around the margins of East Loch Tarbert were patches left to indicate what was once a comparatively large land surface.

In one of our hauls with the dredge in Lochfyne, a little south of Tarbert, and in moderately deep water, a valve of *Panopæa Norvegica* was fished up, but its occurrence was so unusual, and it had such an old-world look about it, that we refrained from giving it a place in our list of recent marine forms. It may perhaps have been washed from the clay which was carried out by the sea from East Loch Tarbert.

In concluding these remarks I wish to acknowledge the kindness of Mr. John Young, F.G.S.—who is always ready to lend a helping hand to honest seekers after knowledge—for naming the specimens of minerals from Tarbert, and for information connected therewith. The analyses of ankerite and ferrocalcite were made by my son, who is indebted to Mr. J. W. Biggart, F.C.S., F.I.C., public analyst for Greenock, for valuable hints on correct quantitative estimation.

NO. XXIV.—SOME NOTES ON A BED OF SHELL-BEARING CLAY AT ROXBURGH STREET, GREENOCK. By THOMAS SCOTT, *Corresponding Member, Assistant Naturalist to the Fishery Board for Scotland*. WITH A PLATE [No. VI].

[Read 8th March, 1888.]

ALMOST fifty years have now passed away since the late James Smith of Jordanhill, in a paper read to the Wernerian Society, "On the Elevated Marine Beds of the Basin of the Clyde," called attention to the existence of a laminated clay containing marine shells which had been exposed near Greenock through the operations connected with the construction of the Caledonian Railway from Glasgow. This clay occurred in the vicinity of the Cartdyke Station, and was therefore probably a continuation of the extensive deposit which has been exposed during recent years—first when the Graving Dock at Garvel Park was formed, and latterly and more extensively, during the formation of the James Watt Wet Dock at the same place.

Although the number and variety of the organisms collected from the clays which were exposed while the excavations for the James Watt Dock were being proceeded with greatly exceeded

those found anywhere else in Clydesdale, and a very valuable and interesting chapter was thus added to the Post-pliocene geology of the West of Scotland, yet in one way the interest attaching to the discovery of the Cartsdyke clay was greater, for at a time when this department of the science was not so well understood as it is now, a notable addition was here made to the rapidly accumulating evidence that within comparatively recent times a very considerable change had taken place not only in the climatal conditions of the British Islands, but also in the relative levels of sea and land. The Cartsdyke deposit was 50 feet above the present sea-level, while the shell-clay at Garvel Park was in part only a few feet above, and very much of it considerably below, the same level.

During the construction of the branch line of the Glasgow and South-Western Railway which connects the main line with the new docks at Garvel Park, a clay containing the usual boreal shells was cut into a little west of the Bogston Station of the Caledonian Railway. This clay had an elevation somewhat similar to that at Garvel Park, and was possibly a continuation of it. Another Post-pliocene clay was cut into during the excavation for a sewer across what is locally known as the "Battery Field," and near the junction of the High and Low Gourock Roads. The same bed was subsequently exposed at the west end of Westbourne Terrace and behind the garden attached to the old Gourock Toll-house, where sand was being dug out for building purposes. (A short paper on this deposit was read to the Society by Mr. Thomas Steel, see *Transactions*, vol. vi., p. 261.) This deposit also was very little elevated above sea-level, so that the clay which was exposed at Cartsdyke, and examined and described by Mr. Smith of Jordanhill, was, until quite recently, the highest recorded in the neighbourhood of Greenock.

In the construction of the extension of the Caledonian Railway, which is at present being carried out from near the Cathcart Street Station, Greenock, to the Steamboat Quay at Gourock, extensive excavations in the form of tunnelling and open cutting have had to be made. One of these open cuttings is at Roxburgh Street, Greenock, where the old Highlanders' Academy stood [See Plate vi., plan of Greenock.] In making this cutting a bed of sandy clay, containing the remains of marine and other organisms, has been exposed, and appears to be of Post-pliocene

Scale of Half a Mile.

PART OF THE PLAN OF GREENOCK
TO SHOW THE POSITION OF THE DEPOSIT CONTAINING MARINE SHELLS.
 (X. Where the Shells occurred.)

Macdure Macdonald & Co

age. I examined this clay early in December last year, and found *Tellina calcaria* of frequent occurrence, the spines and plates of *Strongylocentrotus (Echinus) Dröbachiensis* and *Mytilus modiolus* and *edulis*. Very few species of shells, however, were observed. Mosses, seeds, and leaves of land plants were common. Marine Ostracoda were fairly numerous, but Foraminifera, though comparatively common, included but few species. It should be mentioned, however, that I had an opportunity of examining only a very small portion of the clay, so that there is every likelihood, had a considerable quantity of it been examined, that a much larger number of species would have been observed than those actually recorded in the appended list. All the shells and other calcareous remains were very fragile, so that it was difficult to secure anything like a perfect specimen; even such heavily-built shells as *Mytilus modiolus* being so much eroded that frequently little more than the epidermis was left.

