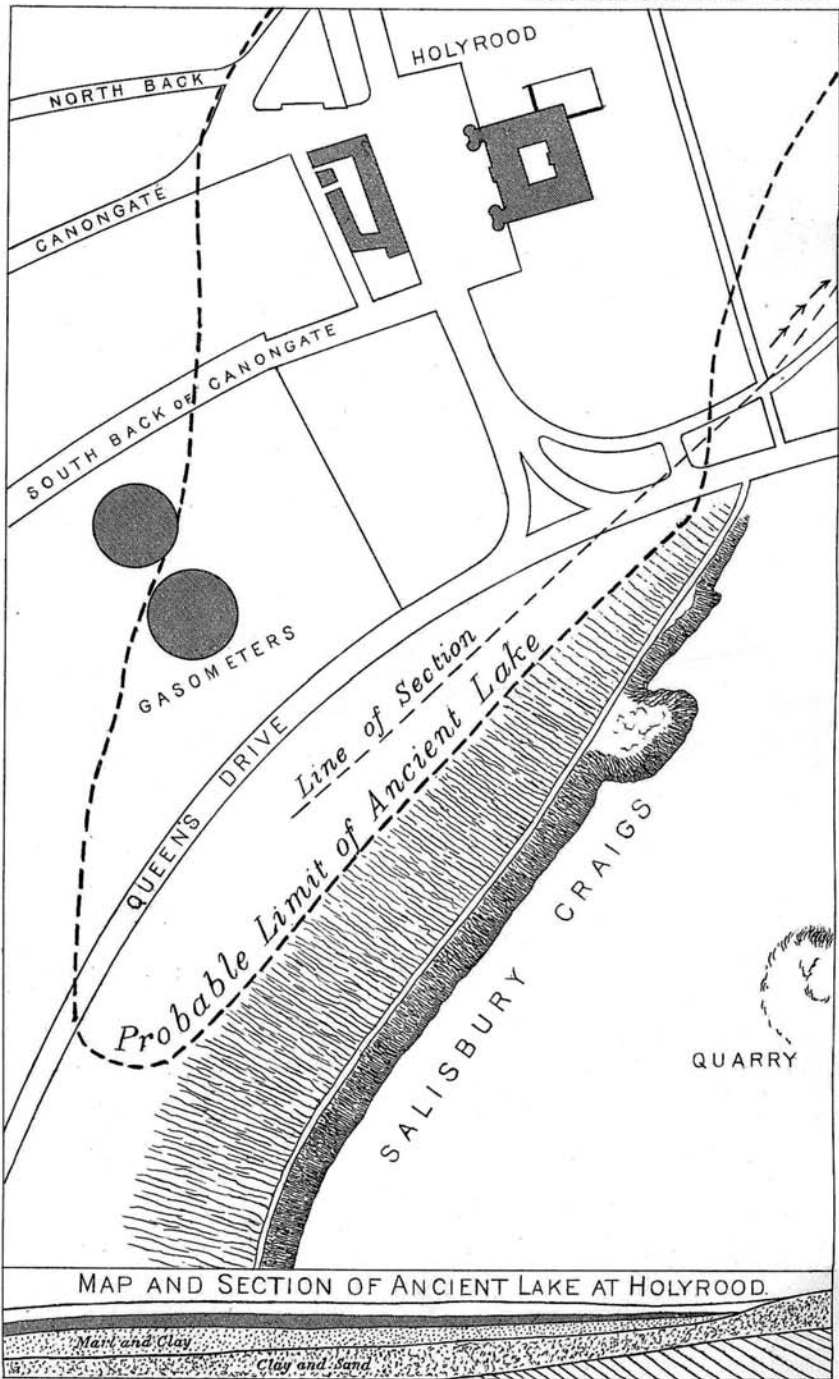


XL.—*On Sections exposed in making a Drain through the Queen's Park at Holyrood.* By JOHN HENDERSON, F.G.S.E. (Plate XV.).

(Read 17th February 1887.)

