XVIII. *Notes on the* Section *of* Strata *in the* Gilmorehill Quarry, *and* Boulder-clay, *on the* Site *of the* New University Buildings, Glasgow. By John Young.

(Read November 5, 1868.)

During the working of the sandstone in the western portion of the Gilmorehill grounds, for the purpose of obtaining stone for the New University Buildings, an interesting section of carboniferous strata has been exposed, which belongs to that division of our coal measures lying between the upper and the lower limestone series found to the north and west of Glasgow.

Throughout the district this group of rocks is best known as the Possil and Govan ironstone series, from the valuable bands of that ore which it contains. But the equivalents of the group are also to be found in other tracts of our western Scottish coalfield, as at Kilsyth, Wilsontown, Carluke, and Lesmahagow, to the north-east, east, and south-east, and in the west at Johnstone and Dalry.

The group of strata in which the Gilmorehill beds are placed, ranges from about 440 fathoms under the upper red sandstone of the Lanarkshire coalfield, down to the horizon of the Govan ironstone, which is stated to lie about 588 fathoms under the above-mentioned red sandstone. This series of rocks, nearly 900 feet in thickness, is therefore in the position of the middle division of the carboniferous limestone system of this and other countries, yet in the Glasgow district it contains very few persistent bands of limestone or other calcareous strata. The mineralogical aspect of the group is so much alike to that of our upper coal measures, that I have no doubt but that they were deposited under somewhat similar conditions.

The strata consist of numerous thin seams of free coal, cannel coal, black-band ironstone, thick beds of bituminous shale and clay-shale, with bands of clay-ironstone, and beds of white sandstone of considerable thickness. There are very few natural sections where these beds can be studied, and very little was known of the strata of this portion of our coalfield or their organisms, until of recent years, when they came to be opened up for the valuable fields of ironstone which they contain.

There can be no doubt of the true position of the beds. The upper limestone series to the north of Glasgow, with its abundant group of characteristic marine fossils, is clearly seen to overlie

them, while the lower limestone series is observed cropping out under them along the outer borders of the various basins. Moreover, their intermediate position in our Scottish carboniferous limestone series, has been clearly proved by several deep bores put down in our own neighbourhood.

If we take the Cowglen limestone, seen near Pollokshaws, and in the railway cutting near Bishopbriggs, as the base of the upper limestone series, then it is known by boring, that we have but few intercalated bands of limestone in this group of strata near Glasgow, until we reach some 18 fathoms under the Govan ironstone, a distance of more than 160 fathoms under the Cowglen limestone. At this point and downwards, several bands of limestone have been found in the bores, which may be considered as the uppermost beds of the lower limestone series, the limestones occurring at intervals in descending order throughout a thickness of fully 150 fathoms of strata, but they are more abundant, and of greater thickness towards the bottom of the group.

The relative distances here given as existing between the upper and lower limestone series, will only hold good for the district north and west of Glasgow, for if we trace our carboniferous limestones to the south-east, we find that there is a rapid thinning-out of those sedimentary strata that alternate with the limestones, whereby the various calcareous strata of our coalfield in the Carluke and Lesmahagow districts are brought much closer together than is to be found round Glasgow.

I have elsewhere shown[1] that the carboniferous limestone series of Scotland has been split up into numerous beds by interruptions of muddy sediment; and Mr. E. Hull has clearly, and, I think, satisfactorily, pointed out to this Society that, as nearly all our carboniferous limestones are of organic origin, and are due to the growth of various animal organisms that have flourished on the sea bottom, so beds of limestone could only be formed over those tracts in which no other sediment was being deposited.

No group of strata in our Scottish carboniferous limestone series contains so few calcareous bands as that embraced between the Cowglen bed and the first limestone under the Govan ironstone; and the study of these beds, and their various organisms, throws some little light upon the conditions under which they seem to have been deposited.

[1] Trans. Geol. Soc., Glasgow, Vol. I., Part I., second edition, p. 48.

It is generally admitted that we have very little evidence of true marine conditions having existed over the area of our Scottish coalfield during the deposition of our upper coal measures. The various animal organisms found in the strata being therefore of such doubtful character as to their habitats, the crustacea and mollusca may have been of species that lived either in freshwater, or in that which was slightly brackish. Neither do the fishes nor reptiles of the upper coal measures tell us much of the condition of the waters. There is a total absence of those decidedly marine types that characterise so strongly the fauna of the upper and lower limestone series, many species of which we know must have flourished in other tracts of the sea-bottom during the deposition of our upper coal measures, as some of them appear in at least one of our higher beds in this district, while others are recurrent in the Permian formation of England.

