Hornblende schist, H. S.
Metamorphic limestone, M. L.
Chlorite schist, Ch. S.
Clay slate, C. S.
Cambrian rocks, C.
Silurian, S.
Old red sandstone, O. R. S.
Mountain limestone, Mn. L.
Millstone grit, M. G.
Carboniferous rocks, Ca.
Red conglomerate, R. C.
Magnesian limestone, Ma. L.
Zechstein, Z.
New red sandstone, N. R. S.
Lias, L.
Inferior oolite, I. O.
Middle oolite, M. O.
Upper oolite, U. O.
Weald, W.
Green sand, G. S.
Chalk, Ch.
Lower cretaceous, L. Cr.
Middle cretaceous, M. Cr.
Upper cretaceous, U. Cr.
Eocene, E.
Miocene, Mi.
Older pliocene, O. P.
New pliocene, N. P.
Post pliocene, P. P.
Serpentine, Se.
Greenstone, Gr.
Trap, T.
Basalt, B.
Trachyte, Tr.
Porphyry, P.
Amygdaloid, Am.
Lava, La.

A paper was then read by Mr. Nicollet, on the mineral resources of St. Louis and its vicinity. It was then

Resolved, That this Association close its present session and adjourn te meet on the second Wednesday of May, 1844, at 10 o'clock, A. M., at Washington, D. C.

H. D. Rogers, *Chairman.*
B. Silliman, Jr. *Secretary.*

Art. XI.—*On the upright Fossil Trees found at different levels in the Coal Strata of Cumberland, Nova Scotia;* by Charles Lyell, Esq., F. G. S., F. R. S., &c.

[Communicated to this Journal by the author.]

The first notice of these fossil trees was published in 1829 by Mr. Richard Brown, in Haliburton's Nova Scotia, at which time the erect trunks are described as extending through one bed of sandstone twelve feet thick. Their fossilization was attributed by Mr. Brown to the inundation of the ground on which the forest stood. Mr. Lyell in 1842 saw similar upright trees at more than ten different levels, all placed at right angles to the planes of stratification, which are inclined at an angle of 24° to the S. S. W.

The fossil trees extend over a space of from two to three miles from N. to S., and according to Dr. Gesner, to more than twice that distance from E. to W. The containing strata resemble lithologically the English coal-measures, being composed of white and brown sandstones, bituminous shales, and clay with ironstone. There are about nineteen seams of coal, the most considerable being four feet thick. The place where these are best seen is called the South Joggins, where the cliffs are from one hundred and fifty to two hundred feet high, forming the southern shore of a branch of the Bay of Fundy, called Chignecto Bay. The action of tides, which rise sixty feet, exposes continually a fresh section, and every year different sets of trees are seen in the face of the cliffs.

The beds with which the coal and erect trees are associated are not interrupted by faults. They are more than two thousand feet thick and range for nearly two miles along the coast. Immediately below them are blue grits, used for grindstones, after which there is a break in the section for three miles, when there appear, near Minudie, beds of gypsum and limestone, and at that village a deep red sandstone, the whole having the same southerly dip as the coal at the Joggins, and being considered by Mr. Lyell as the older member of the carboniferous series.

Above the coal-bearing beds and stretching southward for many miles continuously along the shore, are grits and shales of prodigious thickness, with coal plants, but without vertical trees.

Mr. Lyell next describes in detail the position and structure of the upright trees at the South Joggins. He states that no part of the original tree is preserved except the bark, which is marked externally with irregular longitudinal ridges and furrows without any leaf-scars, precisely resembling in this respect the vertical trees found at Dixonfold, on the Bolton Railway, described by Messrs. Hawkshaw and Bowman. No traces of structure could be detected in the internal cylinder of the fossil trunks, which are now filled with sandstone and shale, through which fern leaves and other plants are occasionally scattered. Mr. Lyell saw seventeen vertical trees, varying in height from six to twenty feet, and from fourteen inches to four feet in diameter. The beds which inclose the fossil trees are usually separated from each other by masses of shale and sandstone, many yards in thickness.

