The Archæology of Scotland.[1]

By Sir GEORGE MACDONALD, K.C.B.

THE first movement towards an organised study of Scottish antiquities dates from the last quarter of the eighteenth century. The Society of Antiquaries of Scotland was founded in 1780, and with it there came into existence what is now the National Museum. The leading spirit in the enterprise was David Erskine, eleventh Earl of Buchan. If we may trust Sir Walter Scott, who characterised him as "a person whose immense vanity, bordering on insanity, obscured, or rather eclipsed, very considerable talents," Lord Buchan was not altogether a promising sponsor for the infant science. But at this distance of time we may forgive his eccentricities and honour his memory for the substantial service which he rendered to our common cause.

In point of fact, it was probably the first president's very vanity, so severely stigmatised by Scott, that inspired William Smellie to produce his full contemporary 'Account' of the origin of the Society and its Museum with a list, or rather lists, of acquisitions. Lord Buchan's speeches and letters, which are there to be found verbatim, show plainly how limited was the archæological horizon of the age. Thus in his inaugural address, which maps out the field of the new Society's activities, he states explicity that the starting-point must be "the period of the Roman attempts to subjugate the northern parts of Britain." The monuments which we call prehistoric, but which in those days were called Druidical, "the Cairn, the Mount of Earth, Four Gray Stones covered with Moss"—I am quoting his own words—he attributes to the time of Ossian, and Ossian and his heroes he supposes to have lived in the reign of Caracalla. It is quite consistent with such a perspective that, after a gift of twenty pounds in cash, the first recorded donation to the Museum should have been "a quantity of Roman arms, consisting of twenty-three pieces of the heads of hasta and jaculum, twenty pieces of the blades, and nine of the handles of the gladius and pugio; a ring, three inches in diameter, fastened to the end of a staple; and a mass of different pieces of these arms, run together by fire, all of brass." It is not easy to realise that the objects masquerading in this classical garb are the contents of the well-known Bronze Age hoard which was dredged from the marl at the bottom of Duddingston Loch. Bronze Age weapons, indeed, are systematically labelled 'Roman' in the official record. Nor was it only to weapons that the epithet was applied. The relics of a Bronze Age interment figure as "an antient sacrificing ax of Roman brass . . . antient Roman cinereal urns . . . and pieces of burnt Roman bones." That is typical. The men of the Stone Age fare even worse. One or two perforated axe-heads of stone do appear in the catalogue, but they stand cheek by jowl with *lusus naturæ* like "a chicken preserved in spirits, having two heads conjoined laterally at the back of the skull." They are entered, too, under the old-fashioned name of "purgatory hammer," an echo of the popular belief that the purpose of placing such objects in graves was to equip the spirit of the dead with an instrument which should be sufficiently heavy to ensure a prompt response to his knocking at the gate of the after-world. Yet, despite the quaintness of these first beginnings, the institution thus cradled has developed, within a century and a half, into one of the finest archæological collections in Europe. The Earl of Buchan and his friends had builded better than they knew.

The story of our National Museum of Antiquities is a parable. It reflects the process by which, in every European country, the dilettante was transformed into the scholar, the antiquary into the archæologist. There are no general features which can be said to be peculiar to Scotland. *Honoris et pietatis causa*, however, mention must be made of one conspicuous figure. In retrospect, Dr. Joseph Anderson towers head and shoulders above the whole of his contemporaries. He was in charge of the National Museum for the long period of forty-three years, and the present collections are, in large measure, the fruit of his energy and discriminating zeal. But he did much more than merely stimulate their growth. He used them as material for that invaluable compendium of Scottish archæology which he embodied in his successive series of Rhind Lectures, the first of which was delivered so long ago as 1879. The intervening period has added much to our knowledge, so that, in the light of the fresh information now available, the details require to be corrected here and there. More frequently they merely require to be supplemented.

The pre-history of Scotland has much in common with the pre-history of other areas; but the country also contains groups of monuments and classes of archæological objects to which no parallel can be adduced from any other part of the world. Scotland, in a word, has an archæology of its own. The Scottish brochs, for example—those strange towers of dry-built stone with chambers in the thickness of the wall and no opening towards the outside save a very narrow doorway—are peculiar to the area. Scarcely less characteristic is one of the principal varieties of Scottish earth-house. Similarly the so-called 'Pictish' symbols on the sculptured stones stand quite alone, as do the heavy silver chains on which they occasionally appear, and the massive bronze armlets and carved stone balls of a somewhat earlier age.

Finally, as regards the archæological material generally, Scotland enjoys in one important respect a distinct advantage over her southern neighbour. Her medieval monuments may always have been relatively few and inconspicuous. Certainly her castles and her abbeys and her cathedrals have too often suffered grievously from hands that were

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bent on malicious and wilful destruction. But her prehistoric remains are extraordinarily numerous and, ruinous as the condition of many of them is, they are not seldom sufficiently well preserved to offer a rich field for scientific investigation.