Carboniferous limestone types of fossils are abundant in the limestone series above and below the Possil group, but their absence in these beds is about as marked as in our upper coal strata; and it is interesting to note the fact, that the various species of Entomostraca and several of the fishes of the Possil series, are such as are characteristic of the so-called freshwater beds of the lower limestone series in this district, as well as of the freshwater strata of our upper coal measures.

Appended to this paper is a list of all the organisms that I know to have been found in the Possil and Govan series, and it will be seen from its examination that there has been at certain rare intervals a return to a more marine condition of the waters, as evidenced by the appearance of a whole colony of *Lingula* and one or two other marine shells in some of the beds. But their stay in these tracts was often very short, owing no doubt to the changing condition of the waters back to their fresh or brackish state.

The chief interest of the section in the Gilmorehill quarry, beyond that of any other in this neighbourhood to a geologist, consists in the frequent alternations of its strata, there being no fewer than 33 beds exposed in descending series. These consist of five beds of white sandstone, seven seams of coal, one thin seam of black-band ironstone, with accompanying beds of bituminous shale, clay shale, and fireclay, as in the following section :—

	Fath.	ft.	in.
Surface soil and Boulder-clay,	1	4	6
Grey sandy shale, with nodules of impure clay ironstone,	0	3	0
Dark grey shale,	0	0	6
Bituminous shale,	0	0	3
Free coal,	0	0	3
Grey shale,	0	2	0
Foul coal,	0	0	6
Fire clay,	0	0	6
White sandstone,	0	3	9
Grey shale with hard nodular bands,	0	2	4
Dark grey shale,	0	0	6
Free coal,	0	1	4
White sandstone,	1	2	0
Light grey sandy shale,	0	2	0
Grey shale,	0	1	6
Dark grey shale,	0	1	0
Bituminous shale,	0	0	6
Black-band ironstone,	0	0	2½
Free coal,	0	0	9
Grey shale,	0	2	6
Grey shale with hard nodular bands,	0	2	0
Dark brown shale,	0	0	10
Bituminous shale,	0	0	6
Free coal,	0	1	3
Fire clay,	0	1	0
White sandstone,	2	0	0
Grey sandy shale,	0	1	0
Grey shale,	0	0	6
Free coal,	0	0	7
Fire clay,	0	0	7
White sandstone,	0	4	0
Free coal,	0	0	10
White sandstone,	2	0	0
Grey shale in bottom of quarry, thickness not ascertained,	0	0	0
Total,	13	0	11½

The strata of the quarry dip to the south-east at an angle of ten degrees, and are traversed by two faults. One, seen in the north-east corner of the quarry, lifts the third bed of sandstone to the surface under the Boulder-clay the displacement being upwards of thirty feet. The other fault in the middle of the quarry, only displaces the beds about three feet, the downthrow of the beds being to the west. Other faults are seen in the bottom of the Kelvin, as we ascend the river towards Clayslap Mills. These seem to run in the same general direction as those in the quarry, the downthrow being also to the west.

In the working of the upper bed of sandstone the quarrymen came upon the erect stumps of five or six large fossil trees. They appeared to be *Sigillaria*, and measured from 20 inches to two feet in diameter. They seem to have been broken, or to have decayed to within a few inches of the ground, and were composed of shaly sandstone similar to the surrounding rock. The trees stood some three or four feet apart, and the roots of the one were seen in some cases interlacing with those of the others. While the remains of this old forest of the coal period were allowed to stand, they formed a very interesting object in the quarry, but were ultimately

removed in the working of the sandstone. Remains of large erect stumps of fossil trees from this neighbourhood, are recorded in the writings of Dr. Buckland, Mr. Smith of Jordanhill, and Mr. John Craig, mineral surveyor. Dr. Buckland states,[1]—"At Balgray, three miles north of Glasgow, I saw in the year 1824, as there still may be seen, an unequivocal example of the stumps of several stems of large trees, standing close together in their native place in a quarry of sandstone of the coal formation."—These trees have all been removed, but their position was, I believe, nearly on the same geological horizon as the trees found in the sandstone of Gilmorehill quarry. It is therefore interesting to find them scattered over a considerable tract of country.