The section, as I saw it in December, consisted of a thin superficial layer, next a thick bed of nearly pure sand, a sandy clay containing marine shells, a thick unstratified deposit of sandy Till, with numerous boulders, and, last, Calciferous sandstone of unknown thickness. The following measurements, which may be relied on as practically correct, were made for me by Mr. Patrick Grant, Clerk of Works, Greenock:—

Surface of ground at corner of Duncan and Roxburgh Streets, 72 feet 5 inches above sea-level.

- (1) Thin superficial layer, from 9 inches to 1 foot thick.
- (2) Surface of ground to top of shell-clay, 10 feet—nearly pure sand, excluding (1).
- (3) Surface of ground to bottom of shell-clay, 14 feet (shell-clay, 4 feet thick).
- (4) Surface of ground to top of rock, 30 feet (Till, underlying shell-clay, 16 feet).

It will be seen from these measurements that the bottom of the shell-clay is about 58½ feet, and the top 62½ feet, above sea-level, and therefore considerably higher than the Carlsdyke deposit.

The following is a list of remains observed in the small quantity of clay examined by me:—

PLANTÆ.

MUSCI.

A few species (not yet identified).

PHANEROGAMS.

Leaves, seeds, and fruits.

The seeds and fruits, of which there appears to be at least ten different kinds, are representatives of, among others, the following orders :—Caryophyllææ, Polygonacææ, Cyperacææ, Gramineææ.

[Since this paper was written I have submitted the seeds and fruits to Mr. Clement Reid, F.G.S. (of the Geological Survey), and he has been able to identify the following—*Potentilla tormentilla*, Sibth.; *Taraxacum officinale*, Wig.; *Thymus serpyllum* (?), L.; *Rumex*, sp.; *Atriplex patula*, L.; *Potamogeton*, sp.; *Carex dioica* (?), L.; *Anthoxanthum odoratum*, L.; and *Poa trivialis*, L. Two others have not yet been identified—June, 1888.]

Layers of vegetable matter were frequent all through the clay, and had a large quantity of it been examined, no doubt other plant remains would have been observed. No remains of Marine Algæ were noticed, but this was the more likely owing to the small quantity of clay examined, and partly to the bad state of preservation in which all the remains were, than to the real absence of marine vegetation.

FORAMINIFERA.

Reophax fusiformis, Will. Appeared scarce.

Polymorphina lactea, W. and J.

„ *compressa*, D'Orb.

Truncatulina lobatula, Walker. Frequent.

Polystomella striato-punctata, F. and M. Common.

Nonionina depressula, W. and J. Frequent.

ECHINODERMATA.

Echinus (*Strongylocentrotus*) *Dröbachiensis*, Müll. Parts of test, spines, etc., frequent.

OSTRACODA.

Cythere lutea, Müll.

„ *viridis*, Müll.

„ *pellucida*, Baird.

„ *porcellanea*, Brady.

„ *tuberculata*, G. O. Sars.

„ *concinna*, Jones.

„ *angulata*, G. O. Sars.

„ *villosa*, G. O. Sars.

Cytheridea papillosa, Bosquet.

Cytherura nigrescens, Baird.

„ *undata*, G. O. Sars.

„ *flavescens*, Brady.

Paradoxostoma variabile, Baird.

} These were all more or less frequent, but not very well preserved.

DECAPODA.

Only part of a claw, possibly of a Hermit-crab, was observed.

CIRRIPEDIA.

Balanus crenatus, Brug. Scarce.

INSECTA.

Wingcases (Elytra) of two Beetles.

MOLLUSCA.

Mytilus edulis, Lin. Very common, especially young.

„ *modiolus*, F. and H. Frequent, but very much eroded and fragile.

Tellina calcaria, Chemn. Very common, but fragile.

Littorina obtusata, Lin. Frequent.

„ *rudis*, Maton. Frequent.

Although from the preceding list such characteristic species as *Pecten Islandicus* and *Astarte borealis* are absent, a more extended search might have brought to light one or both of them. But leaving these shells out of account altogether, the fact that *Tellina calcaria* was of common occurrence and perfect, though very fragile, points to the reasonable inference that the molluscs had lived and died where we found them—that they had not been washed into the clay from an older deposit—and thus affords fairly sufficient grounds for considering this clay to be of Post-pliocene age. [I have since learned that *Pecten Islandicus* has now been found near where the shells here recorded occurred—June, 1888.]

NO. XXV.—NOTES ON THE JORDANHILL COALFIELD.

By JAMES S. M'LENNAN.

[Read 10th November, 1887.]

THIS Coalfield is situated partly in the counties of Renfrew and Lanark, and comprises parts of the parishes of Renfrew and Govan. Its length from north to south is somewhat over a mile, and from east to west rather more than $1\frac{1}{2}$ miles, extending over an area of nearly 1,000 acres.

The dip of the strata in the eastern portion is to the north, and in the western towards the north-east.

In the centre of the field is a deposit of Brick clay, having an average thickness of 18 feet. It consists of two parts—the upper of a brownish-yellow colour, and unstratified, some 7 feet in thickness; and the lower of a blackish-blue colour, disposed in layers of various thicknesses and about 11 feet in depth. In these are