The first thing needful is a proper survey of the ground. That is being carefully, if slowly, carried out by the Ancient Monuments Commission, which has already dealt with several of the districts that are of most interest to the student from the prehistoric point of view. The reports on Sutherland, Caithness, Galloway, Skye, and the Outer Isles have all been published. Orkney and Shetland are under examination now. Argyll and Bute, Aberdeen and Kincardine, Peebles and Roxburgh will follow in due course. When these have been completed, a long step forward will have been taken. But something more than a proper survey is required; it should be accompanied by systematic and well-directed excavation.

It has been calculated that in Aberdeen and Kincardine alone there are some 200 stone circles. These, of course, are of the Bronze Age. Equally worthy of note is the abundance of remains belonging to the Early Iron Age. Thus the Inventories of the Royal Commission actually register as many as 67 brochs in Sutherland and no fewer than 145 in Caithness. If the pottery and chambered cairns of the Neolithic Period are less spectacular, they are scarcely less remarkable. In a word, it is not open to doubt that, in the days before history began, the north of Scotland and the Western and Northern Islands carried a population that was relatively very numerous. The contrast with the scene of desolation which they now present is often very striking.

The solitude of to-day is easy enough to understand. It is the density of population in prehistoric times that calls for explanation. I believe that the key will be provided by geography. That means distribution-maps. As yet our supply of these is far from adequate. Imperfect as it is, however, it may prove sufficient for our present purpose, more especially as we can fortify ourselves by an appeal to the sister-science of history.

Nowadays the vast majority of those who invade the Highlands and Islands approach them by way of southern and central Scotland. In prehistoric times that avenue was barred. The Caledonian Forest, which spread far southwards into what we regard as the Lowlands, must have been an impenetrable obstacle. The early immigrants arrived by sea and reached the mainland via the Western Islands. This implies that they came from Ireland, and that it is in Ireland that the roots of Scottish prehistoric civilisation must be studied. At the moment, however, we are concerned not with studying the roots, but merely with establishing a connexion between them and the full-grown plant. In other words, all that is necessary is to satisfy ourselves as to the set of the current of migration. It is significant that so late as the dawn of the historic period it was flowing strongly towards the north and east. The Scots themselves were, of course, incomers from Ireland and, if we can trust Continental analogies regarding the movement of peoples, we may assume that the foundation of the kingdom of Dalriada was preceded by a prolonged process of gradual infiltration. I have more than a suspicion that the troubles which the Romans experienced, and in particular the restlessness which compelled them to abandon the Forth and Clyde wall, were in no small measure due to the encouragement which the turbulent natives received from the passage of a steady stream of reinforcements across the narrows of Stranraer.

The case for migration from Ireland in prehistoric times rests upon a basis more stable than analogy. Further excavation and an ampler supply of distribution-maps are needed to make it complete, particularly for the Neolithic Period. The evidence however, is already considerable enough to furnish what may perhaps be accepted as convincing proof. Some years ago Mr. A. O. Curle, in his Rhind Lectures, directed attention to the testimony supplied by cup-and-ring markings. Such markings are recorded as occurring in twenty counties—Wigtown, Kirkcudbright, Roxburgh, Berwick, Ayr, Bute, Argyll, Dumbarton, Lanark, Mid and West Lothian, Peebles, Fife, Clackmannan, Perth, Forfar, Ross, Aberdeen, Sutherland, and Caithness. The Royal Commission's survey of North Uist and Benbecula enables us to add Inverness to the list. But, for the proper interpretation of the record, Mr. Curle went on to say, we must have regard to the number of examples that have been noted in each of the various countries. The poverty of the three shires that march with England—Berwick a single example, Roxburgh two, Dumfries none at all—precludes the idea that the folk responsible for these mysterious sculpturings entered Scotland by crossing the border. On the other hand, the area in which the markings are found in greatest number and with the greatest variation of device and complexity of design, is exactly the region that lies over against Ireland—the coastal districts of west and south-west Scotland. They abound in Wigtown and Kirkcudbright, and are still more common in Argyll. As they are also frequent in Ireland, the inference seems plain.

Cup-and-ring markings, in Scotland at least, must be associated with the phase of culture that was distinguished by the use of bronze. To discover what happened during the phase that succeeded it, we may turn to the brochs. At the outset it has to be admitted that the broch was not imported from Ireland. There are no brochs in Ireland. The broch is a purely Scottish creation, evolved on Scottish soil. Nevertheless, it is scarcely possible to doubt that it was from the shores of Ireland that the ancestors of the broch-builders originally came. They certainly did not make their way into Scotland across the border, any more than did the men who carved upon the rocks those mysterious cups and rings. There are no brochs at all in Dumfries or in Roxburgh. It is true that Berwick, Selkirk, and Midlothian can boast of one apiece. But that is a paltry display compared with Orkney's 70 and Shetland's 75. Nor is it only their rarity in the south that is

significant. The three sporadic examples I have named seemed to show the characteristic features of this type of structure already fully developed. The broch did not spring full-grown from the brain of some architectural genius of the prehistoric period; it was the outcome of a slow process of evolution. The southern brochs can only have been built by intruders from the north.