Portions of stems of *Lepidodendron*, *Sigillaria*, *Stigmaria*, and some obscure impressions of the leaves of plants are found scattered throughout the various sandstones and shales of the quarry, and wherever the coal rests close upon the sandstone or fire-clay, the underlying rock is seen to be penetrated in all directions by the rootlets of *Stigmaria*, affording along with other evidence, clear proof that the various coal-beds have grown upon the spots where we now find them.

The flaggy strata under the second sandstone are very finely ripple-marked, indicating comparatively shallow water for the deposit; and they present us with a beautiful series, in which we can trace upwards all the gradations from a bed of clay shale, into sandy shale and white sandstone.

In connection with the 9-inch seam of coal, we have a very thin black-band ironstone and bituminous shale. These contain some fragmentary remains of fishes, belonging to *Palœoniscus*, *Rhizodus*, etc., along with numerous Entomostraca, which appear to be crushed *Cythere fabulina*. This ironstone I take to be either the second or third band of the Possil series. These vary in character and thickness in many parts of the district; in some places being good workable ironstones, in others replaced by free coal, gas coal, or bituminous shale, with only a thin rib of ironstone. According to the various tables that have been given of the strata of the Glasgow district, the Gilmorehill beds may be placed with all probability in the lower portion of the Possil coal series, or about 510 fathoms under the upper red sandstone. They correspond with the coals of the Carluke district that overlie the cannel

[1] Anniversary Address to Geological Society, 1840.

coal, this coal being believed to be the equivalent of the Knightswood and Skaterig gas coal of this district, the position of which is three fathoms under the Possil lower ironstone.

In former years, the gas coal in the Gilmorehill section seems to have been worked to some extent in the adjoining grounds, as in proving the extension of the sandstone to the east-ward, they came upon some of the old coal workings in the bores, the worked out seam being found from 40 to 50 feet from the surface.

As the coals of the Possil series are of excellent burning quality, some of the seams are still worked in the district on their own account, others in connection with some of the black-band ironstones. In the quarry, the various coal seams afford an abundant supply of fuel to the contractor, Mr. Thompson, for the engines employed at the quarry and the New Buildings.

The main seam of coal in the Possil series is in some parts of the district three feet in thickness, in others it is much thinner. This variation also occurs in the uppermost of the black-bands, which at Hilton farm pit, east of Possil marsh, is from four to six feet, while in the greater part of the district it is only six or eight inches.

The sandstone of the Gilmorehill quarry is a whitish fine-grained rock, compact in texture, streaked at intervals with carbonaceous matter, and parted in the various beds by very thin layers of clay shale, which causes it to be easily split up into blocks of solid rock from one to three feet in thickness. It seems to be as durable as any of the other sandstones of the Glasgow district, and is very largely employed in the erection of the New Buildings, near which it is situated very conveniently—200 tons, on an average, being extracted from the quarry every working-day.

The Boulder-clay that overlies the strata at the quarry, and caps the crown of Gilmorehill, belongs to that great wide-spread deposit, which covers the country around Glasgow to such a depth at many places. It increases in thickness from the quarry to the crown of the hill, where it has been bored to the depth of seventy feet; the valley of the Kelvin between the hill and the adjoining West-end Park being scooped out for nearly its whole depth in the Till.

It contains great numbers of rounded, angular, and striated stones. A few of the largest boulders, varying in weight from one to two tons, were found lying at depths of from ten to twenty feet in the Till, but the great majority are of much less weight.

On the removal of the Till from the upper bed of sandstone in the quarry, its surface was seen to be very finely striated, the striæ running from a few points south of west to north of east, which is nearly the average direction in which the great ice-sheet passed over the Glasgow district.

During the levelling operations on the crown of the hill, and the cutting out of the deep foundations for various portions of the New Buildings, excellent opportunities were afforded of studying the structure of the Till and its boulders on this portion of the grounds, some two or three hundred tons of the largest stones having been laid aside in heaps, to be afterwards used for macadamizing purposes.

In these boulder heaps, examples may be selected of nearly all the typical rocks known to exist in the west and north-west of Scotland. During the last year, I have formed a collection of 200 dressed specimens of the most distinct varieties found on the crown of the hill. These I have placed in the Hunterian Museum of the Glasgow University, so that after it is removed to Gilmorehill, the collection will form a sort of memorial of the great variety of travelled rocks found on the site.