FOR several months past operations have been going on in making a large drain to take the place of one that already exists in the Queen's Park from the foot of Arthur Seat to the north end of the Park at Spring Gardens. When I first saw the excavations they were being carried across the park at the back of Holyrood Palace towards the north end of Salisbury Crags. The cutting for the drain when I first saw it was about 20 feet deep, mostly through sand, gravel, and boulder clay, but at the bottom of the section beds of the lower carboniferous rocks were exposed to a depth of about 5 or 6 feet. These consisted of brown, blue, and greenish shales, and thin beds of cherty sandstone dipping to the east-north-east at about 12 deg. They were exposed in this cutting for about 200 yards, and within a few yards of the north-east corner of the palace garden-wall several thin beds of black shale were exposed containing entomostraca and fragments of fish remains. The entomostraca, which were crowded in some of the layers of the shale, I submitted to Mr John Young of the Hunterian Museum, Glasgow, who identified them as belonging to two forms known in the carboniferous—viz., *Cythere superba* and *Beyrichia subarcuata*. Mr Young tells me that the first has been got in the shales north of Pittenweem and Craigkelly Quarry, Fifeshire, and at Oakbank sandstone Quarry, Linlithgowshire. The other, he says, is the first entomastracan that appears in the lower carboniferous of the east of Fife.

The fish remains have been identified by Dr R. Traquair of the Edinburgh Museum of Science and Art, as *Cosmoptychius striatus*, found both in the Wardie shales and the Burdiehouse strata. Other fragments belong to the genera *Elonichthys* and *Rhadinichthys*, and to species of lower carboniferous age. The occurrence of fish remains with abundance of entomostraca in beds of the lower carboniferous of the Edinburgh district is not uncommon, but the finding of such beds in this locality is rather interesting. If these beds continue in their line of strike in a south-easterly direction for a short distance, they ought to pass into the hill on the back of Salisbury Crags, and consequently belong to the beds that lie between the Crags and the



Hunter's Bog. In that case these fish and entomostracan remains will be the first fossils of the kind found in the Arthur's Seat series of rocks that have been identified with known carboniferous species.

From the north end of Salisbury Crags the cutting is carried southwards between the south wall of the palace garden and the roadway as far as the entrance to the Park at Holyrood, and although no carboniferous rock has been exposed in this portion of the cutting, yet a very interesting section of a much more recent series of deposits is to be seen there at present.

From the south-east corner of the palace garden wall beds of loose clayey sand, with boulders in the lowest portion, were cut through to a depth of about 18 feet, and at the gate in the south wall of the gardens thin beds of peat marl and clay rested on this sand. These beds gradually thickened till at the north-east corner of the roadway that enters the park from Holyrood the following section is to be seen—first 5 or 6 feet of artificial deposit, then about a foot of brown peaty clay, below this a bed of peat 12 inches in thickness, then marl 12 inches; beneath the marl, brown clay 18 inches; then blue clay 2 feet, resting on loose clayey sand. In front of the roadway that enters the park, a section about 50 yards long has been opened up, exposing the peat and marl. Here there is between 3 and 4 feet of artificial deposits, containing fragments of pottery, oyster-shells, and bones; below this a black, earthy mould 18 inches thick, with occasional fragments of pottery, oyster-shells, &c.; then a brown peaty clay, 18 inches, resting on the peat, which is here 18 inches thick. Beneath this the marl was exposed to a depth of over 2 feet, but the underlying beds were not exposed, as the drain shallowed rapidly and was stopped a short distance beyond this section. It is evident from the thickening of the peat and marl southwards that a considerable extent of these deposits occupies the valley that lies round the base of Salisbury Crags at their northern end, and this is borne out by the fact that peat and marl were exposed in excavating for the foundation of a gasometer about 300 yards south-west from where the drainage operations have been stopped. The sections exposed while excavating for the gasometer were described by Mr Andrew Taylor, in a paper read before this Society on 21st February 1884. The sections then exposed prove that the peat and marl extend at least 300 yards southwards from Holyrood, and this is not extraordinary, for the surface of the ground rather falls in that direction for that distance.

The marl contains abundance of fresh-water shells, principally *limnea*, *valvata*, and *cyclas*. The same genera are abundant in the marl of the Meadows and other silted-up lochs in the

neighbourhood, and the same species live in the lochs around Edinburgh at the present time. These facts go to prove that an extensive loch existed round the base of the northern portion of Salisbury Crag, and that in very recent geological times. Of its extent we can only form an approximate estimate. The ground around the foot of the Crag, from Holyrood to the foot of Arthur Street, is nearly level, and from the foot of the Crag to beyond Holyrood Palace is the same, and it is not unlikely that the peat and marl may occupy all that district. If so, a loch as large as Duddingston Loch is at the present time, must have occupied the valley in front of the northern portion of Salisbury Crag. That its silting-up is of comparatively recent date I have no doubt, from the fact that so far as the beds have been exposed, very little natural deposit lies on the peat and marl, and there are many people who can remember when a marsh existed round the base of Salisbury Crag.