DECEMBER 13. 1843.

The Rev. Thomas Image, M.A., was elected a Fellow of this Society.

The following communications were read :—

1. *On the GEOLOGY of CAPE BRETON.* By RICHARD BROWN, Esq.*

In a letter to Mr. Lyell, dated Sydney Mines, Cape Breton, Oct. 20. 1843, the author stated—

“I have made a survey of some forty miles of coast on the eastern side of our coal-field; and have since devoted a few days to the examination of the shores of the Island of Boularderie, which is four miles wide, and twenty-six miles long, and exhibits natural sections on both sides from end to end. Nothing can be more definite than the position of the masses of gypsum in this island. I have examined them this summer in four different places, scores of miles apart, and find the following, with little variation, to be a section of the accompanying strata :

SECTION I. (Ideal).

General sequence of the COAL MEASURES and GYPSIFEROUS FORMATIONS near SYDNEY, CAPE BRETON.

† *g.* Coal measures.

f. Coarse sandstone with coal plants—Shale.

e. Limestone in thin beds—Fossils.

d. Gypsum.

c. Soft red shale.

b. Coarse concretionary limestone and shales.

a. Coarse conglomerate, highly inclined.

“Wherever I have had an opportunity of making observations, they have confirmed your views as to the relative age of the gypsum.”

Subjoined is the *Memoir* received from Mr. Brown.

THE following is a sketch of the north-western end of the Sydney coal-field. On the W. side of Sydney Harbour, the coal-measures can be traced transversely, without interruption, for 5200 yards, dipping to the N. E. at an angle of 7° , which gives a thickness of 1900 feet. The coal measures, generally speaking, are very free from faults.

* This paper and the next (Mr. Dawson's on Nova Scotia) are both illustrated by the map of Nova Scotia appended; but the map was originally prepared by Dr. A. Gesner to illustrate the paper of which a notice has already appeared in the “Proceedings,” vol. iv. p. 186. One portion of the map is repeated, and coloured according to Mr. Brown's survey.

† These references are continued throughout the paper in the other Sections.

The coal-measures are underlaid by a series of sandstone beds, with some beds of shale. The thickness of the sandstone, in some places, exceeds 2000 feet; but to the west of the Little Entrance it is much thinner; and, finally, when it approaches the granite ridge that lies between the Great Entrance and St. Anne's Harbour, it has thinned out. The sandstones, with their superincumbent coal-measures, are very uniform in their dip to the north-east.

Next to the sandstone is the limestone; and this accompanies the sandstone very uniformly, along the whole course of its outcrop, from the southern branch of Sydney Harbour to the Granite ridge west of the Great Entrance. On both branches of Sydney Harbour, and at George's River, the limestone dips distinctly beneath the sandstone. The shore, from George's River to Long Island, gives the following Section,

SECTION II.

LONG ISLAND to the COAL MEASURES East of GEORGE'S RIVER.

First we have the limestone (*e*); then a low, flat space of half a mile, where the stratification cannot be observed; then beds of a red and brown micaceous slaty rock, dipping at high angles in various directions between south and west.

The base of Round Island is of the same kind of rock; but the Isle is capped with a limestone which, to judge from its fossils, is quite different from the limestone * above described beneath the sandstone. Long Island, on its eastern side, is 200 feet high, and very precipitous; but, in a westerly direction, it slopes gradually to the water. It is composed principally of Porphyritic rocks.

On the opposite side of the channel, the shore exhibits the following section:—

SECTION III.

First, the sandstone (*f*) which underlies the coal-measures, and can be traced to within a few hundred yards of Roe's Point.

At Roe's Point the limestone (containing here *Productus Lyelli*) shows itself, having an easterly dip. This limestone, both in its local position, dip, and general appearance, corresponds with the limestone on the other side of the channel, at George's River;

* This limestone contains *Terebratula elongata*, and a *Modiola*.

and these circumstances lead to the supposition that in both instances it dips under the sandstone. Between Roe's Point and Campbell's Cove, on the western shore of the Island of Boularderie, the strata are very much broken and disturbed by faults. It would be difficult to describe these disturbances by words; but the Section will give the most distinct idea of them. Gypsum appears along this line in two places, which are shown in the Section.