It may be interesting to note shortly the principal varieties embraced in this collection, as stated in the following list:—

Granite, 9 varieties, - - - - - - -	Very rare.
Gneiss, 3 vars., - - - - - - - -	Do.
Micaceous and Chloritic schists, 8 vars., - -	Rather rare.
Quartz rock and Quartzite, 14 vars., - - -	Do.
Grauwacke or quartzose Silurian schists, 12 vars.,	Common.
Metamorphic limestone, 2 vars., - - - -	Very rare.
Old red sandstone, 12 vars., - - - -	Common.
Carboniferous sandstone, 12 vars., - - -	Very common.
Carboniferous limestone, 10 vars., - - -	Rather rare.
Carboniferous clay-band ironstone, 5 vars., -	Common.
Carboniferous black-band ironstone, 1 var., -	Rare.
Red felstone porphyry, 4 vars., - - - -	Very rare.
Purple and greenish grey porphyritic felstone, 24 vars., - - - - - - -	Very common.
Greyish-white compact felstone, 4 vars., - -	Rare.
Diorite—greenstone and greystone, 20 vars., -	Common.
Basalt, and porphyritic basalt, 4 vars., - -	Rare.
Amygdaloidal felstone (some porphyritic), 28 vars.,	Common.
Trappean volcanic ash, 4 vars., - - - -	Very rare.

Besides the varieties mentioned in the above list, there are one or two specimens of jasper, hornstone, and several other rocks

of a sort of nondescript character, which do not strictly belong to any of the above groups, but which I collected from their peculiarity. More than two-thirds of the boulders are sandstones and trap, the largest met with being boulders of a greenish-grey felstone porphyry. The greater bulk are more or less rounded on their edges, and as a general rule, those which seem to have come from the greatest distances, as the granites, red felstone porphyries, and quartzites are very much water-worn and rounded. They suggest the idea of their having been water-worn boulders, either scattered over the face of the country, or lying in river beds, before they were transported by ice agency into this district. During their passage in the ice-sheet over the face of the country, they may have received much of their present polish and striation, but it could not have been the agent that gave them their rounded form.

The Boulder-clay as seen in the deep cuttings on Gilmorehill and at other points in this district, is a very stiff, stony formation, of a brownish-grey colour on the top, and gradually deepening to a black or bluish-grey at the bottom of the deposit. This change in colour is due, I think, to the oxidation by atmospheric action of the ferruginous rocks in the Till as the deposit nears the surface. It is entirely devoid of anything like stratification, and on Gilmorehill there have been no beds of stratified sand or other materials observed in any part of the cuttings. This latter phenomenon is found to be of very rare occurrence in the true Boulder-clay of this district lying above the present sea-level.

I am inclined to view the Till of the low-lying districts of central Scotland, as a marine deposit, spread over submerged, glaciated tracts of the present land-surface—then forming part of the sea-bottom,—from the successive melting of rubbish-laden ice, as it kept continually moving sea-wards from the higher levels of the country, rather than as a deposit resulting from the melting of the same ice over tracts of land lying above the sea. My reasons for holding this view in opposition to the latter opinion, are, that the Boulder-clay has been found in the Kilmaurs and Endrick valleys, lying over sand and claybeds containing arctic shells, while in numerous other localities in the west of Scotland, the Till is found to be overlaid by similar deposits, with arctic shells. The first case proves clearly I think, that these valleys were under the sea when the Till of those districts were deposited, and in the latter case, that the lower tracts of the Till could not have been above the sea when the arctic

shell beds of the Clyde valley were laid down over it. Besides, if we closely examine the composition of the Boulder-clay in this district, we find that nearly one-half of its bulk is composed of a clay so fine in its character, that the greater portion floats away in the washing, as an impalpable mud.

Had the Till been left as a deposit from rubbish-laden ice, melting over tracts above the sea-level, I would not then have expected it to contain in its composition all the elements of the finest glacier mud, for the melting of the water in the ice-sheet would naturally carry this mud down to the lowest levels of the country, and spread it out over lake or sea-bottoms as a deposit similar in character to our brick-clays, which have evidently been formed at a later period, out of a rewash of the finest materials composing the Till. The Boulder-clay, as it at present exists, contains all the elements of this glacier mud, mixed up with the boulders and other coarse materials, ground from off the face of the country by the ice-sheet. This rock matter, coarse and fine, seems to have settled down in comparatively still water, over the submerged tracts then covered by the sea, and now forms a very different sort of deposit from the loose moraine matter, seen in some of our Highland glens, which is the debris of later local glaciers, and out of which, the finer materials have been carried, during the escape of the waters, to the lower levels of the country.

