone (Meifod), are really the upper members of the now more accurately defined Llandeilo group. I may here observe, that the unconformity between the Llandeilo and the Caradoc, which Ramsay and Avelyn† were the first to trace through certain counties, is after all a local phenomenon; for the same authors have ascertained, that, in the vicinity of Bala itself, the equivalent of the Caradoc sandstone overlies conformably the limestone which is identical with that of Llandeilo‡. And thus I am led to adhere more than ever to my old and simple classification of "Upper and Lower Silurian" rocks, and not to divide the latter into two groups, particularly when it is now ascertained that so very many characteristic species are common to all the lower parts of the series, whether sandstones, limestones, schists, or slates. Caradoc and Llandeilo may be conveniently separated in certain tracts, but, as respects general views, they constitute one natural group.

Again, my old sections in Pembrokehire, such as that near Llandewi Felfrey§, which also indicate lower schists conformable to Llandeilo limestone, are correct, if the name of Cambrian be omitted. In other sections|| along the original frontier there are even strata coloured Cambrian which *overlie* the Lower Silurian, proving that at all events I endeavoured to draw fairly what I saw, though I did not then attempt to solve such enigmas.

With these physical obscurities along the frontier-line I never grappled, because they led me away from a region where all was comparatively clear into a highly complicated tract, the survey of which Prof. Sedgwick had undertaken: and now that the Government Surveyors have shown that our mutual boundary-line was a mere hypothesis, and that the so-called "Cambrian" is absolutely composed of undulations of my Silurian rocks, there is no question at issue.

I trust that on reflection my friend Professor Sedgwick will see,

* 'Silurian System,' pl. 29. fig. 9.

† Quart. Journ. Geol. Soc. vol. iv. p. 294 *et seq.*

‡ Such local unconformity can indeed never be admitted as a ground for breaking up any natural group. In parts of South Wales, for example, one portion of the coal is unconformable to another; and in Brittany, the great break, differing essentially from that in the Silurian rocks of Wales, which is above alluded to, occurs beneath the Llandeilo or lowest Silurian strata, and between these and the unfossiliferous slates or Cambrian.

§ 'Silurian System,' pl. 35. fig. 5.

|| *Ibid.* pl. 34. fig. 3.

that if there be errors in so large and diffuse a work as the 'Silurian System,' I ought not in fairness to be judged in 1852 by errors put forth in 1835-38. How progressive our science is, he has himself shown in several of his memoirs, in which, using the clue afforded by the fossiliferous rocks of the Silurian System, he unravelled and classified the older rocks of North Wales and Cumberland. In justice also he will not, I am sure, ignore what was done by myself and associates in foreign countries, where we traced a "base-line" on a great scale. Ten years have elapsed since I applied that view to Britain, and I claim, therefore, to be judged only by the final and extended Silurian System which was promulgated in 1842, and not by every detail in the original work of 1838; though I am well pleased to find that its general views have been sustained by the researches of the Government Surveyors.

Together with proofs of physical identity, the Naturalists of the Government Survey have satisfied themselves, that the Silurian, though locally divisible into parts and formations, is *one Natural History System*, and as such they have arranged it; showing that a very great number of the species of its fossils are common to its lower and upper divisions. I am further distinctly assured, both by their publications and by many recent communications, that eminent palæontologists of foreign countries are of the same opinion; and in proof of it they have adopted the word "Silurian" as applied by myself during the last eleven years, to the lowest known fossil-bearing strata.

Widely as the Lower Silurian rocks are expanded in North Wales, and interlaminated as they are there with huge igneous masses, they contain no greater number of fossils characteristic of their age, than beds of only a twentieth part their thickness in some other parts of the world. The Silurian rocks of Norway, for example, as copiously laden with fossils as strata of the same age in any other part of Europe, rise up to the east and west from beneath the Old Red Sandstone of Ringerigge, and so occupy the depressions of Christiania and Steensfiord, that both the lowest and uppermost members of the System are repeated in undulations within the space of a mile or two, are perfectly conformable, and utterly inseparable. The accompanying section, which I made in the year 1844, fully explains the phenomena*.