The trunks of the trees, which are all broken off abruptly at the top, extend through different strata, but were never seen to penetrate a seam of coal however thin. They all end downwards, either in beds of coal or shale, no instance occurring of their termination in sandstone. Sometimes the strata of shale, sandstone and clay with which the fossil trunks have been filled are much more numerous than the beds which they traverse. In one case nine distinct deposits were seen in the interior of a tree, while only three occurred on the outside in the same vertical height.

Immediately above the uppermost coal-seams and vertical trees are two strata, probably of fresh-water origin, of black calcareo-bituminous shale, chiefly made up of compressed shells of two species of Modiola and two kinds of Cypris.

Stigmariæ are abundant in the clays and argillaceous sandstones, often with their leaves attached, and spreading regularly in all directions from the stem. The other plants dispersed through the shales and sandstones bear a striking resemblance to those of the European coal-fields. Among these are Pecopteris Conchitica, Neuropteris flexuosa? Calamites cannæformis, C. approximatus, C. Steinhaueri, and C. Nodosus, Sigillaria undulata and another species. The genera Lepidodendron and Sternbergia are also present. The same plants occur at Pictou, and at Sydney in Cape Breton, accompanied with Trigonocarpum, Asterophyllites, Sphænophyllum, and other well known coal-fossils.

The author then gives a brief description of a bed of erect Calamites, first discovered by Mr. J. Dawson, in the Pictou coal-field, about one hundred miles eastward of the Cumberland coal-measures before described. They occur at Dickson's mills, one mile and a quarter west of Pictou, in a bed of sandstone about ten feet thick. They all terminate downwards at the same level, where the sandstone rests on subjacent limestone, but the tops are broken off at different heights, and Mr. Dawson observed in the same bed a prostrate Lepidodendron with leaves and Lepidostrobi attached to its branches.

From the facts above enumerated Mr. Lyell draws the following conclusions:—

1. That the erect position of the trees, and their perpendicularity to the places of stratification, imply that a thickness of several thousand feet of coal-strata, now uniformly inclined at an angle of 24°, were deposited originally in a horizontal position.

2. There must have been repeated sinkings of the dry land to allow of the growth of more than ten forests of fossil trees one above the other, an inference which is borne out by the independent evidence afforded by the Stigmaria found in the under-clays beneath coal-seams in Nova Scotia, as first noticed in South Wales by Mr. Logan.

3. The correspondence in general characters of the erect trees of Nova Scotia with those found near Manchester, leads to the opinion that this tribe of plants may have been enabled by the strength of its large roots to withstand the power of waves and currents much more effectually than the Lepidodendra and Sigillariæ, which are more rarely found to retain a perpendicular position.

Lastly, it has been objected that if seams of pure coal were formed on the ground where the vegetables grew, they would not bear so precise a resemblance to ordinary subaqueous strata, but ought to undulate like the present surface of the dry land. In answer to this Mr. Lyell points to what were undoubtedly terrestrial surfaces at the South Joggins, now represented by coal-seams or layers of shale supporting erect trees, and yet these surfaces conform as correctly to the general planes of stratification as those of any other strata.

He also shows that such an absence of superficial inequalities and such a parallelism of successive surfaces of dry land, ought to be expected according to the theory of repeated subsidence, because sedimentary deposition would continually exert its levelling action on the district submerged.

ART. XII.—*On the Coal Formation of Nova Scotia, and on the Age and Relative Position of the Gypsum and accompanying Marine Limestones;* by C. LYELL, Esq. F. G. S. &c. &c.

[Communicated to this Journal by the author.]

THE stratified rocks of Nova Scotia more ancient than the carboniferous consist chiefly of metamorphic clay-slate and quartzite, their strike being nearly east and west. Towards their northern limits these strata become less crystalline and contain fossils, some of which Mr. Lyell identifies with species of the upper Silurian group, or with the Hamilton group of the New York geologists.