On the eastern flank of Gilmorehill opposite the West-end Park, there were to be seen during the cutting of the terraces, several beds of coarse and fine gravel, sand, and brick-clay. They lay some sixty or seventy feet above the present level of the river Kelvin; and, at first sight, it might have been concluded that they were stratified beds in the Boulder-clay like others that are said to occur in the Till of the Kelvin valley north of Glasgow; but in the working of the finer gravel and sand beds for building purposes connected with the New Buildings, it was clearly seen, that they only flanked the outer border of the Till, and at no point higher up the hill were they ever seen to be covered by that deposit. The beds are evidently a rewash of the various materials composing the Till, and must have been laid down in water, when the land stood 100 feet or more lower than it does at present under the sea, and before the channel of the Kelvin was scooped out to its present depth.

Before closing this paper, I may remark, that to those members

who have never had an opportunity of seeing coal-beds lying in their natural position, with their accompanying strata of sandstone and shale, an early visit to the instructive section in Gilmorehill quarry, would, I am sure, afford them pleasure, as it is one of the best examples that I know in this district, of a condensed section, as it were, of the strata forming the typical coal measures of this country. As the quarry is being filled up, it will soon lose much of its interest; and as the New Buildings near completion, the whole of the sections and other cuttings that have called forth these remarks, will be entirely obliterated on the face of the hill.

LIST OF FOSSILS FROM THE POSSIL AND GOVAN SERIES.

(Upper Series)—Possil Upper Coals and Ironstones.

PLANTÆ.

Species.	*Modes of occurrence and localities.*
Lepidodendron elegans, *Brongn.*	In ironstone and shale, Bishopbriggs and Cadder pits.
——— ——— obovatum, *Sternb.*	Crushed specimens in ironstone and coal, Do. do.
Sigillaria organum, *Lindley.*	Crushed specimens in coaly shale, Do. do.
——— reniformis, *Brongn.*	Crushed specimens in coaly shale, Do. do.
Stigmaria ficoides, *Brongn.*	In sandstone and shale, do. do.

CRUSTACEA.

Cythere Rankiniana, *J. & K.*	In black-band ironstone, Bishopbriggs.
——— fabulina, *J. & K.*	Dwarf variety in stem of *Lepidodendron*, Cadder pits.
——— pungens, *J. & K.*	Rare; black-band ironstone, do.

PISCES.

Rhizodus Hibberti, *Ag.*	Rare; single teeth in shale, Cadder pits.
Megalichthys Hibberti, *Ag.*	Rare; single scales, do.
Palæoniscus, *sp.?*	Single scales, etc., do.
Gyrolepis?	Portions of jaws, scales, etc., supposed to belong to a small undescribed species of this genus, Bishopbriggs pits.
Diplodus gibbosus, *Ag.*	Rare; in shale, do.

(MIDDLE SERIES)—POSSIL LOWER COALS AND IRONSTONES.

PLANTÆ.

Lepidodendron elegans, *Brongn.*	In sandy shale Gilmorehill quarry.
——— gracile, *Lindl.*	Do. do. Cowcaddens quarry.
Sigillaria, *sp.?*	Erect stumps in sandy shale, Gilmorehill quarry; crushed specimens at all the pits.
Stigmaria ficoides, *Brongn.*	Gilmorehill quarry, and all the pits, in sandy shale.

CRUSTACEA.

Cythere Rankiniana, *J. & K.*	In bituminous shale, Possil pits.
——— fabulina, *J. & K.*	Do. do., Gilmorehill quarry.
Estheria?	Small bivalve shells striated concentrically, doubtfully referred to this genus. In shale, Possil pits.

BRACHIOPODA.

Lingula squamiformis, *Phill.*	Very abundant, of large size, but imperfectly preserved, in a coaly black-band ironstone, Possil pits, etc.

PISCES.

Rhizodus Hibberti, *Ag.*	In sandstone and shale, Gilmorehill quarry. Large teeth and portions of jaws in black-band, Possil pits, etc.
Cœlacanthus?	Single scales in shale, Gilmorehill quarry, doubtfully referred to this genus.
Acanthodes sulcatus? *Ag.*	Very rare, black-band, Possil pits.
Palæoniscus Robisoni, *Hibbert.*	In bituminous shale and black-band, Possil pits.
——— striolatus, *Ag.*	Do. do. do.
——— Duvernoyi, *Ag.*	Specimens with concentrically striated scales, have been doubtfully referred to this species, Possil pits.
———	Other species of this genus not yet determined occur in the Possil pits, and scattered scales in Gilmorehill quarry.
Gyrolepis?	Jaws of seemingly the same fish as that found in the Possil upper series, black-band, Possil pits.
Gyracanthus formosus, *Ag.*	Very rare, black-band do.
Ctenodus, *sp.?*	Do. do.