It therefore follows, that if, when Professor Sedgwick formerly examined the rocks of Cambria, he had ascertained by examination that both the strata and the fossils were really the same as what I described as Lower Silurian, and that, in consequence, two distinct

* A rough and imperfect sketch of this important section appeared in the Proceedings of April 30, 1845 (Quart. Journ. Geol. Soc. vol. i. p. 469); and an enlarged and more correct sketch, taken from 'The Geology of Russia in Europe and the Ural,' was inserted in 'Miscellanea' of the second volume of the Quart. Journ. Geol. Soc. (Part II. p. 71). In this position, however, it has escaped notice; and it is here reproduced in illustration of the above remarks on the facts relating to the small development of the rich Upper and Lower Silurian rocks in Norway. —[R. I. M.]

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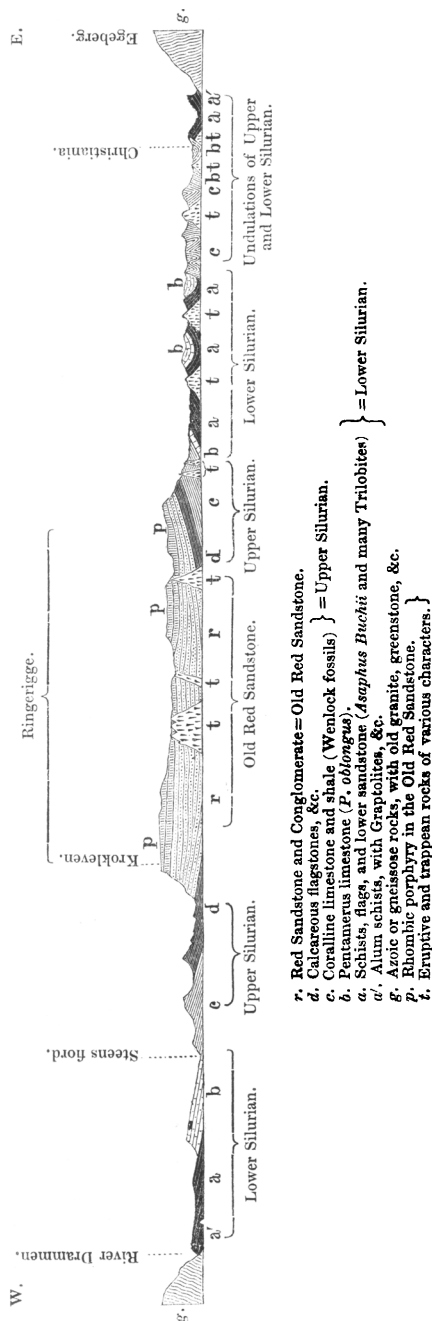
ERRATA.

Page 181, nine lines from bottom, and first two lines in p. 183, *for* that in consequence, &c., *read* nevertheless had retained two distinct names for *one natural system*, he would thereby have done disservice to geological science.

Page 183, six lines from the bottom, *for* synonymous, *read* equivalent.

Section across the Territory of Christiania.

Distance about 30 miles.



N.B. The undulations of the beds a, b, c, as seen in nature, are but imperfectly represented in a section of such a reduced scale as the above.

names had been applied to that which is ascertained to be *one natural system*, great disservice would have been done to geological science.

I am now well pleased to find, that, with the exception of my old friend, all my geological contemporaries in my own country adhere to the unity of the Silurian System, and thus sustain its general adoption. In fact, they know that the proposed application of the word "Cambrian" must necessarily cause an alteration of a fundamental character in the nomenclature used in every memoir and work on rocks of this age during the last ten or eleven years; for the Lower Silurian rocks of North Wales so described by Sharpe, Phillips, Davis, and Ramsay, and, finally, so styled in all the Government works by Sir H. De la Beche,—the Lower Silurian of Ireland so named, mapped, and illustrated by Griffith, Portlock, and M'Coy,—and the Lower Silurian of Scotland so expounded and illustrated by Moore, Nicol, Harkness, Salter, and myself—must, according to Professor Sedgwick's project, be changed to Cambrian. Again, the British writers on general geology, Lyell, De la Beche, Mantell, Ansted, as well as E. Forbes and all palæontologists, must alter the names and arrangements they have adopted.