First, to the N. W. of Roe's Point, we have solitary pinnacles of gypsum appearing on the beach. Next, three beds of limestone, with two of sandstone interposed, these beds all dipping in an opposite direction to those at Roe's Point. The middle bed of limestone contains *Productus spinosus*. The third and upper of these limestones is cut off by a vertical fault, which is succeeded by a flat arch of limestone, resting upon sandstone. This again is cut off by a vertical fault, which is succeeded by a horizontal bed of limestone.

This is followed by a level space; and beyond that we have a series of beds dipping in the same direction with those of Roe's Point.

1. A thin bed of limestone.	5. Rich marl, 6 feet.
2. A bed of sandstone.	6. Green sandstone, with veins of gypsum, 2 feet.
3. A thick bed of coarse limestone.	7. Red marl, with grains of gypsum, 12 feet.
4. Gypsum, 18 feet thick.	

This is followed by a level space, when no beds are seen, and beyond that we have limestone, dipping in the same direction with the gypsiferous marls.

SECTION IV.

CAMPBELL'S COVE, near LIME POINT.

Proceeding from Campbell's Cove along the shore of the Island of Boularderie in a south-westerly direction, we have similar limestones, lying in a horizontal position, for the space of two miles, until we arrive at Lime Point, where a small cove exhibits three beds of limestone with two interposed beds of sandstone dipping to the S. S. E., and apparently underlying the sandstone with coal-plants; but separated from it by a space which affords no section. The lowest of the three beds of limestone contains *Spirifer glaber* (Lyell); the middle bed contains shells.

The writer mentions in his letter to Mr. Lyell that, "on the eastern side of the Sydney coal-field, he has found below the coal-seams, in every instance, beds of fire-clay, containing the long fibrous leaves of *Stigmara*, matted together.

"In the black bituminous Shale, which lies about twenty yards

above the Main Coal at Sydney, he has found the scales of different kinds of fishes, as hard and bright as enamel ; one tooth, and a number of Coprolites ; also the *Cypris* in great abundance, and a *Modiola*."

2. *On the LOWER CARBONIFEROUS ROCKS, or GYPSIFEROUS FORMATION of NOVA SCOTIA.* By JOHN WILLIAM DAWSON, Esq., of Pictou, Nova Scotia.*

THE coal formation of the eastern part of Nova Scotia consists of a great thickness of sandstones, shales, and conglomerates, of various reddish and grey colours, the former being most prevalent. The lower part of the series is distinguished by the presence of limestones with marine shells and gypsum. Its central portion is characterised by a greater prevalence of grey and dark colours, and by containing an abundance of vegetable fossils and beds of bituminous coal. The upper portion of these productive coal measures appears to pass into a thick deposit of reddish sandstones and shales, containing few fossils, either animal or vegetable. To examine the structure and relations of the lower, or gypsiferous part of this series, is the object of the present paper : it will, however, be proper in the first place to notice the general disposition of the rocks of the Carboniferous system, in the region more particularly observed, which extends along the shores of the Gulf of St. Lawrence, from Tatmagouche to Antigonish Harbour.

The coast section between these points cuts at acute angles across two great coal troughs, the one beginning at Pictou, and thence stretching to the west along the northern shore of the Basin of Mines ; the other beginning at Antigonish, and thence extending westward to the Stewiacke and Shubenacadie Rivers. These two troughs are separated by a hilly range composed of igneous rocks and of disturbed lower-carboniferous and Silurian strata. This range beginning at Cape St. George extends westward to the East River of Pictou ; and beyond this it is continued along the outcrops of the oldest carboniferous rocks in the direction of Truro.

The southern boundary of the Antigonish trough is formed by the region of Palæozoic, metamorphic, and Plutonic rocks which occupy the southern side of the province. A chain of hills, similar in structure to the range of Cape St. George, but of greater elevation, separates the Pictou trough from a region belonging to the coal strata which extends beyond Tatmagouche in a northerly direction.

The chain in question commences at the New Annan Hills, and extends westward through the Cobequid Mountains† to the Bay of

* See the map of Nova Scotia.

† Dr. Gesner, many years since, described the Cobequid chain as forming a ridge separating the coal-formation of the north side of the Basin of Mines from that of Cumberland county. Mr. Logan first noticed the existence of a trough of carboniferous strata between Antigonish and Windsor.