(LOWER SERIES.) GOVAN IRONSTONES.

PLANTÆ.

Dadoxylon, *sp. ?*	Portion of stem showing finely preserved woody structure; Govan ironstone, Dalry pits.
Lepidodendron, *sp. ?*	Crushed specimens very common; Dalry pits.
Sigillaria, *sp. ?*	Do. do.
Stigmaria ficoides, *Brongn.*	Found at nearly all the pits.

CRUSTACEA.

Pygocephalus Huxleyi, *Woodward.*	In clay, ironstone nodule; from shale above Govan ironstone; Inkerman pits, near Paisley.
Leperditia Youngiana, *J. & K.*	In dark grey shale, Govan series; Dalry.

BRACHIOPODA.

Athyris ambigua, *Sow.*	In bed of grey shale full of marine shells, overlying the Govan ironstone; Inkerman pits, near Paisley.
Productus semireticulatus var. *Sow.*	Very abundant; do.
——— costatus var. muricatus, *Phill.*	Rather rare; Do. do.
Lingula squamiformis, *Phill.*	Very abundant in a semi-bituminous shale at Inkerman, Govan, and other pits on this horizon throughout the district.
——— mytiloides, *Sow.*	Common on this horizon at Dalry.

LAMELLIBRANCHIATA (MONOMYARIA).

Aviculopecten alternatus, *M'Coy.*	Grey marine shale, Inkerman.
Pinna spatula, *M'Coy.*	Do. do.

LAMELLIBRANCHIATA (DIMYARIA).

Axinus orbicularis, *M'Coy.*	In semi-bituminous shale, Inkerman pits; Govan pits.
Cypricardia, *sp.* ?	Do. do.
Edmondia rudis, *M'Coy.*	Grey marine shale, Inkerman pits.
Sanguinolites (?) plicatus, *Portl.*	Do. do.
Myalina, *sp.* ?	Govan series, Knightswood pits, and Inkerman.
Myacites sulcatus, *Flem.*	Do. do.

GASTEROPODA.

Dentalium priscum, *Goldf.*	Grey marine shale,	Inkerman
Loxonema scalaroidea, *Phill.*	Do.	do.
Macrocheilus imbricatus, *Sow.*	Do.	do.
Murchisonia striatula, *De Kon.*	Do.	Govan pits.
Naticopsis Omaliana, *De Kon.*	Do.	Dalry pits.
Eulima Phillipsiana, *De Kon.*	Do.	do.
Pleurotomaria granulata, *De Kon.*	Do.	Inkerman pits.

GASTEROPODA (NUCLEOBRANCHIATA).

Bellerophon decussatus, *Flem.*	Grey marine shale;	Dalry pits.
——— Dumontii, *D'Orb.*	Do.	Inkerman pits.
——— Urii, *Flem.*	Do.	do.

CEPHALOPODA.

Nautilus tetragonus, *Phill.*	Do.	do.
Orthoceras attenuatum, *Flem.*	Do.	do.
Goniatites, *sp. ?*	Govan ironstone;	Dalry pits.

PISCES.

Rhizodus Hibberti, *Ag.*	Teeth and portions of jaws, do.

NOTE.—The foregoing list embraces all the organisms that I know to have been found in the Possil and Govan coal and ironstone series, but I have hopes of the list being extended, when a more exhaustive search is made amongst the various beds passed through in the sinking of new pits, or amongst the waste shale heaps at the pit mouths, which is the only opportunity we have of obtaining fossils from this group of strata.

XIX. *Notes on the* OCCURRENCE OF SEEDS OF FRESHWATER PLANTS AND ARCTIC SHELLS, *along with the remains of* THE MAMMOTH AND REINDEER, *in beds under the* BOULDER-CLAY *at* KILMAURS. By Messrs. JOHN YOUNG *and* ROBERT CRAIG.

(Read April 1, 1869.)

THE remarks which we have to bring before the Society this evening are upon certain organisms recently found in strata that underlies the Boulder-clay at Kilmaurs, near to Kilmarnock. Ever since the discovery, in the year 1816, of the remains of the Mammoth, *Elephas primigenius*, and the Reindeer, *Cervus tarandus*, at the Woodhill quarry, Kilmaurs, these beds and their remains have