We may go further. Seventeen or eighteen years ago, in surveying Sutherland and Caithness for the Royal Commission, Mr. Curle noted certain points which seemed to him to indicate a gradual improvement in the type as one moved inland from the western coast, and he saw in this—rightly, as I think—a clue to the drift of the population. His deduction has received remarkable confirmation from the Commission's recently published survey of Skye and the Outer Isles, as well as from the late Dr. Erskine Beveridge's investigations in Tiree. In the insular region we find brochs in reasonable abundance—44 are recorded there by the Royal Commission—but we also find numerous specimens of what can best be described as the broch in the making. The so-called 'semi-brochs' of Tiree, the 'galleried duns' of the Hebrides and Skye, all alike appear to represent experiments in the architectural form which was destined to have its fullest expression on the mainland. As the broch-builders moved farther north and then farther east, they carried with them the fruits of their ripening experience.

The facts of early Scottish history and the inferences as to the Bronze Age and the Early Iron Age are thus in complete accord. They bear out the view—in itself *a priori* probable—that for uncounted generations the trend of migration was from the direction of Ireland through the islands of the west coast to the north of Scotland. We may reasonably assume that an exhaustive examination of the chambered cairns, in continuance of the work carried out with such marked success by Prof. Bryce, would give a similar result for the Neolithic Period.

Once the set of the current has been determined, it is not difficult to understand why regions, where the sheep and the deer now wander at will, should have been thickly populated in prehistoric times. Although the causes that prompted the movements of peoples in those far-off days are obscure, one of the most potent was certainly the demand that would be created for fresh means of subsistence when the mouths to be fed were multiplied. At intervals a surplus of humanity would be spilled from Ireland. In front there stretched but one open road, and that was a *cul de sac*. For, to those who followed this route, northern Scotland was literally the end of the world.

Long afterwards, under the pressure of a similar urge, a similar stream descended from Scandinavia. But the later immigrants came in stout ships, and could at need deflect their course, as they did, to the Faroes, to Iceland, even to Greenland. With the earlier wanderers it was different. When they had reached Unst, they would scan the horizon in vain for any sign of land to tempt their frail craft further. The ocean was an insurmountable barrier. The flow from the south would be brought to a standstill on its shore, and the more nearly that limit was approached, the greater would the congestion of population tend to become. This, I think, is the real secret of the abundance of Scotland's prehistoric remains.

Active Nitrogen.

By C. N. HINSHELWOOD.

IN 1900, E. P. Lewis observed that nitrogen could be stimulated by an electric discharge to emit a bright yellow glow, which continued for some time after the discharge had ceased; he made a number of spectroscopic observations on the glowing nitrogen. The present Lord Rayleigh investigated the phenomenon in a more general and systematic manner, discovered that the glowing gas had remarkable chemical properties, and named it 'active nitrogen.'

Certain important conditions must be observed for its production. The pressure of nitrogen should be a few millimetres of mercury: at higher pressures collisions with ordinary nitrogen molecules apparently destroy the glowing substance. The best procedure is to draw a stream of rarefied nitrogen through the discharge tube by means of a pump. The persistence and gradual decay of the glow in the gas which has left the region of the discharge can then be easily observed. When the discharge is from an induction coil, it should be a 'condensed' discharge, the use of the condenser giving a sudden intense current. The importance of this condition can be seen from the fact that if an uncondensed discharge is passed through the gas rendered luminous by passage through a condensed discharge, the glow is actually destroyed. Finally, the presence of a small proportion of some other gas in the nitrogen is necessary for the production of the luminescence.

At first it was thought that a little oxygen must be present, but methane, hydrogen sulphide, ethylene, and various other substances are equally efficacious. It seems to be generally agreed that a trace of some 'electronegative' gas, that is, a gas which readily takes up electrons to give negative ions, is the essential thing. A few parts per thousand of the foreign gas produce the most intense glow: larger amounts destroy it. In the presence of more than about 2 per cent oxygen, the nitrogen does not glow at all. Rayleigh thought that pure nitrogen still could be made to emit a faint glow, but Bonhoeffer and Kaminsky have shown that it emits none at all.

The glowing nitrogen was shown by Rayleigh to have great chemical reactivity, and also to excite many substances to luminescence. It reacts with acetylene to give hydrogen cyanide, and with mercury to give a nitride. Mixed with iodine vapour, it produces a brilliant blue light. Hydrogen