Still more striking would be the revolution as respects foreign countries; for, as Russia, France, Spain, and other regions offer only very slight traces of the Upper Silurian, the System must virtually be there expunged, and the word Cambrian be substituted in all works and maps. The elaborate and valuable monograph of Barrande, 'The Silurian Basin of Bohemia,' must not only have a fresh name, but the whole principle of classification of that able writer, who distinctly affirms that it is one great system of life as of rocks, must also be changed; whilst in America the "system" which Hall and others have so well paralleled with the "Silurian," and the writings and maps of Logan on the Canadas, must all be re-cast and re-named.

I may here say, that I was never so truly gratified as when my contemporary brother workmen (my old friend Professor Sedgwick being one of them) united in recommending me as worthy of the highest British scientific honour; and I specially recur to this point, because the Copley Medal of the Royal Society was bestowed on me in the year 1849, not merely for the publication of the Silurian System of 1838, but also *for its subsequent and extended application to other countries*.*

No one more regrets than myself that Cambria should not have proved what it was formerly supposed to be, more ancient than the Silurian region, and thus have afforded distinct fossils and a separate system; but, as things which are synonymous cannot have separate names, there is no doubt that, according to the laws of scientific literature, the term "Silurian" must be sustained, as applied to all the fossiliferous rocks of North Wales.

Lastly, let me say to those who do not understand the nature of the social union of the Members of the Geological Society, that the

* The terms in which the Copley Medal was awarded in 1849 are—"For the eminent services he has rendered to geological science, and for his works, 'The Silurian System' and 'The Geology of Russia and the Ural Mountains'."

controversy which has prevailed between the eloquent Woodwardian Professor and myself has not for a moment interrupted our strong personal friendship. I am indeed confident we shall slide down the hill of life with the same mutual regard which animated us formerly when climbing together many a mountain both at home and abroad.

MARCH 10, 1852.

The following communications were read :—

1. *On the UPPER TERTIARIES at COPFORD, ESSEX.*
By JOHN BROWN, Esq., F.G.S.

OF the geological features of the county of Essex, none are more interesting than its various freshwater deposits, especially those of Grays, Clacton, and Copford. Notices of these deposits have appeared at various times*, and a general description of the freshwater beds and erratic tertiaries of the last-named place forms the subject of the present paper.

The Copford freshwater beds have been for several years extensively excavated to obtain brick-earth, and an idea of the relative position of the beds exposed by these excavations is given by the accompanying section. The clay or "earth" is obtained from three extensive workings, hereafter referred to as the western, eastern†, and southern sections respectively. Other sections of these beds have also been obtained by casual excavations and by borings, to the west and south of the brick-field. This brick-field is about half a mile N.W. of Stanway Church, and lies between the railway and the high road, occupying about five acres. The ground slopes from the high-road northward to the flat marshy ground which is crossed by the railway embankment.

Although the Copford deposit cannot boast of such a long and varied list of fossil Mammalia as those of Grays and Clacton, it is richer in land and freshwater Mollusca; that of Clacton having produced about fifty species, and Grays about forty-five species, while Copford has afforded sixty-nine species, as far as investigations in these deposits have hitherto gone.

In describing the series of beds forming this deposit, we shall begin at the bottom of the section.

* *Grays*, Loudon's Mag. Nat. Hist. 1836, vol. ix. p. 261; Mag. Nat. Hist. N.S. 1838, vol. ii. p. 546.

Clacton, Mag. Nat. Hist. N.S. 1838, vol. ii. p. 163, and 1840, vol. iv. p. 197; Proc. Geol. Soc. 1845, vol. iv. p. 523, and Quart. Journ. Geol. Soc. vol. i. p. 341.

Copford, Loudon's Mag. Nat. Hist. 1834, vol. vii. p. 436, and 1836, vol. ix. p. 429; Proc. Geol. Soc. 1843, vol. iv. p. 164.

The above together with *Brentford*, Mag. Nat. Hist. N.S. 1838, vol. ii. p. 539.

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† The distance between the east and west excavation is about 250 yards.